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POLITY & GOVERNANCE

One Nation, One Election

UPSC Syllabus Relevance

- **GS Paper 2**: Polity – Constitutional Amendments, Election Commission, Federalism
- **GS Paper 3**: Governance – Reforms in Electoral Processes

Key Points
Context:

- o Two Bills, **The Constitution (129th Amendment) Bill, 2024**, and **The Union Territories Laws (Amendment) Bill, 2024**, were introduced to enable **simultaneous elections** to the **Lok Sabha** and **State Assemblies**.

About the Bill:

- o **Panel Formation**: A six-member panel led by **former President Ram Nath Kovind** was formed in September 2023 to examine and recommend strategies for simultaneous elections.
- o **Joint Parliamentary Committee (JPC)**: The Bill has been referred to the **JPC** for detailed examination.
- o **Key Features of the Constitution (129th Amendment) Bill, 2024**:
    - ▪ **Amendment of Articles**:
        - ▪ **Article 83**: Defines the Lok Sabha's duration and introduces provisions for **unexpired terms**.
        - ▪ **Article 172**: Aligns the terms of State Assemblies with the Lok Sabha.
        - ▪ **Article 327**: Expands Parliament's powers to legislate on **simultaneous elections**.
    - ▪ **Insertion of Article 82A**:
        - ▪ Establishes the framework for **simultaneous elections**, including provisions for:
            - ▪ Presidential notification of election timelines.
            - ▪ Curtailed tenures for Assemblies to align with Lok Sabha.
            - ▪ Election Commission's authority to manage and conduct simultaneous elections.

What is "One Nation, One Election"?

- o **Definition**: Holding elections to the **Lok Sabha**, **State Assemblies**, **Panchayats**, and **Municipalities** simultaneously.
- o **History**: Simultaneous elections were held during India's first four general elections (**1952, 1957, 1962, 1967**) but were disrupted due to premature dissolutions post-1967.
- o **Global Examples**: Countries like **South Africa, Sweden, Germany**, and **Britain** conduct simultaneous elections.

Significance of Simultaneous Elections:

- o **Cost Efficiency**: Reduces election-related expenditures for governments and political parties.
- o **Reduced Voter Fatigue**: Avoids frequent elections, improving voter turnout and engagement.
- o **Policy Continuity**: Enables governments to focus on **long-term planning** rather than short-term electoral strategies.
- o **Minimized MCC Impact**: Reduces governance disruptions caused by the **Model Code of Conduct (MCC)**.
- o **Reduced Black Money**: Fewer elections curb the circulation of unaccounted funds.
- o **Public Services**: Limits disruptions to public administration and services during election periods.
- o **National Unity**: Promotes national over regional perspectives in governance.

Challenges of Implementing One Nation, One Election:

- o **Constitutional Amendments**: Requires changes to Articles like **85**, **172**, and **356**, potentially altering the **basic structure** of the Constitution.
- o **Logistical Challenges**: Massive coordination required for security, **EVMs**, and voter management across India.
- o **Federalism Concerns**: May undermine the **federal character** by overshadowing regional issues with national concerns.
- o **Regional Issues Neglected**: National priorities could dominate at the cost of local and state-specific concerns.
- o **Voting Behavior**: Evidence shows voters tend to vote for the same party at both state and national levels, favoring larger national parties.
- o **Feasibility Issues**: Complexities arise if a coalition government collapses, disrupting the synchronized election cycle.

Recommendations of Committees on Simultaneous Elections:

Committee	Recommendations
Law Commission Report (1999)	Supported simultaneous elections to reduce costs and ensure governance stability.
Parliamentary Standing Committee (2015)	Called for consensus on potential constitutional and practical challenges.
NITI Aayog Draft Report (2016)	Recommended synchronized elections to reduce election cycles' burden on economy and administration.
Election Commission (2018)	Highlighted benefits but pointed to significant constitutional and logistical hurdles.

Way Forward:

- o **Align Election Cycles**: Schedule Assembly elections within six months to one year of Lok Sabha elections.
- o **Enhance Transparency**: Bring political parties under the **RTI Act** for accountability.
- o **Strengthen Election Commission**: Expand its role in regulating poll expenditures and ensuring free and fair elections.
- o **Implement IT Tools**: Use **electronic voter IDs** to eliminate bogus entries.
- o **State Funding of Elections**: Explore mechanisms for state funding to reduce money's influence in politics.

Conclusion:

While simultaneous elections offer advantages like cost savings and stable governance, they raise significant challenges related to constitutional amendments, federalism, and logistical execution. Referring the Bill to the JPCprovides an opportunity to address these concerns comprehensively, ensuring a balance between efficiency and democratic principles.

Pardoning Power

UPSC Syllabus Relevance

- **GS Paper 2**: Polity and Governance – Separation of Powers, Judicial Review

Key Points
Context:

- o **U.S. President Joe Biden** recently granted an **unconditional pardon** to his son, Hunter Biden, raising debates over the **misuse** and **ethical implications** of the pardoning power.

About Pardoning Power:

- o **Definition**:
    - ▪ Refers to the authority vested in a head of state or government to grant clemency to individuals convicted of crimes.
- o **Purpose**:
    - ▪ To provide **mercy** in cases where justice may seem too harsh or inequitable.
- o **Types of Clemency**:
    - ▪ **Pardon**: Completely absolves the person of the crime and its penalties.
    - ▪ **Reprieve**: Temporary postponement of punishment.
    - ▪ **Respite**: Reduction of the severity of punishment due to special circumstances.
    - ▪ **Commutation**: Substitution of a punishment with a less severe one.
    - ▪ **Remission**: Reduction in the length of a sentence without changing its nature.

Comparison of Pardoning Powers:

Aspect	U.S. President	Indian President	Indian Governor
Constitutional Provision	Article II, Section 2, US Constitution	Article 72, Indian Constitution	Article 161, Indian Constitution
Applicability	Federal crimes; excludes impeachment	Offenses under Union laws, court-martial, and death sentences	Offenses under state laws; excludes death sentences and court-martial
Time of Pardoning	Before or after conviction	Post-conviction only	Post-conviction only
Level of Discretion	Absolute; no advice needed	Based on Cabinet advice	Based on state government's advice
Types of Pardoning	Pardon, reprieve, commutation, remission, amnesty	Pardon, reprieve, commutation, remission, respite	Pardon, reprieve, commutation, remission, respite
Death Sentence	Can pardon	Can pardon	Cannot pardon; can suspend/remit/commute
Judicial Review	Not subject to judicial review	Subject to judicial review if arbitrary, mala fide, or irrational	Subject to judicial review if arbitrary, mala fide, or irrational

Controversies and Challenges:

- o **Potential for Misuse**:
  - **Political Bias**: Granting clemency to close associates, family members, or supporters undermines its integrity.
    - *Example*: Hunter Biden's pardon raised concerns over personal favoritism.
- o **Ethical Concerns**:
  - Pardoning individuals convicted of **serious offenses** may erode public trust in governance.
- o **Judicial Overreach vs. Executive Discretion**:
  - The judiciary may scrutinize clemency decisions for **arbitrariness** or **mala fide intent**, creating tension between the executive and judiciary.
- o **Lack of Transparency**:
  - Decisions often lack a **clear rationale**, leading to accusations of **lack of accountability**.
- o **Public Perception**:
  - High-profile pardons can lead to **loss of credibility** for the government, impacting its democratic legitimacy.

Way Forward:

- o **Enhancing Transparency**:
  - Establish a **framework** requiring public disclosure of reasons for clemency.
- o **Judicial Safeguards**:
  - Ensure **judicial review** to prevent arbitrary and mala fide pardoning decisions.
- o **Ethical Standards**:
  - Set clear guidelines to avoid **conflicts of interest** in pardoning decisions.
- o **Public Engagement**:
  - Allow public discourse on clemency decisions to enhance **accountability** and **trust**.
- o **Strengthening Institutions**:
  - Empower independent institutions to **advise** the executive on clemency matters.

Conclusion:

While the **pardoning power** is essential for justice and equity, its potential misuse can undermine **public trust** and **constitutional principles**. A balanced approach—combining **executive discretion** with **judicial safeguards** and **ethical guidelines**—is crucial to maintaining its sanctity.

Impeachment of Vice-President of India

UPSC Syllabus Relevance

- **GS Paper 2**: Polity – Parliament, Constitutional Provisions

Key Points
Context:

- o Opposition parties are preparing to move a **no-confidence or impeachment resolution** against the Vice-President of India, who also serves as the **Chairman of the Rajya Sabha**.

Constitutional Provisions:

- o **Article 67(b)**:
  - Outlines the procedure for the **removal of the Vice-President of India**.

Process for Removal:

- o **Initiation of Resolution**:
  - The **removal resolution** can only be introduced in the **Rajya Sabha**, not in the **Lok Sabha**.
- o **Notice Requirement**:
  - A **14-day advance notice** must be given before moving the resolution.
- o **Voting Requirements**:
  - **Effective Majority** in Rajya Sabha:
    - The resolution must be passed by a majority of the **then members**, excluding vacant seats.
  - **Simple Majority** in Lok Sabha:
    - The resolution must also be agreed upon by a **simple majority** in the Lok Sabha.

Conduct During the Resolution:

- o **Chairman's Role During Proceedings**:
  - The **Vice-President (Chairman)** cannot preside over the House while the resolution is under consideration.
  - However, they can:
    - Participate in proceedings.
    - Speak in the House.
    - Take part in discussions.
  - **Voting**:
    - The Chairman cannot vote, even in the first instance.
- o **Contrast with Lok Sabha Speaker**:
  - The **Speaker** can vote in the first instance but **not in case of a tie**.

Historical Precedents:

- o **Deputy Chairman No-Confidence (2020)**:
  - A no-confidence resolution was moved against **Rajya Sabha Deputy Chairman Harivansh** in 2020 for alleged mishandling of farm bills.
  - The resolution was ultimately defeated.
- o **Impeachment Resolutions Against Lok Sabha Speakers**:
  - Examples include:
    - **G.V. Mavalankar** (1951).
    - **Sardar Hukam Singh** (1966).
    - **Balram Jakhar** (1987).
  - All these resolutions were negated by the House.
- o **No Precedent for Rajya Sabha Chairman**:
  - No resolution for **no-confidence or impeachment** has been moved against a **Rajya Sabha Chairman**to date.

Challenges and Implications:

- o **Effective Majority Requirement**:
  - Ensuring a majority in both Houses presents a significant hurdle.
- o **Institutional Integrity**:
  - Any resolution against the Vice-President could affect the **dignity of the office**.
- o **Political Polarization**:
  - Such moves can deepen **parliamentary and political divides**.
- o **Precedent Setting**:
  - The outcome of this resolution could establish a precedent for future cases.

Way Forward:

- o **Adherence to Constitutional Provisions**:
  - All parties should respect the procedure outlined in **Article 67(b)**.
- o **Promoting Dialogue**:
  - Open and constructive dialogue can address concerns without undermining institutional sanctity.
- o **Strengthening Parliamentary Norms**:
  - Ensure resolutions are based on objective grounds, not political vendettas, to preserve **constitutional values**.

Impeachment of Judges

UPSC Syllabus Relevance

- **GS Paper 2**: Polity – Separation of Powers, Judiciary, Accountability Mechanisms

Context:

- o The Opposition in the **Rajya Sabha** plans to move a motion to impeach **Allahabad High Court Judge Justice Shekhar Kumar Yadav** for his alleged remarks at an event.

Instances of Impeachment Attempts:

- o **Justice Soumitra Sen (Calcutta High Court, 2011)**:
  - Faced impeachment on **corruption charges**.
  - Resigned before the Lok Sabha could discuss the motion.

- o **Justice S.K. Gangele (Madhya Pradesh High Court, 2015)**:
  - Impeachment initiated over **sexual harassment allegations**.
  - Cleared by a committee in 2017.
- o **Chief Justice of India Dipak Misra (2018)**:
  - Faced a politically contentious impeachment attempt.
  - Motion rejected by **Rajya Sabha Chairman M. Venkaiah Naidu** at the preliminary stage.

Constitutional Provisions for Judge Removal:

- o **Article 124(4)**:
  - Lays down the procedure for the **removal of Supreme Court judges**.
- o **Article 218**:
  - Extends the provisions of **Article 124(4)** to High Court judges.
- o **Grounds for Removal**:
  - A judge can only be removed for:
    1. **Proven misbehavior**
    2. **Incapacity**
  - The Constitution does not define what constitutes **misbehavior** or **incapacity**.

Impeachment Process:

- o **Initiation**:
  - Requires a motion signed by:
    - **100 Members** of Lok Sabha, or
    - **50 Members** of Rajya Sabha.
- o **Admission by Presiding Officers**:
  - The **Speaker** (Lok Sabha) or **Chairman** (Rajya Sabha) may admit or reject the motion.
- o **Committee of Inquiry**:
  - Upon admission, a **three-member committee** is formed.
  - **Composition**:
    - Chief Justice of India (CJI) or a Supreme Court judge.
    - Chief Justice of a High Court.
    - A distinguished jurist (e.g., **Fali Nariman** during Justice Soumitra Sen's case).
  - **Role of Committee**:
    - Frames charges.
    - Investigates allegations.
    - Conducts cross-examinations and collects evidence.
    - Submits a report to the **Speaker/Chairman**.
- o **House Deliberations**:
  - If the committee finds the judge **guilty**, the House debates the report.
  - Both Houses must pass the motion with a **special majority**:
    - **Two-thirds** of members present and voting.
- o **Presidential Action**:
  - If passed, both Houses address the President, who issues an order for the judge's removal.

Challenges in Impeachment Process:

- o **High Threshold for Removal**:
  - The need for a **special majority** ensures only serious cases reach the final stages.
- o **Ambiguity in Definitions**:
  - Lack of clarity on **"misbehavior"** and **"incapacity"** allows for subjective interpretations.
- o **Lengthy Process**:
  - Multiple stages and procedural requirements make impeachment time-consuming.
- o **Rare Success**:
  - No judge has been successfully impeached in India so far, highlighting procedural and political challenges.

Significance of the Process:

- o **Judicial Accountability**:
  - Ensures accountability for judges without compromising their independence.
- o **Preserving Public Trust**:
  - Upholds faith in the judiciary by addressing allegations of misconduct.
- o **Checks and Balances**:
  - Balances judicial independence with executive and legislative oversight.

National Human Rights Commission (NHRC)

UPSC Syllabus Relevance

- **GS Paper 2**: Statutory, Regulatory, and Quasi-Judicial Bodies

Key Points
Context:

- o Justice (Retd.) V. Ramasubramanian, a former Supreme Court judge, has been appointed as the **Chairperson of the NHRC** by the **President of India**.

About NHRC:

- o **Nature**: A **statutory body** established under the **Protection of Human Rights Act, 1993**.
- o **Purpose**: Protects and promotes **human rights**, which include the right to life, liberty, equality, and dignity.

Composition of NHRC:

- o **Chairperson**: A person who has been the **Chief Justice of India** or a **Judge of the Supreme Court**.
- o **Full-Time Members**:
  - ▪ **Two Members**:
1. A former **Supreme Court Judge**.
2. A former **Chief Justice of a High Court**.
  - ▪ **Three Members**:
    - ▪ Individuals with knowledge or experience in **human rights**, at least one of whom must be a **woman**.
- o **Deemed Members**: Chairpersons of:
  - ▪ **National Commissions for**: SCs, STs, Minorities, Backward Classes, Women, Child Rights, and Persons with Disabilities.

Appointment Process:

- o **Appointing Authority**: President of India.
- o **Selection Committee**:
  - ▪ **Prime Minister** (Chairman).
  - ▪ **Speaker of Lok Sabha**.
  - ▪ **Union Home Minister**.
  - ▪ **Deputy Chairman of Rajya Sabha**.
  - ▪ **Leaders of the Opposition** in both Houses of Parliament.

Tenure and Removal:

- o **Tenure**:
  - ▪ Members serve for **three years** or until they attain the age of **70 years**, whichever is earlier.
- o **Removal**:
  - ▪ Members can be removed by the **President** for reasons such as:
    1. Insolvency.
    2. Infirmity of mind or body.
    3. Conviction of an offense involving moral turpitude.
    4. Misbehavior or incapacity, as determined by an inquiry conducted by the Supreme Court.

Functions and Powers:

- o **Human Rights Monitoring**: Investigates complaints of **human rights violations** or negligence by public servants.
- o **Advisory Role**: Advises the government on the protection and promotion of human rights.
- o **Awareness Campaigns**: Promotes human rights awareness through education, research, and publications.
- o **Inquiry Powers**:
  - ▪ Can summon witnesses, requisition public records, and conduct on-site inspections.

Significance of NHRC:

- o **Accountability**: Holds public authorities accountable for human rights violations.
- o **Safeguards Democracy**: Ensures that rights are respected in governance and administration.

- o **Focus on Vulnerable Groups**: Protects marginalized communities like **SCs, STs, women, and children**.

Challenges:

- o **Limited Enforcement Powers**: NHRC recommendations are not binding.
- o **Resource Constraints**: Insufficient staff and funding hinder efficiency.
- o **Jurisdiction Limitations**: Cannot investigate human rights violations by **armed forces**.
- o **Overlapping Mandates**: Coordination issues with other commissions and institutions.

Way Forward:

- o **Empower NHRC**: Grant binding powers for recommendations to ensure accountability.
- o **Increase Resources**: Allocate adequate funding and human resources.
- o **Expand Jurisdiction**: Include cases involving armed forces while maintaining safeguards.
- o **Strengthen Awareness**: Conduct campaigns to educate citizens about human rights.

Right to Disconnect: Ensuring Work-Life Balance

UPSC Syllabus Relevance

- **GS Paper 2**: Polity – Labor Rights and Human Resource Development
- **GS Paper 3**: Economy – Workplace Reforms

Key Points
Context:

- o The tragic death of an **EY employee** due to overwhelming work pressure has reignited discussions around the **Right to Disconnect** as a labor and human rights issue.

About Right to Disconnect:

- o **Definition**:
  - ▪ Empowers employees to **disconnect from work-related communication** (calls, emails, messages) during **non-working hours**.
  - ▪ Recognizes the detrimental impact of constant connectivity on mental and physical well-being.
- o **Global Foundation**:
  - ▪ Rooted in **Article 24** of the **Universal Declaration of Human Rights (UDHR)**:
    - ▪ States the right to **rest, leisure**, and **reasonable work hour limitations**.

Consequences of Constant Connectivity:

- o **Stress and Anxiety**: Anticipation of tasks raises anxiety levels.
- o **Burnout Risk**: Lack of work-life boundaries increases burnout.
- o **Disrupted Sleep**: Late-night work engagement affects sleep patterns and cognitive functions.
- o **Reduced Job Satisfaction**: Persistent intrusion into personal time fosters frustration and resentment.
- o **Impact on Creativity**: Constant work hampers innovation and mental rejuvenation.

Right to Disconnect in India:

- o **Legal Framework**:
  - ▪ No specific law recognizing the Right to Disconnect.
  - ▪ However, **constitutional provisions** and **judicial precedents** support a conducive work environment:
    - ▪ **Article 21**: Includes the right to life, leisure, and better living standards.
    - ▪ **Article 38**: Directs the state to promote welfare and fairness.
    - ▪ **Article 39(e)**: Protects the health and strength of workers.
- o **Legislative Efforts**:
  - ▪ A **Private Member Bill** (2018) proposed:
    - ▪ Employees' right to disconnect.
    - ▪ Penalties for non-compliance by companies.
  - ▪ No substantial progress yet.

Challenges in Implementation:

- o **Undefined Work Hours**:
  - ▪ Working hours differ by industry and individual roles.
  - ▪ Example: IT professionals often work **45–50 hours a week**, while some advocate for **70-hour weeks**.
- o **Essential Services**:
  - ▪ Professions like healthcare and security require round-the-clock availability.
- o **Global Operations**:
  - ▪ Different time zones complicate enforcement for multinational companies.
- o **Impact on Careers**:
  - ▪ Fear that exercising this right may hinder promotions or incentives.
- o **Technological Dependence**:
  - ▪ Reliance on instant communication creates operational inefficiencies if disconnecting becomes common.

Recommendations from Economic Survey (2023-2024):

- o **Flexibility in Work Hours**: Relax restrictions to accommodate dynamic needs.
- o **Overtime Management**: Extend permissible overtime hours and adjust wages to balance employee and employer interests.

Way Forward:

- o **Clear Work-Life Boundaries**:
  - ▪ Employers should adopt policies limiting after-hours communication.
- o **Flexible Schedules**:
  - ▪ Allow employees to manage work and personal responsibilities effectively.
- o **Promote Breaks**:
  - ▪ Encourage regular time off and breaks to boost productivity.
- o **Cultural Shift**:
  - ▪ Foster an environment where **disconnecting after work** is normalized and encouraged.
- o **Pilot Projects**:
  - ▪ Test right-to-disconnect policies in select industries before nationwide implementation.
- o **Mental Health Support**:
  - ▪ Provide access to wellness programs and counseling for stress management.

The Indian Constitution

UPSC Syllabus Relevance

- • **GS Paper 2**: Polity – Evolution and Functioning of the Constitution, Governance, and Rights
- • **GS Paper 1**: Modern History – Post-Independence Political Developments

Key Points
Context:

- o **November 26, 2024**, marked the **75th anniversary** of the adoption of the **Indian Constitution** by the **Constituent Assembly in 1949**.

Evolution of the Indian Constitution:

- o **At Commencement**:
  - ▪ Initially had **395 articles**, divided into **22 parts** and **8 schedules**.
- o **Current Status**:
  - ▪ Now comprises **448 articles**, **25 parts**, and **12 schedules**.
  - ▪ Recognized as the **longest written Constitution globally**, it adapts to contemporary needs while serving as the foundation of India's democratic and legal framework.

India and Constitutional Governance:

- o **Constitutional Governance**:
  - ▪ Refers to a system where the **authority of the state** is **defined, limited, and regulated** by the Constitution.
- o **India's Journey**:
  - ▪ Rooted in adopting and implementing the Constitution to govern the **political and legal framework**.

How the Constitution Paves the Way for Progress:

- o **Political Dimensions**:
  - ▪ **Primary Source of Authority**: Empowers **Parliament and State Legislatures** to enact laws.
  - ▪ **Rule of Law**: Ensures **equality before the law** and declares no one is above it.
  - ▪ **Separation of Powers**: Balances the **legislature, executive, and judiciary**.
  - ▪ **Electoral Integrity**: Institutions like the **Election Commission** uphold **free and fair elections**.
  - ▪ **Amendability**: Flexible provisions under **Article 368** enable adaptation to societal changes.
- o **Economic Dimensions**:
  - ▪ **Directive Principles of State Policy (DPSP)**:
    - ▪ Shape welfare policies like **MGNREGA** and **Right to Education**, aligning with **Articles 39 and 45**.
- o **Social Dimensions**:
  - ▪ **Fundamental Rights**: Protect freedoms and individual liberties.
  - ▪ **Secularism**: Ensures **equal treatment** of all religions.
  - ▪ **Affirmative Action**: Empowers marginalized groups under **Articles 15 and 16**.
- o **Judicial Dimensions**:
  - ▪ **Integrated Judiciary**: Single system to administer Union and State laws.
  - ▪ **Judicial Review**: Ensures government actions align with the Constitution, protecting citizens' rights.

Achievements Over 75 Years:

- o **Political Empowerment**:
  - ▪ **Democratic Elections**: Largest democracy with 96.88 crore registered voters for **2024 General Elections**.
  - ▪ **Decentralization**: **73rd and 74th Amendments** empowered **Panchayati Raj Institutions** and **Urban Local Bodies**.
- o **Economic Development**:
  - ▪ **Poverty Reduction**: Multidimensional poverty fell from **29.17% (2013-14)** to **11.28% (2022-23)**.
  - ▪ **Industrial Growth**: India ranks **5th in global GDP** in 2024.
- o **Social and Rights Advancements**:
  - ▪ **LGBTQ+ Rights**: Decriminalization of **Section 377** (Navtej Singh Johar case, 2018).
  - ▪ **Minority Rights**: Strengthened under **Article 30**.
  - ▪ **Judicial Interpretations**: Expansion of rights, e.g., **Right to Privacy (2017)** and **Right to Education (86th Amendment)**.

Challenges to Constitutional Institutions:

- o **Diminished Parliamentary Role**:
  - ▪ Decline in annual sittings from **135 days (1st Lok Sabha)** to **55 days (17th Lok Sabha)**.
- o **Political Interference**:
  - ▪ Attempts to influence bodies like the **Election Commission** and judiciary undermine their independence.
- o **Judicial Pendency**:
  - ▪ Delays due to case backlogs; overreach into executive or legislative domains raises concerns.
- o **Technological Risks**:
  - ▪ Cybersecurity and misinformation threaten processes like elections.

Way Forward:

- o **Preserve Institutional Independence**: Transparent appointments for key constitutional bodies.
- o **Strengthen Federalism**: Promote equitable resource allocation and address biased interventions.
- o **Increase Awareness**: Educate citizens on **constitutional rights and duties**.
- o **Inclusive Development**: Policies must reduce socio-economic disparities while maintaining environmental sustainability.

Code of Conduct for Judges

Context

- Recent comments by an Allahabad High Court judge on sensitive community issues sparked debates on **judicial conduct and accountability**.

What is the Code of Conduct for Judges?

- A **set of ethical guidelines** ensuring integrity, impartiality, and public confidence in the judiciary.
- These codes guide judges to uphold **public trust**, **rule of law**, and avoid personal biases.

Why is a Code of Conduct Necessary?

1. **Safeguarding Judicial Integrity**:
   o Ensures impartial judgments and prevents public distrust.
   o Upholds the judiciary's independence and ethical decision-making.
2. **Upholding Public Trust**:
   o Ethical conduct reassures citizens of fairness and transparency in the judiciary.
3. **Strengthening Rule of Law**:
   o Promotes justice, equality, and fairness.
4. **Preventing Bias and Misconduct**:
   o Deters behaviors that undermine judicial credibility.
5. **Promoting Inclusivity**:
   o Encourages understanding of diversity, ensuring fair treatment of all litigants.
6. **Protecting Independence**:
   o Fosters **self-regulation** and discipline, preserving judicial autonomy.

Provisions for Judicial Conduct in India

1. **Restatement of Values of Judicial Life**:
   o Adopted by the Supreme Court in 1997 as a guide for ethical standards in the higher judiciary.
2. **In-House Procedure**:
   o Mechanism to address complaints against judges for **misconduct**.
   o Complaints are addressed by the **Chief Justice of India** for Supreme Court judges or the **Chief Justices of High Courts** for state judiciary.
3. **Impeachment**:
   o Judges can be impeached under the Constitution for **proved misbehavior or incapacity**.
4. **Judicial Standards and Accountability Bill, 2010** *(not enacted)*:
   o Proposed measures for establishing the **National Judicial Oversight Committee** and other mechanisms for accountability.

Consequences of Lapses in Judicial Conduct

1. **Undermines Credibility**:
   o Reduces public trust in judicial fairness.
2. **Encourages Polarization**:
   o Perceived biases exacerbate societal divisions.
3. **Weakens Rule of Law**:
   o Ethical lapses can politicize the judiciary and threaten democracy.
4. **Demands for Accountability**:
   o Public scrutiny increases calls for oversight and reforms.

Global Best Practices

1. **Chile's Queja System**:
   o Disciplines judges for unethical acts that are non-criminal.
2. **United Kingdom**:
   o Publishes **Guide to Judicial Conduct** for consistent ethical standards.
3. **Inspector General in Senegal & Tunisia**:
   o Oversees judicial conduct with an independent authority.
4. **Magna Carta of European Judges (2000)**:
   o Promotes independence and impartiality through advisory bodies.

Way Forward

1. **Training and Sensitization**:
   o Periodic training on ethics and diversity to align judicial perspectives with societal norms.
2. **Strengthening Oversight Mechanisms**:
   o Institutionalize in-house grievance systems and oversight committees.
3. **Revisiting Legislative Frameworks**:
   o Reconsider bills like the **Judicial Standards and Accountability Bill** for transparency and oversight.
4. **Advisory Councils**:
   o Establish committees to guide judges on ethical dilemmas (e.g., **U.S. state advisory committees**).

No-Detention Policy Scrapped

UPSC Syllabus Relevance

- **GS Paper 2**: Governance – Issues Relating to Development and Management of Education
- **GS Paper 2**: Polity – Constitutional Provisions and Amendments

Context:

- The **Ministry of Education** abolished the **no-detention policy** for students in **Classes 5 and 8** in all government schools, effective **December 2024**.

About No-Detention Policy:

- **Introduced Under**: **Right to Education (RTE) Act, 2009**.
- **Section 16**: Prohibited the detention or expulsion of students in **Classes 1–8** until they completed elementary education.
- **Primary Aim**:
  - Reduce **dropouts**.
  - Make learning **joyful**.
  - Remove the **fear of failure** among students.

Reasons for Scrapping the Policy:

- **Declining Learning Outcomes**:
  - Lack of accountability led to poor **academic performance**.
  - **Foundational learning levels** were observed to be weak across states.
- **High Failure Rates in Higher Classes**:
  - Students struggled in **Classes 10 and 12** due to weak basics.
  - **PRS Report (2017)** highlighted low **transition rates** from primary to secondary levels and high dropout rates in **Class 10**.
- **State Feedback**:
  - **23 states** sought modifications, citing adverse effects on learning quality.
  - States like **Bihar, Rajasthan, and Assam** raised concerns about policy implementation.

Key Provisions of the Amended RTE Rule (2024):

- **Criteria for Detention**:
  - Students in **Classes 5 and 8** can be detained if they fail both the **year-end examination** and a subsequent **re-examination**.
  - A **two-month remedial instruction period** will precede the re-exam.
- **Remedial Measures**:
  - Focused on addressing **learning gaps** through specialized teacher-parent collaboration.
  - Teachers will guide students and parents to improve **learning outcomes**.
- **Exam Pattern**:
  - Competency-based assessments will replace **rote learning**.
  - Emphasis on **holistic development**.
- **School Accountability**:
  - School heads must maintain records of detained students and monitor their **academic progress**.

Implementation and Applicability:

- **Applicability**:
  - Applies to over **3,000 Central Government-run schools**, including **Kendriya Vidyalayas, Navodaya Vidyalayas**, and **Sainik Schools**.
- **State Authority**:
  - States retain the right to adopt or modify the policy, as **school education is a State subject**.

Significance of the Amendment:

- **Improved Accountability**: Encourages better performance among students and teachers.
- **Enhanced Learning Outcomes**: Focuses on strengthening **foundational skills**.
- **Holistic Development**: Promotes competency-based education.
- **Parental Involvement**: Enhances collaboration between schools and parents.

Good Governance Day

UPSC Syllabus Relevance

- **GS Paper 2**: Polity – Governance, Transparency, Accountability, and Reforms

Context:

- **Good Governance Day** is celebrated annually on **December 25th** to honor the **birth anniversary of Atal Bihari Vajpayee** and emphasize the commitment to **transparent and accountable governance**.
- **2024 Celebration**: Marks the **100th birth anniversary** of Atal Bihari Vajpayee.

About Good Governance Day:

- **First Observed**: In **2014**, to reiterate the importance of **development reaching every citizen**.
- **Definition of Good Governance**:
    - As per the **World Bank**, it is the **manner of exercising power** in managing a country's **resources** for development.
    - Ensures **fairness, transparency**, and **accountability** in decision-making and implementation.

Importance of Good Governance in India:

- **Transparency and Accountability**:
    - Builds trust in institutions.
    - Example: **RTI Act, 2005** empowers citizens to demand transparency.
- **Inclusive Development**:
    - Addresses the needs of **marginalized groups**.
    - Example: **Jan Dhan Yojana** enhanced **financial inclusion**, opening over **52 crore bank accounts**(July 2024).
- **Reduction in Corruption**:
    - Streamlines processes and reduces leakages.
    - Example: **DBT** saved over ₹2.7 lakh crore by eliminating middlemen (Budget 2024).
- **Economic Growth**:
    - Promotes a **business-friendly environment**, attracting investments.
    - Example: India ranked **63rd in Ease of Doing Business** (2020).
- **Efficient Service Delivery**:
    - Initiatives like **Digital India** and **Bhoomi Project** ensure timely and dispute-free services.
- **Strengthens Democracy**:
    - Empowers grassroots democracy via **Panchayati Raj Institutions**.
    - Example: **3.3 million elected representatives** uphold democracy at the local level.

Challenges to Good Governance:

- **Corruption**:
    - **Erodes trust** and hampers service delivery.
    - Example: India ranked **85th in the Corruption Perception Index (2023)**.
- **Criminalization of Politics**:
    - 43% of **Lok Sabha MPs** (2023) have criminal cases, undermining governance integrity.
- **Judicial Delays**:
    - **51 million pending cases** weaken public confidence.
- **Regional Disparities**:
    - Uneven development leads to inequality.
    - Example: Kerala's HDI (**0.758**) vs. Bihar's (**0.577**) in 2022.
- **Lack of Accountability**:
    - Frequent **bureaucratic transfers** hinder project implementation.
- **Digital Divide**:
    - Rural areas lack internet access (**35% households**) compared to urban areas (**70%**, TRAI 2021).

Innovations and Initiatives in Governance:

- **E-Governance**:
    - **Digital India**: Connects **2 lakh gram panchayats** with optical fiber under BharatNet.
    - **PRAGATI**: Monitors government projects to reduce delays.
    - **UMANG App**: Offers over **1,000 government services** on a unified platform.
- **Direct Benefit Transfer (DBT)**:
    - Transfers subsidies directly into bank accounts, ensuring efficiency.

- o **Administrative Reforms**:
    - ▪ Scrapped **1,500 outdated laws** for improved governance efficiency.
- o **Good Governance Index (GGI)**:
    - ▪ Ranks states and UTs on governance performance.
- o **Global Practices**:
    - ▪ **Estonia**: Digitized 99% of public services.
    - ▪ **Rwanda**: Uses drones for healthcare delivery in remote areas.

Way Forward:

- o **Promote Transparency**:
    - ▪ Strengthen **RTI** mechanisms and social audits.
- o **Leverage Technology**:
    - ▪ Expand **Digital India** to bridge urban-rural divides.
    - ▪ Use **AI and blockchain** to enhance governance efficiency.
- o **Strengthen Local Governance**:
    - ▪ Empower **Panchayati Raj Institutions** with financial and decision-making autonomy.
- o **Ensure Inclusivity**:
    - ▪ Improve healthcare, education, and social security for marginalized groups.
- o **Judicial Reforms**:
    - ▪ Establish **fast-track courts** and promote **alternative dispute resolution**.
- o **Build Institutional Capacity**:
    - ▪ Invest in **civil servant training** through **Mission Karmayogi**.

eCourts Mission Mode Project

UPSC Syllabus Relevance

- • **GS Paper 2**: Governance, Transparency, and Accountability.

Key Points
Context:

- o The **eCourts Mission Mode Project** aims to leverage **Information and Communication Technology (ICT)** for the modernization of the Indian Judiciary.

About the eCourts Mission Mode Project:

- o **Objective**: To **digitize court processes** and provide faster, transparent, and affordable judicial services.
- o **Under National e-Governance Plan (NeGP)**:
    - ▪ Facilitates **electronic delivery of services** across various sectors, including judiciary.
- o **Implementing Agencies**:
    - ▪ **Department of Justice**, Government of India.
    - ▪ **eCommittee of Supreme Court**, in coordination with High Courts.

Phases of the eCourts Mission:

- o **Phase I (2011–2015)**:
    - ▪ Focused on basic computerization, including installation of hardware in district and subordinate courts.
- o **Phase II (2015–2023)**:
    - ▪ ICT enablement of courts.
    - ▪ Enhanced access through **online services**, including case status, cause lists, and judgments.
- o **Phase III (2023–2027)**:
    - ▪ Approved by the **Union Cabinet in September 2023**.
    - ▪ **Key Features**:
        1. Establishment of **Digital and Paperless Courts**.
        2. **Digitization** of court records (legacy and pending cases).
        3. Introduction of **advanced AI tools** for judicial data management.

About National e-Governance Plan (NeGP):

- o **Objective**: To make **government services accessible electronically** to all citizens.
- o **Formulated by**:
    - ▪ **Department of Electronics and Information Technology (DeitY)**.

- ▪ **Department of Administrative Reforms and Public Grievances (DARPG)**.

Significance of the eCourts Project:

- o **Transparency**: Promotes open access to case data and reduces corruption.
- o **Accessibility**: Empowers citizens by providing online access to case status and judgments.
- o **Efficiency**: Reduces pendency through automated processes.
- o **Cost-Effective Justice**: Saves time and resources for litigants and courts.
- o **Environment-Friendly**: Paperless courts align with sustainability goals.

Challenges in Implementation:

- o **Digital Divide**: Limited access to ICT tools in rural and remote areas.
- o **Capacity Building**: Need for training judicial staff in digital tools and processes.
- o **Data Security**: Concerns over protection of sensitive judicial data.
- o **Integration Issues**: Synchronizing databases across various courts and jurisdictions.

Way Forward:

- o **Bridge Digital Divide**: Ensure access to ICT infrastructure in rural areas.
- o **Capacity Building**: Regular training programs for judges and court staff on ICT tools.
- o **Strengthen Cybersecurity**: Develop robust mechanisms to secure judicial data.
- o **Public Awareness Campaigns**: Educate citizens on using digital court services.
- o **Promote AI Integration**: Use AI for predictive case management and resource allocation.

PRAGATI System

UPSC Syllabus Relevance

- **GS Paper 2**: Governance, Transparency, and Accountability.

Context:

- o **Oxford University Study** praised India's **PRAGATI system** for its efficiency in **fast-tracking infrastructure projects**.

About PRAGATI System:

- o **Full Form**: **Pro-Active Governance and Timely Implementation**.
- o **Launch Year**: 2015.
- o **Implementing Agency**: **Prime Minister's Office (PMO)**.
- o **Objective**:
  - ▪ To ensure **close monitoring** and **timely completion** of large-scale infrastructure and development projects.
  - ▪ **Resolve bottlenecks** through inter-ministerial and Central-State coordination.

Key Features:

- o **Collaboration and Coordination**:
  - ▪ Brings together **Central and State governments** on a single platform.
  - ▪ Addresses issues like **land acquisition** and **inter-ministerial coordination**.
- o **Technology-Driven Approach**:
  - ▪ Utilizes **real-time data**, drone feeds, and **video conferencing** for project monitoring.
  - ▪ Facilitates **faster decision-making** and **problem resolution**.
- o **Accelerated Development**:
  - ▪ Helped **fast-track 340 projects**, contributing to improved infrastructure like roads, railways, water supply, and electricity.

Significance of PRAGATI:

- o **Faster Decision-Making**: Resolves issues in **real-time** using technology.
- o **Improved Governance**: Reduces bureaucratic delays through direct intervention by the PMO.
- o **Enhanced Coordination**: Strengthens collaboration between **Central and State governments**.
- o **Increased Accountability**: Regular monitoring ensures timely actions by all stakeholders.
- o **Boost to Infrastructure**: Accelerates **nation-building projects**, vital for economic growth.

Examples of Success:

- o **National Highway Projects**: PRAGATI resolved bottlenecks, expediting construction.
- o **Railway Electrification**: Helped achieve targets under the National Rail Plan.
- o **Urban Development**: Monitored smart city projects and water supply initiatives.

Challenges:

- o **Technology Accessibility**: Limited infrastructure in rural or remote areas can hinder real-time data collection.
- o **State Cooperation**: Differences in political priorities can delay coordination between State and Central governments.
- o **Data Reliability**: Inaccurate or outdated project data can affect decision-making.

Way Forward:

- o **Enhanced Digital Infrastructure**: Expand technology access in underdeveloped areas.
- o **Capacity Building**: Train officials at all levels in data-driven governance.
- o **Public Engagement**: Involve stakeholders to ensure transparency and accountability.
- o **AI Integration**: Use **artificial intelligence** for predictive analysis and proactive problem-solving.

Henderson Doctrine

Context:

- o The Supreme Court in the case **CELIR LLP v. Mr. Sumati Prasad Bafna & Ors.** explained the **Henderson Doctrine** as a natural corollary to India's **doctrine of constructive res judicata** under **Explanation IV of Section 11** of the **Code of Civil Procedure (CPC)**.

What is the Henderson Doctrine?

- o **Origin**: First propounded in the English case **Henderson v. Henderson, 1843**.
- o **Principle**:
  - ▪ The doctrine mandates that **all issues** arising from the **same subject matter** in a litigation must be addressed in **a single suit**.
  - ▪ **Bars re-litigation**: Prevents parties from re-litigating issues that could or should have been raised in earlier proceedings.
- o **Key Objective**:
  - ▪ Ensures **finality of litigation**.
  - ▪ Prevents **fragmentation of disputes** and **prolonged litigation**.

Relation to Indian Law:

- o **Constructive Res Judicata (Explanation IV of Section 11, CPC)**:
  - ▪ Bars re-litigation of matters that were not raised in an earlier suit but could have been raised as part of the same cause of action.
- o **Henderson Doctrine as Abuse of Process**:
  - ▪ Parties must conduct litigation in **good faith**.
  - ▪ Procedural tactics to delay or undermine the litigation process are treated as **abuse of judicial process**.

Significance of Henderson Doctrine:

- o **Judicial Efficiency**:
  - ▪ Avoids wastage of judicial resources by consolidating disputes into a single suit.
- o **Finality to Decisions**:
  - ▪ Provides closure to parties by preventing repetitive suits.
- o **Fair Play**:
  - ▪ Ensures that parties present their complete case in the initial proceedings.
- o **Prevention of Abuse**:
  - ▪ Discourages litigants from using the legal process to harass or prolong disputes.

Challenges and Criticisms:

- o **Ambiguity in Application**:
  - ▪ Determining what "could or should have been raised" in prior proceedings can be subjective.
- o **Overreach**:
  - ▪ Risk of denying legitimate claims if they were inadvertently omitted in earlier proceedings.
- o **Burden on Litigants**:
  - ▪ Encourages comprehensive pleading, which may be difficult for unrepresented or underrepresented litigants.

Way Forward:

- o **Clear Guidelines**: Courts must outline explicit standards for the application of the doctrine.
- o **Awareness Programs**: Increase litigants' awareness of the principle to encourage complete disclosure in the first suit.
- o **Judicial Sensitivity**: Ensure the doctrine is applied judiciously, balancing finality with fairness.

E-Daakhil Portal

Introduction and Launch:

- o **Launched By**: National Consumer Dispute Redressal Commission (NCDRC).
- o **Legislative Backing**: Introduced under the **Consumer Protection Act, 2019**.

Purpose and Objectives:

- o Provide a **streamlined, paperless, and hassle-free** mechanism for filing consumer complaints.
- o **Enhance Accessibility**: Enable consumers to file complaints **online**, removing the need for physical visits to consumer forums.
- o **Speedy Redressal**: Facilitate the faster resolution of grievances through an integrated digital platform.

Features of E-Daakhil Portal:

- o **Paperless Filing**:
    - Consumers can upload their complaints and supporting documents electronically.
- o **End-to-End Digital Process**:
    - Includes e-notice generation, filing replies, online payments, and virtual hearings.
- o **Nationwide Implementation**:
    - Available across all states and union territories, ensuring pan-India accessibility.
- o **User-Friendly Interface**:
    - Designed to simplify the process for consumers with step-by-step guidance.
- o **Tracking Mechanism**:
    - Complainants can track the status of their cases in real time.

Consumer Protection Act, 2019: Key Provisions Related to E-Daakhil:

- o **Jurisdiction Flexibility**: Consumers can file complaints where they reside or work.
- o **Class Action Complaints**: Empowering groups of consumers to file collective complaints.
- o **Time-Bound Redressal**: Ensuring speedy resolution of disputes within stipulated timeframes.

Significance of E-Daakhil Portal:

- o **Accessibility**: Empowers consumers, especially in remote areas, to seek redressal without physical constraints.
- o **Efficiency**: Reduces pendency of cases by digitizing processes and eliminating manual interventions.
- o **Transparency**: Enhances accountability and trust in the consumer grievance redressal system.
- o **Cost-Effectiveness**: Saves time and travel expenses for consumers.

Challenges and Concerns:

- o **Digital Divide**: Limited internet penetration and digital literacy may restrict access for rural and underprivileged populations.
- o **Technical Glitches**: Issues like server downtime and errors can disrupt the filing process.
- o **Awareness**: Many consumers remain unaware of the portal and its benefits.

Way Forward:

- o **Awareness Campaigns**: Launch nationwide awareness drives to educate consumers about the portal.
- o **Capacity Building**: Train consumer forum officials and staff to efficiently manage the digital platform.
- o **Enhancing Digital Access**: Promote rural internet connectivity and digital literacy initiatives.
- o **Continuous Improvement**: Regular updates and maintenance to address technical challenges and ensure seamless operation.

Viksit Panchayat Karmayogi Initiative

Relevance to UPSC Syllabus

- **GS Paper 2: Governance, Constitution, and Polity – Decentralization and Panchayati Raj.**
- **GS Paper 3: Rural Development and E-Governance.**

About Viksit Panchayat Karmayogi

1. **Launch and Context**
   - **Launched On**: Good Governance Day, commemorating the 100th birth anniversary of **Atal Bihari Vajpayee**.
   - **Part of Campaign**: **'Prashasan Gaon Ki Aur'**, emphasizing grassroots governance.
2. **Purpose**
   - **Strengthen Grassroots Governance**: Focuses on building capacity within **Panchayati Raj Institutions (PRIs)**.
   - **Equitable Development**: Aims to ensure **inclusive rural development** through participatory planning.
3. **Pilot States**
   - Initially launched in **Odisha, Assam, Gujarat, and Andhra Pradesh**.

Key Features

1. **Capacity Building**
   - Provides **elected representatives and officials** with tools to enhance governance and service delivery.
2. **Technology Integration**
   - **E-learning Platforms**: Online training modules for skill enhancement.
   - **AI-Powered Chatbots**: Facilitate easy access to governance-related information.
   - **Mobile Apps**: Simplify participation and governance processes.
3. **Focus Areas**
   - **Bridging Knowledge Gaps**: Empowers PRIs with information for effective decision-making.
   - **Improving Service Delivery**: Focuses on delivering better infrastructure, social services, and welfare schemes.

Significance

1. **Strengthening Local Democracy**
   - Enhances the capacity of PRIs to perform their constitutional mandate.
   - Promotes **participatory governance** and citizen engagement.
2. **Boosting Rural Development**
   - Equips Panchayats to implement **village development plans** effectively, aligning with **Sustainable Development Goals (SDGs)**.
3. **Encouraging Technology Use**
   - Reduces administrative delays and improves transparency through digital solutions.
4. **Replicable Model**
   - Pilot implementation provides a framework for national rollout.

Challenges

1. **Digital Divide**
   - Limited access to technology in remote areas could hinder adoption.
2. **Training Constraints**
   - Inadequate technical expertise among PRI members.
3. **Monitoring and Evaluation**
   - Ensuring consistent assessment of progress and outcomes.

Way Forward

1. **Expand Digital Infrastructure**
   - Improve internet access and ensure the availability of devices for PRI members.
2. **Comprehensive Training Programs**
   - Conduct regular workshops to familiarize PRI officials with technological tools.
3. **Feedback Mechanism**
   - Develop mechanisms to gather input from stakeholders to improve the initiative.
4. **National Rollout**
   - Scale up the initiative across all states based on pilot outcomes.

IPC Section 498A (Now Part of Bharatiya Nyaya Sanhita)

Relevance to UPSC Syllabus

- **GS Paper 2**: Governance, Constitution, and Social Justice
- **GS Paper 1**: Indian Society and Issues related to Women

About Section 498A

1. **Historical Context**
   o Introduced in **1983** to address the rising cases of **domestic violence** and **dowry-related harassment** faced by married women.
2. **Definition of Cruelty**
   o **Physical or Mental Harm**: Acts causing bodily harm or impairing mental well-being of the woman.
   o **Harassment for Dowry**: Includes coercive actions or pressure tactics demanding **property** or **valuables**.
   o **Driving to Suicide**: Situations where the woman is harassed to such an extent that it may lead to suicide.
3. **Punishment**
   o Imprisonment of up to **3 years**.
   o Imposition of a **fine**.
4. **Cognizable and Non-Bailable Nature**
   o **Cognizable**: Police can arrest the accused without prior approval from a magistrate.
   o **Non-bailable**: Bail is not granted as a matter of right and depends on judicial discretion.

Purpose and Significance of Section 498A

1. **Protection of Women's Rights**
   o Aims to safeguard women from **domestic violence** and **dowry-related harassment**.
   o Helps tackle **physical and mental abuse** within the confines of marriage.
2. **Deterrence Against Cruelty**
   o Acts as a **deterrent** for individuals engaging in **cruel acts** against married women.

Concerns Raised by the Supreme Court

1. **Misuse of the Provision**
   o **Allegations of Misuse**: Reports suggest that **false cases** have been filed under Section 498A for **revenge** or **harassment of the husband and relatives**.
   o **Judicial Overburden**: Many cases based on false allegations contribute to **judicial delays** and **increased pendency** of cases.
2. **Impact on Families**
   o Cases have resulted in the **arrest of family members**, including elderly parents and siblings of the husband, based on unsubstantiated allegations.
3. **Judicial Guidelines**
   o The **Supreme Court** has issued guidelines for ensuring proper investigation before making arrests.
   o Encourages **conciliation efforts** to resolve disputes amicably.

Balancing Concerns and Rights

1. **Protecting Genuine Victims**
   o Despite instances of misuse, **genuine victims** of domestic abuse need legal recourse and **timely justice**.
2. **Preventing False Cases**
   o Strengthen mechanisms for **thorough investigations** before filing charges to prevent **harassment** of innocent parties.
3. **Judicial Oversight**
   o Judicial bodies must ensure **fairness** and avoid arbitrary arrests.

Judicial Precedents and Recommendations

1. **Rajesh Sharma & Ors. v. State of U.P. (2017)**
   o The **Supreme Court** laid guidelines to prevent arbitrary arrests, including forming **Family Welfare Committees** to review complaints.
2. **Malimath Committee Report**
   o Suggested **making Section 498A bailable** and introducing provisions for **conciliation** to reduce its misuse.

Way Forward

1. **Balanced Approach**
   o Maintain a **fine balance** between protecting women's rights and preventing **misuse** of the law.
2. **Training Law Enforcement**

- o   Ensure police officers are trained to **handle sensitive domestic violence cases** with **due diligence**.
3. **Strengthening Family Counselling**
   - o   Promote **counselling** and **alternate dispute resolution mechanisms** to handle family conflicts amicably.

Appointment of RBI Governor

(GS Paper 2: Polity – Constitutional and Statutory Bodies)

Context:

The Central Government has appointed **Sanjay Malhotra**, former Revenue Secretary, as the **26th Governor of the Reserve Bank of India (RBI)**, succeeding Shaktikanta Das after the completion of his six-year term.

Legal Framework:

- Governed by the **Reserve Bank of India Act, 1934**.
- Appointment is **made by the Central Government**.

Selection Process:

1. **Financial Sector Regulatory Appointment Search Committee:**
   - o   Members include:
     - ▪ **Cabinet Secretary** (Chairperson).
     - ▪ Current **RBI Governor**.
     - ▪ **Financial Services Secretary**.
     - ▪ Two **independent experts**.
   - o   Prepares a list of eligible candidates.
2. **Shortlisting and Interviews:**
   - o   Candidates from the list are **interviewed**.
   - o   Shortlisted names forwarded to the **Cabinet Committee on Appointments (CCA)**, chaired by the **Prime Minister**.
3. **Final Appointment:**
   - o   The **Cabinet Committee on Appointments** makes the final confirmation.

Tenure and Reappointment:

- **Tenure:**
   - o   Maximum of **five years**, with the exact term determined by the government.
- **Reappointment:**
   - o   Eligible for **reappointment** or term extension.

Qualifications:

- **No specific qualifications** are outlined in the **RBI Act, 1934**.
- Appointees are typically individuals with significant expertise in **finance, banking, and economic policy**.

Significance of the Role:

The RBI Governor plays a crucial role in:

1. **Monetary Policy Formulation:** Managing inflation, interest rates, and economic stability.
2. **Regulating Financial Institutions:** Ensuring a robust banking and financial system.
3. **Currency Issuance:** Overseeing currency management and distribution.
4. **Economic Guidance:** Advising the government on fiscal policies and economic matters.

Apps for Consumer Protection

(GS Paper 2: Governance – Transparency and Accountability, Consumer Rights)

Context:

The **Department of Consumer Affairs** launched three digital tools— **'Jago Grahak Jago App,' 'Jagriti App,'** and **'Jagriti Dashboard'**— on **National Consumer Day 2024** to protect consumers from **dark patterns**.

About the Apps for Consumer Protection:

1. **Jago Grahak Jago App:**
   o Alerts consumers about **unsafe URLs** during online activities.
   o Provides essential information about **e-commerce platforms** for safer transactions.
2. **Jagriti App:**
   o Empowers consumers to report **suspicious URLs** associated with dark patterns.
   o Facilitates direct complaint registration with the **Central Consumer Protection Authority (CCPA).**
3. **Jagriti Dashboard:**
   o Offers real-time **reports and data analytics** on dark patterns in e-commerce.
   o Assists the **CCPA** in monitoring and enforcing compliance.

About National Consumer Day 2024:

1. **Celebration Date:**
   o Observed annually on **December 24.**
2. **2024 Theme:**
   o **"Virtual Hearings & Digital Access to Consumer Justice."**
3. **Significance:**
   o Commemorates the enactment of the **Consumer Protection Act, 1986.**
   o Promotes awareness of **consumer rights** and ensures justice against **unfair trade practices.**

Key Takeaways:

- The launch of these digital tools enhances **consumer safety** in the evolving e-commerce space.
- By leveraging **technology and real-time monitoring**, the government aims to address issues like **dark patterns**and improve access to **consumer justice.**

INTERNATIONAL RELATIONS

India-Kuwait Strategic Partnership

Context

- Prime Minister Modi's first visit to Kuwait marks a significant milestone, as the last visit by an Indian PM was in **1981 (Indira Gandhi)**.
- India and Kuwait agreed to elevate their bilateral relationship to a **Strategic Partnership**.

Key Highlights of the Visit

1. **Award of Knighthood**
   o PM Modi received the **Order of Mubarak Al Kabeer**, Kuwait's prestigious honor for foreign dignitaries.
2. **Establishment of Institutional Mechanisms**
   o **Joint Commission on Cooperation (JCC)**: Headed by the Foreign Ministers of both nations, this mechanism will monitor bilateral relations.
   o **New Joint Working Groups (JWGs)**: Created for sectors like **trade, investments, education, skill development, science, technology, and defense**.
3. **Defense and Security Cooperation**
   o MoU signed for:
     ▪ **Joint military exercises**.
     ▪ Training of defense personnel.
     ▪ Joint production of defense equipment.
   o Commitment to combat **cross-border terrorism** and dismantle terror infrastructure.
4. **Cultural and Sports Cooperation**
   o Renewal of the **Cultural Exchange Programme (2025–2029)**.
   o Signing of an **Executive Program on Sports Cooperation (2025–2028)**.
5. **Support for Vision 2035**
   o PM Modi praised Kuwait's **Vision 2035** development plan, emphasizing collaborative efforts for shared goals.
6. **International Solar Alliance (ISA)**
   o Kuwait joined the ISA, reinforcing its commitment to sustainable energy.

India-Kuwait Bilateral Relations

1. **Energy Cooperation**
   - Kuwait is a key supplier of **crude oil (6th largest)** and **petroleum gas (4th largest)** to India, meeting **3.5%** of India's energy needs.
2. **Trade and Investment**
   - Total bilateral trade for **2023-24** reached **$10.479 billion**.
   - Indian exports to Kuwait exceeded **$2 billion** for the first time.
   - Kuwait's **Investment Authority** has invested **$10 billion** in India.
3. **Diaspora**
   - Indians form **21%** of Kuwait's population, contributing significantly to its economy.

Way Forward

1. **Regular Bilateral Consultations**
   - Maintain high-level dialogues to ensure effective implementation of agreements in **energy, trade, and defense**.
2. **Economic and Trade Expansion**
   - Finalize the **Bilateral Investment Treaty**.
   - Promote **joint ventures** in key sectors.
3. **Strengthen Regional Cooperation**
   - Enhance collaboration in multilateral forums like the **UN** and **GCC** to promote regional stability.
4. **Deepen Defense Collaboration**
   - Conduct **joint military exercises** and explore opportunities for **defense equipment co-production**.
5. **Boost People-to-People Ties**
   - Simplify visa procedures.
   - Promote **student and cultural exchanges**.
6. **High-Level Political Engagement**
   - Encourage regular **parliamentary and ministerial visits**.

Impacts of Strategic Partnership

1. **Energy Security**
   - Diversification of energy imports strengthens India's energy resilience.
2. **Economic Growth**
   - Increased trade and investment create new business opportunities in both nations.
3. **Regional Influence**
   - Enhances India's position in the Gulf, facilitating the conclusion of the **India-GCC Free Trade Agreement**.
4. **Defense and Security**
   - Collaboration on **counter-terrorism** and **regional stability** initiatives enhances security.
5. **Diaspora Welfare**
   - Ensures the well-being of the Indian expatriate community through cultural and labor agreements.

Fall of Assad's Regime in Syria

Context

- Syrian rebels toppled President **Bashar al-Assad's 24-year regime**, leading to his asylum in **Russia**.

Reasons for the Fall of Assad's Regime

1. **Prolonged Civil War and Loss of Legitimacy**
   - The ongoing civil war since **2011** weakened Assad's support base.
   - Public discontent due to **authoritarian rule, corruption, and human rights abuses** intensified the rebellion.
2. **Advances by Rebel Forces**
   - Opposition groups like **Hayat Tahrir al-Sham (HTS)**, with **Turkey's backing**, gained significant ground.
3. **International Pressure and Isolation**
   - Assad's regime faced **sanctions, condemnation, and diplomatic isolation** over alleged war crimes.
4. **Shifts in Geopolitical Dynamics**
   - **Russia's focus** shifted to the Ukraine war, reducing its presence in Syria.
   - **Iran's weakened position** after Qassem Soleimani's death and **Israeli airstrikes** impacted its support.
   - **Hezbollah's conflict with Israel** limited its resources for Syria.

India-Syria Bilateral Relations

1. **Historical Ties**
   o India shares historic and cultural links with Syria.
   o Strong support for **Arab causes**, including **Palestine** and **Golan Heights**.
2. **India's Stand on Syrian Crisis**
   o Advocates a **Syrian-led political solution** based on **UNSC Resolution 2254**.
   o Maintains Syria's **sovereignty and territorial integrity**.
3. **Humanitarian and Development Support**
   o **Pledged $7 million** at Brussels conferences.
   o Organized **artificial limb fitment camps** (2019–2022).
4. **Economic and Cultural Engagement**
   o **Bilateral trade (2023–24): $81.53 million**, including cereals and pharmaceuticals.
   o Framework for cooperation under the **Cultural Exchange Programme** (since 1975).

Importance of Syria for India

1. **Strategic Location**
   o Bridges **West Asia, Europe, and Africa**, enhancing India's **connectivity and trade**.
2. **Counter-Terrorism**
   o Syria's stability is crucial for India's efforts against extremism in **West Asia**.
3. **Economic and Energy Security**
   o Potential opportunities in **reconstruction projects**.
   o Strategic role in **energy supply diversification**.
4. **Geopolitical Influence**
   o Syria's support bolsters India's stance on **Kashmir** and counters **Pakistan's narrative** in the Islamic world.

Impacts of Assad's Fall on India

1. **Rise of Extremism**
   o Increased influence of **HTS and ISIS remnants** threatens **regional and domestic security**.
   o Risk of **radicalization** among Indian Muslim youth.
2. **Energy and Diaspora Security**
   o Instability may disrupt **energy supplies** and jeopardize the safety of the **Indian diaspora**.
3. **Geopolitical Imbalance**
   o Weakens Iran-led **Shia Crescent**, altering regional power dynamics.
4. **Threat to Strategic Initiatives**
   o Instability could derail projects like the **India-Middle East-Europe Economic Corridor (IMEEC)**.

Way Forward for India

1. **Diplomatic Engagement**
   o Proactively engage with the **new Syrian leadership** and **regional powers** to protect India's interests.
2. **Humanitarian Assistance**
   o Expand programs like **ITEC** and provide aid for Syria's reconstruction.
3. **Strengthen Counter-Terrorism**
   o Collaborate with regional allies to address terrorism risks originating from Syria.
4. **Economic Diplomacy**
   o Offer **lines of credit** and invest in rebuilding efforts to gain a foothold in post-conflict Syria.
5. **Balanced Foreign Policy**
   o Maintain **neutral engagement** with all stakeholders in the region.

Indian Chemical Council Wins 2024 OPCW-The Hague Award

Context

The **Indian Chemical Council (ICC)** received the **2024 OPCW-The Hague Award** for its contributions to the goals of the **Chemical Weapons Convention (CWC)**, at a ceremony in The Hague, Netherlands.

About Organisation for the Prohibition of Chemical Weapons (OPCW)

- **Established**: 1997.
- **Headquarters**: The Hague, Netherlands.
- **Membership**: 193 States Parties.

- **Objective**: Oversee the implementation of the **Chemical Weapons Convention (CWC)** and work towards a **world free of chemical weapons**.
- **Recognition**: Awarded the **Nobel Peace Prize in 2013** for efforts in eliminating chemical weapons globally.
- **The Hague Award**:
  - Established in 2014.
  - Honors individuals or organizations advancing the goals of the **CWC**.

About the Chemical Weapons Convention (CWC)

- **Came into Force**: 1997.
- **Objective**:
  - Eliminate chemical weapons as a category of weapons of mass destruction.
  - Prohibit the **development, production, acquisition, stockpiling, transfer, or use** of chemical weapons.
- **Implementation in India**:
  - **National Authority for Chemical Weapons Convention (NACWC)** is the statutory body under the **Chemical Weapons Convention Act, 2000**.
  - Ensures compliance with CWC provisions domestically and internationally.

About Indian Chemical Council (ICC)

- **Established**: 1938.
- **Purpose**: Promote and represent **India's chemical industry**, encompassing sectors like organic, inorganic, petrochemicals, plastics, and specialty chemicals.
- **Industry Representation**:
  - Represents over **80% of India's $220 billion chemical sector**.
  - Liaises with policymakers, stakeholders, and global organizations.
- **Services**:
  - Authorized by the Ministry of Commerce & Industry to issue **Certificates of Origin (CO)** for exporters, facilitating international trade.
  - **CO services** available to both members and non-members nationwide.

Significance of ICC's Contribution

- Promotes **safe and sustainable chemical production** in India.
- Supports **compliance with global chemical safety and security norms**, including those under the **CWC**.
- Enhances India's reputation as a responsible actor in the global chemical sector.

Way Forward

1. **Strengthen Global Collaboration**:
   - Leverage platforms like **OPCW** to enhance **India's leadership role** in global chemical safety.
2. **Capacity Building**:
   - Expand training and compliance programs for stakeholders in the chemical sector.
3. **Innovation and Sustainability**:
   - Focus on **green chemistry** and sustainable practices to align with international standards.
4. **Wider Recognition**:
   - Promote India's achievements in chemical safety and export potential at global forums.

Israel-Hezbollah Ceasefire

Syllabus Mapping:

- **GS-II**: International Relations – **India and its neighborhood**, UNSC resolutions, and regional conflicts.
- **GS-I**: World History – Role of international organizations in conflict resolution.

Context

The recent ceasefire proposal between **Israel** and **Lebanon** leverages the provisions of **UN Security Council Resolution 1701**, originally passed in **2006** to address hostilities between Israel and Hezbollah.

About Resolution 1701

- **Adoption**: Unanimously adopted by the **UN Security Council (UNSC)** in 2006.
- **Purpose**:
  - Establish a **full cessation of hostilities** between Israel and Hezbollah.

o Create a **buffer zone** between the two sides.
o Ensure a **permanent ceasefire** and strengthen Lebanese sovereignty.

Key Provisions of Resolution 1701

1. **Cessation of Hostilities**:
   o Calls for an immediate and complete cessation of all hostilities between Israel and Hezbollah.
2. **Disarmament of Armed Groups**:
   o Advocates for the full implementation of:
     ▪ **Taif Accords**.
     ▪ **UNSC Resolutions 1559 (2004)** and **1680 (2006)**.
   o Stipulates the **disarmament of all armed groups** in Lebanon, ensuring no armed authority except that of the Lebanese State.
3. **Withdrawal of Israeli Forces**:
   o Completes Israel's withdrawal from southern Lebanon (initiated in 2000) along the **Blue Line**.
   o The **Blue Line** is a **temporary line of withdrawal**, established by the **UN** in 2000.
4. **Foreign Forces**:
   o Prohibits the presence of foreign forces in Lebanon without the explicit consent of the Lebanese Government.
5. **Arms Supply Restrictions**:
   o Bans the sale or supply of arms and related materials to any entity in Lebanon, except as authorized by the Lebanese Government.
6. **Landmine Maps**:
   o Requires Israel to provide the UN with **maps of landmines** in Lebanon still in its possession.
7. **Respect for the Blue Line**:
   o Both parties must respect the **Blue Line**.
   o Security arrangements aim to prevent the resumption of hostilities, including creating an **area free of armed personnel, assets, and weapons**, except for Lebanese authorities and **UNIFIL**.
8. **UNIFIL Deployment**:
   o Authorizes the expansion of the **UN Interim Force in Lebanon (UNIFIL)** to a maximum of **15,000 peacekeepers**.
   o Responsibilities of UNIFIL:
     ▪ Monitor the cessation of hostilities.
     ▪ Assist Lebanese troops in securing the buffer zone.
     ▪ Ensure the **safe return of displaced Lebanese**.

ISRAEL ATTACKS LEBANON
Israel-Hezbollah ceasefire agreement
A ceasefire between Israel and the Lebanese group Hezbollah came into effect at 4am local time (02:00 GMT). It will be implemented over 60 days.

UNIFIL, the UN peacekeepers, will monitor implementation, along with France and the United States

LEBANON

Lebanese army to deploy south

Hezbollah to withdraw north of the Litani River

LITANI RIVER

UN BLUE LINE

Lebanese and Israeli civilians will gradually be allowed to return to their homes

Israeli army to withdraw

ISRAELI-OCCUPIED GOLAN HEIGHTS

ISRAEL

Source: Al Jazeera | November 27, 2024   @AJLabs ALJAZEERA

Strategic Importance of Resolution 1701

1. **Stabilization of the Region**:
   o Helps de-escalate tensions and reduce cross-border violence.
   o Provides a platform for longer-term peacebuilding efforts.
2. **Strengthening Lebanese Sovereignty**:
   o Reinforces the authority of the Lebanese Government by restricting foreign interference and armed groups.
3. **Humanitarian Support**:
   o Facilitates the return of displaced populations and improves conditions for civilians affected by the conflict.
4. **Role of UNIFIL**:
   o Acts as a neutral entity ensuring compliance with the resolution, preventing further escalation.

Challenges in Implementation

1. **Non-State Actors**:
   o Hezbollah's continued armed presence and operations undermine the disarmament clause.
2. **Regional Instability**:
   o Geopolitical influences, including the involvement of **Iran** and **Syria**, complicate the ceasefire's sustainability.
3. **Blue Line Disputes**:
   o Border disputes between Israel and Lebanon persist, impacting long-term peace prospects.
4. **UNIFIL's Limitations**:
   o The peacekeeping force faces challenges in fully monitoring and enforcing the resolution in contested areas.

Switzerland Suspends India's Most Favoured Nation (MFN) Status

(GS Paper 2: International Relations – Bilateral and Multilateral Agreements)

Context:

Switzerland has suspended the Most Favoured Nation (MFN) clause in its Double Tax Avoidance Agreement (DTAA) with India, effective January 1, 2025.

About Double Tax Avoidance Agreement (DTAA):

- **Definition:** A tax treaty preventing taxpayers from being taxed twice on the same income in two countries.
- **Application:** Covers individuals and entities earning income in one country while residing in another.
- **Purpose:** Encourages international trade and investment by avoiding dual taxation.

About the Most Favoured Nation (MFN) Clause:

- **Definition:** Ensures non-discriminatory trade practices by mandating equal trade terms among trading partners.
- **WTO Rules:**
  o Prevents discrimination among member nations.
  o Special trade benefits to one partner must extend to all members.
- **Exceptions:**
  o Regional trade agreements (e.g., USMCA, EU).
  o Trade preferences for developing nations.
  o Restrictions for countries like Cuba and North Korea due to geopolitical reasons.

Impact of MFN Removal in India-Switzerland DTAA:

1. **Increased Tax Burden:** Indian companies in Switzerland may face higher tax rates on dividend incomes.
2. **Trade Uncertainty:** The suspension could disrupt India-Switzerland trade relations, affecting investor and business confidence.
3. **Reassessment of Treaties:** India may review its other international trade and tax treaties to adapt to changing global economic dynamics.

India-Sri Lanka Relations

(GS Paper 2: International Relations – India and its Neighborhood)

Context:

Sri Lankan President Anura Kumara Dissanayake held bilateral talks with India's Prime Minister during his three-day visit to India.

Key Outcomes of the Visit:

1. Development Cooperation:

- Phase III & IV of Indian Housing Project.
- Implementation of the 3 Islands Hybrid Renewable Energy Project.
- High Impact Community Development Projects across Sri Lanka.

2. Political Exchanges: Emphasized regular parliamentary exchanges to promote democratic values.

3. Training and Capacity Building: Training of **1,500 Sri Lankan civil servants** through India's **National Centre for Good Governance** over five years.

4. Strategic and Defense Cooperation: Provision of a **Dornier aircraft** for maritime surveillance.

5. Fishermen's Issues: Addressed livelihood concerns of fishermen on both sides, focusing on **humanitarian solutions**.

6. Digital Infrastructure:

- Implementation of the **Sri Lanka Unique Digital Identity (SLUDI)** project.
- Extension of **UPI digital payments** to benefit both nations.

7. Energy Cooperation:

- Establishment of **electricity grid connectivity** and a **multi-product petroleum pipeline**.
- Implementation and augmentation of the **solar power project in Sampur**.

8. Cultural Ties and Tourism:

- Promotion of **Ramayana and Buddhist circuits** for tourism.
- Announced a **ferry service** between **Rameshwaram (Tamil Nadu)** and **Talaimannar (Sri Lanka)**.

13th Amendment to the Sri Lankan Constitution:

Purpose: Enacted in 1987 under the **India-Sri Lanka Accord** to address Tamil grievances via **devolution of power** to Provincial Councils.

Key Provisions:

- Creation of Provincial Councils.
- Recognition of Tamil as an official language.
- Devolved powers in education, health, and agriculture.

India's Stand: Advocates for **full implementation** to ensure **Tamil rights** and meaningful devolution.

Issues: Reluctance by Sri Lankan governments to devolve **land and police powers**, citing **national security concerns**.

Katchatheevu Island Dispute:

- Indian fishermen face arrests and attacks by the Sri Lankan Navy for alleged poaching.
- Tamil Nadu demands the retrieval of **Katchatheevu Island**, claiming its historical ties with India.

Way Forward:

1. **Strengthen Bilateral Cooperation:**
   o Regular high-level dialogues to monitor and implement agreements.
2. **Resolve Fishermen Issues:**
   o Establish a **joint mechanism** to address fishermen's livelihood concerns and territorial disputes.
3. **Promote Energy Connectivity:**
   o Expedite energy projects, especially **grid connectivity and renewable energy partnerships**.
4. **Support Tamil Reconciliation Efforts:**
   o Encourage Sri Lanka to fully implement the **13th Amendment** to foster regional harmony.
5. **Leverage Cultural Diplomacy:**
   o Enhance people-to-people ties through tourism and cultural exchanges like the **Ramayana and Buddhist circuits**.
6. **Economic Collaboration:**
   o Expand trade and investment opportunities through **comprehensive economic agreements**.

Riyadh Design Law Treaty

(GS Paper 3: Science and Technology – Intellectual Property Rights)

Context:

India, along with member states of the **World Intellectual Property Organization (WIPO)**, has adopted the **Riyadh Design Law Treaty (DLT)**.

About the Treaty:

1. Objective:

- To **harmonize procedures** and simplify the **registration processes** of industrial designs across different countries.
- To make **design protection** easier, more affordable, and accessible globally.

2. Key Features:

- **Streamlining Applications:** Simplifies application procedures for protecting and marketing designs.
- **Reducing Red Tape:** Eliminates administrative hurdles for industrial design registration.
- **Global Standardization:** Facilitates unified international protection of industrial designs.

3. Conference Details:

- The treaty was signed in **Riyadh, Saudi Arabia**, during a diplomatic conference hosted to finalize and adopt the treaty.

4. Prepared By:

- **Department for Trademarks, Industrial Designs, and Geographical Indications, Brands** under WIPO.

Significance for India:

1. **Boost to Innovation:** Encourages design innovation by providing streamlined protection mechanisms.
2. **Ease of Doing Business:** Simplifies registration processes, reducing costs for Indian designers and businesses.
3. **Global Competitiveness:** Strengthens India's position in the global intellectual property ecosystem.
4. **Support for MSMEs:** Facilitates affordable design protection for small businesses.

Way Forward:

- **Awareness Campaigns:** Promote awareness of the treaty and its benefits among Indian designers and innovators.
- **Capacity Building:** Enhance administrative infrastructure for seamless implementation of the treaty provisions.
- **International Collaboration:** Actively engage with WIPO and other member states to ensure effective treaty execution.

UK Joins CPTPP

(GS Paper 2: International Relations – Regional Trade Agreements)

Context:

The **United Kingdom** has become the **first European country** to join the **Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP)**.

About CPTPP:

1. **Definition:**
   o A **free trade agreement (FTA)** comprising 12 nations, including Japan, Malaysia, Vietnam, Australia, Singapore, Brunei, New Zealand, Canada, Mexico, Peru, Chile, and the UK.
2. **Significance:**
   o It is one of the **largest trading blocs** globally, accounting for **15% of global GDP** after the UK's inclusion.
3. **Background:**
   o **2005 Formation:** Originally started as the **Trans-Pacific Partnership (TPP)**, including Brunei, Chile, New Zealand, and Singapore.
   o **2017 Rebranding:** After the **United States withdrew** under the Trump administration, it was rebranded as the **CPTPP**.
   o The UK is the **largest economy** in the bloc after Japan and the **first non-Asia-Pacific member** to join.
4. **Membership Distinction:**
   o All members, except the UK, are also part of the **Asia-Pacific Economic Cooperation (APEC)** forum.

Implications of UK's Membership in CPTPP:

1. **Economic Benefits for the UK:**
   o Enhanced **access to markets** in the Indo-Pacific region.
   o Opportunities for **business expansion** in rapidly growing economies.
2. **Boost to Indo-Pacific Presence:**
   o Strengthens the UK's **strategic pivot** toward the Indo-Pacific amidst post-Brexit trade realignments.
3. **Strengthening Global Trade Frameworks:**
   o Reinforces multilateralism and reduces dependency on bilateral agreements.
4. **For CPTPP Members:**
   o Adds a **European perspective** to the trade bloc, increasing its global clout.
   o Enhanced opportunities for member countries to access UK's **consumer market**.
5. **Impact on Global Trade Politics:**
   o Positions the CPTPP as a **counterweight to protectionist trends** in global trade.
   o Expands its influence in the context of **US-China trade tensions**.

UN Internal Justice Council

(GS Paper 2: International Organizations – Structure and Mandate)

Context:

Retired Supreme Court judge Madan B Lokur has been appointed as the **chairperson** of the **United Nations Internal Justice Council (IJC)**.

About United Nations Internal Justice Council (IJC):

1. **Establishment:**
   - Formed by the **UN General Assembly** as part of the UN's internal justice system.
2. **Objective:**
   - To ensure **independence, professionalism**, and **accountability** in the administration of justice within the UN.
3. **Composition:**
   - The **IJC** comprises **five members:**
     - **Staff representative**
     - **Management representative**
     - **Two distinguished external jurists** (one nominated by staff and one by management).
     - **Chairperson**, appointed by the Secretary-General.
4. **Functions:**
   - Oversees the **UN internal justice system**, including:
     - **Office of Staff Legal Assistance (OSLA):** Provides legal advice and representation to UN staff.
     - **UN Dispute Tribunal (UNDT):** Handles disputes between the UN and its staff.
     - **UN Appeals Tribunal (UNAT):** Acts as an appellate court for decisions of the UNDT.

Key Components of the UN Internal Justice System:

1. **Office of Staff Legal Assistance (OSLA):**
   - **Established:** 2009.
   - **Aim:**
     - Offers legal support to UN staff in cases of adverse administrative decisions or disciplinary actions.
2. **UN Dispute Tribunal (UNDT):**
   - **Role:**
     - Serves as the **court of first instance** for resolving disputes and disciplinary matters between the UN and its staff.
3. **UN Appeals Tribunal (UNAT):**
   - **Role:**
     - Handles appeals against the judgments of the UNDT.

Significance of Justice Lokur's Appointment:

1. **Recognition of India's Expertise:**
   - Highlights India's growing influence in global governance and justice administration.
2. **Strengthening UN Justice System:**
   - Lokur's judicial experience adds depth to the council, ensuring **fairness** and **integrity** in decision-making.
3. **Boost to India's Global Image:**
   - Enhances India's standing in **international institutions** and its role in upholding global accountability.

UN Commission on Narcotic Drugs (CND)

(GS Paper 2: International Organizations – Structure, Mandate, and Relevance)

Context:

India has been chosen to **chair the 68th session** of the **United Nations Commission on Narcotic Drugs (CND)** for the **first time**.

About the United Nations Commission on Narcotic Drugs (CND):

1. **Origin:**
   - Established in **1946** by the **Economic and Social Council (ECOSOC)**.
2. **Headquarters:**
   - Located in **Vienna, Austria**.

3. **Membership:**
   - Comprises **53 member states**, elected by **ECOSOC** for four-year terms.
   - Membership is distributed geographically:
     - **Africa:** 11 seats
     - **Asia:** 11 seats
     - **Eastern Europe:** 6 seats
     - **Latin America and the Caribbean:** 10 seats
     - **Western Europe and Others:** 14 seats
4. **Functions:**
   - Acts as the **governing body** of the **United Nations Office on Drugs and Crime (UNODC)**.
   - Supervises the implementation of international drug control treaties.
   - Reviews the global drug situation and formulates policies.
   - Monitors trends in illicit drug trafficking and abuse.

India's Role and Significance:

1. **Global Leadership:**
   - Chairing the session enhances India's role in combating the global drug menace.
2. **Expertise:**
   - India brings its experience in tackling drug trafficking and abuse through domestic programs and international cooperation.
3. **Platform for Advocacy:**
   - Opportunity to emphasize concerns like the **Golden Crescent's** impact on South Asia and promote **global counter-narcotics strategies**.
4. **Strengthened Diplomacy:**
   - Enhances India's standing in the **United Nations** and strengthens ties with member nations.

Golan Heights: Strategic and Geopolitical Significance

Relevance to UPSC Syllabus

- **GS II: International Relations – Israel-Syria conflict, geopolitics in the Middle East.**
- **GS III: Economic Development – Agricultural and resource management in contested regions.**

Recent Developments

- **Israel's Plan**: The Israeli Prime Minister announced plans to **double the population** in the Golan Heights.
- **Budget**: Over **40 million shekels ($11 million)** allocated to encourage demographic growth.

About Golan Heights

1. **Geography**:
   - **Location**: Situated in the **southwest corner of Syria**, the Golan Heights is a **basaltic plateau**.
   - **Capital**: **Katzrin**.
2. **Bordering Regions**:
   - **South**: **Yarmouk River**.
   - **West**: **Sea of Galilee** and **Hula Valley**.
   - **North**: **Anti-Lebanon Mountains**, including **Mount Hermon**.
   - **East**: **Wadi Raqqad**.

Strategic Importance

1. **Military and Surveillance**:
   - The **high elevation** provides a **natural vantage point** to monitor activities in surrounding regions.
   - The region's proximity to **Syria, Israel, and Lebanon** enhances its military significance.
2. **Water Resources**:
   - The **Jordan River**, which flows through the region, is a critical source of **freshwater** for Israel and neighboring areas.
3. **Fertile Land**:
   - The **volcanic soil** supports agriculture, making it suitable for **vineyards**, **orchards**, and other farming activities.

Historical Context

1. **1967 Six-Day War**:
   o Israel captured the Golan Heights from Syria.
   o The region has since been a **contentious territory** in the Middle East.
2. **Annexation**:
   o In **1981**, Israel unilaterally annexed the Golan Heights, a move not internationally recognized.
3. **UN Perspective**:
   o The United Nations considers the Golan Heights **occupied Syrian territory**, though Israel disputes this.

ECONOMY

One Nation One Subscription (ONOS) Scheme

UPSC Syllabus Relevance

- **GS Paper 2**: Governance – Government Policies and Interventions
- **GS Paper 3**: Economy – Science and Technology; Research and Development

Context:

o The **Union Cabinet** approved the **One Nation One Subscription (ONOS)** scheme to enhance access to **scholarly journals and research articles** for academic and research institutions nationwide.

About the ONOS Scheme:

o **Unified Journal Access**:
  ▪ Provides access to **scholarly journals** and **research articles** through a **national subscription** on a **unified portal**.
o **Budget Allocation**:
  ▪ Allocated **₹6,000 crore** for the scheme, covering three years (2025–2027).
  ▪ Classified as a **Central Sector Scheme**.
o **Applicability**:
  ▪ Designed for **government higher education institutions (HEIs)** and **central R&D laboratories**.
  ▪ Overseen by the **Ministry of Education**, coordinated by **INFLIBNET** (Information and Library Network), under the **University Grants Commission (UGC)**.

Target Beneficiaries:

o **Coverage**:
  ▪ Includes over **6,300 institutions**, such as:
    ▪ Central and state government **HEIs**.
    ▪ **Central R&D institutions**.
o **Stakeholders**:
  ▪ Benefits **1.8 crore students, faculty**, and **researchers** across disciplines.

Objectives and Benefits:

o **Promoting Research and Development (R&D)**:
  ▪ Complements the **Anusandhan National Research Foundation (ANRF)** initiative.
  ▪ Aims to create a **nationwide knowledge network** with easy access to research resources.
o **Equitable Access**:
  ▪ Addresses the **digital divide** by providing access to journals for institutions in remote and underprivileged regions.
o **Cost-Effectiveness**:
  ▪ Consolidates journal subscriptions at a national level, reducing individual institutional costs.
o **Enhancing Research Quality**:
  ▪ Facilitates **cutting-edge research** and encourages collaboration by providing researchers access to global knowledge resources.
o **Boost to Higher Education**:
  ▪ Strengthens the academic ecosystem by integrating **global knowledge systems** into Indian academia.

Challenges in Implementation:

- o **High Initial Investment**:
  - The allocated budget of **₹6,000 crore** may strain financial resources if not optimally utilized.
- o **Digital Infrastructure Gaps**:
  - Institutions in rural or remote areas may face challenges due to **limited internet connectivity** and inadequate infrastructure.
- o **Content Curation**:
  - Identifying and subscribing to the **most relevant and diverse journals** across disciplines is complex.
- o **Usage Disparity**:
  - Large institutions might dominate usage, leaving smaller institutions with limited access.
- o **Data Security**:
  - Managing a **centralized portal** could pose challenges in terms of **cybersecurity** and **data protection**.

Way Forward:

- o **Strengthen Digital Infrastructure**:
  - Enhance **internet connectivity** and **digital resources** for rural and remote institutions.
- o **Efficient Coordination**:
  - Ensure smooth collaboration between **INFLIBNET**, **HEIs**, and **research institutions**.
- o **Training and Awareness**:
  - Conduct workshops and training sessions for faculty and students on **maximizing the benefits** of the scheme.
- o **Regular Monitoring**:
  - Establish mechanisms to **track utilization** and ensure equitable access across institutions.
- o **Global Collaborations**:
  - Partner with international publishers and organizations to expand the **journal repository**.
- o **Feedback Mechanism**:
  - Implement feedback systems to address concerns and enhance the scheme's effectiveness.

Coastal Shipping Bill, 2024

UPSC Syllabus Relevance

- **GS Paper 2**: Polity – Government Policies and Interventions
- **GS Paper 3**: Economy – Infrastructure Development and Logistics

Context:

- o The **Coastal Shipping Bill, 2024**, was introduced in the **Lok Sabha** to enhance **coastal trade** and develop a robust **maritime ecosystem** in India.

Key Highlights of the Coastal Shipping Bill, 2024:

- o **Objective**:
  - **Promotes coastal trade** and encourages the participation of **Indian-flagged vessels** operated by **Indian citizens**.
  - Balances **national security** with **commercial needs**.
- o **Provisions**:
  - **Licensing for Coastal Trade**:
    - Prohibits trade in coastal waters by vessels without a license, except **Indian vessels**.
    - Allows **inland vessels** to engage in coastal trade under specified conditions.
  - **Role of Director-General**:
    - Empowers the Director-General to issue licenses after considering factors such as **citizenship of the crew** and **vessel building requirements**.
    - Promotes **job creation for Indian seafarers** and **shipbuilding in India**.
  - **Revocation of Licenses**:
    - Licenses can be suspended, revoked, or modified for reasons such as:
      - Violation of license terms or laws.
      - Non-compliance with directions from the Director-General.
  - **National Database**:
    - Establishes a **National Coastal Shipping Database** to ensure **transparency** and facilitate **information sharing**.
  - **Strategic Plan for Coastal Development**:
    - Mandates the preparation of a **National Coastal and Inland Shipping Strategic Plan** to boost coastal shipping.
  - **Protection of License Holders**:
    - Ensures license holders are given a **reasonable opportunity to be heard** before license modification, suspension, or revocation.
  - **Powers to Exempt**:

▪ The central government can exempt certain vessel classes from the Bill's application.
- **Compounding of Offences**:
  - Specifies **compoundable offences**, such as:
    - Operating without or with an expired license.
    - Violating detention orders or failing to provide information.

Coastal Shipping in India:

- **Definition**:
  - Involves **transporting goods and passengers** along India's coastline without entering **international waters**.
- **Strategic Advantages**:
  - India has a coastline of **7,500 km**, offering immense potential for **coastal shipping**.
  - Proximity to major **global shipping routes** boosts its strategic importance.
- **Current Status**:
  - Coastal shipping constitutes only **7% of India's transportation mix**, compared to **62% by road** and **31% by rail**.

Significance of the Bill:

- **Enhanced Trade Efficiency**:
  - Reduces dependency on road and rail transport, lowering costs and emissions.
- **Job Creation**:
  - Encourages employment in the **maritime sector**.
- **Support for Maritime Infrastructure**:
  - Promotes **shipbuilding** and the **expansion of ports**.
- **Boost to Economy**:
  - Enhances the competitiveness of **Indian exports** by lowering logistics costs.

Challenges in Coastal Shipping:

- **Infrastructure Gaps**:
  - Lack of **modern ports** and **dedicated coastal shipping terminals**.
- **Policy Implementation**:
  - Ensuring **inter-departmental coordination** for effective policy rollout.
- **Limited Awareness**:
  - Stakeholders lack awareness of **coastal shipping benefits** and incentives.

Way Forward:

- **Infrastructure Development**:
  - Upgrade ports and establish **dedicated coastal terminals**.
- **Streamline Processes**:
  - Simplify licensing and regulatory procedures to attract investments.
- **Public-Private Partnerships (PPP)**:
  - Engage the private sector to develop **modern maritime infrastructure**.
- **Awareness Campaigns**:
  - Promote the advantages of **coastal shipping** among stakeholders.
- **Digital Integration**:
  - Leverage technology to establish **real-time monitoring systems** for transparency and efficiency.

Bharatiya Vayuyan Vidheyak Bill, 2024

UPSC Syllabus Relevance

- **GS Paper 2**: Polity – Government Policies and Interventions
- **GS Paper 3**: Infrastructure – Transport and Civil Aviation

Context:

- The **Bharatiya Vayuyan Vidheyak Bill, 2024**, was passed by Parliament to update and modernize aviation regulations, replacing the **Aircraft Act, 1934**.

Key Highlights of the Bharatiya Vayuyan Vidheyak Bill, 2024:

- o **Replacement of Aircraft Act, 1934**:
    - Retains regulatory structures under the **Aircraft Act, 1934**.
    - Continues with aviation oversight bodies:
        - **Directorate General of Civil Aviation (DGCA)**: Safety and regulatory functions.
        - **Bureau of Civil Aviation Security (BCAS)**: Security oversight.
        - **Aircraft Accident Investigation Bureau (AAIB)**: Accident investigations.
- o **Central Government Oversight**:
    - Maintains authority to **review and modify orders** issued by regulatory bodies.
- o **Expanded Regulatory Scope**:
    - Introduces powers to regulate **aircraft design** and the locations of design, manufacturing, repair, and maintenance.
- o **Second Appeal Mechanism**:
    - Provides for **second appeals** against penalties imposed for violations under the Act.
- o **Transfer of Licensing Responsibilities**:
    - **RTR (Radio Telephone Operator Restricted)** certification now falls under the DGCA instead of the **Department of Telecom (DoT)**.
- o **Anti-Corruption in Licensing**:
    - Aims to reduce corruption in licensing exams, particularly for trainee pilots, by bringing examinations under the DGCA's purview.

Key Issues with the Bharatiya Vayuyan Vidheyak Bill, 2024:

- o **Lack of DGCA Autonomy**:
    - **Qualifications, selection process, and tenure** of the DGCA head are not defined.
    - DGCA operates more like a **government department** rather than an independent regulator, unlike those in telecom or insurance sectors.
- o **Arbitration Process Concerns**:
    - The government has unilateral powers to appoint an arbitrator in disputes related to airport structures.
    - **Exclusion of the Arbitration and Conciliation Act, 1996** may violate the **right to equality**.
- o **Delegation of Criminal Penalties**:
    - Grants the **Executive** authority to impose criminal penalties for rule violations, potentially breaching the **separation of powers** principle.

Significance of the Bill:

- o **Modernized Regulation**:
    - Adapts aviation laws to contemporary requirements, promoting safety and innovation.
- o **Enhanced Transparency**:
    - Tackles corruption in licensing exams and streamlines procedures for aviation personnel.
- o **Boosts Domestic Aviation Industry**:
    - Promotes **aircraft design and manufacturing**, supporting **Make in India** initiatives.
- o **Strengthened Safety Measures**:
    - Expands regulatory scope to ensure compliance with international safety and design standards.

Challenges in Implementation:

- o **Institutional Limitations**:
    - Absence of autonomy and transparency in DGCA's functioning.
- o **Potential Legal Conflicts**:
    - Unilateral arbitration appointments and criminal penalties delegated to the Executive may face judicial scrutiny.
- o **Capacity Constraints**:
    - DGCA requires significant **technological and personnel capacity** to handle expanded responsibilities.

Way Forward:

- o **Enhance DGCA Autonomy**:
    - Clearly define **qualifications, tenure**, and **selection processes** for leadership positions.
- o **Adopt Transparent Arbitration Mechanisms**:
    - Ensure arbitrations comply with **fair legal principles**, using existing frameworks like the **Arbitration and Conciliation Act, 1996**.
- o **Strengthen Institutional Capacity**:
    - Invest in **training and technology** for DGCA to effectively oversee new responsibilities.
- o **Public-Private Collaboration**:
    - Engage private players to improve licensing, compliance, and infrastructure for aviation.

Oilfields (Regulation and Development) Amendment Bill, 2024

UPSC Syllabus Relevance

- **GS Paper 2**: Polity – Government Policies and Interventions
- **GS Paper 3**: Economy – Energy Resources and Infrastructure

Context:

- o **Rajya Sabha** passed the **Oilfields (Regulation and Development) Amendment Bill, 2024** to boost **domestic petroleum production**, attract **private investment**, and reduce India's **import dependency**.

2. **Key Highlights of the Bill**:
   - o **Separation of Scope**:
     - Amends the **1948 Oilfields Act**, distinguishing it from the **Mines and Minerals (Development and Regulation) Act, 1957**.
     - Exclusively focuses on **petroleum and mineral oils**.
   - o **Definition of Mineral Oil**:
     - Mineral oil includes **crude oil**, **petroleum**, and **natural gas** in all forms.
     - Excludes **coal, lignite**, and **helium** associated with petroleum or coal, which remain governed by the **1957 Mines and Minerals Act**.
   - o **Petroleum Leases**:
     - Replaces "mining leases" with **petroleum leases** for activities like **exploration**, **production**, and **transportation** of mineral oils.
     - **Centre's Role**: Empowers the central government to regulate and grant petroleum leases.
   - o **Promotion of Private Investment**:
     - Encourages private sector participation to enhance domestic production.
     - Ensures no changes to existing leases that could disadvantage lessees.
   - o **Penalty Adjudication**:
     - Appoints **senior officers** (rank of Joint Secretary or above) for adjudicating penalties.
     - Appeals to be heard by the **Appellate Tribunal** under the **Petroleum and Natural Gas Regulatory Board (PNGRB) Act, 2006**.
   - o **Monetary Penalties**:
     - Replaces imprisonment with **fines** for violations.
       - Fine of up to **₹25 lakh** with an additional **₹10 lakh per day** for ongoing violations.
   - o **Environmental Considerations**:
     - Empowers the Centre to establish rules for reducing **carbon emissions** and promoting **renewable energy projects** at oilfields.

Rule-Making Powers of the Central Government:

- o **Petroleum Lease Mergers**: Regulations for managing mergers and combinations.
- o **Shared Facilities**: Guidelines for sharing production and processing infrastructure.
- o **Environmental Obligations**: Rules for protecting the environment and reducing emissions.
- o **Dispute Resolution**: Mechanisms for resolving lease-related disputes.

Significance of the Bill:

- o **Boost to Domestic Production**:
  - Reduces reliance on **imported petroleum**, promoting energy self-sufficiency.
- o **Private Sector Involvement**:
  - Encourages **private investment**, fostering competition and innovation in the petroleum sector.
- o **Environmental Sustainability**:
  - Focuses on **reducing carbon emissions** and supporting **renewable energy integration** in oilfields.
- o **Simplified Regulatory Framework**:
  - Streamlines the regulatory structure, reducing delays and enhancing operational efficiency.

Concerns Raised:

- o **State Rights**:
  - Critics argue the Bill undermines state authority to **tax mining activities** under **Entry 50 of the State List (Schedule 7)**.
- o **Accountability and Enforcement**:
  - Replacing **criminal penalties** with monetary fines may weaken enforcement mechanisms.
- o **Call for Further Review**:
  - Ambiguities in provisions require clarification, with demands to refer the Bill to a **select committee**.

Way Forward:

- o **Safeguard State Interests**:
  - ▪ Ensure states retain their authority over taxation and regulatory matters related to petroleum.
- o **Enhance Transparency**:
  - ▪ Clearly define adjudication processes and rules for **environmental compliance**.
- o **Capacity Building**:
  - ▪ Train regulatory authorities and strengthen the **Petroleum and Natural Gas Regulatory Board (PNGRB)** to handle expanded roles.
- o **Environmental Safeguards**:
  - ▪ Enforce stringent **carbon reduction** and **renewable energy integration** measures in oilfield operations.
- o **Periodic Reviews**:
  - ▪ Establish mechanisms to periodically review the Bill's implementation, addressing evolving industry challenges.

Banking Laws (Amendment) Bill, 2024

(GS Paper 3: Indian Economy – Banking Reforms)

Context:

The **Lok Sabha** passed the **Banking Laws (Amendment) Bill, 2024** through a voice vote, introducing significant changes to streamline governance and boost financial inclusion in the banking sector.

Key Changes Under the Bill:

Feature	Earlier Provision	New Provision
Nominees	Up to 2 nominees	Up to 4 nominees with simultaneous/successive distribution options
Substantial Shareholding for Directorship	₹5 lakh	₹2 crore
Tenure of Co-operative Bank Directors	Maximum 8 years	Maximum 10 years
Common Directors in Co-operative Banks	Not allowed	Allowed for central co-op bank directors on state co-op boards
Unclaimed Amounts	Transferred to IEPF after 10 years	Transferred to IEPF after 7 years
Claiming from IEPF	Limited to legal heirs	Direct claim allowed for individuals
Auditor Remuneration	RBI approval required	Decided by the bank

Major Challenges in India's Banking Sector:

1. **Low Capital Adequacy:**
   - o Public sector banks (PSBs) face challenges in meeting Basel III norms.
   - o Recapitalization efforts remain inadequate.
2. **High NPAs:**
   - o Gross NPAs of PSBs stood at **3.12%** (Sept 2024).
   - o Rising NPAs hinder credit growth and financial stability.
3. **Low Credit-to-GDP Ratio:**
   - o India's bank credit to GDP is **~50%**, far below global standards.
4. **Governance Issues in PSBs:**
   - o Limited autonomy and political interference reduce efficiency.
5. **Unmet MSME Credit Demand:**
   - o MSMEs face an unmet credit demand of ₹25 trillion.
   - o Banks meet only **15% of MSME credit needs**.
6. **Global Competitiveness:**
   - o Indian banks lag in meeting global Basel III standards.
7. **Dependence on Government Support:**
   - o PSBs rely heavily on government funding, reducing autonomy.

Way Forward for Banking Reforms:

1. **Strengthening Governance and Autonomy:**
   - o Implement **P.J. Nayak Committee recommendations** for PSBs, including reducing government stakes to below 50%.
2. **Privatization and Consolidation:**
   - o Merge weaker PSBs and privatize underperforming banks to boost efficiency.
3. **MSME Credit Flow:**
   - o Collaborate with **NBFCs** to address the unmet credit demand in the MSME sector.

4. **Technological Adoption:**
   o Use AI and big data for better risk assessment and credit management.
   o Expand the **Account Aggregator framework** for detailed financial insights.
5. **Develop Bond Markets:**
   o Encourage large corporations to raise funds through bonds to reduce dependence on bank loans.
6. **Niche Banking and Development Finance:**
   o Promote **Development Finance Institutions (DFIs)** for infrastructure projects and sector-specific banking for agriculture and MSMEs.
7. **Reduce Lazy Banking Practices:**
   o Shift focus from large corporations to smaller borrowers to diversify lending.

Tourism in India

(GS Paper 3: Economy – Infrastructure and Economic Development)

Context:

The Centre recently approved interest-free loans of **₹3,295 crore** for 40 new tourism projects across 23 states under the **Special Assistance to States for Capital Investment (SASCI)** scheme.

About SASCI Scheme:

- **Launch Year:** 2020-21 in response to the COVID-19 economic crisis.
- **Objective:** Provides **50-year interest-free loans** to states for comprehensive development of **iconic tourist centers.**
- **Focus Areas:** Branding, global marketing, and fostering local economic growth through sustainable tourism projects.

Impact of Tourism in India:

1. **Foreign Exchange Earnings:** Contributed **₹2.3 lakh crore** in 2023, highlighting its economic importance.
2. **Employment Generation:** Created **76.17 million jobs** (direct & indirect) in 2022-23.
3. **Cultural Impact:** Promotes heritage preservation (e.g., Taj Mahal in Agra).
4. **Social Impact:** Initiatives like rural tourism in **Raghurajpur, Odisha,** preserve traditional crafts like **Pattachitra painting** while supporting livelihoods.
5. **Environmental Concerns:** Tourism leads to challenges like waste and pollution (e.g., **Ladakh** generates 200 tons of waste monthly during peak seasons).

Challenges in India's Tourism Sector:

1. **Infrastructure & Connectivity:**
   o Remote areas (e.g., Northeast) face poor transport and road access.
2. **Safety & Hygiene:**
   o Concerns, particularly for women (e.g., waste management in **Varanasi** deters visitors).
3. **Underutilized Heritage:**
   o Sites like **Khajuraho** and **Hampi** remain under-promoted.
4. **Seasonal Tourism:**
   o Destinations like **Shimla** and **Manali** experience overcrowding in peak seasons but low off-season demand.
5. **Skilled Workforce Shortages:**
   o Lack of trained personnel in hospitality impacts service quality.

Way Forward:

1. **Infrastructure Development:**
   o Enhance connectivity (e.g., **new airports in the Northeast**) and rail networks.
2. **Sustainable Tourism:**
   o Kerala's **Responsible Tourism** initiative serves as a model for eco-friendly tourism.
3. **Focused Marketing:**
   o Revamp **Incredible India** campaigns to promote spiritual tourism and Ayurveda.
4. **Safety Measures:**
   o Deploy **tourist police, improve signage, and enhance digital safety,** especially for women.
5. **Off-Season Tourism Promotion:**
   o Organize events like **Ladakh Winter Festival** or offer discounts to spread tourism year-round.

Inland Water Transport (IWT) in India: Jalvahak Scheme

(GS Paper 3: Indian Economy – Infrastructure Development and Transport)

Context:

The government has launched the **Jalvahak Scheme** to promote cargo movement through **inland waterways** on National Waterways (NW), primarily the **Ganga, Brahmaputra, and Barak rivers.**

About National Waterways (NWs):

- **Definition:** Navigable rivers, lakes, canals, and backwaters used for transportation of goods, materials, and passengers.
- **National Waterways Act, 2016:** Declared **111 inland waterways** as NWs, with **13 currently operational.**

Significance of Inland Water Transport (IWT):

1. **Fuel Efficiency and Cost-Effectiveness:**
   o IWT is more fuel-efficient than road or rail transport.
   o Reduces logistics costs, which currently account for **14% of India's GDP** (global average: **8-10%**).
2. **Eco-Friendly:**
   o Produces lower emissions, aligning with **Paris Agreement** and **SDGs on climate action.**
3. **Decongests Roads and Railways:**
   o Reduces dependency on road and rail infrastructure.
   o Example: **Kolkata-Varanasi stretch (NW-1)** facilitates scheduled cargo movement.
4. **Connectivity for Remote Regions:**
   o Links the **Northeast** to trade routes.
   o Example: **NW-2 (Brahmaputra)** connects Guwahati and other cities.
5. **Tourism and Employment:**
   o Boosts local economies via tourism and job creation.
   o Example: **Kerala's NW-3** supports backwater tourism.
6. **International Trade:**
   o Promotes cross-border trade via agreements like the **Indo-Bangladesh Waterways Protocol.**

Challenges in Inland Waterways:

1. **Navigability Issues:**
   o Inadequate depth and seasonal siltation restrict large vessel operations.
2. **Infrastructure Deficiencies:**
   o Lack of **modern terminals, night navigation aids, and repair facilities.**
3. **Underinvestment:**
   o IWT constitutes only **0.4% of transport share** compared to road (60%) and rail (25%).
4. **Regulatory Gaps:**
   o Fragmented state and central policies hinder uniform development.
5. **Limited Private Sector Involvement:**
   o High capital costs and absence of long-term cargo commitments deter private investments.
6. **Environmental Challenges:**
   o Pollution and reduced water flows threaten river ecosystems.
7. **Skilled Workforce Shortage:**
   o Inadequate training facilities for vessel operations and infrastructure management.

Way Forward for Inland Waterways Development:

1. **Infrastructure Development:**
   o Upgrade terminals, night navigation aids, and dredging activities to maintain depth.
   o Expand multimodal connectivity to enhance efficiency.
2. **Policy and Regulation Reforms:**
   o Create **uniform regulations** and integrate IWT with other transport modes via a **National Integrated Transport Policy.**
3. **Encourage Private Participation:**
   o Provide **tax benefits, subsidies, and long-term agreements** to attract private investments.
4. **Focus on Regional Connectivity:**
   o Strengthen IWT in the **Northeast and peninsular regions** (e.g., NW-16 on Barak River).
5. **Adopt Green Technology:**
   o Introduce **electric and hybrid vessels** to align with climate goals.
6. **Capacity Building:**

o Establish training centers for vessel operations and infrastructure management.

RBI Report on State Finances 2024-25

(GS Paper 3: Indian Economy – Public Finance and Budgeting)

Context:

The Reserve Bank of India (RBI) released the **"State Finances — A Study of Budgets of 2024-25"**, highlighting trends, concerns, and recommendations for state-level fiscal management.

Key Highlights of the Report:
State Performance Post-Pandemic

- **Improved Tax Revenue:**
  - Tax buoyancy increased to **1.4 (2021-25)** from **0.86 (2013-20)**, boosting allocations for infrastructure.
- **Capital Expenditure:**
  - Increased from **2.4% of GDP (2021-22)** to **2.8% (2023-24)**; budgeted at **3.1% (2024-25)**, indicating better spending quality.
- **Fiscal Discipline:**
  - Gross Fiscal Deficit (GFD) budgeted at **3.2% of GDP** for FY25, up from **2.9%** in FY24.
  - Revenue expenditure projected at ₹47.5 trillion (14.6% of GDP) in FY25 compared to ₹39.9 trillion (13.5% of GDP) in FY24.
- **Debt Levels:**
  - Debt-to-GDP ratio reduced from **31% (March 2021)** to **28.5% (March 2024)**, but above the pre-pandemic level of **25.3% (March 2019)**.
  - **FRBM Review Committee (2017):** Recommended debt-to-GDP target at **20%.**

Concerns in State Budgets

- **Rising Subsidy Burden:**
  - Farm loan waivers, free/subsidized services, and income transfers (~₹2 lakh crore or 0.6% of GDP) crowd out infrastructure investments.
- **Revenue Generation Issues:**
  - Decline in **non-tax revenues** and central grants.
  - Slower growth in **State Goods and Services Tax (SGST)** affecting state finances.
- **Fiscal Transparency:**
  - Poor reporting of **off-budget liabilities** obscures the true fiscal position.

Key Terms:

- **Tax Buoyancy:** Reflects how responsive tax revenue is to changes in the economic growth rate.
- **Gross Fiscal Deficit (GFD):** Difference between total expenditure (Revenue + Capital) and total revenue receipts (including non-debt capital receipts).
- **Debt-to-GDP Ratio:** Measures a government's debt relative to the country's GDP.

RBI Recommendations:

1. **Debt Consolidation:**
   - Establish clear, time-bound plans for debt reduction and improve liability reporting.
2. **Expenditure Efficiency:**
   - Focus on **climate-sensitive** and **outcome-based budgeting.**
   - Rationalize **centrally-sponsored schemes.**
3. **Subsidy Rationalization:**
   - Optimize subsidies to redirect funds toward **productive expenditures.**
4. **Revenue Generation:**
   - Strengthen **SGST collection**, increase **non-tax revenues**, and secure higher central grants.

55th Meeting of GST Council

(GS Paper 3: Indian Economy – Taxation and Fiscal Policy)

Context:

The **55th GST Council meeting** was held in Jaisalmer, Rajasthan, under the chairmanship of the Union Finance & Corporate Affairs Minister. It focused on rate rationalizations, exemptions, and administrative changes.

Key Recommendations of the GST Council:
1. Changes in GST Rates for Goods and Services

- **Goods:**
  - **Fortified Rice Kernel:** GST reduced to **5%**.
  - **Old and Used Vehicles (including EVs):** GST increased from **12% to 18%**, except for sales by unregistered persons.
  - **Autoclaved Aerated Concrete (AAC) Blocks:** Containing over 50% fly ash will attract **12% GST**.
  - **Exemptions:**
    - Pepper (fresh/dried) and raisins supplied by agriculturists.
    - Gene therapy.
  - **Popcorn GST Structure:**
    - 5% GST on ready-to-eat popcorn (non-packaged and labelled).
    - 12% GST on pre-packaged and labelled popcorn.
    - 18% GST on caramelized popcorn (sugar confectionery).
- **Services:**
  - **Payment Aggregators Regulated by RBI:** Exempted from GST (excludes payment gateways and fintech services).
  - **Penal Charges by Banks/NBFCs:** No GST on charges for non-compliance with loan terms.
  - **Sponsorship Services by Body Corporates:** To fall under the **Forward Charge Mechanism**.
  - **Motor Vehicle Accident Fund Contributions:** Exempt from GST.

2. Taxability of Vouchers

- **Not Considered Supply:** Transactions in vouchers are neither treated as goods nor services.
- **Principal-to-Principal Basis:** Exempt from GST.
- **Principal-to-Agent Basis:** Commission or fee charged by agents is taxable under GST.

3. Introduction of Track and Trace Mechanism

- **Provision in CGST Act, 2017:** Enables a **Unique Identification Marking** for tracing specific commodities throughout the supply chain.

About the GST Council:

- **Constitutional Basis:** Established under **Article 279A** of the Constitution.
- **Objective:** Efficient GST implementation through decisions on tax rates, exemptions, and procedures.
- **Secretariat:** Located in **New Delhi**.
- **Members:**
  - **Chairperson:** Union Finance Minister.
  - **Union Minister of State (Revenue/Finance).**
  - **State Representatives:** Finance/Taxation Ministers of states.
  - **Permanent Invitee:** Chairperson of CBEC (non-voting).
- **Decision Making:**
  - **Weighted Votes:**
    - Central Government: **1/3rd weightage**.
    - State Governments: **2/3rd weightage combined**.
  - Requires **3/4th majority** of weighted votes.
  - **Supreme Court Ruling:** GST Council recommendations are persuasive, not binding.

Panel to Revise GDP Base Year to 2022-23

(GS Paper 3: Indian Economy – Economic Growth and Development)

Context:

The government has initiated a revision of the **GDP base year** from **2011-12 to 2022-23**, under the supervision of the **26-member Advisory Committee on National Accounts Statistics (ACNAS)**, chaired by **Biswanath Goldar**. The revision is expected to be completed by early 2026.

About the Base Year:

- **Definition:** The base year is a reference year used to measure economic changes over time.
- **Purpose of Revision:** Reflects structural and compositional changes in the economy.
- **First Estimates:**
    - Introduced in 1956 with **1948-49** as the base year.
- **Current Base Year:**
    - **2011-12**, implemented in January 2015.

Role of Base Year in GDP Calculation:

1. **Price Index Creation:** The base year's prices are used to construct indices such as the GDP deflator.
2. **GDP Deflator:**
    - Measures the overall price level of final goods and services in the economy.
    - **Formula:** $\text{GDP Deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$
3. **Real GDP Calculation:** $\text{Real GDP} = \frac{\text{Nominal GDP}}{\text{GDP Deflator}}$

Implications of the Base Year Change:

1. Improved Growth Insights:

- Adjusted historical GDP data will provide a clearer view of economic trends and growth patterns, factoring in modern economic dynamics.

2. Enhanced Policy Planning:

- Accurate GDP estimates will support **targeted government policies** in sectors like:
    - **Health, Education, and Infrastructure.**
- Ensures efficient resource allocation.

3. Boost to Investor Confidence:

- **Updated and transparent data** will better reflect the economy's state, enhancing credibility among **domestic and global investors**.

4. Incorporation of New Sectors and Technology:

- Reflects contributions from emerging sectors such as:
    - **Digital economy, renewable energy, and modern manufacturing.**

5. International Comparability:

- Aligns with **UN System of National Accounts (SNA)** standards, improving global comparability.

6. Reflection of Pandemic Impact:

- The revised base year will incorporate the **post-COVID-19 economic environment**, offering insights into recovery trends.

Green Steel Taxonomy

(GS Paper 3: Environment – Conservation, Sustainable Development)

Context:

India unveiled the **Green Steel Taxonomy** at an event in Vigyan Bhavan, New Delhi, marking a crucial step in the nation's journey toward a **low-carbon economy** and its **net-zero emissions goal by 2070.**

Key Features of Green Steel Taxonomy:

1. **Objective:**
   o To establish **clear guidelines** for defining **Green Steel** based on **emission intensity** in steel production.
2. **Definition of Green Steel:**
   o Steel produced with **significantly lower carbon emissions** compared to traditional methods.
   o **Threshold for Green Steel:**
     ▪ Steel plants emitting less than **2.2 tonnes of CO_2 equivalent per tonne of finished steel (tfs)** qualify as Green Steel.
3. **Star Rating System:**
   o **Five-star:** Emission intensity < **1.6 t-CO_2e/tfs.**
   o **Four-star:** Emission intensity between **1.6 to 2.0 t-CO_2e/tfs.**
   o **Three-star:** Emission intensity between **2.0 to 2.2 t-CO_2e/tfs.**
   o Steel emitting more than **2.2 t-CO_2e/tfs** is ineligible for the Green Steel rating.
4. **Review Cycle:**
   o **Star rating thresholds** will be reviewed every **three years** to reflect advancements in technology and emission standards.

India's Target for Green Steel:

1. **Decarbonization Target:**
   o Reduce emissions to **2.2 t-CO_2 per tonne of steel** by **2030.**
   o Mandatory adoption of the **Green Steel Taxonomy** for the steel sector to meet emissions targets.
2. **Net-Zero Vision:**
   o Aligns with India's **net-zero emissions goal by 2070.**

Significance of the Green Steel Taxonomy:

1. **Promotes Low-Carbon Economy:**
   o Encourages **sustainable practices** in steel production, reducing environmental impact.
2. **Global Competitiveness:**
   o Ensures Indian steel remains competitive in global markets where sustainability is increasingly prioritized.
3. **Technological Advancements:**
   o Drives **innovation and adoption** of low-emission technologies in the steel sector.
4. **Climate Goals:**
   o Contributes to India's **commitment under the Paris Agreement** and broader **Sustainable Development Goals (SDGs).**
5. **Monitoring and Accountability:**
   o A **standardized framework** facilitates monitoring and enhances accountability in the steel industry.

De-Dollarisation

(GS Paper 3: Indian Economy – International Trade and Finance)

Context:

The **Reserve Bank of India Governor, Shaktikanta Das**, clarified India's position on "de-dollarisation," emphasizing no plans to replace the U.S. dollar in trade but to mitigate risks associated with dollar dependence.

What is De-Dollarisation?

1. **Definition:**
   o Efforts by countries to reduce dependence on the U.S. dollar as a global reserve and trading currency.
2. **Reasons for De-Dollarisation:**
   o **Mitigation of Risks:** Reduce vulnerability to U.S. economic policies, sanctions, and dollar volatility.
   o **Global Trade Stability:** Counter risks of **dollar weaponization**, especially post **Russia-Ukraine conflict**.
   o **Geopolitical Concerns:** Encourage trade in local currencies to assert economic independence.

India's Initiatives to Reduce Dollar Dependence:

1. **Bilateral Currency Trade Agreements:**
   o **Local Currency Settlement:** Encourages trade settlements in local currencies, bypassing the dollar.
   o Example: **India-UAE Currency Swap Agreement** to facilitate direct rupee-dirham trade.
2. **Vostro Accounts:**
   o Foreign banks maintain rupee-denominated accounts in Indian banks for direct trade settlements.
   o This reduces dollar conversion needs and promotes rupee-based international transactions.
3. **Focus on Derisking:**

- o **Diversification:** Broadening trade partnerships to reduce reliance on a single currency.
- o **Alternative Payment Systems:** Exploring systems like the **Unified Payments Interface (UPI)** and **CBDCs (Central Bank Digital Currencies)**.

Global Context of De-Dollarisation:

1. **Post-Ukraine Crisis Momentum:**
   - o **Sanctions Impact:** Restriction on dollar-based transactions heightened concerns about the **weaponization** of the currency.
2. **Global Initiatives:**
   - o **BRICS Nations:** Exploring mechanisms for trade in local currencies.
   - o **China's Yuan:** Gaining traction in international trade settlements.

India's Approach:

India is not actively pursuing de-dollarisation but is focusing on **risk mitigation strategies** to safeguard its trade from dollar fluctuations, ensuring **financial stability** while embracing global economic diversity.

Conclusion:

India's focus on **derisking** rather than outright **de-dollarisation** reflects a balanced approach to reducing reliance on the dollar. This strategy aligns with India's goal of fostering economic stability, strengthening trade resilience, and promoting rupee internationalization.

RBI Allows SFBs to Extend Credit Lines through UPI

(GS Paper 3: Indian Economy – Banking and Financial Inclusion)

Context:

The Reserve Bank of India (RBI) has permitted **Small Finance Banks (SFBs)** to provide pre-sanctioned **credit lines**through the **Unified Payments Interface (UPI)**, aiming to improve **financial inclusion** and access to formal credit systems.

Key Details of the Announcement:

1. **Previous Restrictions:**
   - o Previously, only **scheduled commercial banks** could offer credit lines via UPI.
   - o SFBs, **payments banks**, and **regional rural banks (RRBs)** were excluded.
2. **About UPI Credit Line:**
   - o **Objective:** Simplify and democratize access to credit.
   - o **Developed by: National Payments Corporation of India (NPCI)**.
   - o **Vision:** Aligns with RBI's goal of expanding **credit accessibility** for underserved populations.

Benefits of UPI Credit Line:

1. **Instant Convenience:**
   - o Offers **immediate credit access** for seamless payments.
2. **Boosts Financial Inclusion:**
   - o Targets **"new-to-credit"** customers who lack access to traditional banking systems.
3. **Economic Growth:**
   - o Facilitates smooth transactions, supporting **business growth** and reducing **credit barriers**.
4. **Lower Costs:**
   - o Reduces reliance on costly informal credit channels.

What are Small Finance Banks (SFBs)?

1. **Definition:**
   - o Specialized banks licensed by the RBI to provide banking services to **low-income groups** and **underserved communities**.
2. **Primary Functions:**
   - o Offer **microfinance**, **micro-enterprise loans**, **savings accounts**, and other basic financial products.
3. **Eligibility for Scheduled Bank Status:**
   - o Must meet operational criteria as per **Section 42 of the RBI Act, 1934**.
4. **Examples of SFBs:**
   - o **Ujjivan Small Finance Bank**, **Utkarsh SFB**, **Capital SFB**, etc.

Significance of the Move:

1. **Enhanced Access to Formal Credit:**
   o Enables more people, especially in **rural and semi-urban areas**, to access credit via digital platforms.
2. **Promotes Digital Banking Ecosystem:**
   o Increases the adoption of UPI and strengthens the **digital financial infrastructure**.
3. **Supports Underserved Communities:**
   o Targets the economic upliftment of low-income groups through better **credit accessibility**.
4. **Strengthens SFB Operations:**
   o Empowers SFBs to expand their **customer base** and diversify their offerings.

India Skills Report 2025

(GS Paper 3: Indian Economy – Employment and Human Resources)

Context:

The **India Skills Report 2025**, based on a **Global Employability Test (GET)**, has been released, providing insights into the **employability** of Indian youth, skill trends, and India's role as a global talent hub.

About India Skills Report:

1. **Published By:**
   o **Wheebox**, in collaboration with **AICTE, CII**, and the **Association of Indian Universities**.
2. **Purpose:**
   o **Assess Employability:** Evaluate job readiness of Indian youth.
   o **Track Skill Trends:** Identify emerging skills for future workforce needs.
   o **Promote Global Mobility:** Highlight India's potential in providing talent globally.

Key Highlights:
1. Rising Employability Rates:

- **Global Employability:**
  o **55%** of Indian graduates expected to be globally employable in 2025 (**up from 51.2% in 2024**).
- **Top Fields:**
  o **Management Graduates:** 78% employability.
  o **Engineering Graduates:** 71.5%.
  o **MCA Graduates:** 71%.
  o **Science Graduates:** 58%.

2. Regional Talent Hubs:

- **States:** Maharashtra, Karnataka, and Delhi dominate as talent hubs.
- **Cities:** Pune, Bengaluru, and Mumbai lead in skilled workforce availability.

3. Gender Analysis:

- **Men:** Employability rate to rise from **51.8% (2024)** to **53.5% (2025)**.
- **Women:** Employability rate to **decline** from **50.9% (2024)** to **47.5% (2025)**.

4. Vocational Training:

- **Coverage:** 50% of secondary and tertiary students to receive vocational training in 2025.
- **Focus Areas:**
  o **Artificial Intelligence (AI)**.
  o **Cybersecurity**.
  o **Green Energy Technologies**.

Significance:

1. **Global Talent Hub:** Reinforces India's growing potential to supply talent for global markets.
2. **Skill Alignment:** Addresses the industry's evolving demands in emerging sectors like **AI, green energy, and cybersecurity**.

3. **Regional Development:** Highlights the role of specific states and cities in providing employable talent.
4. **Policy Insight:** Provides actionable data to bridge **skill gaps** and promote inclusive growth.

Challenges:

1. **Declining Female Employability:** Indicates the need for targeted policies to encourage female participation in the workforce.
2. **Skill Gaps:** Emerging fields demand **upskilling** to meet industry requirements.
3. **Regional Disparities:** States and cities outside the talent hubs lag in employability rates.

Way Forward:

1. **Enhanced Vocational Training:** Strengthen partnerships between industry and educational institutions for skill-based training.
2. **Promote Gender Inclusion:** Implement targeted policies to enhance women's employability and workforce participation.
3. **Regional Focus:** Invest in underdeveloped regions to create balanced talent hubs across India.
4. **Upskilling Initiatives:** Foster upskilling programs in emerging fields like AI, cybersecurity, and renewable energy.

National Urban Co-operative Finance and Development Corporation (NUCFDC)

(GS Paper 3: Economy – Issues related to banking and financial sectors)

Context:

The **National Urban Co-operative Finance and Development Corporation (NUCFDC)** was recently established to address the challenges faced by **Urban Cooperative Banks (UCBs)** and strengthen the cooperative banking sector.

About NUCFDC:

- **Type of Organization:**
  - It is an **Umbrella Organization (UO)** for Urban Cooperative Banks in India.
- **Established On:**
  - **March 2, 2024.**
- **Nodal Ministry:**
  - **Ministry of Cooperation.**
- **Objectives:**
  - Address challenges faced by UCBs.
  - Enhance operational efficiency.
  - Strengthen the cooperative banking ecosystem.
- **Functionality:**
  - It will act as a **Self-Regulatory Organization (SRO)** under guidelines by the **Reserve Bank of India (RBI).**

Key Services Offered:

1. Fund-Based Services:

- **Capital Support:** Assisting UCBs with capital adequacy.
- **Investment Assistance:** Providing financial backing for growth and sustainability.
- **Emergency Financial Support:** Offering aid during unforeseen crises.

2. Non-Fund-Based Services:

- **Payment and Settlement Services:** Ensuring smooth financial transactions.
- **IT Services:** Offering technological solutions for modernization.
- **Consultancy Services:** Advising UCBs on compliance, strategy, and operations.

Significance of NUCFDC:

1. **Strengthening Urban Cooperative Banks (UCBs):**
   - Addresses long-standing operational and financial challenges.
2. **Enhancing Regulatory Oversight:**
   - Acts as a centralized **self-regulatory authority** for better compliance and risk management.
3. **Promoting Financial Inclusion:**

o Supports the cooperative banking model to cater to underserved urban populations.
4. **Improved Efficiency and Modernization:**
   o Introduces **technology-driven solutions** for UCBs to stay competitive.
5. **Resilience in the Banking Ecosystem:**
   o Provides financial and strategic resilience to the cooperative sector, reducing systemic risks.

(SMILE) Program

(GS Paper 3: Infrastructure – Investment Models and Transport Systems)

Context:

The **Government of India** and the **Asian Development Bank (ADB)** signed a **$350 million policy-based loan** under the **second subprogram** of the **SMILE program**.

About the SMILE Program:

1. **Type of Program:**
   o A **programmatic policy-based loan (PBL)** initiative to reform and develop India's logistics sector.
2. **Structure:**
   o **Subprograms:**
      ▪ Consists of **two subprograms**, aimed at:
         ▪ Expanding India's manufacturing sector.
         ▪ Enhancing the resilience of supply chains.
3. **Alignment:**
   o Fully aligned with **ADB's India Country Partnership Strategy (2018–2022).**

Objectives of the SMILE Program:

1. **Institutional Strengthening:**
   o Enhance the institutional framework for multimodal logistics development at **national, state, and city levels.**
2. **Standardization:**
   o Develop standardized **warehousing and logistics assets** to improve **supply chain efficiency.**
3. **Private Sector Participation:**
   o Incentivize **private sector investment** in logistics infrastructure.
4. **Trade Logistics Efficiency:**
   o Improve efficiencies in **external trade logistics** to enhance India's competitiveness.
5. **Smart and Sustainable Systems:**
   o Promote **smart systems** for efficient, low-emission logistics.

Significance of the SMILE Program:

1. **Economic Growth:**
   o Strengthens logistics to support the **Make in India** initiative and manufacturing expansion.
2. **Cost Reduction:**
   o Improves logistics efficiency, reducing **transportation and warehousing costs.**
3. **Sustainability:**
   o Encourages **low-emission** logistics systems, aligning with India's **Net Zero by 2070** goals.
4. **Global Trade:**
   o Enhances India's position in global supply chains by improving **trade logistics.**
5. **Private Sector Role:**
   o Attracts investment and boosts **public-private partnerships** (PPPs) in infrastructure.
6. **Resilient Supply Chains:**
   o Builds resilience to disruptions in global and domestic supply chains.

Way Forward:

- **Policy Integration:**
  o Harmonize logistics policies across sectors and regions.
- **Technology Adoption:**
  o Expand the use of **smart logistics technologies** and digital platforms.
- **Capacity Building:**
  o Train workforce for **modern logistics operations**.
- **Sustainable Practices:**

    o   Emphasize green logistics and **energy-efficient solutions.**

Windfall Tax on Fuels Scrapped

(GS Paper 3: Indian Economy – Taxation, Energy Security)

Context:

The Government of India has scrapped the **windfall tax** on **aviation turbine fuel (ATF)**, crude oil, petrol, and diesel, which was initially imposed to address volatility in the energy market.

About Windfall Tax:

1. **Definition:**
   o A **higher tax levied** on industries experiencing **unexpected and extraordinary profits** due to sudden market changes.
2. **Purpose:**
   o To **redistribute excess profits** and fund **greater public welfare.**
3. **Historical Example:**
   o In the **1980s**, the **U.S. government** imposed windfall tax on oil companies that profited from a sudden rise in oil prices during the **1979 oil crisis.**
4. **Introduction in India:**
   o India introduced windfall tax on **July 1, 2022,** as a **special additional excise duty** to address shortages in domestic energy markets and to benefit from the unexpected gains of oil companies.

Pros and Cons of Windfall Tax:

Pros:

- **Revenue Generation:** Provides the government with significant funds during periods of high profits.
- **Wealth Redistribution:** Utilizes excessive corporate gains for broader social welfare.
- **Fair Market Practices:** Discourages **excessive profiteering** in volatile sectors.

Cons:

- **Discourages Investment:** Deters companies from investing in **volatile sectors** like oil.
- **Investor Uncertainty:** Creates unpredictability, affecting **long-term planning** for businesses.
- **Implementation Challenges:** Defining "**windfall profits**" and determining appropriate tax rates is difficult.

Implications of Scrapping the Tax:

1. **Boost to Investment:** Encourages domestic and foreign investments in oil and energy sectors.
2. **Improved Market Sentiment:** Eliminates uncertainty, improving the confidence of stakeholders.
3. **Revenue Impact:** Reduces short-term government revenue, but fosters long-term economic stability.
4. **Energy Prices:** Could stabilize or reduce prices for aviation fuel and other energy products.

Atal Innovation Mission 2.0 (AIM 2.0)

UPSC Syllabus Mapping

GS Paper II:

- **Government Policies and Interventions: AIM 2.0's role in fostering innovation.**
- **Developmental Processes: Strengthening innovation ecosystems.**

GS Paper III:

- **Science and Technology: Promoting research and innovation.**
- **Economy: Boosting entrepreneurship and startups.**
- **Inclusive Development: Reaching underserved and rural areas.**

Context

The **Union Cabinet** approved the continuation of the **Atal Innovation Mission (AIM)** with an enhanced scope, a budget allocation of **₹2,750 crore**, and extended implementation till **March 31, 2028**.

Key Features of AIM 2.0

1. **Objective**:
   o Strengthen India's **innovation and entrepreneurship ecosystem** to drive **economic growth** and **societal development**.
2. **Enhanced Components**:
   o **Language Inclusive Program of Innovation (LIPI)**:
     ▪ Focus on promoting innovation in **22 scheduled languages**.
     ▪ Aims to reduce barriers for **non-English-speaking innovators**, **entrepreneurs**, and **investors**.
   o **Frontier Program**:
     ▪ Targets development of **innovation ecosystems** in **underserved regions**.
   o **Human Capital Development**:
     ▪ Focuses on training **professionals** to support innovation ecosystems.
   o **Deep-Tech Reactor**:
     ▪ Promotes the growth of **deep-tech startups** focused on advanced technologies.
   o **State Innovation Mission**:
     ▪ Assists states in building localized **innovation ecosystems**.
   o **International Collaborations**:
     ▪ Fosters **global partnerships** to exchange knowledge and best practices.
   o **Industrial Accelerator**:
     ▪ Facilitates collaborations between **industry players and startups**.
   o **Atal Sectoral Innovation Launchpads (ASIL)**:
     ▪ Creates platforms for **government-startup partnerships** in specific sectors.

Atal Innovation Mission (AIM)

1. **Launched**: 2016 by **NITI Aayog**.
2. **Objective**: Promote a **culture of innovation and entrepreneurship** across schools, universities, MSMEs, industries, and research institutions.
3. **Key Initiatives**:
   o **Atal Tinkering Labs (ATL)**:
     ▪ Foster creativity in **school students** by providing tools and equipment.
     ▪ Established in over **10,000 schools** across India.
   o **Atal Incubation Centres (AICs)**:
     ▪ Supports **startups and entrepreneurs** through incubation facilities and mentorship.
   o **ARISE Program**:
     ▪ Promotes innovation in **MSMEs** to address India's industrial and social needs.
   o **Mentor India**:
     ▪ A national mentor network aimed at guiding **young innovators**.

Significance of AIM 2.0

1. **Inclusivity**:
   o Focus on **language inclusivity** ensures equitable access to resources and opportunities across India.
2. **Regional Development**:
   o Frontier programs aim to **bridge the innovation gap** in underserved regions.
3. **Global Competitiveness**:
   o Encourages **deep-tech advancements** and **international collaborations**, making India a global innovation hub.
4. **Economic Growth**:
   o Drives **entrepreneurship** and **startup ecosystems**, fostering job creation and economic resilience.
5. **Education and Skill Development**:
   o Enhances **STEM education** and equips professionals to nurture innovation.

Challenges

1. **Digital Divide**:
   o Lack of access to **technology** and **internet infrastructure** in rural areas.
2. **Resource Constraints**:
   o Limited funding and **manpower** for startups and innovation initiatives.
3. **Coordination**:
   o Effective **state-federal collaboration** is essential for successful implementation.
4. **Startup Survival Rates**:
   o High **failure rates** of startups due to lack of mentorship and funding.

Way Forward

1. **Strengthen Implementation**:
   o Ensure robust **monitoring and evaluation mechanisms**.
2. **Foster Collaboration**:
   o Promote **public-private partnerships** to scale initiatives.
3. **Incentivize Innovation**:
   o Provide **tax benefits**, **grants**, and **subsidies** for startups and innovators.
4. **Expand Awareness**:
   o Conduct **outreach programs** to raise awareness about AIM 2.0 initiatives.

AGRICULTURE

Legal Guarantee of MSP Recommended by Standing Committee

(GS Paper 3: Indian Economy – Agriculture, MSP Policy)

Context:

The **Standing Committee of Parliament on Agriculture**, chaired by Charanjit Singh Channi, recommended a legally guaranteed **Minimum Support Price (MSP)** to ensure farmer welfare and address agricultural challenges.

Key Recommendations:

1. **Legal Guarantee of MSP:**
   o Develop a **roadmap for MSP implementation** with periodic parliamentary reporting on its impact.
   o Expand MSP coverage beyond wheat and rice to include diverse crops.
2. **Compensation for Stubble Management:**
   o Propose financial incentives for managing crop residue to mitigate environmental hazards.
3. **Enhanced PM-KISAN Benefits:**
   o Double the support under PM-KISAN from ₹6,000 to **₹12,000 per annum** and include tenant farmers and laborers.
4. **Debt Waiver for Farmers:**
   o Address rising farmer suicides by implementing a **debt relief program.**
5. **Universal Crop Insurance:**
   o Make crop insurance compulsory for farmers with **landholdings under 2 acres.**
6. **Increased Agricultural Budget:**
   o Reverse the declining budget share for agriculture, which dropped from **3.53% (2020-21)** to **2.54% (2024-25).**
7. **National Commission for Farm Laborers:**
   o Create a commission to ensure **minimum living wages for agricultural laborers.**

Advantages of Legal MSP:

- **Income Stability:** Provides assured returns, reducing income volatility and debt burden.
- **Encourages Diversification:** Promotes growing **millets, pulses, and oilseeds**, aligning with sustainable practices.
- **Rural Economic Growth:** Enhances rural spending and local business activity.
- **Food Security:** Ensures steady supply for the **Public Distribution System (PDS).**
- **Empowerment:** Formalizes market transactions, reducing exploitation by middlemen.

Challenges of Legal MSP:

- **Fiscal Burden:** Estimated annual expenditure of **₹6 lakh crore** for MSP implementation across 23 crops.
- **Inflation Risk:** Higher MSP rates could increase food prices for consumers.
- **Regional Disparities:** A uniform MSP policy may not address state-specific agricultural needs.
- **Environmental Impact:** Guaranteed MSP for water-intensive crops like rice exacerbates **groundwater depletion.**
- **WTO Compliance Issues:** Legal MSP may conflict with the **WTO de minimis rule,** which limits subsidies.

Way Forward:

1. **Regional MSP Strategies:**
   o Promote **region-specific crops** (e.g., ragi in Karnataka).

2. **Improved Infrastructure:**
    o Develop robust procurement, storage, and transport systems to minimize post-harvest losses.
3. **Sustainability Linkage:**
    o Incentivize sustainable practices like **organic farming and water conservation.**
4. **Digital Empowerment:**
    o Expand platforms like **e-NAM** for transparent procurement and market access.
5. **Awareness Programs:**
    o Educate farmers about MSP benefits and legal mechanisms.
6. **WTO Alignment:**
    o Adapt policies to comply with the **WTO de minimis rule** and seek exemptions under food security clauses.
7. **Independent Pricing Commission:**
    o Establish a **National Agricultural Pricing Commission** for unbiased MSP determination.

Framework on Agricultural Marketing in India

(GS Paper 3: Indian Economy – Agricultural Marketing and Allied Issues)

Context:

The **Agriculture Ministry** released the draft of the **National Policy Framework on Agricultural Marketing** for public review, aiming to reform agricultural markets and promote a unified national market.

Key Proposals in the Draft Policy:

1. **Empowered Agricultural Marketing Reform Committee:**
    o Modeled after the **GST Empowered Committee.**
    o Includes **state agriculture ministers** with rotational chairmanship.
    o Goals:
        ▪ Encourage state adoption of reforms in **APMC Acts.**
        ▪ Move toward a **single licensing/registration system** and **uniform fee structure.**
2. **Proposed State-Level Reforms:**
    o Adoption of **Model APMC Act, 2003.**
    o Key areas:
        ▪ Private wholesale markets.
        ▪ **Farm-gate purchases** by processors and exporters.
        ▪ **Deemed market yard status** for warehouses and cold storages.
3. **Price Insurance for Farmers:**
    o Similar to **PM Fasal Bima Yojana (PMFBY).**
    o Ensures farmer income stability during price crashes.

Significance of the Draft Policy:

- **Unified Market:** Addresses fragmentation caused by state-specific APMC laws.
- **Bridging Gaps:** Resolves divergence between **Centre, states, and farmers** on marketing issues.
- **Price Stability:** Provides fair price mechanisms and transparency.

Challenges in Agricultural Marketing:

1. **Fragmented Market Structure:**
    o **2,500 APMCs** restrict access to wider markets.
2. **Inefficiency in APMCs:**
    o Limited competition, trader cartels, and high commission charges.
3. **Inadequate Storage:**
    o Lack of proper storage forces distress sales.
4. **Limited Credit Access:**
    o Farmers depend on high-interest loans from informal sources.
5. **Information Gaps:**
    o Lack of market price awareness among farmers.

Government Measures to Improve Agricultural Marketing:

1. **e-NAM:**
    o Launched in **2016,** connects farmers to electronic marketplaces.
2. **Farmer Producer Organizations (FPOs):**

- o Formation of **10,000 FPOs** by **2027-28.**
3. **Agricultural Marketing Infrastructure (AMI) Scheme:**
   - o Supports construction of warehouses to enhance storage capacity.
4. **Model Contract Farming Act, 2018:**
   - o Excludes contract farming from **APMC jurisdiction** and includes dispute resolution mechanisms.

Way Forward:

1. **e-NAM Expansion:**
   - o Integrate more APMCs and implement a **unified trading license.**
2. **Incentives for States:**
   - o Financial incentives for implementing reforms, as proposed by the **15th Finance Commission.**
3. **Sustainable Practices:**
   - o Link MSP to sustainable practices like growing **pulses** and **millets.**
4. **Infrastructure Development:**
   - o Build storage and banking facilities near APMCs to reduce post-harvest losses.

National Mission on Natural Farming (NMNF)

(GS Paper 3: Indian Economy – Agriculture and Sustainable Practices)

Context:

The Union Government launched the **National Mission on Natural Farming (NMNF)** to promote sustainable, chemical-free, and livestock-based farming.

About NMNF:

- **Type:** Centrally Sponsored Scheme.
- **Financial Outlay:** ₹2,481 crore (Centre: ₹1,584 crore; States: ₹897 crore) till 2025-26.
- **Vision:**
  - o Self-sustainable, low-input farming systems.
  - o Reduce cultivation costs, increase farmers' income, and ensure resource conservation and food safety.

About Natural Farming:

- **Definition:** Chemical-free farming that integrates crops, livestock, and trees.
- **Global Approach:** A regenerative agricultural practice restoring soil health and reducing greenhouse gas emissions.
- **Origin:** Introduced by Masanobu Fukuoka in *The One-Straw Revolution (1975).*
- **Indian Model:**
  - o Promoted under **Bhartiya Prakritik Krishi Paddhati (BPKP)** and **Paramparagat Krishi Vikas Yojana (PKVY).**
  - o Components:
    - ▪ **Bijamrit:** Microbial seed coating.
    - ▪ **Jivamrit:** Soil microbe enhancement.
    - ▪ **Mulching:** Soil cover with residues.
    - ▪ **Waaphasa:** Soil aeration through humus.

Challenges of Natural Farming:

1. **Reduction in Yields:**
   - o Farmers in Sikkim reported yield declines after transitioning to organic farming.
2. **Economic Uncertainty:**
   - o Lack of conclusive evidence for increased productivity and income.
3. **Preparation Difficulties:**
   - o Bio-inputs like **Jivamrit** require time and effort, which deters farmers.
4. **Nutrient Deficiency:**
   - o Lower nutrient availability compared to chemical fertilizers.
5. **Resistance to Change:**
   - o Farmers hesitant to shift from conventional methods.
6. **Infrastructure Gaps:**
   - o Limited **Bio-Resource Centers** and underdeveloped certification mechanisms.

Government Initiatives for Natural Farming:

1. **Paramparagat Krishi Vikas Yojana (PKVY):**
   - o Launched in 2015 to promote organic and natural farming.
2. **Bhartiya Prakritik Krishi Paddhati (BPKP):**
   - o Focuses on indigenous practices under **PKVY.**
3. **Zero Budget Natural Farming (ZBNF):**
   - o Promotes cost-effective farming with locally sourced inputs.
4. **Mission Organic Value Chain Development (MOVCDNER):**
   - o Targets the **North East Region** for organic farming.
5. **State Initiatives:**
   - o **Madhya Pradesh** and **Sikkim** leading in natural and organic farming models.

Way Forward:

1. **Farmer Training:**
   - o Expand capacity-building programs at **Krishi Vigyan Kendras (KVKs)** and universities.
2. **Infrastructure Development:**
   - o Establish **Bio-Resource Centers** for easy input access.
3. **Market Linkages:**
   - o Simplify certification and enhance branding for natural products.
4. **Policy Incentives:**
   - o Subsidies and financial support for transitioning farmers.
5. **Research and Development:**
   - o Focus on **climate-resilient crops** and optimize natural farming techniques.
6. **Community Engagement:**
   - o Promote awareness and community-driven initiatives for adoption.

Digital Farmer ID

(GS Paper 3: Agriculture – E-technology in the Aid of Farmers)

Context:

The **Ministry of Agriculture and Farmers' Welfare (MoA&FW)** has urged states to expedite the issuance of **digital Farmer IDs**, known as **'Kisan Pehchaan Patra'**, to enhance access to government schemes and digitize agricultural information.

About Farmer ID or 'Kisan Pehchaan Patra':

- **Objective:** A **digital identity card** for farmers, integrating their agricultural information.
- **Details Included:**
  - o **Land ownership data.**
  - o **Crop patterns** and types of crops cultivated.
  - o **Livestock details.**
  - o **Village land maps.**
- **Integration:**
  - o Linked with **Aadhaar** and **state land records**.
  - o Forms the core of the **Farmers' Registry** under the **'Agri Stack' initiative**.

About Digital Agriculture Mission:

- **Definition:** Use of digital tools like computers and electronic devices in agriculture.
- **Launch:** Approved on **September 2, 2024**, with a financial outlay of **₹2,817 crore** (central share: **₹1,940 crore**).
- **Part of:**
  - o The Centre's **Digital Agriculture Mission.**
  - o Aimed at creating a unified **Agri Stack** for improved agricultural outcomes.

Benefits of Farmer ID for Farmers:

1. **Access to Facilities:**
   - o **Crop insurance** and **loans.**
   - o Information on **village land maps** and **crop data.**
2. **Digital Monitoring:**
   - o Enables **digitized agricultural operations** for better monitoring and targeted support.

3. **Efficient Policy Implementation:**
   o Facilitates effective delivery of government schemes.
4. **Data-Driven Decisions:**
   o Supports farmers in making **informed decisions** using data-driven insights.

Credit Guarantee Scheme for e-NWR Based Pledge Financing (CGS-NPF)

(GS Paper 3: Indian Economy – Agriculture and Allied Sectors)

Context:

The **Union Minister of Consumer Affairs, Food, and Public Distribution** launched the **Credit Guarantee Scheme for e-NWR Based Pledge Financing (CGS-NPF)** to improve farmers' access to post-harvest loans.

About CGS-NPF:

1. **Objective:**
   o To enable **farmers**, **FPOs**, and other stakeholders to secure **post-harvest loans** by leveraging **e-NWRs (Electronic Negotiable Warehouse Receipts).**
2. **Budget Outlay:**
   o **₹1,000 crore** corpus for implementation, targeting **₹5.5 lakh crore** post-harvest lending over the next decade.
3. **Eligibility:**
   o Open to **scheduled banks** and **cooperative banks**.
4. **Key Implementation Targets:**
   o **Warehouse Registration:** Increase WDRA-accredited warehouse registrations to **40,000** in the next 1–2 years.
   o **Awareness Campaigns:** Educate farmers and stakeholders about the scheme and simplify processes via platforms like **e-Kisan Upaj Nidhi**.
   o **Target Borrowers:**
     ▪ Small and marginal farmers.
     ▪ Women, SC/ST communities, Persons with Disabilities (PwD).
     ▪ **MSMEs**, **traders**, **FPOs**, and **farmer cooperatives**.

About e-NWRs:

1. **Introduction:**
   o **Negotiable Warehouse Receipts (NWRs):** Introduced in 2011 to help farmers use warehouse-stored commodities as loan collateral.
   o **e-NWRs:** Launched in 2017 under the **Warehousing (Development and Regulation) Act, 2007**, offering digital records for better accessibility and transparency.
2. **Features of e-NWRs:**
   o Facilitates **trade transactions, transfers, and pledging** of commodities without requiring physical delivery.
   o Integrated with the **e-NAM platform**, enabling seamless ownership transfers.
3. **Benefits of e-NWRs:**
   o Provides **digital proof** of commodities stored in accredited warehouses.
   o Encourages **transparency** and reduces **market inefficiencies**.

Significance of CGS-NPF:

1. **Boosts Post-Harvest Lending:**
   o Improves **credit access** for farmers, helping them avoid distress sales.
2. **Enhances Storage Infrastructure:**
   o Promotes the establishment of **modern warehouses** near farmlands for better accessibility.
3. **Reduces Dependence on Middlemen:**
   o Direct access to institutional credit ensures farmers are not exploited by intermediaries.
4. **Promotes Digital Agriculture:**
   o Aligns with the **Digital Agriculture Mission**, promoting digitization in agricultural operations.
5. **Supports Marginalized Groups:**
   o Prioritizes benefits for **small farmers**, **women**, and **vulnerable groups**.

Way Forward:

1. **Expand Infrastructure:**
   o Build **storage facilities** near farmlands and ensure their **WDRA accreditation.**
2. **Awareness Campaigns:**
   o Conduct targeted programs to educate farmers about **e-NWRs** and **pledge financing schemes.**

3. **Digital Integration:**
    o Strengthen the integration of **e-NWRs with e-NAM** and other platforms to boost market linkages.
4. **Monitoring and Evaluation:**
    o Regularly assess the scheme's impact to improve operational efficiency and ensure inclusion.

National Seed Congress 2024

(GS Paper 3: Agriculture – Issues related to direct and indirect farm subsidies, inputs, and technology)

Context:

The **13th edition of the National Seed Congress (NSC)** concluded in Uttar Pradesh, attracting **over 700 participants**, including scientists, policymakers, farmers, and industry leaders.

About National Seed Congress:

- **Objective:**
    o A platform to discuss advancements in:
        ▪ **Seed production** and delivery systems.
        ▪ **Crop improvement** for sustainable agricultural practices.
    o Strengthening agriculture in **India and globally**.
- **Organized By:**
    o **Union Ministry of Agriculture & Farmers' Welfare**.
    o **International Rice Research Institute (IRRI).**
- **Key Stakeholders:**
    o Researchers, policymakers, public and private sector representatives, and farmers.
- **Theme of NSC 2024:**
    o **"Innovating for a Sustainable Seed Ecosystem."**

Significance of National Seed Congress:

1. **Focus on Sustainable Agriculture:**
    o Promotes research and innovation to meet challenges like **climate resilience** and **yield improvement**.
2. **Technology Integration:**
    o Advances in **genomics**, **hybrid seed technology**, and **precision agriculture** for better seed quality.
3. **Policy Framework:**
    o Encourages discussions on **seed policies** to improve access and affordability for farmers.
4. **Public-Private Partnerships:**
    o Strengthens collaboration to improve the seed supply chain and **R&D investments**.
5. **Farmer Empowerment:**
    o Disseminates knowledge and best practices directly benefiting **seed producers and users**.

GEOGRAPHY, DISASTER MANAGEMENT

Ken-Betwa River Linking Project

UPSC Syllabus Relevance

- **GS Paper 1**: Geography – Water Resources
- **GS Paper 3**: Environment and Disaster Management – River Interlinking

Context:

- o The **Prime Minister** laid the foundation stone for the **₹45,000-crore Ken-Betwa River Linking Project** in **Khajuraho, Madhya Pradesh**.

About the Ken-Betwa Project:

- o **Objective**: Transfers **surplus water** from the **Ken River** in Madhya Pradesh to the **Betwa River** in Uttar Pradesh.
- o **Governance**:
    - Managed by a **Special Purpose Vehicle (SPV)** called the **Ken-Betwa Link Project Authority (KBLPA)**.
    - Requires consensus between the concerned states for successful implementation.

Benefits of the Project:

- o **Irrigation**:
    - Addresses water needs in **Bundelkhand**, a drought-prone region.
    - Benefits at least **10 districts** in Madhya Pradesh and several districts in Uttar Pradesh.
- o **Hydropower and Renewable Energy**:
    - Generates over **100 MW of hydropower** and **27 MW of solar energy**.

About Ken and Betwa Rivers:

- o **Origins**:
    - **Ken River**: Originates from the **Kaimur Range**, Madhya Pradesh, and meets the Yamuna in **Banda District**, Uttar Pradesh.
    - **Betwa River**: Originates in the **Vindhya Range**, Madhya Pradesh, and joins the Yamuna at **Hamirpur**, Uttar Pradesh.
- o **Tributaries**: Both rivers are tributaries of the **Yamuna River**.
- o **Significance**:
    - **Ken River** flows through the **Panna Tiger Reserve**.
    - Dams on the **Betwa River**: Include **Rajghat, Paricha, and Matatila dams**.

About River Linking Projects:

- o **Definition**: Construction of canals and dams to transfer water from **water-surplus basins** to **water-deficient basins**.
- o **Purpose**: Addresses **water scarcity**, improves **irrigation**, and generates **hydropower**.
- o **Example**:
    - **Volga-Don Canal, Russia**: Connects the Caspian and Black Seas, enabling water transfer and navigation.
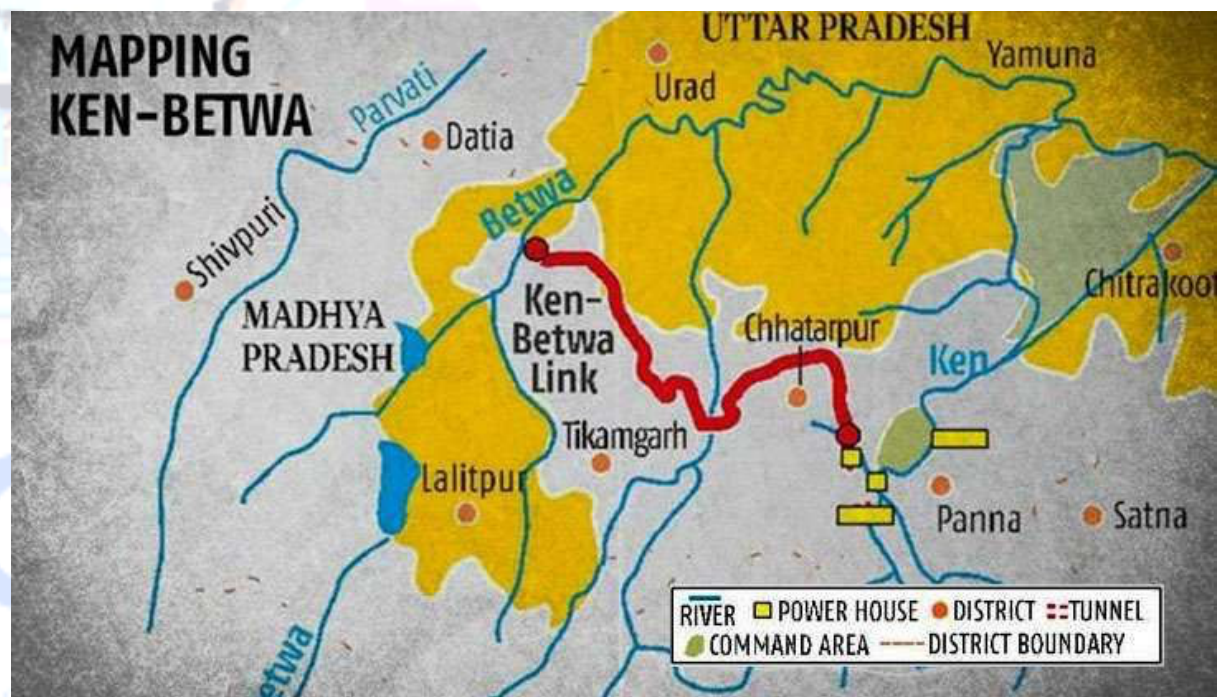
Pros and Cons of River Linking Projects:

Pros	Cons
Water Security: Improves availability in water-scarce regions.	**Environmental Impact**: Disrupts ecosystems and biodiversity.
Irrigation: Enhances agricultural productivity.	**Social Displacement**: Affects communities and livelihoods.
Hydropower Generation: Produces clean energy.	**Geological Instability**: May trigger earthquakes and hazards.
Navigation: Facilitates transportation and trade.	**High Cost**: Expensive construction and maintenance.

Discovery of Hydrothermal Vent in the Indian Ocean

UPSC Syllabus Relevance

- **GS Paper 1**: Geography – Oceanography and Marine Ecosystems
- **GS Paper 3**: Science and Technology – Research and Innovation

Context:

- Indian oceanographers from **NCPOR** and **NIOT** captured a historic image of an **active hydrothermal vent** in the **Indian Ocean**.

About Hydrothermal Vents:

- **Formation**:
  - Occur in **tectonically active regions**.
  - Formed when **cold seawater** interacts with **magma**, becomes superheated (up to **370°C**), and emerges as **mineral-rich plumes** through chimneys or vents.
- **Recent Discovery**:
  - The vent was found at a depth of **4,500 meters** along the **Central Indian Ridge**.

What is Chemosynthesis?

- **Definition**:
  - A process where organisms produce organic compounds using **chemical energy** from the oxidation of inorganic molecules, unlike **photosynthesis**, which relies on sunlight.
- **Ecosystems**:
  - Hydrothermal vents sustain **unique ecosystems** powered by **chemosynthesis**.
  - **Microbes** act as primary producers, supporting diverse organisms in extreme conditions.
- **Significance**:
  - Offers insights into **extreme marine ecosystems** and potential **resource exploration**.

About the Deep Ocean Mission (DOM):

- **Objective**:
  - To explore and harness **deep ocean resources** and contribute to **sustainable ocean resource management**.
- **Implementing Body**:
  - **Ministry of Earth Sciences (MoES)**.
- **Approval and Budget**:
  - Approved by the **Union Cabinet** in **2021** for a duration of **five years** with a budget of **₹4,077 crore**.
- **Key Focus Areas**:
  - Development of **deep-sea technologies**.
  - Exploration of **marine biodiversity and resources**.

Significance of the Discovery:

- **Scientific Advancement**:
  - Enhances understanding of **tectonic activity** and **marine ecosystems** in the Indian Ocean.
- **Resource Exploration**:
  - Highlights potential for **mineral extraction**, such as **polymetallic nodules and sulfides**.
- **Global Collaboration**:
  - Strengthens India's role in **oceanographic research** and **sustainable resource utilization**.

Way Forward:

- o **Enhanced Research**:
  - Increase exploration of **unmapped deep-sea regions** in Indian waters.
  - Expand studies on **chemosynthetic ecosystems** for potential biotechnological applications.
- o **Global Cooperation**:
  - Collaborate on **international ocean missions** to share data and best practices.
- o **Sustainability**:
  - Balance resource exploration with **marine conservation**.

Denali Fault: Geological Significance and Tectonic Insights

UPSC Syllabus Relevance

- **GS Paper 1**: Geography – Physical Features and Plate Tectonics
- **GS Paper 3**: Disaster Management – Earthquakes and Seismic Activities

Context:

- o A recent study revealed that **three sites along the Denali Fault** in Alaska were once part of a **smaller, unified geological feature**.

About the Denali Fault:

- o **Location**: A major **strike-slip fault** located in **Alaska, USA**.
- o **Tectonic Context**:
  - Part of the **Pacific Ring of Fire**, characterized by significant **tectonic activity**.
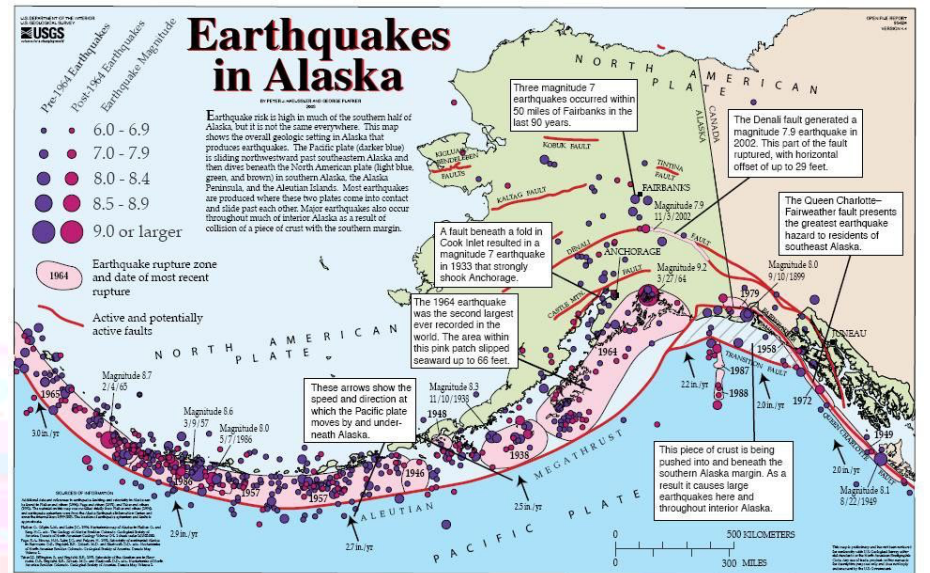
What is a Fault?

- o **Definition**:
  - A **fault** is a planar fracture or crack in the Earth's crust where **significant displacement of crustal blocks** has occurred.
- o **Formation Causes**:
  - Result of **tensile and compressive forces** acting on the Earth's crust.
  - Movement along faults releases energy, causing **earthquakes**.

Types of Faults:

Type of Fault	Description	Cause/Stress	Examples
Strike-Slip Fault	Horizontal movement as tectonic plates slide past each other.	Lateral Stress	**San Andreas Fault**, California
Normal Fault	One block slides downward, moving away from the adjacent block.	Tensile Stress	**East African Rift Zone**
Reverse Fault	One block moves upward, overlapping the adjacent block.	Compressive Stress	**Himalayas (India-Eurasian Plate)**, Rocky Mountains

Significance of the Denali Fault:

- o **Seismic Activity**:
  - A **highly active fault** capable of generating major earthquakes, influencing the **seismic landscape** of Alaska.
- o **Geological Research**:
  - Insights into **plate tectonics** and crustal movements.
  - Recent studies indicate a unified origin of geological features along the fault.
- o **Tectonic Impacts**:
  - Part of the **complex tectonic interactions** in the Pacific Ring of Fire, impacting regional geology and ecosystems.

Hawaii's Kilauea Volcano

UPSC Syllabus Relevance

- **GS Paper 1**: Geography – Physical Geography and Volcanism
- **GS Paper 3**: Environment – Natural Disasters

Context:

- o **Hawaii's Kilauea Volcano**, one of the **most active volcanoes** globally, erupted again in **December 2024**.

About Kilauea Volcano:

- o **Location**:
  - Situated on the **southeastern shore** of **Hawaii's Big Island**, within the **Hawaii Volcanoes National Park**.
- o **Type of Volcano**:
  - An **active shield volcano**.
- o **Significance**:
  - Kilauea is one of the **five volcanoes** forming Hawaii's Big Island and contributes to the **formation of Earth's tallest mountain** when measured from its base on the ocean floor.
- o **Summit Caldera**:
  - Features a **large depression** formed by the partial collapse of the volcano after its **magma chamber** was released.
- o **Proximity to Mauna Loa**:
  - Kilauea's slopes merge with those of **Mauna Loa**, another massive **shield volcano**.
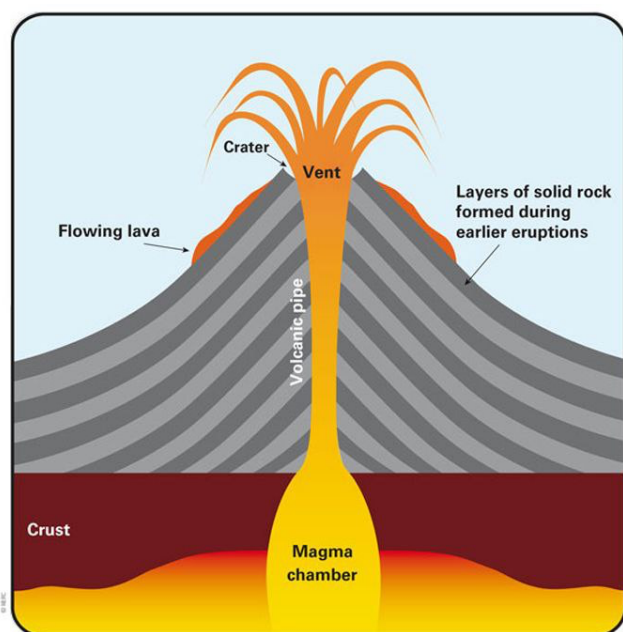
About Shield Volcanoes:

- o **Definition**:
  - A type of volcano with **broad, gentle slopes**, formed by highly fluid **basaltic lava**.
- o **Features**:
  - **Shape**: Dome-like, **elongated profiles**, unlike the steep peaks of composite volcanoes.
  - **Eruption Style**:
  - Typically **non-explosive**, but may form **cinder cones** and **spatter cones** at vents.
  - Explosions occur if **water enters the vent**, creating steam pressure.
- o **Examples**:
  - **Hawaiian Shield Volcanoes**: Kilauea and Mauna Loa.

Significance of Kilauea's Eruption:

- o **Geological Importance**:
  - Offers insights into **volcanic activity**, **magma dynamics**, and **tectonic processes**.
- o **Environmental Impact**:
  - Affects local ecosystems and **air quality** due to volcanic gases like **sulfur dioxide**.
- o **Tourism and Culture**:
  - Plays a pivotal role in Hawaiian culture and attracts **scientific and tourist interest** globally.

20 Years of the Indian Ocean Tsunami: Lessons Learned and the Way Forward

UPSC Syllabus Relevance

- **GS Paper 1**: Geography – Natural Hazards and Disasters
- **GS Paper 3**: Disaster Management – Preparedness and Mitigation

Context:

- o **December 26, 2024**, marks **20 years** since the **2004 Indian Ocean earthquake and tsunami**, one of the deadliest natural disasters in history.

About the 2004 Indian Ocean Tsunami:

- o **Date**: Occurred on **December 26, 2004**, triggered by a **magnitude 9.1 earthquake** in the **Sunda Trench**.
- o **Impact**:
  - Affected **14 countries**, including **Indonesia, Sri Lanka, India, and Thailand**.
  - Caused over **2,27,000 deaths**.
- o **Source**:
  - **Third-largest earthquake since 1900**, originating **30 km below the ocean floor** in the Sunda Trench.
  - Caused by the **Indo-Australian plate subducting** beneath the **Burma microplate**.

Understanding Tsunamis:

- o **Definition**: Series of large ocean waves caused by underwater disturbances like earthquakes, volcanic eruptions, landslides, or asteroid impacts.
- o **Etymology**: Derived from Japanese words **"tsu" (harbor)** and **"nami" (wave)**.
- o **Causes**:
  - **Submarine Earthquakes**: Most common cause (e.g., 2004 tsunami).
  - **Volcanic Eruptions**: Sudden displacement of water (e.g., **1883 Krakatoa eruption**).
  - **Landslides**: Both coastal and submarine (e.g., 2017 Greenland landslide).
  - **Asteroid Impacts**: Rare but catastrophic.

Impact of Tsunamis:

- o **Destruction of Ecosystems**: Loss of natural barriers like **mangroves and coral reefs**.
- o **Marine Pollution**: Tons of waste, including plastics, dragged into oceans.
- o **Loss of Biodiversity**: Coastal and marine species affected by habitat destruction.
- o **Geographical Shifts**:
  - The **2004 tsunami** shifted the **North Pole by 2.5 cm** and reduced the length of the day by **2.68 microseconds**.
  - The **Andaman and Nicobar Islands** shifted by **1.25 meters**.
- o **Livelihood Loss**: In **Tamil Nadu, India**, over **30,000 fishing boats** were destroyed.

Steps Taken Post-2004 Tsunami:

- o **Early Warning Systems**:
  - **Indian Tsunami Early Warning Centre (ITEWC)** established in 2007, using seismic stations, bottom pressure recorders (BPRs), and tidal stations.
  - Integrated with global systems like **IOTWMS** and **DART buoys**.
- o **Real-Time Monitoring**: Alerts now issued within **10 minutes** of detection.
- o **Technological Advancements**: Use of **AI, GIS, and supercomputers** to improve prediction accuracy.
- o **Seismic Slip Research**: Focus on slow slips at plate boundaries to predict seismic activity.
- o **Global Cooperation**:
  - Coordinated through **UNESCO IOC** for global tsunami preparedness and warning systems.

Challenges with Early Warning Systems:

- o **Near-Field Detection**: Minimal time to detect and warn about near-field tsunamis.
- o **Limited Coverage**: Vulnerable regions like **East Africa** lack monitoring capabilities.
- o **Maintenance Issues**: Equipment like **DART buoys** requires regular maintenance, often delayed.
- o **Communication Gaps**: Delays in dissemination to local authorities and communities.
- o **Public Awareness**: Communities often fail to recognize natural warning signs like **sea recession**.

Way Forward:

- o **Strengthen Monitoring Infrastructure**:
  - Expand seismic stations, tide gauges, and **DART buoys**.
  - Incorporate **AI and machine learning** for real-time modeling.
- o **Community Resilience**:
  - Regular **mock drills** and **awareness campaigns**.
  - Scale up initiatives like **UNESCO-IOC's Tsunami Ready program**.
- o **Nature-Based Solutions**:
  - Restore natural barriers like **mangroves** and **coral reefs**.
  - Example: Mangroves in Odisha mitigated tsunami impacts in 2004.
- o **Regional and Global Collaboration**:
  - Enhance data-sharing and preparedness exercises with **Indian Ocean Rim countries**.
- o **Risk Reduction in Coastal Development**:

- ▪ Integrate **tsunami risk assessments** into urban planning.
  - ▪ Construct **elevated shelters** and tsunami-resistant infrastructure.
- o **Mitigate Financial Risks**:
  - ▪ Develop financial tools like **catastrophe bonds** to manage disaster-related costs.

The Disaster Management (Amendment) Bill, 2024

UPSC Syllabus Relevance

- **GS Paper 1**: Geography – Disaster and Disaster Management
- **GS Paper 2**: Governance – Policies and Interventions
- **GS Paper 3**: Environment – Climate Change and Resilience

Context:

- o The **Lok Sabha** passed the **Disaster Management (Amendment) Bill, 2024**, aiming to strengthen India's **disaster management framework**.

About the Bill:

- o **Introduction**: Introduced in the Lok Sabha on **August 1, 2024**.
- o **Amendment**: Updates the **Disaster Management Act, 2005**.
- o **Key Authorities**:
  - ▪ **National Disaster Management Authority (NDMA)**
  - ▪ **State Disaster Management Authority (SDMA)**
  - ▪ **District Disaster Management Authority**

Key Provisions of the Bill:

- o **Climate Resilience**:
  - ▪ Integrates **climate change adaptation** into disaster management plans.
- o **Strengthened Governance**:
  - ▪ Establishes a dedicated **Climate and Disaster Management Fund**.
- o **Technology Integration**:
  - ▪ Mandates the use of **AI**, **GIS**, and **satellite technology** for early warning systems.
- o **Private Sector Participation**:
  - ▪ Encourages **Public-Private Partnerships (PPP)** for disaster mitigation and relief.
- o **Accountability**:
  - ▪ Introduces stringent penalties for non-compliance with disaster safety norms.

Significance of the Bill:

- o **Proactive Approach**:
  - ▪ Shifts focus from **reactive measures** to **prevention and mitigation**.
- o **Climate Adaptation**:
  - ▪ Aligns with India's **Net Zero 2070 target** and the **Sendai Framework for Disaster Risk Reduction**.
- o **Local Empowerment**:
  - ▪ Strengthens **panchayats** and **municipalities** in disaster response and planning.

Differences Between the DM Act, 2005, and the DM (Amendment) Bill, 2024:

Feature	DM Act, 2005	DM (Amendment) Bill, 2024
Focus	Reactive measures	Climate resilience and mitigation
Financing	Disaster Response Fund	Climate and Disaster Management Fund
Technological Use	Limited	AI, GIS, and satellite integration
Private Sector Role	Minimal	Promotes PPP in disaster infrastructure

Concerns Regarding the Bill:

- o **Implementation Challenges**:
  - ▪ Weak institutional capacity at **state and district levels**.
  - ▪ Example: Delays in disaster response during **Cyclone Amphan (2020)**.
- o **Financial Burden**:
  - ▪ Risk of underfunding due to central allocation dependency.
- o **Role Clarity**:

- Overlapping jurisdiction among **NDMA, SDMAs, and local bodies**.
  - o **Inequality Risks**:
    - Vulnerable communities may be neglected in favor of **private sector participation**.

Way Forward:

- o **Capacity Building**:
  - Train local authorities in **disaster and climate risk management**.
  - Example: Gujarat's disaster preparedness model after the **2001 Bhuj earthquake**.
- o **Strengthen Funding**:
  - Explore innovative financing like **catastrophe bonds** and **carbon taxes**.
  - Example: Mexico's **FONDEN Catastrophe Bond** for immediate disaster relief.
- o **Community Participation**:
  - Involve communities in **vulnerability assessments** and disaster planning.
  - Example: Odisha's **Cyclone Resilience Committees** during **Cyclone Fani (2019)**.
- o **Policy Integration**:
  - Align with **National Action Plan on Climate Change (NAPCC)** and **Sendai Framework (2015–2030)**.

National Landslide Risk Mitigation (NLRM) Project

UPSC Syllabus Relevance

- **GS Paper 1**: Geography – Natural Hazards and Disasters
- **GS Paper 3**: Disaster Management – Risk Mitigation and Preparedness

Context:

- o A **High-Level Committee (HLC)** chaired by the Union Home Minister approved **₹1,115.67 crore** for disaster mitigation and capacity-building projects.

Key Approvals by the HLC:

- o **National Landslide Risk Mitigation (NLRM) Project**:
  - ₹1,000 crore allocated to mitigate **landslide risks** across **15 states**.
- o **Training and Capacity Building for Civil Defence**:
  - ₹115.67 crore sanctioned under the **National Disaster Response Fund (NDRF)** for enhancing disaster preparedness.

Need for the NLRM Project:

- o **India's Landslide Risk**:
  - India is among the **top four countries** with the highest landslide risk, as per the **ISRO Landslide Atlas of India**.
- o **Prevention and Prediction**:
  - Unlike **earthquakes and tsunamis**, landslides can be **both prevented and predicted**, enabling **proactive disaster management**.
- o **Scientific Culture**:
  - The project aims to promote **scientific investigation, analysis**, and **management** of landslides, fostering **preparedness and mitigation**.

Significance of NLRM:

- o **Disaster Risk Reduction**:
  - Focus on **prevention and early warning systems** to minimize loss of life and property.
- o **Capacity Building**:
  - Enhances the **capabilities of local and regional authorities** to respond effectively to landslides.
- o **Infrastructure Protection**:
  - Safeguards **critical infrastructure** like roads, railways, and settlements in **landslide-prone regions**.
- o **Promoting Resilience**:
  - Strengthens community-level **disaster resilience** through targeted interventions.

DEFENCE & SECURITY

Eliminating Maoist Insurgency by March 2026

UPSC Syllabus Mapping

- **GS Paper III: Internal Security – Challenges to internal security through communication networks, role of media and social networking sites, and basics of cyber security.**
- **GS Paper II: Governance – Issues relating to poverty, development, and the welfare of vulnerable sections.**

Context

The Union Home Minister has announced a target to eliminate **Left Wing Extremism (LWE)**, also known as Maoism, by **March 2026**, highlighting significant progress in reducing violence and neutralizing Maoist cadres.

Key Announcements and Developments

- **Reduction in Violence**:
  - 73% reduction in deaths of security personnel and a 70% decrease in civilian killings over the past decade.
  - 287 Maoists neutralized, 1,000 arrested, and 837 surrendered in Chhattisgarh last year.
- **Restoration of Infrastructure**:
  - Schools and roads destroyed by Maoist violence are being rebuilt.
- **Recognition for Chhattisgarh Police**:
  - Awarded the **President's Colour** for exemplary service.

About Maoism

- **Definition**: A form of communism inspired by Mao Zedong's ideology, aiming to overthrow the state through **armed insurgency**, **mass mobilization**, and **strategic alliances**.
- **Affected States**: Primarily Jharkhand, Chhattisgarh, Odisha, Maharashtra, Bihar, and Andhra Pradesh.

Factors Contributing to Maoism

1. **Land Alienation and Displacement**:
   - Lack of land reforms and displacement due to **mining** and **development projects**.
   - Example: Displacement from mining in Jharkhand and Chhattisgarh.
2. **Poverty and Underdevelopment**:
   - High poverty levels and poor access to **education**, **healthcare**, and **infrastructure**.
   - Example: Bastar region in Chhattisgarh has **development indices far below** the national average.
3. **Governance Deficit**:
   - Weak state presence in remote tribal areas.
   - Example: **D. Bandopadhyay Committee (2006)** emphasized governance failure as a root cause.
4. **Exploitation**:
   - Marginalized communities face exploitation by **landlords**, **moneylenders**, and **corporations**.
   - Example: Forcible land acquisitions in Andhra Pradesh during the 1990s.
5. **Social Marginalization**:
   - Tribals and Dalits feel excluded from the political process and justice system.
6. **Poor Connectivity**:
   - Remote areas lack **roads** and **telecom connectivity**, isolating them from state services.

Government's Efforts

1. **National Policy and Action Plan (2015)**:
   - **Focus**: Security, development, and ensuring rights of local communities.
2. **SAMADHAN Strategy**:
   - **S**: Smart Leadership.
   - **A**: Aggressive Strategy.
   - **M**: Motivation and Training.
   - **A**: Actionable Intelligence.
   - **D**: Dashboard-based Monitoring.
   - **H**: Harnessing Technology.
   - **A**: Action Plans.

     o **N**: No Financing Access for Maoists.
3. **Rehabilitation Policies**:
     o Skill training, education, and financial incentives for surrendered cadres.
4. **Civic Action Programmes**:
     o Medical camps, sports events, and community engagement to foster trust.

Challenges

1. **Geographical Barriers**:
     o Maoist strongholds in **dense forests** and **hilly terrain**.
     o Example: **Dandakaranya forests** in Chhattisgarh.
2. **Socio-Economic Issues**:
     o Poverty and exploitation provide a **breeding ground for extremism**.
3. **Governance Deficit**:
     o Weak state services create a vacuum exploited by Maoists.
     o Example: Maoists operate **parallel governance systems** in remote regions.
4. **Rehabilitation Gaps**:
     o Surrendered cadres face **stigma** and lack of skills, undermining reintegration.
5. **External Support**:
     o Maoists maintain ties with other **insurgent groups** and receive **external funding**.
6. **Counter-Propaganda Challenges**:
     o Maoist narratives exploit **public grievances** and spread misinformation.

Way Forward

1. **Strengthen Governance**:
     o Improve delivery of **public services** like healthcare, education, and water supply.
     o Effective implementation of **Forest Rights Act, 2006**.
2. **Promote Inclusive Development**:
     o Expand socio-economic programs such as the **Aspirational Districts Programme**.
     o Build **infrastructure** like roads and telecom in affected regions.
3. **Enhanced Security Measures**:
     o Use **drones**, **UAVs**, and **advanced surveillance** for better intelligence gathering.
     o Strengthen coordination between **state and central forces**.
4. **Rehabilitation and Reintegration**:
     o Focus on **skill training**, **employment**, and **counseling** for surrendered cadres.
5. **Community Engagement**:
     o Empower **local leaders** and promote **community policing**.
     o Initiatives to foster trust between tribal communities and the state.
6. **Counter Propaganda**:
     o Public awareness campaigns to counter Maoist narratives.
7. **Youth Engagement**:
     o Rebuild schools destroyed by Maoists and promote **education** among tribal youth.

India Tests Ballistic Missile with a Range of Around 3,500 km

UPSC Syllabus Mapping

- **GS Paper III: Security – Security challenges and their management in border areas, role of external state and non-state actors in creating challenges to internal security.**
- **GS Paper II: International Relations – India's defense capabilities and nuclear policy.**

Context

India successfully tested the **K-4 Submarine-Launched Ballistic Missile (SLBM)** with a range of 3,500 km from **INS Arighaat**, further strengthening its **nuclear triad** and second-strike capability.

About INS Arighaat

- **Class**: India's **second indigenous nuclear-powered ballistic missile submarine (SSBN)** after **INS Arihant**.
- **Construction**: Built at the **Ship Building Centre (SBC)** in **Visakhapatnam**.
- **Propulsion**: Powered by **pressurized light-water nuclear reactors**, enabling prolonged underwater operations compared to conventional submarines.
- **Speed**:
     o **Surface**: 12–15 knots (~22–28 km/h).
     o **Submerged**: 24 knots (~44 km/h), ensuring stealth and agility.

K-4 Missile

- **Type**: Intermediate-range **Submarine-Launched Ballistic Missile (SLBM)**.
- **Range**: Approximately **3,500 km**.
- **Developer**: **Defence Research and Development Organisation (DRDO)**.
- **Purpose**: Strengthens **nuclear deterrence** and India's **second-strike capability**.
- **Deployment**: Designed for deployment on India's **Arihant-class SSBNs**.

Missile Capabilities

- Can carry either:
  - **Four K-4 SLBMs**, each with a range of over 3,500 km.
  - **Twelve K-15 SLBMs**, with a shorter range of around 750 km, capable of carrying conventional warheads.

Significance of the Test

1. **Strengthening the Nuclear Triad**:
   - Ensures India's **second-strike capability**, completing the nuclear triad of **land-based, air-launched, and submarine-launched missiles**.
   - Enhances **deterrence** and strategic stability.
2. **Geopolitical Implications**:
   - Projects India's capability to deter adversaries within and beyond the **Indian Ocean Region (IOR)**.
   - Counters regional threats, particularly from China and Pakistan.
3. **Technological Advancements**:
   - Demonstrates India's expertise in **nuclear-powered submarines** and **ballistic missile technology**.
   - Strengthens India's **Make in India** defense capabilities.
4. **Maritime Security**:
   - Increases the stealth and survivability of India's **nuclear arsenal** in case of a first-strike scenario.
   - Boosts India's dominance in the **IOR**.

India's Nuclear Triad

- **Land-based Missiles**: Agni series (e.g., **Agni-V** with a range of 5,000+ km).
- **Air-based Systems**: Strategic bombers like **Mirage-2000** and **Rafale** equipped with nuclear-capable missiles.
- **Sea-based Missiles**: K-series SLBMs launched from **Arihant-class SSBNs**.

Strategic Advantages of INS Arighaat and K-4

1. **Prolonged Underwater Operations**:
   - Nuclear propulsion allows continuous submersion, enhancing stealth and survivability.
2. **Deterrence in Depth**:
   - Ensures **second-strike capability**, a critical component of India's **No First Use (NFU)** nuclear policy.
3. **Force Multiplier**:
   - Increases India's ability to respond to any nuclear threat in its neighborhood or beyond.

Way Forward

- **Enhancing Capabilities**: Continue developing **next-generation SSBNs** with improved missile ranges and stealth features.
- **Indigenous Development**: Strengthen indigenous efforts under **Make in India** for reducing dependence on foreign technology.
- **International Collaboration**: Leverage partnerships like **Quad** and bilateral engagements to ensure maritime security in the **Indo-Pacific region**.
- **Strategic Deployment**: Ensure effective deployment of nuclear-powered submarines for better coverage across potential conflict zones.

Protected Area Regime (PAR)

UPSC Syllabus Mapping

- **GS Paper II: Governance – Government policies and interventions for development in various sectors.**
- **GS Paper III: Internal Security – Security challenges and their management in border areas.**

Context

The **Central Government** has reimposed the **Protected Area Regime (PAR)** in the northeastern states of **Manipur**, **Mizoram**, and **Nagaland** due to security concerns arising from an influx of individuals from neighboring countries.

What is the Protected Area Regime (PAR)?

- **Legal Basis**: Governed under the **Foreigners (Protected Areas) Order, 1958**.
- **Purpose**: Security measure to regulate the movement of foreign nationals in sensitive border regions.
- **Coverage**: Parts of **Arunachal Pradesh**, **Manipur**, **Mizoram**, **Nagaland**, and **Sikkim** are designated as Protected Areas.

Provisions for Protected Area Permit (PAP)

1. **Validity**:
   o Generally valid for **10 days**, extendable based on need.
2. **Issuing Authorities**:
   o **Ministry of Home Affairs (MHA)**.
   o **State Governments** where the protected area is located.
3. **Application Requirements**:
   o Foreign nationals must submit:
     ▪ Valid **passport**.
     ▪ **Itineraries** specifying travel plans.
   o Additional restrictions apply to certain **nationalities** for security reasons.
4. **Exemptions**:
   o **Bhutanese citizens** are exempted from the PAP requirement.

Reasons for Reimposing PAR

1. **Geopolitical Concerns**:
   o Increasing security threats due to **influx of foreign nationals** from neighboring countries.
2. **Border Vulnerability**:
   o Northeastern states share sensitive borders with **Myanmar**, **China**, and **Bangladesh**.
3. **Insurgency Threats**:
   o Enhanced risks of **illegal migration**, **trafficking**, and **cross-border insurgency**.

Impact of PAR

1. **Security Benefits**:
   o Helps monitor and control the entry of foreign nationals in sensitive areas.
   o Deters illegal activities like smuggling and insurgency.
2. **Development Constraints**:
   o Restricts foreign investment and tourism in these regions, affecting economic development.
   o Limits cultural and knowledge exchange due to restricted access for researchers and NGOs.
3. **Community Impact**:
   o Ensures protection of indigenous communities from external influences.
   o However, it may restrict developmental assistance in border areas.

Way Forward

1. **Balance Security and Development**:
   o Evolve strategies that ensure security without stifling economic opportunities.
2. **Enhanced Border Surveillance**:
   o Use **advanced technology** like drones and AI-based monitoring systems to secure borders effectively.
3. **Promote Local Economy**:
   o Develop **local tourism and trade** within permissible areas to benefit the region economically.
4. **Engage Locals in Security Measures**:
   o Empower local communities to act as the **first line of defense** and ensure better integration with national development goals.

Eklavya Digital Platform

UPSC Syllabus Mapping

- **GS Paper III: Security – Challenges to internal security through communication networks.**
- **GS Paper II: Governance – E-governance applications and role of technology in governance.**

Context

The **Chief of the Army Staff (COAS)** launched the **Eklavya Digital Platform**, an online learning initiative aimed at enhancing professional education and training for Indian Army personnel.

About Eklavya Digital Platform

1. **Objective**:
   o Enhance **professional military education** and training under the Indian Army's **Decade of Transformation (2023–2032)**.
   o Align with the **2024 theme**: **Year of Technology Absorption**.
2. **Development**:
   o **Developed by**: **Bhaskaracharya National Institute of Space Applications and Geoinformatics (BISAG-N)**, Gandhinagar.
   o **Supported by**: Directorate General of Information Systems (DGIS).
   o **Sponsor Agency**: Army War College, under the **Headquarters Army Training Command (ARTRAC)**.
3. **Platform Features**:
   o **Knowledge Highway**:
      ▪ Centralized repository for journals, research papers, articles, and training resources.
      ▪ Aims to serve as a **single-window solution** for educational content.
   o **Architecture**:
      ▪ **Hosted on**: Army Data Network.
      ▪ **Scalability**: Can integrate with multiple training establishments.
      ▪ Offers a variety of courses tailored for **Army officers**.

Significance of Eklavya Platform

1. **Modernizing Military Training**:
   o Facilitates a **technology-driven approach** to training.
   o Offers **online courses and resources** for continuous learning.
2. **Seamless Knowledge Sharing**:
   o Centralized platform ensures **access to updated and diverse learning materials**.
   o Promotes **interconnectivity among training establishments**.
3. **Strategic Development**:
   o Strengthens **military preparedness** by improving officers' technical and operational knowledge.
   o Aligns with global trends in **digital military education**.
4. **Data Security**:
   o Hosted on a secure **Army Data Network**, ensuring confidentiality of sensitive information.

Way Forward

1. **Expand Course Offerings**:
   o Include **multidisciplinary subjects** such as cyber warfare, AI, and space applications.
2. **User Engagement**:
   o Conduct regular feedback sessions to improve the platform's usability and relevance.
3. **Integration with Civil Institutions**:
   o Collaborate with leading **academic and research institutions** for course content and expertise.
4. **Monitor Effectiveness**:
   o Establish metrics to evaluate the impact of Eklavya on **officers' training outcomes**.

US-India MH-60R Helicopter Deal

UPSC Syllabus Mapping

- **GS Paper II: International Relations – India-USA relations, defense and security cooperation.**
- **GS Paper III: Security – Modernization of defense forces, indigenization of technology.**

Context

The **United States** has approved a **$1.17 billion deal** to provide **support equipment** for **India's MH-60R Seahawk helicopters**, reinforcing India's maritime security capabilities.

About MH-60R Helicopter

1. **Manufacturer**:
   o Built by **Lockheed Martin**.
   o Operated as the **primary maritime helicopter** in the **U.S. Navy**.
2. **Capabilities**:
   o **Anti-Submarine Warfare (ASW)**: Detection and neutralization of underwater threats.
   o **Anti-Surface Warfare (ASuW)**: Combat against surface vessels.
   o **Search and Rescue (SAR)**: Assists in humanitarian missions.
   o **Surveillance**: Advanced sensors for coastal monitoring.

- o **Naval Gunfire Support**: Precision targeting for naval artillery.
- o **Logistics and Vertical Replenishment (VERTREP)**: Efficient resupply operations at sea.
3. **Deployment Platforms**:
   - o Operates from **frigates, destroyers, cruisers, amphibious ships, and aircraft carriers**.
4. **Unique Features**:
   - o **Advanced Sensors**:
     - ▪ Airborne active sonar.
     - ▪ Multi-mode radar.
     - ▪ FLIR turret (Forward-Looking Infrared).
   - o **Integrated Self-Defense System**: In-built defense mechanisms against threats.
   - o **Capacity**: Can carry **three or four crew members** and **five passengers**.

India's Acquisition of MH-60R

1. **Order Details**:
   - o **24 MH-60R helicopters** ordered in **2020** for ₹14,000 crores.
   - o Deliveries commenced in **2022** and will be completed by **2025**.
2. **Significance for India**:
   - o Enhances **maritime security** and **anti-submarine warfare capabilities**.
   - o Boosts India's **blue-water navy ambitions**.
   - o Strengthens **interoperability with U.S. forces**, reinforcing bilateral defense ties.

Importance of the US-India Deal

1. **Strategic Partnership**:
   - o Reflects growing **India-USA defense cooperation** under the **Comprehensive Global Strategic Partnership**.
2. **Countering Regional Threats**:
   - o Enhances India's ability to counter challenges from adversaries in the **Indian Ocean Region (IOR)**.
3. **Advanced Technology**:
   - o Access to **state-of-the-art systems** boosts India's **indigenization efforts** by complementing the Make-in-India initiative.
4. **Maritime Dominance**:
   - o Enhances India's role in **Quad cooperation** for ensuring a **free and open Indo-Pacific**.

Challenges and Way Forward

1. **Operational Challenges**:
   - o **Maintenance and logistics** for high-tech equipment may require advanced training and infrastructure.
   - o Dependence on **U.S. support for spare parts and servicing**.
2. **Way Forward**:
   - o Build **domestic expertise** for maintenance through collaboration.
   - o Leverage the **offset clause** to strengthen India's defense manufacturing sector.

Major Military Exercises and Details (2024 Edition)

Exercise Name	Participating Nations	Type	Location
Exercise Agni Warrior (XAW-2024)	India, Singapore	Bilateral Army Exercise	Field Firing Ranges, Devlali, Maharashtra
Exercise Harimau Shakti	India, Malaysia	Bilateral Military Exercise	Bentong Camp, Pahang District, Malaysia
Exercise Desert Knight	India, France, UAE	Trilateral Air Combat Exercise	Arabian Sea
Exercise SLINEX 2024	India, Sri Lanka	Bilateral Naval Exercise	Visakhapatnam, Eastern Naval Command
SAREX-2024	India (Indian Coast Guard) + Regional Partners	National Maritime Exercise	Off the Kochi Coast

Significance of the Exercises

1. **Strengthening Bilateral and Multilateral Ties**:
   - o Enhances cooperation and interoperability between armed forces of participating nations.
2. **Geostrategic Importance**:
   - o Exercises like **Desert Knight** emphasize maritime and aerial collaboration in critical regions like the **Arabian Sea**.
3. **Capacity Building**:
   - o Training exercises like **Exercise Harimau Shakti** improve tactical readiness and joint response capabilities.
4. **Regional Security**:
   - o Initiatives such as **SLINEX 2024** and **SAREX-2024** enhance maritime security and disaster response coordination.

ETHICS, SOCIETY & SOCIAL ISSUES

Female Labour Force Participation in India

UPSC Syllabus Relevance

- **GS Paper 1: Society – Role of Women and Social Empowerment**
- **GS Paper 2: Governance – Government Policies and Interventions**

Context:

- o **Economic Advisory Council to the Prime Minister (EAC-PM)** reports a rise in female labor force participation in rural India from **24.6% to 41.5%** between **2017–18 and 2022–23**.

Definition of Female Labour Force Participation (FLFP):

- o **Meaning**: Refers to the percentage of women engaged in the **formal or informal workforce**, either employed or seeking employment.
- o **Significance**: Acts as an indicator of **economic empowerment** and **social equality**.

Data Insights:

- o **Survey Source**: Data from **Periodic Labour Force Survey (PLFS)** conducted by **NSO, MoSPI**.
- o **India's Participation Rate**: Increased to **37% in 2022–23**.
- o **Global Comparison**: The global FLFP is **50%**, significantly lower than the **80% male participation rate**.

Challenges to Female Labour Force Participation:

- o **Unpaid Domestic Duties**:
  - Women face a disproportionate burden of **caregiving responsibilities**.
  - **PLFS 2021–22** reports **44.5%** of women outside the labor force due to household commitments.
- o **Early Marriage**:
  - Marriage, especially **early marriage**, reduces female participation.
  - **World Bank Report**: Post-marriage, women's employment drops by **12 percentage points**.
- o **Rising Household Income**:
  - Increased family income reduces the **financial necessity** for women to work.
- o **Wage Disparity**:
  - Gender pay gaps discourage participation.
  - **DBS Bank Report**: **23% of salaried women** perceive a gender pay gap in India.
- o **Educational Barriers**:
  - Women's **literacy rate (63%)** lags behind men's **80%** (Census 2011).
- o **Limited Rural Opportunities**:
  - Rural areas lack **non-farm jobs** and suitable employment for women.
- o **Crime Against Women**:
  - Rising cases hinder participation.
  - **NCRB 2022**: **4,45,256 cases** of crimes against women reported, averaging **51 cases per hour**.

State of discrimination, in nine charts
Legal barriers to women's rights to choose to work in India

Trends in women's labour force participation, literacy and fertility rate
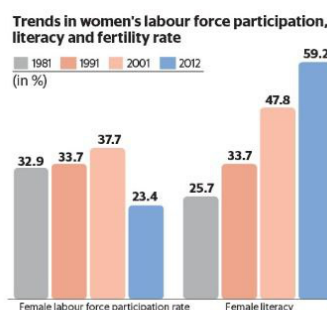
Break-up of women of working age population in India
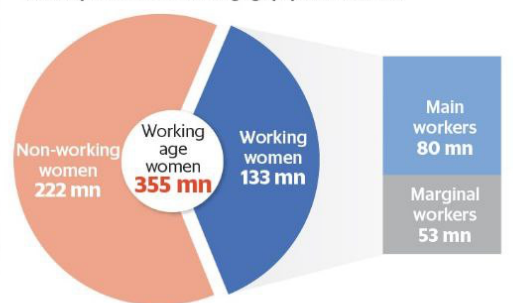
How states fare overall on legal restrictions for female jobseekers
Higher the rank, lower the extent of restrictions
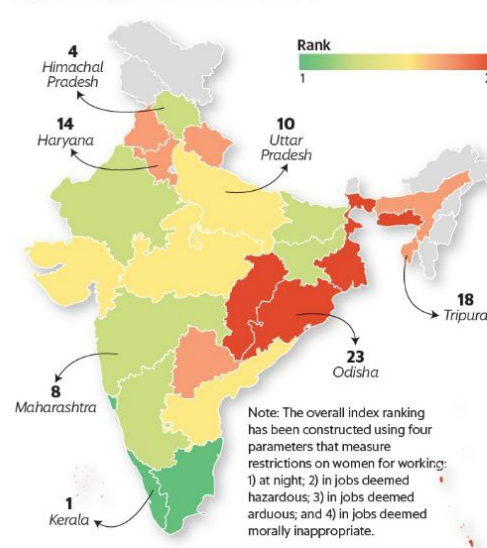
States' ratings on freedom to work...
Greater the rating, greater the freedom

	At night	In jobs deemed hazardous	In jobs deemed arduous	In jobs deemed morally inappropriate
Kerala	3.2	1.5	1	3
Tamil Nadu	3.2	1.3	1	3
Goa	3	1.5	1	3
Himachal Pradesh	2.8	1.5	1	3
Karnataka	3.2	1.7	1	2
Bihar	2.2	1.5	2	
Rajasthan	2.6	1.5	1	2.5
Jharkhand	2	1.5	2	2
Maharashtra	3	1.5	1	2
Uttar Pradesh	3.2	1.5	1	1.5
Gujarat	2.8	1.5	1	
Andhra Pradesh	2	2	1	2
Madhya Pradesh	2.4	1	1	2
Haryana	2.8	1.5	1	1
Punjab	2.8	1.5	1	1
Telangana	1.2	2	1	2
Assam	2	1.7	1	1.5
Tripura	1.8	1.3	1	2
Uttarakhand	2.6	1.5	1	1
West Bengal	2.2	1.5	1	1
Chhattisgarh	2.2	1.5	1	1
Meghalaya	1.4	1.7	1	1.5
Odisha	1.2	1.5	1	1

Note: The overall index ranking has been constructed using four parameters that measure restrictions on women for working: 1) at night; 2) in jobs deemed hazardous; 3) in jobs deemed arduous; and 4) in jobs deemed morally inappropriate.

Top and bottom performers on various parameters

Freedom to work at night
Most free: Kerala, Tamil Nadu, Karnataka, Uttar Pradesh
Least free: Meghalaya, Telangana, Odisha

Freedom in jobs deemed hazardous
Most free: Andhra Pradesh, Telangana, Assam, Meghalaya, Karnataka
Least free: Tamil Nadu, Tripura, Madhya Pradesh

Freedom in jobs deemed arduous
Most free: Bihar, Jharkhand
Least free: All other states

Freedom in jobs deemed morally inappropriate
Most free: Kerala, Goa, Himachal Pradesh, Tamil Nadu
Least free: Uttarakhand, Punjab, West Bengal, Chhattisgarh, Odisha

Significance of Increasing FLFP:

- o **Economic Growth**:
  - ▪ Higher FLFP boosts **productivity** and **GDP growth**.
  - ▪ **McKinsey Report**: Equal opportunities for women can add **$770 billion** to India's GDP by 2025.
- o **Demographic Dividend**:
  - ▪ Increases the share of economically active population.
- o **Empowerment and Equality**:
  - ▪ Enhances women's decision-making in **personal, family, and societal spheres**.
- o **SDG Goals**:
  - ▪ Directly contributes to achieving **SDG 5 (Gender Equality)**, **SDG 8 (Decent Work)**, and **SDG 10 (Reduced Inequalities)**.

Government Initiatives to Improve FLFP:

- o **Budget 2024–25**:
  - ▪ ₹2 lakh crore outlay to empower **4.1 crore women** through skilling and employment.
  - ▪ Establishing **working women hostels** and **crèches**.
- o **Palna Scheme**:
  - ▪ Provides **day-care facilities** for children of working parents.
- o **Namo Drone Didi Scheme**:
  - ▪ Equips women SHGs with **drone technology** for agricultural services.
- o **Skill India Mission**:
  - ▪ Offers vocational training through **Women ITIs** and **Vocational Training Institutes**.
- o **WISE-KIRAN Scheme**:
  - ▪ Addresses challenges faced by women in **STEM fields** through diverse programs.

Way Forward:

- o **Social Norms**:
  - ▪ Destigmatize **caregiving roles** and promote men's participation through public campaigns.
- o **Flexible Work**:
  - ▪ Encourage **remote work** and **adjustable hours**.
- o **Education**:
  - ▪ Focus on improving **female literacy** and providing vocational training.
- o **Structural Reforms**:
  - ▪ Create inclusive workspaces in **manufacturing** and **services sectors**.
- o **Role Models**:
  - ▪ Highlight women leaders like **Nirmala Sitharaman**, **Sudha Murty**, and **Kiran Bedi** to inspire participation.

Conclusion

Increasing **female labor force participation** is essential for **economic growth**, **social transformation**, and achieving **gender equality**. Focused interventions, policy changes, and breaking social stereotypes will unlock the potential of millions of Indian women, transforming them into active contributors to the nation's progress.

Universal Health Coverage in India

UPSC Syllabus Relevance

- • **GS Paper 2: Governance – Health Policies and Interventions**
- • **GS Paper 3: Development – Social Sector/Health**

Context:

- o Discussions on **Universal Health Coverage (UHC)** have gained momentum to ensure **'Health for All'** in a developing country like India.

What is Universal Health Coverage (UHC)?

- o **Definition**: As per **WHO**, UHC ensures **access to quality health services** for everyone without financial hardship.
- o **Principles**: Equity, non-discrimination, and the **right to health**.
- o **Key Features**:
  - ▪ **Access**: Includes health promotion, prevention, treatment, rehabilitation, and palliative care.
  - ▪ **Equity**: Prioritizes marginalized populations.
  - ▪ **Financial Protection**: Prevents healthcare-induced financial stress.

Constitutional Provisions:

- o **Article 21**: Recognizes the **right to health** as part of the **right to life**.
- o **Article 47 (DPSP)**: Directs the state to improve **public health**, **nutrition levels**, and **living standards**.

Current Status of Healthcare in India:

- o **Mixed Health System**: Public and private sectors coexist, with the private sector dominating in expenditure and delivery.
- o **Spending**: India spends only **2.1% of GDP on healthcare** (2023), below the **WHO-recommended 5%**.
- o **Out-of-Pocket Expenditure (OOPE)**: Accounts for **70%** of healthcare financing.

Challenges in Achieving UHC:

- o **Access to Healthcare**:
  - ▪ **70% OOPE** leads to financial hardship for many families.
- o **Healthcare Workforce**:
  - ▪ **Doctor-to-population ratio**: 1:1,500 (WHO recommends 1:1,000).
  - ▪ **Nurses**: 2.06 per 1,000 population (WHO recommends 3 per 1,000).
- o **Urban-Rural Divide**:
  - ▪ **70% of healthcare infrastructure** is urban, while **65% of India's population** resides in rural areas.
- o **Financial Protection**:
  - ▪ Only **41% population** covered under health insurance (NFHS-5).
- o **Quality of Care**:
  - ▪ Less than **10% of private hospitals** are accredited by **NABH**, leading to inconsistency in care.
- o **Governance Issues**:
  - ▪ Inefficiency, corruption, and lack of accountability in fund utilization.

Government Initiatives Supporting UHC:

- o **National Health Policy 2017**: Aims for health assurance and quality care for all.
- o **Mission Mode Projects**:
  - ▪ **PM-ABHIM**: Strengthens health infrastructure.
  - ▪ **PMJAY**: Provides health insurance to vulnerable sections.
  - ▪ **ABHWCs**: Establishes health and wellness centers.
  - ▪ **NDHM**: Promotes digital health solutions.
- o **Other Schemes**:
  - ▪ **Palna Scheme**: Provides crèche facilities for working parents.
  - ▪ **Skill India Mission**: Enhances employability of healthcare workers.
  - ▪ **WISE-KIRAN Scheme**: Supports women in STEM health roles.

Way Forward:

- o **Integrated Approach**: Combine health, education, and nutrition schemes like **PM POSHAN**.
- o **Increase Spending**: Raise public health expenditure to **2.5% of GDP by 2025**, as per Economic Survey 2022–23.
- o **Preventive Care**: Focus on immunization, clean water, and sanitation to reduce disease burden.
- o **Strengthen Rural Healthcare**: Build infrastructure and hire more workforce in underserved areas.
- o **Digital Health**: Leverage telemedicine and health-tech solutions for remote areas.
- o **Expand Insurance**: Broaden coverage of **PMJAY** to include informal workers.
- o **Regulate Private Sector**: Cap treatment costs and enforce quality standards.
- o **Global Cooperation**: Collaborate on pandemic preparedness and adopt best practices from **WHO UHC 2030 Partnership**.

Significance of UHC:

- o **Economic Growth**: A healthier workforce enhances productivity and GDP growth.
- o **Demographic Dividend**: Ensures maximum utilization of India's population potential.
- o **Achieving SDGs**: Aligns with **SDG 3.8** for health and well-being.

Koraga Tribal Community

UPSC Syllabus Relevance

- **GS Paper 1: Indian Society – Tribal Communities and Their Development**
- **GS Paper 2: Governance – Welfare Schemes for Vulnerable Sections**

Context:

o The **Kerala Government** launched **Operation Smile** to provide **land titles (patta)** to the **Koraga community**, a **Particularly Vulnerable Tribal Group (PVTG)**.

About the Koraga Tribal Community:

o **Habitat**:
  ▪ Found primarily in **Kasaragod district (Kerala)** and **Karnataka**.
o **PVTG Status**:
  ▪ Recognized as a **Particularly Vulnerable Tribal Group (PVTG)** by the **Ministry of Tribal Affairs**.
  ▪ India has a total of **75 PVTG communities**.
o **Scheduled Tribe (ST) Status**:
  ▪ Categorized under **Scheduled Tribes** as per the **Presidential Order of 1956**.
o **Language**:
  ▪ Primarily speak **Tulu**, along with their **independent language**.
o **Social Structure**:
  ▪ Divided into **17 exogamous clans** known as **Bali**.
  ▪ **Matrilineal family system**: Descent traced through the **female line**.
  ▪ **Residence after marriage**: Patrilocal.
  ▪ **Property rights**: Equal division between **sons and daughters**.
o **Religion and Beliefs**:
  ▪ Worship various **Bhutas (spirit deities)**, including **Panjurli, Kallurti, Korathi**, and **Guliga**.
  ▪ Associated with **Bhuta Kola**, a ritualistic folk dance tradition of **Tulu Nadu**.

Significance of Operation Smile:

o **Land Rights**:
  ▪ Providing land titles empowers the Koraga community to secure **livelihoods and housing stability**.
o **Welfare Integration**:
  ▪ Enhances their access to **government schemes and benefits**.
o **Cultural Preservation**:
  ▪ Recognition and support help maintain their **unique identity and traditions**.

Conclusion

The **Koraga tribal community**, as a **PVTG**, reflects India's rich tribal diversity and socio-cultural fabric. Initiatives like **Operation Smile** highlight the importance of inclusive governance, ensuring tribal communities achieve **land security**, **economic stability**, and **social empowerment**. This aligns with the constitutional mandate of promoting **tribal welfare** under **Article 46**.

Reang Tribe

UPSC Syllabus Relevance

- **GS Paper 1: Indian Society – Tribal Communities and Their Development**
- **GS Paper 2: Governance – Welfare and Representation of Vulnerable Sections**

Context:

o The **Reang tribe**, one of the **75 Particularly Vulnerable Tribal Groups (PVTGs)**, has requested **official recognition** for their language, **Kaubru**.

About the Reang Tribe:

o **Alternative Name**:
  ▪ Also known as **"Bru"**, the Reang tribe is the **second-largest tribal community in Tripura**, after the **Tripuri clan**.
o **Habitat**:
  ▪ Primarily found in **Tripura**, with significant populations in **Mizoram** and **Assam**.
o **Ethnicity**:
  ▪ Belong to the **Indo-Mongoloid racial stock**, which reflects their distinct ethnic identity.

- o **Language**:
  - ▪ Speak **Kaubru**, a language of the **Kok-Borok dialect**, part of the **Tibeto-Burmese linguistic family**.
  - ▪ The community is advocating for **official recognition** of Kaubru to preserve their **linguistic and cultural heritage**.

Significance of Language Recognition:

- o **Cultural Preservation**:
  - ▪ Recognition of **Kaubru** will safeguard the tribe's **heritage and identity**.
- o **Linguistic Diversity**:
  - ▪ Enhances India's commitment to promoting **linguistic plurality** and **tribal representation**.
- o **Empowerment**:
  - ▪ Official status may provide access to **education, resources, and documentation** in their native language.

Conclusion

The **Reang (Bru) tribe** represents an integral part of India's **tribal diversity**, with their language **Kaubru** being a key cultural marker. Recognizing Kaubru will not only empower the community but also reinforce India's constitutional mandate to preserve its **linguistic and cultural diversity** under **Article 29**.

SCIENCE & TECHNOLOGY

Milkweed Fiber

(GS Paper 3: Science and Technology – Innovation and Textile Industry)

Context:

The **Ministry of Textile** has expanded its **R&D efforts** to explore new natural fibers, including **milkweed fiber**, for **sustainable textile innovation** in India.

About Milkweed Fiber:

- • **Type:** Sustainable, natural plant fiber, also called **vegetable silk**.
- • **Family:** Belongs to the **Asclepias genus** of the **Asclepiadaceae family**.
- • **Native To:** Originates in **North America**, grows in various soil conditions.

Key Features of Milkweed Fiber:

1. **Composition:**
   - o Made of **cellulose**, **hemicellulose**, and **lignin**.
2. **Hydrophobicity:**
   - o Naturally **water-repellent** due to waxy surfaces.
3. **Oil Sorption:**
   - o Can absorb **over 100 grams of engine oil** per gram of fiber.
4. **Density:**
   - o Lower than water, making it **lightweight** and buoyant.
5. **Perennial Growth:**
   - o Plants do not require **replanting** annually and thrive without fertilizers.
6. **Toxicity:**
   - o **Leaves and sap** are toxic to mammals, adding a natural deterrent to pests.

Applications of Milkweed Fiber:

1. **Water Safety Equipment:**
   - o Used in **life jackets** and belts, supporting **30 times its weight** while floating.
2. **Upholstery:**
   - o Lightweight with excellent **insulation properties**, suitable for padding and insulation.
3. **Technical Textiles:**

IQRA IAS
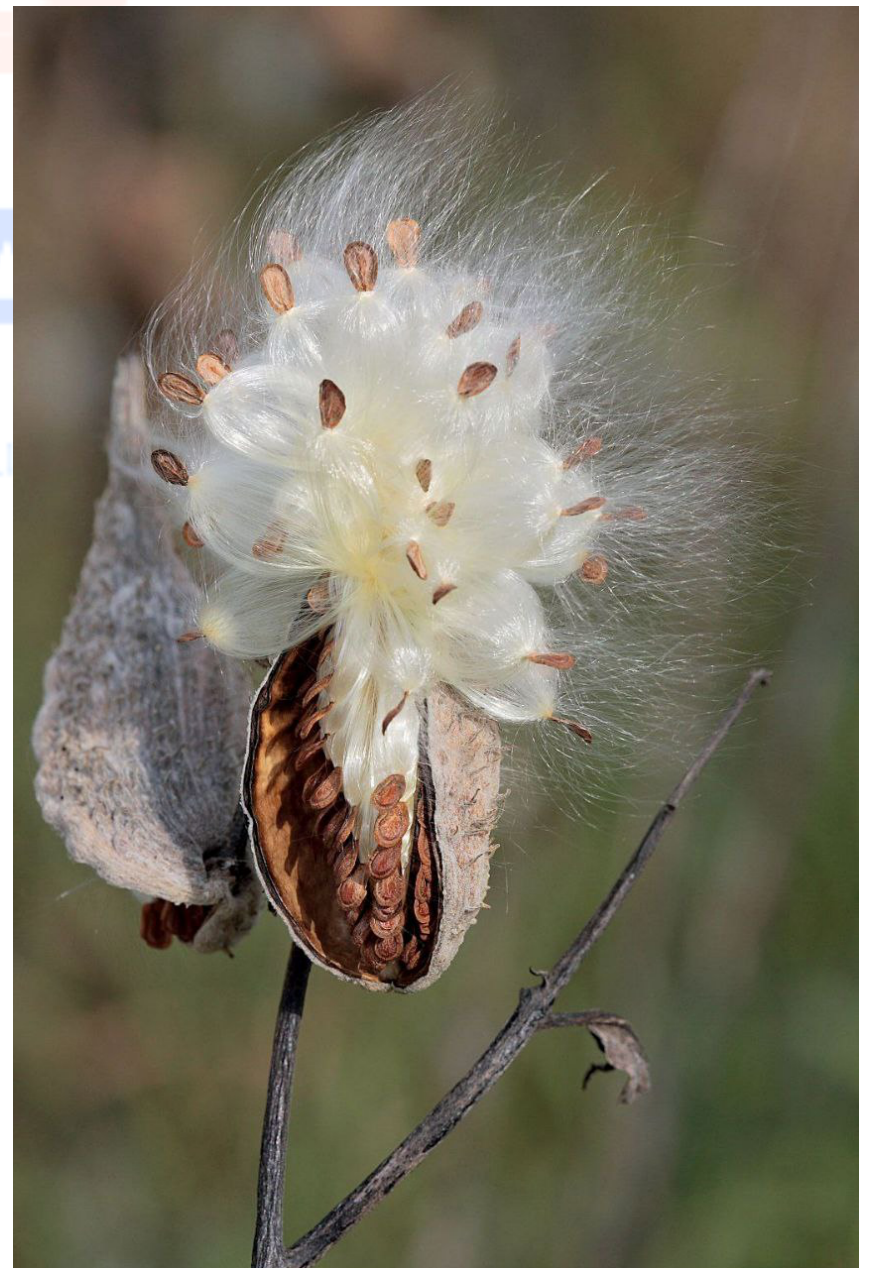
    o   Eco-friendly and **non-allergenic** fabrics.
4. **Sanitary Napkins:**
    o   High liquid retention and **vertical wicking properties** make it ideal for absorbent products.
5. **Medical Goods:**
    o   Preferred for **ecological and chemical benefits** in medical textiles.

Significance:

- **Sustainability:** Offers a **renewable and eco-friendly alternative** to synthetic fibers.
- **Economic Potential:** Opens new avenues for **technical textiles** and **bio-based industries**.
- **Rural Development:** Cultivation and processing can promote **rural employment**.

Way Forward:

- **R&D Investment:** Develop technologies to process milkweed fibers efficiently.
- **Awareness Campaigns:** Promote its **economic and ecological benefits** to attract farmers and industries.
- **Market Expansion:** Leverage global demand for **sustainable textiles** through innovation and exports.

Research Security Should Be a National Priority

Syllabus

Prelims: Science and Technology: Developments and applications in everyday life.

Role of Science and Technology in India's Development Goals (2047)

- **Strategic Importance**:
    o   Enhance **global competitiveness** in emerging technologies like **AI**, **quantum computing**, and **cybersecurity**.
    o   Drive **economic growth** and innovation.
    o   Address **societal challenges** such as health, energy, and environment.
- **Key Objectives**:
    o   Invest in cutting-edge technologies.
    o   Strengthen **intellectual property protections**.
    o   Secure critical research to mitigate global threats.

Importance of Research Security

1. **Definition**:
    o   Safeguarding the **means, processes, and outcomes** of research from threats like intellectual property theft, foreign interference, and cyberattacks.
2. **Critical for**:
    o   Protecting **public investments** in research.
    o   **Preventing misuse** of sensitive data.
    o   Ensuring **national security** and **technological independence**.
3. **Emerging Threats**:
    o   **Foreign Interference**: Manipulation by foreign entities.
    o   **Intellectual Property Theft**: Stealing proprietary technologies.
    o   **Cyberattacks**: Disruption of critical research systems.
    o   **Insider Threats**: Leaks or compromises by individuals.

Global Approaches to Research Security

1. **United States**:
    o   **CHIPS and Science Act**: Strengthens research security provisions.
    o   **NSPM-33**: Mandates disclosure of foreign partnerships.
2. **Canada**:
    o   **National Security Guidelines for Research Partnerships**: Restricts sensitive collaborations with foreign entities.
3. **European Union**:
    o   **Horizon Europe**: Encourages **risk-based approaches** and research self-governance.

Challenges in Research Security

1. **Conflict with Open Science**:
    o   Restrictions hinder **global collaborations**, essential for innovation.
2. **Administrative Burden**:

o Increased compliance requirements strain resources.
3. **Dynamic Threats**:
   o Rapid advancements in technologies like AI make threats unpredictable.
4. **Balancing Innovation and Regulation**:
   o Over-regulation may deter researchers from exploring **cutting-edge topics**.
5. **Ethical Concerns in AI**:
   o Risks of misuse and lack of trust in research outputs.

Initiatives to Promote Research Security in India

1. **Existing Frameworks**:
   o **IT Act, 2000**: Legal framework for cybersecurity.
   o **Digital Personal Data Protection Act, 2023**: Strengthens privacy protections.
   o **Cyber Surakshit Bharat**: Educates IT professionals on cybersecurity.
2. **Steps to Enhance Research Security**:
   o **National Research Security Policy**: Framework for safeguarding sensitive research.
   o **Cybersecurity Infrastructure**: Investments in **real-time threat detection**.
   o **Training Programs**: Awareness on secure research practices.
   o **International Collaboration**: Secure partnerships with trusted global entities.

Way Forward

1. **Classify Strategic Research**:
   o Categorize projects by **sensitivity** to ensure proportionate security measures.
2. **Adopt Ethical Standards for AI**:
   o Develop norms to prevent misuse and ensure accountability.
3. **Establish a Research Security Office**:
   o A specialized body under **Anusandhan National Research Foundation (ANRF)** for policy coordination.
4. **Leverage Quad Partnerships**:
   o Focus on research security in **emerging technologies** like **semiconductors** and **clean energy**.
5. **Financial Support**:
   o Allocate funding for secure **research infrastructure** and **training programs**.

Major Atmospheric Cherenkov Experiment (MACE) Telescope

Syllabus Mapping

- **Prelims: Science & Technology (space technology, quantum mechanics).**
- **Mains: GS III: Science & Technology (Quantum Computing, Space Technology), applications and implications for national security.**

Context

- MACE telescope, a cutting-edge ground-based gamma-ray telescope, has been inaugurated in Hanle, Ladakh.

Key Features of MACE

1. **World's Highest Imaging Cherenkov Telescope**:
   o Located at **4.3 km above sea level** in Hanle.
   o Asia's largest imaging Cherenkov telescope and the **second-largest globally**.
2. **Advanced Construction and Technology**:
   o **21-metre-wide dish** with 356 honeycomb-structured mirror panels.
   o **High-resolution camera** with 1,088 photomultiplier tubes.
   o Mounted on a **180-tonne altitude-azimuth structure** for wide-sky coverage.
3. **Gamma-Ray Detection**:
   o Uses Cherenkov radiation generated when cosmic gamma rays interact with the Earth's atmosphere.
   o Operates as an **Imaging Atmospheric Cherenkov Telescope (IACT)** for high-energy gamma rays (>20 billion eV).
4. **Indigenous Development**:
   o Designed and developed by Indian institutions, including **BARC, TIFR, and IIA**.

Applications and Research Objectives

1. **Study of High-Energy Gamma Rays**:
   o Investigates gamma rays from phenomena like pulsars, supernovae, and black holes.
   o Analyzes gamma rays beyond the Milky Way, including emissions from **blazars** and gamma-ray pulsars.
2. **Dark Matter Research**:

- o Seeks evidence for **WIMPs (Weakly Interacting Massive Particles)**, potential components of dark matter.
- o Examines gamma rays from WIMP annihilation in galaxy clusters and near the Milky Way's center.
3. **High-Energy Astrophysics Contributions**:
   - o Enhances understanding of particle physics, gamma-ray astronomy, and cosmology.
   - o Validates or challenges existing theories on the universe's fundamental structure.
4. **Technological Advancements**:
   - o Sets a benchmark for gamma-ray observatories globally.
   - o Promotes collaboration and innovation in Indian astrophysics.

Significance

- **Scientific Milestone**: Advances India's role in high-energy astrophysics and gamma-ray research.
- **Strategic Location**: High-altitude site ensures optimal conditions for astronomical observations.
- **Global Collaboration**: Establishes India as a leader in gamma-ray astronomy and fosters international partnerships.

Quantum Satellite

Syllabus Mapping

- **Prelims: General Science (Space and Astronomy).**
- **Mains: GS III: Science & Technology (Space Exploration, Exoplanet Research).**

Context

India plans to launch its first quantum satellite in the next 2–3 years to enable **secure quantum communications**, under the National Quantum Mission.

About Quantum Satellite

- **Definition**: A satellite that uses quantum mechanics, like **superposition** and **entanglement**, to enable highly secure communication.
- **Example**: **Micius (China, 2016)** – the first quantum satellite, demonstrated secure quantum cryptography via entangled photons.

Purpose and Features

1. **Quantum Key Distribution (QKD)**:
   - o Distributes encryption keys securely.
   - o Detects eavesdropping and aborts compromised transmissions.
2. **Enhanced Security**:
   - o Protects against unauthorized interception, making it vital as **quantum computers** can break conventional cryptographic methods.
3. **Applications**:
   - o **Defense**: Secure communication for military operations.
   - o **Finance**: Protects sensitive financial transactions.
   - o **Critical Infrastructure**: Safeguards data in sectors like energy and healthcare.

Comparison: Quantum vs. Conventional Satellites

Feature	Quantum Satellite	Conventional Satellite
Core Technology	Quantum mechanics (e.g., entanglement)	Classical physics
Primary Function	Secure communication (QKD)	Communication, navigation, remote sensing
Data Transmission	Encodes information in **qubits**	Encodes information in classical **bits**
Security	**Unconditionally secure**	Relies on cryptographic algorithms
Challenges	Maintaining quantum states	Vulnerable to quantum attacks

Principles of Quantum Mechanics Involved

1. **Superposition**:
   - o A particle can represent multiple possibilities simultaneously, unlike classical binary states.
2. **Quantum Entanglement**:
   - o Correlation between quantum particles, enabling instant communication over long distances.
3. **Quantum Interference**:
   - o Wave-like properties of particles enable constructive and destructive interference.
4. **Quantum Tunneling**:
   - o Particles can cross barriers that would be impossible under classical physics.

Challenges in Quantum Satellites

- **Technical Complexity**:
  - Maintaining quantum states during transmission and reception.
  - Developing cost-effective and scalable systems.
- **Data Loss Risks**: High sensitivity to environmental factors like temperature and radiation.

Quantum Communication

- **Definition**: Secure data transmission using quantum systems.
- **Applications**: Defense, finance, and national security.

Significance for India

- **Global Leadership**: Strengthens India's position in **quantum technologies**.
- **Security**: Protects sensitive communication from advanced threats.
- **Collaboration**: Opens doors for international partnerships in quantum research.

GG Tau A System

Syllabus Mapping

- **Prelims: General Science (Space Science and Technology, Physics).**
- **Mains: GS III: Science & Technology (Space Exploration, Advances in Space Research).**

Context

Astronomers have discovered a **protoplanetary disk** in the **GG Tau A system**, offering critical insights into planet formation in **multi-star environments**.

About GG Tau A System

1. **Triple-Star System**:
   - GG Tau A comprises **three interacting stars**, located **489 light-years** away.
2. **Young System**:
   - Age: **1–5 million years**, making it ideal for studying **early planetary formation** processes.
3. **Protoplanetary Disk**:
   - The swirling ring of **gas and dust** in the system acts as a **planet-birth environment**.
4. **Star Interactions**:
   - Interactions between stars create **unique forces**, influencing the disk and making planet formation **more complex** than in single-star systems.

Key Highlights of the Discovery

1. **Advanced Observation**:
   - Researchers from **NISER, Odisha**, used **radio telescopes** in Chile's Atacama Desert.
   - Detected emissions from **key molecules**, aiding in analyzing the disk's **chemical composition**.
2. **Low-Temperature Conditions**:
   - Disk temperatures: **12–16 K**.
   - Low temperatures **freeze carbon monoxide**, enabling **clumping of gas and dust**, essential for planet formation.

Significance of the Discovery

1. **Planet Formation in Multi-Star Systems**:
   - Offers insights into **planet formation dynamics** in **multi-star environments**, which are less predictable than single-star systems.
2. **Chemical and Physical Analysis**:
   - Understanding the disk's **composition** and conditions sheds light on the **diversity of planetary systems**.
3. **Comparison with Single-Star Systems**:
   - Highlights differences in planet formation between **single-star systems** (like the Sun) and **multi-star systems**.
4. **Exoplanet Diversity**:
   - Provides clues about the **variety of exoplanets** in the universe, enhancing our understanding of planetary systems.

Expansion of the Universe

Syllabus Mapping

- **Prelims: General Science (Space Science, Astronomy).**
- **Mains: GS III: Science & Technology (Space Exploration, Space Phenomena).**

Context

Recent findings by NASA's **James Webb Space Telescope (Webb)** confirm the **faster-than-expected expansion of the universe**, previously observed by the **Hubble Space Telescope**, highlighting a phenomenon known as **Hubble Tension**.

Key Concepts in the Universe's Expansion

1. **Hubble Tension**:
   - The discrepancy between the **observed expansion rate** of the universe (Hubble constant) and the rate predicted by cosmological models.
2. **Hubble Constant**:
   - Measures the **expansion speed** of the universe.
   - Expected Value: **67-68**.
   - Observed Value: **73**, with a possible range of **70-76**, suggesting an **8% faster expansion**.
3. **Dark Energy and Dark Matter**:
   - **Dark Energy** (69% of the universe): Drives the **accelerated expansion** of space.
   - **Dark Matter** (27%): Influences visible matter through **gravitational effects**.

How Scientists Measured Expansion

1. **Cepheid Stars as Cosmic Mile Markers**:
   - These stars help measure distances to galaxies, crucial for calculating the expansion rate.
2. **Hubble and Webb Observations**:
   - Both telescopes studied Cepheid stars across multiple galaxies.
   - Webb's advanced sensitivity confirmed Hubble's findings, eliminating observational errors.

Historical Context

1. **Big Bang and Accelerated Expansion**:
   - The universe began with the **Big Bang**, around **13-14 billion years ago**.
   - In **1998**, researchers discovered that the universe's expansion is **accelerating** due to **dark energy**.
2. **Nobel-Winning Research**:
   - Adam Riess and team's discovery of the universe's **accelerated expansion** earned a **Nobel Prize**.

Possible Explanations for Hubble Tension

1. **Gravity's Unique Behavior**:
   - Gravity might function differently on **cosmic scales** than currently understood.
2. **Hidden Elements**:
   - **Dark radiation** or unknown particles (e.g., neutrinos) may influence the expansion rate.
3. **Theoretical Gaps**:
   - Existing cosmological models might need **revision** to incorporate new physics.

Challenges in Understanding the Universe's Expansion

1. **Dark Matter and Energy**:
   - Limited understanding of these components makes accurate modeling difficult.
2. **Measurement Errors**:
   - Telescope calibration or data analysis issues could skew results.
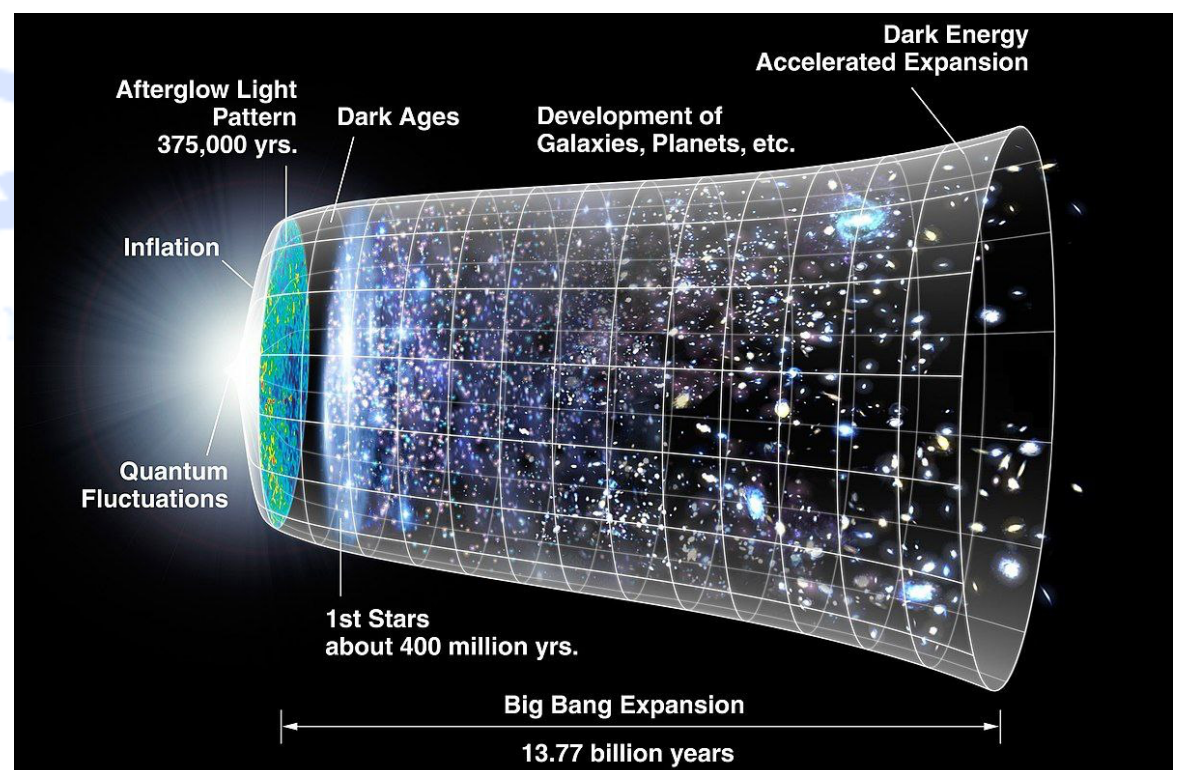
3. **Theoretical Gaps**:
   o Current models may lack critical elements, requiring a **paradigm shift** in physics.
4. **Statistical Variations**:
   o Random fluctuations or insufficient data may contribute to discrepancies.
5. **Unforeseen Factors**:
   o Unknown influences or discoveries could further complicate the picture.

Key Findings from Webb Telescope

- **Faster Expansion**: Universe is expanding about **8% faster** than models predict.
- **Dark Energy's Role**: Major driver of the accelerated expansion.
- **Accurate Measurements**: Webb confirmed Hubble's findings with high precision.

Dark Comets

Context

The **Dark Energy Camera (DECam)** in Chile recently discovered **10 new dark comets**, advancing our understanding of these unique celestial objects.

About Dark Comets

- **Definition**:
  Dark comets are celestial objects resembling **asteroids** (devoid of bright comas) but move and behave like **comets** with sudden accelerations.
- **First Discovery**:
  o **2016**: Asteroid **2003 RM**, nicknamed *"The Asteroid that Wanted to be a Comet"*.
  o **2017**: NASA discovered *'Oumuamua'*, the first documented interstellar object resembling an asteroid but behaving like a comet.
- **Categories**:
1. **Inner Dark Comets**:
   ▪ Reside in the **inner solar system**.
   ▪ Move in nearly **circular orbits** and are generally smaller (tens of meters or less).
2. **Outer Dark Comets**:
   ▪ Resemble **Jupiter-family comets** with highly **elliptical orbits**.
   ▪ Larger in size (100 meters or more).
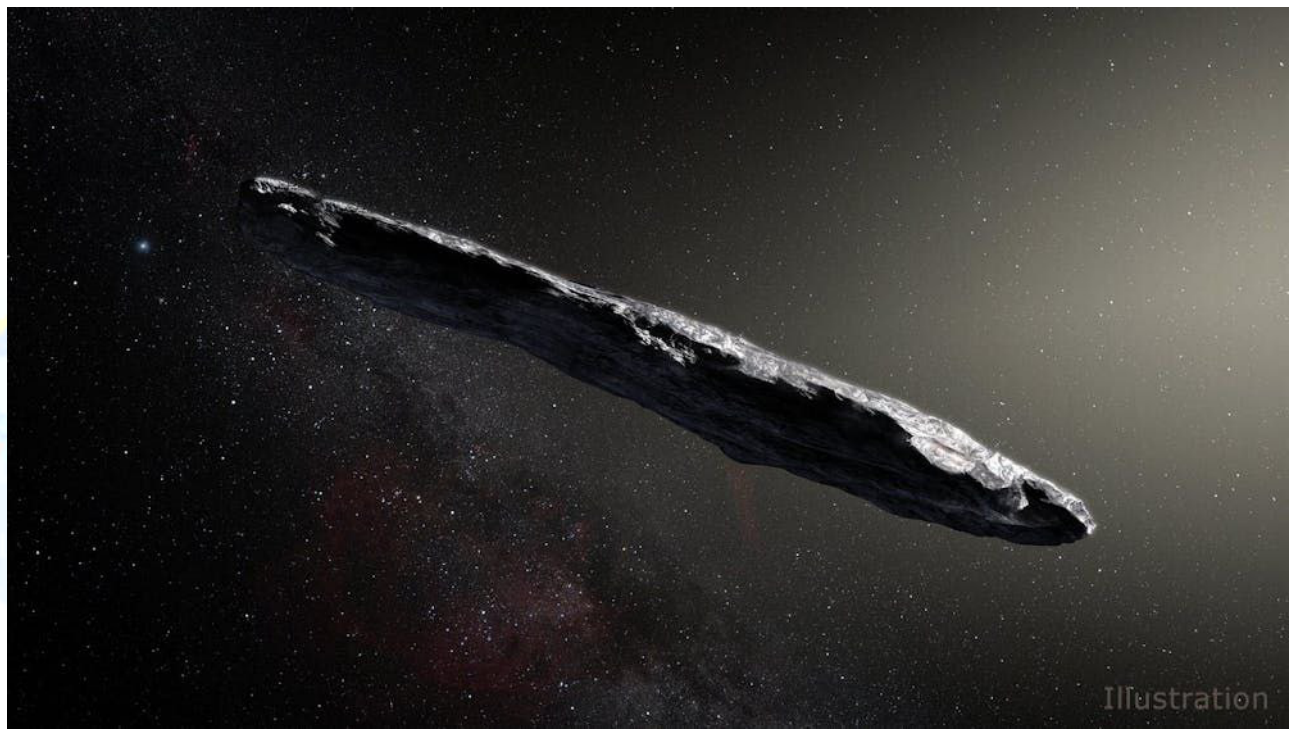
Characteristics

1. **Elusiveness**:
   o Lack glowing tails (comas), appearing as faint points of light, similar to asteroids.
2. **Orbits**:
   o Follow **elongated, elliptical paths**, often extending beyond **Pluto** or into the **Oort Cloud**.
3. **Size**:
   o Range from a few meters to a few hundred meters in width.
   o Minimal surface area reduces visibility of gas or dust emissions.
4. **Spin**:
   o Rapid spinning disperses gas and dust in all directions, further obscuring visibility.
5. **Composition and Age**:
   o Weak or no gas loss due to depleted materials that typically form bright comet tails.

Significance of Dark Comets

1. **Understanding Planet Formation**:
   o Offer clues about **Earth's formation**, the **origins of water**, and the **beginning of life** on Earth.
2. **Prevalence**:
   o A 2023 study estimated that **0.5% to 60%** of all **Near-Earth Objects (NEOs)** could be dark comets originating from the **asteroid belt** between Mars and Jupiter.

Comparison with Traditional Comets

Feature	Dark Comets	Traditional Comets
Appearance	Faint, asteroid-like	Bright with glowing tails (comas)
Composition	Depleted volatile materials	Rich in volatiles (gas and dust)
Orbit	Elongated, often extending to Oort Cloud	Highly elliptical, shorter orbits
Visibility	Difficult to detect	Easily visible due to emitted gas/dust

Way Forward

1. **Advanced Observations**:
   o Use instruments like the **Dark Energy Camera** and **space telescopes** to detect and study faint objects.
2. **Interdisciplinary Research**:
   o Integrate findings from **planetary science**, **astrophysics**, and **geochemistry** to understand the **role of dark comets** in solar system evolution.
3. **International Collaboration**:
   o Enhance global efforts in tracking **Near-Earth Objects** (NEOs) and dark comets to assess potential impacts on Earth.

World's First Carbon-14 Diamond Battery

UPSC Syllabus Mapping

GS Paper III:

- **Science and Technology: Developments and applications in renewable and clean energy.**
- **Environment: Radioactive waste management.**

GS Paper II:

- **Government policies and international relations in technology and energy collaboration.**

Context

Researchers from the **University of Bristol** and the **UK Atomic Energy Authority (UKAEA)** have developed the **world's first carbon-14 diamond battery**, offering long-lasting energy solutions for niche applications.

About Carbon-14 Diamond Battery

1. **Battery Mechanism**:
   o Utilizes **radioactive decay** of **carbon-14**, an unstable isotope with a **half-life of 5,700 years**.
   o Generates energy by harnessing fast-moving **beta particles** (electrons) released during decay.
   o Functions like **solar panels**, but instead of light, it captures beta particles within a **diamond structure** to produce electricity.
2. **Safety**:
   o Encased in diamond, which is one of the hardest and most durable materials.
   o Absorbs radiation safely with **no leakage**, ensuring safe handling and operation.

Applications

1. **Electrical Appliances**:
   o Produces **low-power output**, making it unsuitable for high-energy devices like laptops or smartphones.
2. **Space Missions**:
   o **Ideal for satellites and space missions**:
      ▪ Long operational lifespan supports extended missions.
      ▪ Can power active radio frequency tags for **tracking spacecraft or payloads**.
3. **Medical Devices**:
   o Powers **low-energy medical implants**:
      ▪ **Pacemakers**, **hearing aids**, and **ocular devices**.
   o Offers patients **long-term reliability** without frequent battery replacements.
4. **Nuclear Waste Management**:
   o Extracts **carbon-14** from nuclear waste, reducing:
      ▪ **Radioactive material volume**.
      ▪ **Storage costs**.
   o Utilizes carbon-14 effectively, aligning with waste management goals.

Key Advantages

1. **Long Operational Life**:
   - Half-life of **5,700 years** ensures thousands of years of power generation.
   - Minimizes maintenance and replacement needs.
2. **Sustainability**:
   - Recycles carbon-14 from **nuclear waste**, reducing environmental impact.
   - Helps manage **radioactive waste disposal** sustainably.
3. **Safety and Reliability**:
   - Encased in diamond, offering resistance to wear and extreme conditions.
   - Emits **low levels of electricity**, ensuring operational safety.

Challenges

1. **Low Power Output**:
   - Unsuitable for high-energy devices like smartphones or laptops.
   - Limited applications in consumer electronics.
2. **Cost**:
   - The use of **diamond structures** makes the battery **expensive to manufacture**.
3. **Scaling Issues**:
   - High production costs and technical complexities hinder large-scale deployment.

ISRO Successfully Tests CE20 Cryogenic Engine

UPSC Syllabus Mapping

GS Paper III:

- **Science and Technology: Developments in Space Technology.**
- **Achievements of Indians in Science and Technology.**

Context

The **Indian Space Research Organisation (ISRO)** achieved a key milestone by successfully conducting the **sea-level hot test** of the **CE20 cryogenic engine** at the **ISRO Propulsion Complex**, Mahendragiri, Tamil Nadu.

About CE20 Cryogenic Engine

1. **What is it?**
   - A **cryogenic rocket engine** using **liquefied gases** as fuel and oxidizer, maintained at extremely low temperatures to stay in liquid form.
   - Developed by the **Liquid Propulsion Systems Centre (LPSC)** of ISRO.
2. **Fuel and Oxidizer**:
   - **Liquid Oxygen (LOX)**: Oxidizer, liquefied at **-183°C**.
   - **Liquid Hydrogen (LH2)**: Fuel, liquefied at **-253°C**.
   - The reaction between LOX and LH2 generates thrust.

TRIAL BY FIRE

India is the sixth space power to develop own cryogenic engine after US, Russia, China, Japan and European Space Agency

What it is

CE-20 is a high-thrust indigenous cryogenic engine to be **used for launching heavy satellites** on board GSLV-MarkIII

How it works

With an engine thrust of 19 tonnes against its predecessor's 7.5-tonne thrust, CE-20 can propel to space payloads up to 4 tonnes

What it means for India

This means India can take up heavy communication satellite launches for itself, besides earning foreign exchange through commercial launches for other countries. It can also power India's manned space missions

Key Features of CE20

1. **Engine Restart Capability**:
   - Equipped with a **multi-element igniter**, allowing **mid-mission restart**.
   - Crucial for missions requiring orbital insertion, such as **Gaganyaan**.
2. **Nozzle Protection System**:
   - Prevents **flow separation** in the nozzle and reduces vibrations.
   - Enhances overall engine performance and simplifies testing.
3. **High Efficiency**:
   - Delivers **increased thrust**, boosting payload capacity.
4. **Thrust Upgrades**:
   - Initially designed for **19 tonnes of thrust**.
   - Upgraded to:
     - **20 tonnes** for the **Gaganyaan mission**.
     - **22 tonnes** for the **C32 stage**, enhancing the **LVM3 rocket's payload capacity**.

Applications

1. **Primary Use**:
   o Powers the **upper stage** of the **LVM3 rocket**.
   o Crucial for placing **satellites** or **spacecraft** into **geostationary and interplanetary orbits**.
2. **Mission-Specific Applications**:
   o Gaganyaan: India's **first human spaceflight mission**.
   o Enhancing payload capacity for launching **heavier satellites** or **interplanetary missions**.

Significance of the Test

1. **Technological Advancement**:
   o Validated **vacuum ignition** capability without nozzle closure.
   o Demonstrates India's **indigenous cryogenic propulsion** expertise.
2. **Boost to Gaganyaan**:
   o Ensures readiness for **Gaganyaan**, a flagship program for manned spaceflight.
3. **Enhanced Payload Capacity**:
   o Allows LVM3 to launch **heavier payloads**, improving India's competitiveness in the global space industry.
4. **Strengthens Space Exploration**:
   o Positions India for ambitious **interplanetary missions** like **Chandrayaan** and **Mangalyaan** successors.

Hydroxymethanesulphonate (HMS)

UPSC Syllabus Mapping

GS Paper III:

- **Environmental Pollution and Degradation: Role of secondary aerosols in air pollution.**
- **Science and Technology: Applications of chemical compounds in industries and environmental sciences.**
- **Prelims: Basics of chemical compounds relevant to air quality and environmental studies.**

Context

A recent study in **Science Advances** highlights that **low sulphate concentrations and cold temperatures** (~ -35°C) enhance the production of **hydroxymethanesulphonate (HMS)** in the atmosphere. This discovery revises earlier assumptions about HMS formation pathways and its role in air quality.

What is Hydroxymethanesulphonate (HMS)?

1. **Definition**:
   o HMS is a **secondary aerosol** formed through atmospheric chemical reactions, primarily between **sulphur dioxide ($SO2$)** and **formaldehyde (CH_2O)** in the presence of **liquid water**.
2. **Formation**:
   o Earlier believed to form under **warm conditions**, new findings suggest HMS can form even in **extremely cold conditions** (~ -35°C).
3. **Role as a Secondary Aerosol**:
   o **Secondary aerosols** form through atmospheric chemical processes involving **primary pollutants**, such as SO_2 and CH_2O.

Significance of HMS Formation

1. **Impact on Particulate Matter (PM2.5)**:
   o HMS increases the **acidity** of PM2.5, promoting the formation of other **secondary aerosols**, worsening **air pollution** and **haze events**.
2. **Air Quality Issues**:
   o The increased acidity exacerbates pollution, significantly affecting regions prone to **low temperatures** and high **sulphur dioxide emissions**.

Applications of Hydroxymethanesulphonate (HMS)

1. **Environmental Science**:
   o Key in understanding the **formation of atmospheric aerosols**, particularly during **haze events**.
   o Helps model the **chemical pathways** contributing to secondary air pollutants.
2. **Air Quality Monitoring**:
   o Acts as a **marker** for pollutants like **SO_2** and **formaldehyde**.
   o Used to assess the impact of **pollution control measures**.
3. **Industrial Uses**:
   o **Sulfonating Agent**: Introduces **sulfonic acid groups** into organic molecules for use in chemical synthesis.
4. **Water Treatment**:
   o Potential applications in **removing pollutants** or controlling water chemistry in **industrial and municipal water systems**.

5. **Biochemistry Research**:
   o Facilitates studies in **enzyme kinetics** and **biological processes**, offering insights into reaction mechanisms.

Relevance to Air Quality and Climate

1. **Role in Air Pollution**:
   o Contributes to the formation of **haze events** and **acidic particulate matter**.
   o Exacerbates the environmental burden in **industrialized and urban areas**.
2. **Climate Impact**:
   o Alters **radiative forcing** by influencing the properties and behavior of aerosols in the atmosphere.
3. **Policy Implications**:
   o Highlights the need for targeted policies to reduce SO_2 **and formaldehyde emissions**, especially in **cold regions**.

Way Forward

1. **Enhanced Monitoring**:
   o Deploy **advanced monitoring systems** to track HMS levels and its precursors (SO_2 and CH_2O).
2. **Mitigation Measures**:
   o Strengthen regulations to curb SO_2 **emissions** from industrial processes and power plants.
3. **Research and Innovation**:
   o Focus on understanding **secondary aerosols** like HMS to develop **data-driven air quality management strategies**.
4. **Global Collaboration**:
   o Coordinate with international bodies to address transboundary pollution and its global climatic implications.

Hybrid Aerogel

UPSC Syllabus Mapping

GS Paper III:

- **Science and Technology: Developments and applications of novel materials.**
- **Environment: E-waste management and sustainable technologies.**

Prelims: Basics of aerogels and their applications.

Context

Researchers from the **Indian Institute of Science Education and Research (IISER), Pune**, have developed a **hybrid aerogel** that efficiently extracts **gold ions** from **electronic waste (e-waste)** and contaminated water. This innovation addresses both **resource recovery** and **e-waste management** challenges.

What is the Hybrid Aerogel?

1. **Definition**:
   o A **hybrid aerogel** is a lightweight, porous material synthesized by combining **metal-organic polyhedral**(based on zirconium) with **2D imine-linked covalent organic frameworks** (COFs).
   o The linkage is achieved using **iron nitrate salt** in a rapid process lasting just 2–5 minutes.
2. **Efficiency**:
   o **Gold Ion Extraction**:
     ▪ **99% extraction efficiency** from e-waste.
     ▪ **1689 mg/g** under daylight conditions.
     ▪ **2349 mg/g** under blue light exposure.
   o Extracts gold ions even from **contaminated water**.

What are Aerogels?

1. **Definition**:
   o **Aerogels** are ultralight materials with **extremely low density** and **high porosity**.
   o They are formed by replacing the liquid component of a gel with gas while preserving the structural framework.
2. **Characteristics**:
   o **Low Density**: One of the lightest solid materials.
   o **High Porosity**: Air constitutes ~97% of its volume.
   o **Thermal Insulation**: Minimal convection and conduction of heat.
3. **Types**:
   o **Silica Aerogel**: Common and used as thermal insulators.
   o **Carbon Aerogel**: Known for **electrical conductivity**.

- **Metal Oxide Aerogel**: Derived from alumina, iron oxide, etc.
- **Polymer Aerogel**: Flexible and customizable.
- **Hybrid Aerogel**: Combines two or more material types for enhanced functionality.

Key Features of IISER's Hybrid Aerogel

1. **Selective Gold Capture**:
   - Active sites in the aerogel are tailored for **selective gold ion extraction**, crucial for **e-waste management** and **water purification**.
2. **Rapid Synthesis**:
   - The **covalent linkage process** occurs within minutes at room temperature, making it cost-effective and scalable.
3. **Light-Assisted Extraction**:
   - Works efficiently under both **daylight** and **blue light**, enhancing its versatility.

Applications

1. **E-Waste Management**:
   - Facilitates recovery of precious metals like **gold** from discarded electronic devices.
2. **Water Purification**:
   - Removes gold ions and other contaminants from **industrial effluents** and polluted water bodies.
3. **Sustainable Material Science**:
   - Reduces dependency on traditional mining by recovering metals from secondary sources.

Significance

1. **Tackling E-Waste**:
   - India generates **3.2 million tonnes** of e-waste annually, making efficient recovery systems essential.
2. **Economic Benefits**:
   - Recovery of **valuable metals** like gold adds economic value.
3. **Environmental Sustainability**:
   - Reduces **mining pressure**, mitigates **toxic pollution** from e-waste, and supports **circular economy principles**.
4. **Innovation in Material Science**:
   - Demonstrates India's growing capability in **advanced materials research**.

Challenges

1. **Cost of Scaling**:
   - Industrial-scale production of hybrid aerogels may require substantial investment.
2. **Specialized Applications**:
   - While efficient, the aerogel may be limited to **specific use cases** like gold extraction.
3. **Disposal of Aerogels**:
   - Managing **used aerogels** post-extraction remains a concern.

Way Forward

1. **Commercialization**:
   - Collaborate with industries to scale production and integrate aerogels into **e-waste processing plants**.
2. **Policy Support**:
   - Include hybrid aerogel technology in India's **E-Waste Management Rules, 2022** to promote adoption.
3. **Research Expansion**:
   - Explore similar aerogels for extracting other **precious metals** and purifying **toxic contaminants**.

New Undersea Cables to Boost India's Digital Connectivity

UPSC Syllabus Mapping

GS Paper III:

- **Science and Technology: Developments in technology and their applications in improving digital infrastructure.**
- **Infrastructure: Ports, roads, airports, railways, and digital connectivity.**

Prelims: Concepts of submarine cables, fiber optics, and India's connectivity framework.

Context

India is set to strengthen its **digital infrastructure** with the launch of two new submarine cable systems:

1. **India Asia Xpress (IAX)**: Connecting India to Asia.
2. **India Europe Xpress (IEX)**: Linking India to Europe, the Middle East, and Africa.

About IAX and IEX Submarine Cables

1. **India Asia Xpress (IAX)**:
   o **Route**: Connects **Chennai** and **Mumbai** with **Singapore**, **Thailand**, and **Malaysia**.
   o **Purpose**: Improves connectivity with **Asia-Pacific markets**.
2. **India Europe Xpress (IEX)**:
   o **Route**: Links India with **France**, **Greece**, **Saudi Arabia**, **Egypt**, and **Djibouti**.
   o **Purpose**: Boosts connectivity with **Europe**, **Middle East**, and **Africa**.

What are Submarine Cables (SMCs)?

1. **Definition**:
   o Submarine cables are **fiber optic cables** laid on the ocean floor, designed to transmit optical signals over long distances.
2. **Key Components**:
   o **Core Fibre Strands**: Enable high-speed data transmission with minimal signal loss.
   o **Outer Protective Layer**: Shields the cable from environmental hazards such as **deep-sea pressure**, **corrosion**, and **marine activity**.
3. **Role in Connectivity**:
   o Submarine cables form the backbone of global **internet infrastructure**, carrying **99% of international data**.
4. **Advantages**:
   o **High Bandwidth**: Facilitates rapid data transfer.
   o **Low Latency**: Ensures minimal delays in data transmission.
   o **Reliability**: Supports uninterrupted global communication.

India's Submarine Cable Connectivity

1. **Current Status**:
   o **17 International Subsea Cables** connect India through **14 landing stations**.
   o Key cities: **Mumbai**, **Chennai**, **Cochin**, **Tuticorin**, **Trivandrum**.
2. **Major Landing Stations**:
   o **Mumbai** and **Chennai** host the highest concentration of submarine cable landing stations.
3. **Impact**:
   o Enhances India's role as a global **digital hub**.
   o Improves **cloud services**, **content delivery**, and **data management**.

Regulation of Submarine Cable Connectivity in India

1. **Department of Telecommunications (DoT)**:
   o Issues **International Long-Distance (ILD)** licenses for cable operations.
   o Authorizes ILD licensees to:
     ▪ Set up **Cable Landing Stations**.
     ▪ Lay submarine cables within Indian territory.
2. **Unified License for Internet Service Providers**:
   o Enables operators to install and operate **International Internet Gateways** using submarine cables.

About Optical Fibre Technology

1. **Composition**:
   o Made of **glass** or **plastic** fibers to transmit information as **light pulses**.
2. **Working Principle**:
   o Operates on the concept of **Total Internal Reflection**, allowing light to travel through the fiber core by bouncing off the cladding.
3. **Advantages**:
   o **High Data Transfer Rate**: Transmits vast amounts of data quickly.
   o **Minimal Signal Loss**: Reduces optical power loss.
   o **Secure Communication**: Less susceptible to interception compared to wireless methods.

Significance of IAX and IEX

1. **Economic Impact**:
   o Reduces **data costs** by increasing bandwidth availability.
   o Attracts **global investments** in digital infrastructure.
2. **Technological Advancements**:
   o Supports **5G networks** and emerging technologies like **IoT** and **AI**.

- o Enhances **cloud computing** capabilities.
3. **Geostrategic Advantage**:
    - o Strengthens India's role in the global **digital supply chain**.
    - o Improves connectivity with **Asia-Pacific** and **Europe-Africa** regions.
4. **National Development Goals**:
    - o Contributes to India's **Digital India Initiative**.
    - o Boosts **e-governance** and **smart city projects**.

Challenges

1. **Maintenance Costs**:
    - o Repairing and maintaining underwater cables is **expensive** and time-consuming.
2. **Environmental Risks**:
    - o Submarine cables are vulnerable to **natural disasters**, **fishing activities**, and **marine currents**.
3. **Geopolitical Concerns**:
    - o Cross-border cables face risks from **cybersecurity threats** and **geopolitical tensions**.

Way Forward

1. **Resilient Infrastructure**:
    - o Build **redundant systems** to ensure uninterrupted connectivity during outages.
2. **Enhanced Security**:
    - o Invest in advanced **cybersecurity protocols** to protect cable data.
3. **International Collaboration**:
    - o Partner with global organizations to develop **standards for cable deployment** and **maintenance**.

Speed Gun: Ensuring Safety and Precision

UPSC Syllabus Mapping

GS Paper III:

- **Science and Technology: Principles of operation of devices using electromagnetic waves.**
- **Infrastructure: Role of technology in enhancing traffic management systems.**

Prelims: Concepts of the Doppler Effect and its applications.

Context

Speed guns are increasingly being deployed to monitor vehicle speeds, ensuring **traffic safety** and enforcing **speed regulations**.

What is a Speed Gun?

- **Definition**: A **speed gun** is a radar or laser-based device used to measure the speed of a moving object without direct physical contact.
- **Development**: Originally designed during **World War II** for military purposes, later adapted for **civilian applications**.

Working Mechanism

1. **Doppler Effect**:
    - o Based on the principle discovered by **Austrian physicist Christian Doppler**.
    - o **Frequency Shift**: The device emits electromagnetic radiation (radar or laser).
        - ▪ **Approaching Object**: The frequency of reflected waves increases.
        - ▪ **Receding Object**: The frequency decreases.
    - o The **difference in frequency** is directly proportional to the object's speed.
2. **Steps in Speed Measurement**:
    - o The gun emits a radio or laser wave.
    - o The wave hits the moving object and reflects back.
    - o The device calculates the speed by analyzing the frequency shift.

Types of Speed Guns

1. **Radar Speed Guns**:
    - o Operates on **radio waves**.
    - o Widely used for **traffic enforcement**.
2. **Laser Speed Guns (LIDAR)**:

- o   Utilizes **light waves** for more accurate readings.
- o   Effective for **long-range and targeted measurements**.

Applications

1. **Traffic Monitoring**:
   - o   **Law Enforcement**: Monitors vehicle speeds, issues fines for violations, and ensures compliance with speed limits.
   - o   **Road Safety**: Reduces accidents by discouraging speeding.
2. **Sports**:
   - o   Measures the speed of balls, players, or vehicles in sports like:
     - ▪ **Cricket**: Bowling speed.
     - ▪ **Baseball**: Pitch speed.
     - ▪ **Racing**: Vehicle speeds.
3. **Industrial Uses**:
   - o   Tracks **motion** in manufacturing and logistics for precision and efficiency.
4. **Scientific Applications**:
   - o   Used in **research** and **experiments** requiring speed measurement.

Advantages

- **Non-Contact Measurement**: No interference with the moving object.
- **Accuracy**: High precision, especially in LIDAR-based systems.
- **Portability**: Easy to carry and deploy in various scenarios.
- **Real-Time Results**: Instantaneous speed calculation.

Challenges

1. **Environmental Factors**:
   - o   Performance may be affected by weather conditions like **rain**, **fog**, or **dust**.
2. **Human Error**:
   - o   Incorrect positioning or handling can lead to inaccurate readings.
3. **Legal Concerns**:
   - o   Disputes over accuracy often arise in traffic violation cases.
4. **Cost**:
   - o   Advanced LIDAR speed guns are expensive, limiting accessibility for widespread use.

Way Forward

1. **Enhanced Accuracy**:
   - o   Adoption of **AI** and **machine learning** for real-time adjustments and error reduction.
2. **Affordable Technology**:
   - o   Development of cost-effective models for broader deployment.
3. **Awareness Campaigns**:
   - o   Educate the public on the importance of speed monitoring for safety.
4. **Integration with Smart Infrastructure**:
   - o   Connect speed guns to **smart traffic systems** for automated monitoring and reporting.

Nano Bubble Technology

UPSC Syllabus Mapping

GS Paper III:

- **Science and Technology: Nano bubble technology application.**
- **Environment: Water purification and sustainability.**
- **Biodiversity and Conservation: Promoting aquatic health.**

Context

The **Ministry of Environment, Forest and Climate Change** launched **Nano Bubble Technology** for cleaning and purifying water at the **National Zoological Park, Delhi**, aiming to promote the health of aquatic animals.
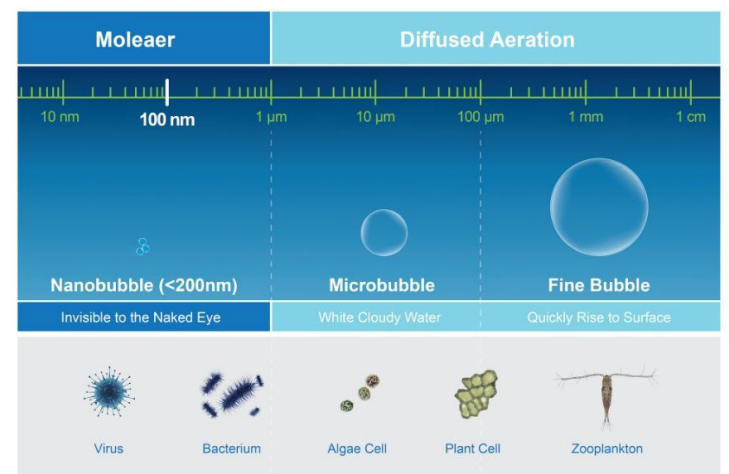
About Nano Bubble Technology

1. **Definition**:
   - Nano bubble technology involves the use of **ultra-fine bubbles** (less than **200 nanometers** in diameter) to improve **water quality**.
2. **Key Characteristics**:
   - **Ultra-fine size**: Smaller than visible bubbles.
   - **Stability**: Can remain suspended in water for extended periods.
   - **Strong negative surface charge**: Enhances pollutant breakdown.
3. **Generation Methods**:
   - **Centrifugal force**, **ultrasound**, and **electrolysis**.
4. **Working Mechanism**:
   - **Suspension and Stability**: Nanobubbles maintain stability due to their size and high surface energy.
   - **Surface Charge**: Attracts and breaks down impurities like algae and organic waste.
   - **Oxygen Enrichment**: Increases dissolved oxygen levels, promoting organic matter breakdown.
   - **Oxidative Effects**: Collapsing bubbles produce **hydroxyl radicals**, which degrade pollutants and kill pathogens.

Advantages of Nano Bubble Technology

1. **Pollutant Removal**:
   - Eliminates impurities like **algae**, **organic waste**, **oil**, and **grease**.
2. **Environmentally Friendly**:
   - Chemical-free and **energy-efficient** compared to traditional methods.
3. **Enhanced Aquatic Health**:
   - Improves dissolved oxygen levels, promoting the health of aquatic flora and fauna.
4. **Broad Applications**:
   - Effective in **water purification**, **agriculture**, **industrial wastewater treatment**, and **aquaculture**.

Applications in India

1. **Water Purification**:
   - Addressing water pollution in urban water bodies and zoos.
2. **Conservation Initiatives**:
   - Maintaining **aquatic ecosystems** in national parks and wildlife sanctuaries.
3. **Agriculture and Aquaculture**:
   - Enhancing **water quality** for crops and aquatic animals.
4. **Industrial Waste Management**:
   - Managing wastewater in **chemical** and **textile industries**.

Significance of the Initiative

1. **Sustainability**:
   - Promotes **eco-friendly solutions** to water pollution.
2. **Biodiversity Conservation**:
   - Protects aquatic life by improving water health.
3. **Efficient Resource Management**:
   - Reduces dependency on chemicals and energy-intensive cleaning methods.
4. **Global Relevance**:
   - Aligns with **UN Sustainable Development Goal (SDG 6)** for clean water and sanitation.

Challenges

1. **High Initial Costs**:
   - Equipment and setup expenses could be a deterrent.
2. **Technology Access**:
   - Limited accessibility in rural areas.
3. **Scale of Implementation**:
   - Difficulties in large-scale adoption for rivers and lakes.

Way Forward

1. **Government Support**:
   - Incentives for widespread adoption of **nano bubble technology**.
2. **Research and Development**:
   - Focus on cost-effective methods and **indigenous production**.
3. **Awareness Campaigns**:

o Educating stakeholders on the **benefits** and **applications** of the technology.
4. **Pilot Projects**:
   o Testing in polluted rivers and industrial areas to gauge efficiency and scalability.

GenCast: Google's Advanced Machine-Learning Weather Prediction Model

UPSC Syllabus Mapping

GS Paper III:

- **Science and Technology: Role of AI in weather forecasting.**
- **Disaster Management: Predicting weather events to mitigate risks.**
- **Environment and Climate Change: Tools for climate monitoring and mitigation.**

About GenCast

1. **Definition**:
   GenCast is a **machine-learning-based weather forecasting system** developed by **Google DeepMind** that utilizes historical data to provide highly accurate and efficient weather predictions.
2. **Development Basis**:
   o Trained on **historical reanalysis data** spanning from **1979 to 2018**.
   o Employs **diffusion model methodology**, a technique similar to AI **image generation systems**.
3. **How It Works**:
   o **Initial Input**: Starts with random noise.
   o **Refinement**: Uses a **neural network** to refine forecasts iteratively.
   o **Ensemble Forecasting**: Generates multiple forecasts and combines them to:
      ▪ Identify the **best estimate**.
      ▪ Assess the **level of uncertainty**.
4. **Performance Metrics**:
   o Outperforms traditional **numerical weather prediction models** (e.g., the European Centre for Medium-Range Weather Forecasts).
   o Can predict multiple atmospheric variables, including:
      ▪ **Temperature**, **pressure**, **humidity**, and **wind speed** at the surface and 13 altitude levels.
5. **Efficiency**:
   o **Prediction Speed**: Generates forecasts up to **15 days ahead** in just **8 minutes** on a **Tensor Processor Unit (TPU)**.
   o **Training Time**: Trained in **5 days** using 32 TPUs.

Significance of GenCast

1. **Enhanced Accuracy**:
   o **Machine learning** ensures better precision compared to traditional models.
2. **Faster Predictions**:
   o Rapid forecasting enables timely disaster response and planning.
3. **Longer Forecast Windows**:
   o Provides extended predictions, improving resource planning for **agriculture**, **energy**, and **transportation**.
4. **Climate Research**:
   o Assists in studying atmospheric patterns and long-term **climate change impacts**.
5. **Disaster Preparedness**:
   o Facilitates early warnings for extreme weather events, reducing casualties and economic losses.

Challenges

1. **Data Dependency**:
   o Requires extensive and accurate **historical data** for training.
2. **Computational Resources**:
   o High-performance computing resources like **TPUs** are costly and not widely accessible.
3. **Ethical Concerns**:
   o Misuse of advanced AI tools for unintended purposes.
4. **Adaptability**:
   o Integrating AI models with existing weather systems may face resistance and technical hurdles.

Applications

1. **Disaster Management**:
   o Early warnings for **cyclones**, **floods**, and **heatwaves**.
2. **Agriculture**:
   o Accurate rainfall predictions to support **crop planning** and **irrigation**.

3. **Urban Planning**:
   - o Better forecasting aids in mitigating the effects of urban **heat islands**.
4. **Aviation and Shipping**:
   - o Real-time weather updates for safe and efficient **navigation**.
5. **Energy Sector**:
   - o Supports planning for **renewable energy** generation, especially for solar and wind.

Way Forward

1. **Infrastructure Investment**:
   - o Governments should invest in **high-performance computing resources** to democratize access.
2. **Data Sharing**:
   - o Establish global data-sharing frameworks for **training AI models** like GenCast.
3. **Public-Private Partnerships**:
   - o Collaborate with private players like Google to leverage cutting-edge AI technologies.
4. **Capacity Building**:
   - o Train professionals in **AI integration** for meteorology and disaster management.
5. **Ethical AI Frameworks**:
   - o Develop guidelines to prevent misuse of advanced AI systems.

IRIS2

UPSC Syllabus Mapping

- • **GS Paper III: Science and Technology - Developments and their applications and effects in everyday life.**
- • **GS Paper II: International Relations - Role of regional and global organizations in development.**

Context

The **European Space Agency (ESA)**, in collaboration with the **SpaceRISE consortium**, has developed **IRIS2**, the European Union's flagship **internet satellite constellation** project aimed at enhancing secure connectivity for Europe.

About IRIS2

1. **Definition**:
   IRIS2 is a **satellite internet constellation** designed to secure **resilient and high-speed connectivity** across Europe and beyond.
2. **Specifications**:
   - o Comprises **290 satellites**:
     - ▪ **264 in Low Earth Orbit (LEO)**
     - ▪ **18 in Medium Earth Orbit (MEO)**
   - o Focuses on efficient, interlinked satellite systems as opposed to large-scale constellations like SpaceX's Starlink.
3. **Objectives**:
   - o Ensure **secure, high-speed internet** in under-connected and remote areas.
   - o Address critical areas such as **border security**, **crisis management**, **remote healthcare**, and **smart energy grids**.

Key Features of IRIS2

1. **Broadband Connectivity**:
   - o Delivers **secure, high-speed broadband** to regions with low or no internet access.
2. **Multi-Sector Use**:
   - o **Governmental Applications**: Border surveillance and crisis management.
   - o **Civilian Use**: Connectivity for rural areas, maritime, railway, and aviation sectors.
3. **Technological Approach**:
   - o Prioritizes **interlinked satellite systems** for efficient communication and reduced orbital congestion.
4. **Enhanced Security**:
   - o Provides **end-to-end encryption** for secure data transmission, crucial for government and sensitive applications.

Comparative Analysis with Other Satellite Constellations

Feature	IRIS2	SpaceX Starlink	OneWeb (UK)	Kuiper (USA)
Focus	Regional (Europe-centric)	Global	Global	Global
Satellites	290	7,000+	648	3,236
Orbit	LEO and MEO	LEO	LEO	LEO
Primary Use	Secure, resilient connectivity	Consumer internet services	Rural broadband connectivity	Consumer internet services

Applications of IRIS2

1. **Maritime and Aviation**:
   o Provides uninterrupted internet connectivity for ships and aircraft.
2. **Rural and Remote Areas**:
   o Ensures reliable broadband for communities with no prior access to the internet.
3. **Critical Infrastructure**:
   o Supports **smart energy grids** and **remote monitoring systems**.
4. **Emergency and Crisis Management**:
   o Enables seamless communication during disasters or emergencies.
5. **Healthcare**:
   o Facilitates **remote healthcare services**, including telemedicine in rural areas.

Other Satellite Internet Constellations

1. **SpaceX Starlink (USA)**:
   o Offers global satellite internet with over 7,000 satellites in LEO.
2. **OneWeb (UK)**:
   o Focuses on rural and remote connectivity using 648 satellites.
3. **Kuiper Project (USA)**:
   o Amazon's internet constellation aiming for 3,236 satellites in LEO.

Significance of IRIS2

1. **Strategic Autonomy**:
   o Reduces Europe's dependence on non-European internet service providers.
2. **Technological Leadership**:
   o Strengthens Europe's position in the global **satellite communication sector**.
3. **Enhanced Security**:
   o Provides **secure, encrypted communications** for government and sensitive data transmissions.
4. **Economic Impact**:
   o Boosts innovation and job creation in Europe's **space and technology sectors**.
5. **Environmental Considerations**:
   o Prioritizes **efficient interlinked systems** to minimize space debris and congestion.

Polar Sundial by Vikram Sarabhai Space Centre (VSSC)

UPSC Syllabus Mapping

- **GS Paper III: Science and Technology – Developments in Space and their Applications.**
- **GS Paper I: Art and Culture – Historical significance of scientific instruments.**

Context

The **Vikram Sarabhai Space Centre (VSSC)** has designed a **Polar Sundial** with analemmatic correction, now displayed at the **Rocket Garden** of its **Space Museum** in Thumba, Thiruvananthapuram, Kerala.

About the Analemma-Corrected Polar Sundial

1. **Unique Features**:
   o **Analemma-Correction**:
     ▪ The sundial incorporates the **figure-eight pattern (analemma)** formed by the Sun's position over a year, due to the Earth's **tilt** and **elliptical orbit**.
     ▪ This correction enables it to provide accurate **Indian Standard Time (IST)** along with the **local solar time** and **date**.
   o **Style and Design**:
     ▪ The **upright section (style)** is a **1.6 ft 3D-printed miniature** of the **Rohini series RH200 sounding rocket**, which casts the shadow to indicate time.
   o **Polar Configuration**:
     ▪ The sundial plate is affixed at an angle determined by the **latitude** of Thumba, making it **parallel to Earth's polar axis**.
     ▪ The **style** is aligned parallel to the Earth's **equatorial plane**.
   o **Automatic Solar Time Conversion**:
     ▪ The hour lines are replaced with **inverted analemma curves**, converting **local solar time to mean solar time** automatically.
   o **Indian Standard Time (IST)**:
     ▪ A **longitude correction** specific to Thumba is applied to align the sundial with IST.

About Sundials

1. **Definition**:
   o Sundials use the Sun's position in the sky to indicate the **time of day** through shadows.
2. **Components**:
   o **Dial**: A flat plate with **hour-lines** marked.
   o **Gnomon**: A rod or metal structure that casts a shadow.
   o **Style**: The **time-telling edge** of the gnomon.
3. **Mechanism**:
   o As the Sun moves, the **shadow of the gnomon** aligns with hour-lines, showing the time.
4. **Historical Significance**:
   o The oldest known sundial is an **Egyptian shadow clock** (~4,000 years old).
   o Sundials were integral to timekeeping in ancient cultures.
5. **Limitations**:
   o Sundials require **direct sunlight** and cannot function at night or on **cloudy days**.

Significance of the Polar Sundial

1. **Scientific Innovation**:
   o Demonstrates **advanced engineering** and mathematical corrections for accurate timekeeping.
2. **Space Awareness**:
   o Promotes public understanding of **Earth's axial tilt**, orbital motion, and **timekeeping mechanics**.
3. **Cultural and Educational Importance**:
   o Merges **space technology** with historical timekeeping tools, enhancing public engagement.
4. **Promotion of Indian Space Achievements**:
   o Showcases the role of **ISRO** and VSSC in scientific and technological advancements.

Jupiter's Moon Io: Volcanic Secrets Unveiled

UPSC Syllabus Mapping

- **GS Paper I: Geography – Geophysical phenomena, planetary systems.**
- **GS Paper III: Science and Technology – Developments and their applications in space exploration.**

Context

NASA's **Juno Mission** has resolved a long-standing mystery regarding Jupiter's moon **Io**, revealing critical details about its volcanic activity and internal structure.

Key Findings

1. **Volcanic Source**:
   o **Io's volcanoes** are fed by **individual magma chambers**, not by a global magma ocean as previously hypothesized.
2. **Significance for Planetary Science**:
   o This discovery provides **insights into volcanic activity** on other celestial bodies, aiding in understanding planetary formation and evolution.

Insights into Io's Volcanic Activity

1. **Most Volcanic Body**:
   o Io is the **most volcanic celestial body** in the solar system, hosting around **400 active volcanoes**.
   o These volcanoes eject **lava flows** and **plumes** reaching up to **500 km above its surface**.
2. **Discovery Timeline**:
   o **1610**: Discovered by **Galileo Galilei**, who named Jupiter's moons the "Medicean planets" after the **Medici family**.
   o **1979**: Voyager 1 captured images confirming Io's volcanic activity.
3. **Size and Distance**:
   o Io is slightly **larger than Earth's Moon**.
   o It is the **third-largest** of Jupiter's moons and the **fifth closest** to the planet in terms of orbital distance.
4. **Causes of Volcanism**:
   o **Elliptical Orbit**: Io's non-circular orbit leads to **varying gravitational forces**.
   o **Tidal Flexing**: Strong gravitational pulls from **Jupiter and its other moons** stretch and bend Io, causing internal heat buildup.
   o **Internal Heating**: Heat from **radioactive elements** melts rock inside Io, fueling its volcanic activity.

Significance of the Discovery

1. **Planetary Formation and Evolution**:
   o Resolving the magma source mystery reshapes **theories about planetary processes** and volcanic mechanisms.
2. **Insights into Other Moons**:
   o Findings may enhance understanding of **volcanic activity** on moons like **Enceladus** (Saturn) and **Europa**(Jupiter).
   o Helps in assessing **habitability potential** in icy moons with subsurface oceans.

Other Moons of Jupiter

1. **Europa**: Known for its **subsurface ocean**, which may harbor conditions suitable for life.
2. **Ganymede**: The largest moon in the solar system, with a magnetic field and an icy crust.
3. **Callisto**: A heavily cratered moon with a possible subsurface ocean.

ENVIRONMENT & ECOLOGY

India's First Solar Border Village

(GS Paper 3: Environment and Energy – Renewable Energy Initiatives)

Context:

Masali village in **Banaskantha district, Gujarat**, has become the first **solar border village** in India, achieving 100% solar power status.

Key Details About Masali Village:

- **Location:**
  o Situated **40 km** from the **Pakistan border** in Gujarat.
- **Significance:**
  o The **first solar-powered village** under the **Border Development Project.**
- **Project Objective:**
  o To make **11 villages in Vav taluka** and **6 villages in Suigam taluka** entirely solar-powered.
- **Implementation:**
  o Spearheaded by the **Banaskantha district administration** under the **PM Suryaghar Yojana.**

About the PM Suryaghar Yojana:

- **Objective:**
  o Provide **free electricity** to households by subsidizing the installation of **solar panels** on rooftops.
- **Launch Date:**
  o **February 15, 2024.**
- **Key Features:**
  o **Subsidy:**
    ▪ Up to **40% subsidy** on the cost of solar panels.
  o **Focus:**
    ▪ Encourage renewable energy adoption in rural and border areas.
  o **Benefits:**
    ▪ Reduce dependency on conventional energy sources.
    ▪ Promote energy security in remote areas.

Significance of the Solar Border Project:

1. **Energy Independence:**
   o Provides uninterrupted power to border villages, enhancing self-sufficiency.
2. **Cost Savings:**
   o Reduces electricity bills for households and improves affordability.
3. **Environmental Sustainability:**
   o Supports **India's renewable energy targets** under the **Paris Agreement.**
4. **Strategic Importance:**
   o Promotes development in remote, border regions, boosting connectivity and livelihoods.

5. **Replication Model:**
   o Sets a precedent for solar-powered village development in other parts of the country.

India State of Forest Report (ISFR) 2023

(GS Paper 3: Environment, Biodiversity, and Conservation)

Context:

The **India State of Forest Report 2023 (ISFR 2023)** was released by the **Minister for Environment, Forest, and Climate Change** at the **Forest Research Institute, Dehradun.** The report provides comprehensive insights into India's forest and tree cover, biodiversity, and challenges.

Key Highlights of ISFR 2023:

Forest and Tree Cover in India

- **Total Forest and Tree Cover:** 8,27,356.95 sq km (25.17% of India's geographical area).
- **Forest Cover:** 7,15,342.61 sq km (21.76% of geographical area).
- **Tree Cover:** 1,12,014.34 sq km (3.41% of geographical area).
- **Increase in Forest and Tree Cover (2021-2023):**
   o Forest Cover: **156.41 sq km** (+0.05%).
   o Total Forest and Tree Cover: **1,445.81 sq km** (+0.18%).

State Rankings

- **Largest Forest and Tree Cover Area:**
   1. Madhya Pradesh: 85,724 sq km.
   2. Arunachal Pradesh: 67,083 sq km.
   3. Maharashtra: 65,383 sq km.
- **Highest Percentage Forest Cover (of Geographical Area):**
   1. Lakshadweep: 91.33%.
   2. Mizoram: 85.34%.
   3. Andaman & Nicobar Islands: 81.62%.

Mangrove Cover

- **Total Mangrove Cover:** 4,992 sq km (0.15% of geographical area).
- **Decrease (2021-2023):** Net loss of 7.43 sq km.
   o **Highest Loss:** Gujarat (-36.39 sq km).
   o **Highest Gain:** Andhra Pradesh (+13.01 sq km) and Maharashtra (+12.39 sq km).

Carbon Stock

- **Total Carbon Stock:** 7,285.5 million tonnes.
- **Increase:** 81.5 million tonnes since 2021.
- **Major Contributor:** Soil organic carbon (55.06% of total stock).

Forest Cover in Specific Regions

- **North Eastern Region:**
   o Total: 1,74,394.70 sq km (67% of the region's area).
   o Decline: **327.30 sq km**.
- **Western Ghats Eco-Sensitive Areas (WGESA):**
   o Forest Cover: 44,043.99 sq km (73% of WGESA).
   o Loss (10 years): 58.22 sq km.

Agroforestry

- **Tree Green Cover:** 1,27,590.05 sq km.
- **Increase (2013-2023):** 21,286.57 sq km (+28.56%).

Challenges Highlighted in ISFR 2023:

1. **Decline in Forest Types:**
   o Reductions in Moderately Dense Forest (MDF) and Open Forest (OF).
2. **Deforestation in Sensitive Zones:**
   o Western Ghats and biodiversity hotspots face threats from urbanization and infrastructure projects.
3. **Forest Fire Vulnerability:**
   o About 32.06% of forests are "highly fire-prone."
   o States with maximum forest fires: **Uttarakhand, Odisha, Chhattisgarh.**
4. **Fragmentation and Habitat Loss:**
   o Caused by mining, infrastructure, and urban sprawl, especially in Himalayan and Western Ghats regions.
5. **Management Gaps:**
   o Inadequate enforcement against illegal logging and encroachment.

Way Forward:

1. **Strengthen Policy Implementation:**
   o Enforce **Forest (Conservation) Act, 1980** and impose strict penalties for violations.
2. **Promote Sustainable Forest Management (SFM):**
   o Adopt scientific methods for balancing conservation and resource use.
3. **Community Participation:**
   o Enhance local involvement through **Joint Forest Management (JFM)** programs.
4. **Leverage Technology:**
   o Use **GIS mapping**, satellite imagery, and forest fire alert systems for monitoring and response.
5. **Focus on Biodiversity and Mangroves:**
   o Prioritize conservation in biodiversity hotspots like **Northeast India** and mangrove regions.
6. **Awareness and Education:**
   o Campaigns like **"Ek Ped Maa Ke Naam"** to promote public participation in afforestation.

Coastal Erosion Crisis in India

(GS Paper 3: Environment and Biodiversity)

Context:

The Union Ministry of Environment presented data on **coastal erosion** in India during the **Winter Session of Parliament**, highlighting the severe impact on the nation's coastline and communities.

Key Data on Coastal Erosion in India

1. **India's Coastline:**
   o Spanning **7,500 km** across 13 states and union territories.
   o **Study Period:** 1990–2018, conducted by the **National Centre for Coastal Research (NCCR)** using satellite imagery and field surveys.
2. **Extent of Erosion:**
   o **33.6% of India's coastline** faces erosion.
   o **26.9% shows accretion**, and **39.6% remains stable**.
3. **States Severely Affected:**
   o **West Bengal (63%)**, **Puducherry (57%)**, **Kerala (45%)**, and **Tamil Nadu (41%)** show the highest erosion.
4. **District-Level Insights (Karnataka):**
   o **Dakshina Kannada:** 48.4% of the 36.66 km coastline eroded.
   o **Udupi:** 34.7% erosion.
   o **Uttara Kannada:** Lowest erosion (12.3%).

About Coastal Erosion

- **Definition:** The process of coastlines wearing away due to natural forces like waves, currents, and tides, compounded by **human activities** such as sand mining and mangrove destruction.

Impact of Coastal Erosion

1. **Land and Habitat Loss:**
   o Displacement of communities and loss of biodiversity, e.g., **mangroves in the Sundarbans**.
2. **Agricultural Disruption:**
   o **Saltwater intrusion** affects crop yields, e.g., in **Kochi, Kerala**.

3. **Flooding and Storm Surges:**
   o Erosion of natural barriers like **mangroves** increases vulnerability.
4. **Biodiversity Threats:**
   o Coastal habitats such as **coral reefs** and **sandy beaches** are at risk.
5. **Climate Change Impact:**
   o Rising sea levels exacerbate coastal erosion, e.g., **Andaman and Nicobar Islands**.
6. **National Security Concerns:**
   o Vulnerability of **naval bases, ports**, and island territories like **Lakshadweep**.

Government Initiatives to Combat Coastal Erosion

1. **Hazard Line Mapping:**
   o Developed by **MoEFCC** to plan disaster management and mitigation measures.
2. **Coastal Regulation Zone (CRZ) Notification, 2019:**
   o Aims to conserve coastal ecosystems and support livelihoods.
3. **Coastal Zone Management Plans (CZMPs):**
   o Include mapping of erosion-prone areas and preparation of **Shoreline Management Plans (SMPs).**
4. **BEAMS Program:**
   o Promotes eco-labeling and sustainable beach management under the **Integrated Coastal Zone Management (ICZM) Project**.
5. **CMIS (Coastal Management Information System):**
   o Data collection for planning and maintaining coastal protection structures.

International Efforts

1. **UNESCO's Ocean Decade (2021-2030):**
   o Focuses on transformative solutions for sustainable ocean development.
2. **Global Adaptation Network (GAN):**
   o Shares climate adaptation knowledge globally.
3. **Global Examples:**
   o **Netherlands and Denmark:** Strengthened coastal infrastructure standards.
   o **China's Sponge Cities:** Urban models for flood management using green infrastructure.

Way Forward

1. **Sustainable Coastal Management:**
   o Transition from **reactive measures** to **proactive strategies**, addressing both natural and human-induced erosion drivers.
2. **Promote Nature-Based Solutions (NbS):**
   o Restore **mangroves, bamboo fences**, and implement **oyster reefs**.
3. **Enhanced Monitoring:**
   o Expand **GIS mapping** and real-time AI-based erosion monitoring systems.
4. **Shoreline Management Plans:**
   o Expedite SMP implementation for erosion-prone areas.
5. **Community and Policy Alignment:**
   o Include **local stakeholders** in conservation efforts.
6. **Infrastructure and Rehabilitation:**
   o Develop policies under the **National Disaster Management Authority (NDMA)** for resettlement of displaced communities.

FAO's Report on Soil Salinity

(GS Paper 3: Environment, Agriculture, and Biodiversity)

Context:

The **Food and Agriculture Organization (FAO)** released the report **"The Global Status of Salt-Affected Soils"**, highlighting that **1.4 billion hectares** (10.7% of global land) are salt-affected, posing significant risks to food security and agriculture.

About Salt-Affected Soils

1. **Definition:**
   o Soils with elevated soluble salts (saline soils) or exchangeable sodium (sodic soils), adversely affecting plant growth.
2. **Types of Salt-Affected Soils:**
   o **Saline Soils:**
     ▪ High water-soluble salts like chlorides, sulfates, and carbonates.
     ▪ Predominantly found in arid and semi-arid regions.

- ▪ Solution: Drainage improvement and salt leaching.
  - o **Sodic Soils:**
    - ▪ High sodium content displacing nutrients like calcium and magnesium.
    - ▪ Common in semi-arid and sub-humid regions.
    - ▪ Solution: Addition of gypsum to improve soil structure.
3. **Processes:**
  - o **Soil Salinisation:** Accumulation of salts in the soil.
  - o **Soil Sodification:** Accumulation of sodium ions on soil particles.

Key Findings of FAO Report

1. **Global Impact:**
  - o **1 billion hectares** of additional land are at risk due to **climate change** and poor land management.
  - o Crop yield reductions (e.g., rice and beans) due to salinity stress can reach **70%**, threatening food security.
2. **Most Affected Countries:**
  - o **Australia:** 357 million ha.
  - o **Argentina:** 153 million ha.
  - o **Kazakhstan, Russia, and the U.S.:** Significant salinity levels.
3. **India's Status:**
  - o **Extent:** 6.72 million ha (2.1% of total land area).
    - ▪ **Saline soils:** 2.95 million ha.
    - ▪ **Sodic soils:** 3.77 million ha.
  - o **Most Affected States:** Gujarat, Uttar Pradesh, Maharashtra, West Bengal, Rajasthan (75% of salt-affected soils).
  - o **Impact on Agriculture:**
    - ▪ 20% of agricultural land affected, particularly in **Jaisalmer, Gujarat coastline**, and **Ganges basin**.
    - ▪ Secondary salinisation due to **brackish irrigation water** affects 17% of irrigated agriculture.

Causes of Soil Salinisation

1. **Natural Causes:**
  - o **Climate change-induced aridity** and freshwater scarcity.
  - o Rising **sea levels** and thawing permafrost.
  - o Accumulation of salts due to evaporation in low-rainfall areas.
2. **Human-Induced Factors:**
  - o Poor irrigation practices using low-quality water.
  - o Inadequate drainage systems.
  - o Overuse of chemical fertilizers.
  - o Deforestation and overexploitation of aquifers.

Impact of Salt-Affected Soils

1. **Food Security Threats:**
  - o Salinity reduces agricultural productivity, leading to lower crop yields.
2. **Soil Health Degradation:**
  - o Loss of organic matter and disruption of microbial activity.
3. **Economic Losses:**
  - o Reduced incomes for farmers in salinity-prone areas.
4. **Environmental Concerns:**
  - o Ecosystem degradation and biodiversity loss.

Recommendations by FAO

1. **Mitigation Strategies:**
  - o **Mulching:** Retains soil moisture.
  - o **Drainage Systems:** Prevent waterlogging and salinity.
  - o **Improved Crop Rotations:** Enhances soil fertility.
2. **Adaptation Measures:**
  - o **Salt-Tolerant Crops:** Mangroves, salt-desert plants, and tropical grasses.
3. **Bioremediation:**
  - o Use of bacteria, fungi, and plants to remove hazardous substances from soil.
4. **Policy Recommendations:**
  - o Legal frameworks for safeguarding saline ecosystems.
  - o Promote sustainable irrigation practices.

India's Measures to Combat Soil Salinity

1. **Soil Health Card (SHC) Scheme:**
   - Provides soil-specific recommendations for nutrient use.
   - Parameters: pH, organic carbon, nitrogen, phosphorus, potassium, and micronutrients.
2. **Digital Agriculture:**
   - IoT and AI-based smart irrigation systems to manage salinity and conserve water.
3. **Promotion of Biosaline Agriculture:**
   - Use of salt-tolerant species like **Leptochloa fusca** and **Acacia nilotica**.
4. **Biodrainage:**
   - Planting high transpiration species like **Eucalyptus** and **Casuarina** to lower groundwater levels.

Way Forward

1. **Integrated Soil Management:**
   - Promote **conservation agriculture** using organic manures and green manure crops.
2. **Technological Interventions:**
   - Update **groundwater quality maps** for precise resource management.
   - Satellite-based monitoring of salinity-prone regions.
3. **Community Participation:**
   - Engage local communities in adopting **sustainable soil management practices**.
4. **Research and Innovation:**
   - Develop affordable salt-tolerant crop varieties.

World Drought Atlas

Context

The United Nations Convention to Combat Desertification (UNCCD) and the European Commission Joint Research Centre (JRC) launched the **World Drought Atlas** during the 16th Conference of Parties (COP16) in Riyadh, Saudi Arabia.

About the World Drought Atlas

- **Objective**: To assess and depict systemic drought risks across critical sectors, such as agriculture, water resources, and urban management, on a global scale.
- **Funding**: Jointly supported by the UNCCD, the European Commission Joint Research Centre (JRC), and other international partners.

Key Highlights of the 2024 World Drought Atlas

1. **Global Risks**:
   - By **2050**, **75% of the global population** is projected to face significant impacts from droughts.
   - Regions with arid and semi-arid climates are particularly vulnerable.
2. **India's Vulnerability**:
   - **Agricultural Impact**: Soybean yield losses and crop failures pose a major threat to India's agrarian economy, impacting millions dependent on agriculture.
   - **Urban Challenges**: The **2019 Chennai water crisis** ("Day Zero") highlights risks from urban water mismanagement and over-reliance on groundwater.
3. **Urban "Day Zero" Scenarios**:
   - Increasing instances of cities running out of water due to unsustainable usage and climate change are projected.
   - These scenarios emphasize the need for urban water management reforms.
4. **Focus on Systemic Risks**:
   - Highlights interlinkages between climate change, land degradation, and water scarcity.
   - Offers actionable insights into vulnerabilities across critical sectors.

Significance of the Atlas

- **Decision-Making Tool**: Provides critical data for policymakers, researchers, and global organizations to develop sustainable drought mitigation strategies.
- **Global Collaboration**: Emphasizes the importance of coordinated global actions to address water scarcity and land degradation.

India-Specific Insights

- **Drought Mitigation Needs**:
   - Improved **agricultural practices**, such as drought-tolerant crop varieties.

o   Strengthening **water conservation policies**, especially in urban areas.
- **Technological Interventions**:
  - o   Use of AI and remote sensing for **real-time monitoring of drought conditions**.
  - o   Expanding initiatives like **Per Drop More Crop** under the **Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)**.

FAO's Report on Soil Salinity

Context

The **Food and Agriculture Organization (FAO)** released a report titled **"The Global Status of Salt-Affected Soils"**, highlighting that **1.4 billion hectares**, or **10.7% of the global land area**, are affected by salinity, posing significant challenges to agriculture and food security.

About Salt-Affected Soils

- **Definition**: Soils with elevated levels of **soluble salts** (saline soils) or **exchangeable sodium** (sodic soils) that negatively impact plant growth.

Types of Salt-Affected Soils

1. **Saline Soils**:
   - o   Rich in **soluble salts** like chlorides, sulfates, and carbonates.
   - o   Common in **arid and semi-arid regions**.
   - o   **Solutions**: Improved drainage and leaching of salts.
2. **Sodic (Alkali) Soils**:
   - o   High levels of **exchangeable sodium**, disrupting soil structure.
   - o   Common in **semi-arid and sub-humid regions**.
   - o   **Solutions**: Adding gypsum to improve structure.
3. **Processes**:
   - o   **Soil Salinisation**: Accumulation of salts.
   - o   **Soil Sodification**: Sodium ions displacing vital nutrients like calcium and magnesium.

Key Findings of the Report

1. **Global Impact**:
   - o   **1 billion hectares at risk** due to climate change and poor land management.
   - o   Salinity can reduce crop yields (e.g., rice, beans) by up to **70%**, threatening global food security.
2. **Countries Most Affected**:
   - o   **Largest Affected Areas**:
     - ▪   Australia (357 million ha), Argentina (153 million ha), Kazakhstan (94 million ha).
   - o   **Proportional Impact**:
     - ▪   Oman (93.5% of land), Uzbekistan (92.9%), Jordan (90.6%).
3. **Global Cropland Impact**:
   - o   **10% of irrigated** and **10% of rainfed cropland** affected by salinity.
4. **India's Status**:
   - o   **Extent**: 6.72 million hectares (2.1% of total land area).
     - ▪   **Saline soils**: 2.95 million ha.
     - ▪   **Sodic soils**: 3.77 million ha.
   - o   **Most Affected States**: Gujarat, Uttar Pradesh, Maharashtra, West Bengal, and Rajasthan.
   - o   **Agricultural Impact**:
     - ▪   20% of agricultural land affected.
     - ▪   Crops: Rice, cotton, barley, sorghum, and millets.
     - ▪   **17% of irrigated land** affected due to brackish water use.

Causes of Soil Salinisation

1. **Natural Causes**:
   - o   **Aridity** and **freshwater scarcity** due to climate change.
   - o   Rising **sea levels** and thawing **permafrost**.
   - o   Accumulation of salts in low rainfall areas due to evaporation.
2. **Human-Induced Factors**:
   - o   Poor-quality irrigation water.
   - o   Inadequate drainage systems.
   - o   Overuse of chemical fertilizers and deforestation.

Strategies for Management of Salt-Affected Soils

1. **Mitigation**:
   - Mulching, installing drainage systems, and improving crop rotations.
2. **Adaptation**:
   - Breeding salt-tolerant plants for degraded lands.
3. **Bioremediation**:
   - Using bacteria, fungi, and plants to remove hazardous substances.
4. **Policy Recommendations**:
   - Develop legal frameworks for saline ecosystem protection.
   - Promote sustainable soil management practices in irrigation areas.

Measures Taken in India

1. **Soil Health Card (SHC)**:
   - Provides farmers with soil health information and nutrient recommendations.
   - Covers **12 soil parameters**, including pH and nutrient levels.
2. **Promotion of Digital Agriculture**:
   - Smart irrigation systems leveraging **IoT** and **AI** to manage salinity.

Way Forward

1. **Biodrainage**:
   - Planting tree species like **Eucalyptus** and **Casuarina** to lower groundwater levels and prevent salinization.
2. **Biosaline Agriculture**:
   - Using salt-tolerant plants like **Leptochloa fusca** and **Acacia nilotica** to restore degraded lands.
3. **Groundwater Quality Mapping**:
   - Update maps to guide sustainable extraction practices.
4. **Sustaining Productivity**:
   - Promote green manuring and organic farming for long-term productivity.

Aravalli Green Wall Project (AGWP)

Context

India presented the **Aravalli Green Wall Project (AGWP)** during the **16th Conference of Parties (COP16)** of the **United Nations Convention to Combat Desertification (UNCCD)** held in Riyadh.

About the Aravalli Green Wall Project (AGWP)

Overview

- **Launch Year**: 2019.
- **Implementing Agency**: **Ministry of Environment, Forest and Climate Change (MoEFCC)**.
- **Objective**: A **large-scale afforestation initiative** aimed at restoring degraded land and combating desertification in the **Aravalli Range**.

Inspiration

- Inspired by the **Great Green Wall Initiative in Africa**, which addresses desertification in the **Sahel region**.

Geographic Scope

- **Buffer Zone**: Aims to green a **5 km buffer zone** around the **Aravalli Hill Range**.
- **States Covered**:
  - Haryana,
  - Rajasthan,
  - Gujarat, and
  - Delhi.

Objectives of AGWP

1. **Land Restoration**:
   - Restore **1.15 million hectares** of degraded land by **2027**.
2. **Combat Desertification**:

- o Prevent the **eastward expansion of the Thar Desert**.
- o Reduce **land degradation** in the Aravalli region.
3. **Improve Ecosystem Services**:
    - o Enhance **biodiversity** and **carbon sequestration** in the region.
4. **Enhance Livelihoods**:
    - o Provide employment and sustainable income sources through **eco-tourism**, **agroforestry**, and other initiatives.

Significance of AGWP

1. **Environmental Benefits**:
    - o Reduces **soil erosion** and improves **groundwater recharge**.
    - o Mitigates **urban heat island effects** in nearby cities like Delhi and Gurgaon.
    - o Supports India's commitment to **restoring 26 million hectares of degraded land by 2030**.
2. **Biodiversity Conservation**:
    - o Protects and restores the **unique flora and fauna** of the Aravalli region.
3. **Climate Mitigation**:
    - o Acts as a **natural carbon sink** by increasing forest cover.
4. **Livelihood Generation**:
    - o Promotes **sustainable forestry** and allied activities, creating jobs for local communities.

Challenges

1. **Urban Encroachment**:
    - o Urbanization near the Aravalli region hampers afforestation efforts.
2. **Mining Activities**:
    - o Illegal and excessive mining degrades the land and reduces the effectiveness of restoration efforts.
3. **Water Scarcity**:
    - o Limited water resources in the region make afforestation and maintenance of vegetation difficult.
4. **Community Involvement**:
    - o Lack of active participation from local communities can hinder long-term success.

Way Forward

1. **Enforcement of Regulations**:
    - o Strict implementation of the **Aravalli Notification** to prevent encroachment and mining.
2. **Innovative Water Management**:
    - o Use of **rainwater harvesting** and **drip irrigation** to support afforestation.
3. **Community Participation**:
    - o Engage local communities through awareness campaigns and **Joint Forest Management Committees**(JFMCs).
4. **Integration with Other Programs**:
    - o Align the AGWP with initiatives like **CAMPA (Compensatory Afforestation Fund Management and Planning Authority)** and **Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)**.

Global Strategy for Resilient Drylands (GSRD) 2030

Context

The **Consortium of International Agricultural Research Centres (CGIAR)** launched the **Global Strategy for Resilient Drylands (GSRD) 2030** during the **16th Conference of Parties (COP16)** of the **United Nations Convention to Combat Desertification (UNCCD)** in Riyadh, Saudi Arabia.

About the Global Strategy for Resilient Drylands (GSRD) 2030

Overview

- A transformative initiative aimed at addressing the **challenges of dryland ecosystems**.
- Builds upon **50 years of research** conducted by CGIAR on dryland management.

Vision

- To **reframe drylands** from areas of scarcity into hubs of **untapped resilience potential**.
- **Core Goals**:
    1. **Enhance Food Security**: Ensure sustainable agricultural productivity in drylands.
    2. **Conserve Biodiversity**: Protect and rehabilitate dryland ecosystems.
    3. **Build Resilient Livelihoods**: Support the **2.7 billion people** living in drylands, particularly in **Asia** and **Africa**.

IQRA IAS
An Institute for Civil Services

Key Stakeholders

- **Developed By**:
    o Led by **ICARDA (International Center for Agricultural Research in the Dry Areas)**.
    o Supported by **ICRISAT (International Crops Research Institute for the Semi-Arid Tropics)** and other CGIAR institutions.

Launch Platform

- Introduced at **COP16 UNCCD**, Riyadh, Saudi Arabia.

Significance of the GSRD 2030

1. **Food Security in Drylands**:
    o Targets regions prone to **desertification and climate change**, enhancing **agricultural productivity**.
2. **Biodiversity Conservation**:
    o Protects critical ecosystems and promotes **restoration of degraded lands**.
3. **Resilient Communities**:
    o Provides strategies for **sustainable livelihoods**, ensuring economic stability for vulnerable populations.
4. **Sustainable Resource Management**:
    o Focuses on **water-efficient practices** and **climate-smart agriculture** to reduce resource stress.
5. **Global Collaboration**:
    o Represents a collective effort to integrate **science, policy, and local action** for dryland development.

Key Challenges in Drylands

1. **Climate Vulnerability**:
    o Frequent droughts, erratic rainfall, and extreme temperatures.
2. **Land Degradation**:
    o Loss of arable land due to desertification, soil erosion, and salinization.
3. **Food Insecurity**:
    o Low crop yields and poor access to food resources.
4. **Water Scarcity**:
    o Overdependence on limited water resources exacerbates stress on ecosystems.
5. **Social and Economic Inequality**:
    o Limited access to markets, technology, and financial resources.

Way Forward

1. **Innovative Research and Technology**:
    o Leverage advanced **crop breeding techniques**, including drought-tolerant seeds.
    o Utilize **remote sensing** and **GIS** for land monitoring.
2. **Community-Centric Solutions**:
    o Engage local communities in planning and implementing sustainable practices.
3. **Policy Support and Funding**:
    o Align with national and global policies to **secure investments** in dryland restoration.
4. **Nature-Based Solutions (NbS)**:
    o Promote **afforestation, agroforestry, and watershed management**.
5. **Capacity Building**:
    o Strengthen the skills of farmers and local institutions for sustainable resource management.

Global Peatland Hotspot Atlas 2024

Context

The **Global Peatland Hotspot Atlas (GPHA) 2024** was recently published by the **United Nations Environment Programme's (UNEP)** Global Peatlands Initiative, highlighting the critical state of global peatlands.

About the Global Peatland Hotspot Atlas

- **Publisher**: United Nations Environment Programme's **Global Peatlands Initiative**.
- **Purpose**: To provide updated data and insights into the state of peatlands worldwide, addressing threats and promoting opportunities for **conservation and sustainable management**.
- **Objective**: To bridge the gap between **scientific research** and **policy-making** for effective decision-making on peatland conservation.

Key Findings of the 2024 Atlas

1. **Updated Mapping**:
   o Builds upon the **Global Peatlands Assessment (2022)** and **Global Peatland Map 2.0**.
   o Features **hotspot maps** intersecting data on **climate change**, **land use**, and **biodiversity loss**.
2. **Peatland Distribution and Degradation**:
   o Total identified peatland area: **488 million hectares globally**.
   o **12% of peatlands** are classified as **highly degraded**, raising concerns over their conservation.
3. **Peatland Emissions**:
   o Degraded peatlands contribute **1,941 Mt CO2** annually due to human activities like **agriculture, drainage, and deforestation**.

About Peatlands

1. **Definition**:
   o **Peatlands** are waterlogged wetland ecosystems where slow decomposition of plant material leads to the formation of **peat soils**.
2. **Significance**:
   o Serve as one of the most **efficient carbon sinks**, storing **twice as much carbon as all global forests combined**.
   o Host unique biodiversity and provide critical **ecosystem services**, including water regulation.
3. **Global Distribution**:
   o Peatlands cover **3-4% of the Earth's land surface**.
   o Found in diverse regions, including **tropical**, **temperate**, and **boreal zones**.
   o Largest tropical peatland: **Congo Basin**.
4. **Peatlands in India**:
   o Cover approximately **0.2% of India's landmass**.
   o Key regions: **Eastern Himalayas**, **Western Ghats**, and **North-East Indian region**.

Threats to Peatlands

1. **Human Activities**:
   o **Drainage for agriculture** and **urbanization**.
   o **Deforestation** and conversion to plantations.
   o **Mining** and peat extraction.
2. **Climate Change**:
   o Rising temperatures lead to **accelerated peat decomposition** and **release of stored carbon**.
3. **Biodiversity Loss**:
   o Habitat destruction affects unique species that thrive in peatland ecosystems.

Conservation Strategies

1. **Policy and Legislation**:
   o Develop and enforce policies to protect peatlands from degradation.
   o Integrate peatland conservation into **climate action plans**.
2. **Restoration Initiatives**:
   o Rewetting drained peatlands to restore their natural hydrology.
   o Afforestation with native species.
3. **Sustainable Practices**:
   o Promote **sustainable agriculture** in peatland regions.
   o Discourage the use of peat in horticulture.
4. **International Collaboration**:
   o Strengthen global partnerships like UNEP's **Global Peatlands Initiative**.
5. **Community Engagement**:
   o Involve local communities in conservation and restoration activities.

Manganese Contamination in Bihar's Gangetic Plains

Context

A recent study by the **Mahavir Cancer Sansthan Research Centre** has uncovered severe **manganese contamination** in the drinking water of Bihar's Gangetic plains, posing significant health risks to millions.

Key Highlights

1. **Extent of Contamination**:
   o Manganese levels in Bihar's Gangetic basin are **10 times higher** than the permissible limits set by the World Health Organization (WHO).

- o Approximately **50 million people** are directly exposed to contaminated water in this region.
2. **Impact on Public Health**:
    - o Significant rise in **cancer cases** in districts such as **Bhagalpur** and **Munger**.
    - o Increased prevalence of **neurological disorders** and **developmental issues** linked to manganese exposure.
3. **Affected Regions**:
    - o Groundwater across Bihar's Gangetic plains is identified as a hotspot for manganese contamination.

About Manganese (Mn)

- **Chemical Element**: Transition metal with atomic number 25, found naturally in **rocks**, **soil**, and **groundwater**.
- **Industrial Uses**:
    - o **Steel production**, **battery manufacturing**, and **fertilizer production**.
- **Biological Importance**:
    - o Essential micronutrient for **metabolic functions**, **bone health**, and **enzyme activation**.

WHO Guidelines for Manganese in Drinking Water

- **Permissible Limit**: 0.1 mg/L.
- Manganese concentrations above this limit can pose **severe health risks**, including chronic toxicity.

Toxic Effects of Overexposure

1. **Cancer Risks**:
    - o Long-term exposure is linked to increased cases of **gastrointestinal and liver cancers**.
    - o **Case Study**: Rising cancer rates in Bihar's Gangetic plains highlight the correlation between manganese contamination and public health crises.
2. **Neurological Disorders**:
    - o **Manganism**: A condition resembling **Parkinson's disease**, characterized by tremors, rigidity, and motor dysfunction.
    - o Cognitive impairments and **behavioral disorders**, especially in children.
3. **Developmental and Behavioral Impacts**:
    - o Exposure during early development can lead to **reduced IQ** and **learning difficulties**.
    - o **Global Example**: Studies in **South Asia** and the **U.S.** have documented developmental delays in manganese-contaminated areas.

Sources of Contamination

1. **Natural Sources**:
    - o Leaching of manganese from **rocks** and **soil** into groundwater.
2. **Anthropogenic Activities**:
    - o Use of **fertilizers** and **industrial discharge** exacerbate contamination levels.
3. **Water Table Depletion**:
    - o Over-extraction of groundwater exposes deeper layers rich in manganese.

Measures to Address Contamination

1. **Water Quality Monitoring**:
    - o Regular testing of groundwater for manganese and other heavy metals.
    - o Use of **GIS mapping** to identify hotspots.
2. **Improved Water Filtration**:
    - o Encourage **cost-effective filtration technologies** such as **reverse osmosis** and **activated carbon filters**.
3. **Alternate Water Sources**:
    - o Promote the use of **surface water** and rainwater harvesting to reduce dependency on contaminated groundwater.
4. **Community Awareness**:
    - o Educate communities about the health risks of manganese exposure and safe water practices.
5. **Policy Interventions**:
    - o Strengthen regulations for **industrial waste management** to prevent groundwater contamination.
6. **Research and Development**:
    - o Develop manganese-specific remediation techniques.
    - o Pilot studies on bio-remediation and **phytoextraction** using specific plants.

UN Champion of the Earth 2024

Context

Veteran Indian ecologist **Madhav Gadgil** has been honored as a **2024 Champion of the Earth** by the **United Nations Environment Programme (UNEP)** for his exceptional contributions to environmental conservation and sustainability.

About the 'Champion of the Earth' Award

- **Established by UNEP**: Initiated in **2005**, it is the **UN's highest environmental honor**.
- **Objective**:
  - Recognizes individuals, organizations, and governments for their outstanding efforts toward **environmental protection** and **sustainability**.
- **Categories**:
  - **Policy leadership**
  - **Science and innovation**
  - **Entrepreneurial vision**
  - **Inspiration and action**
- **Notable Indian Recipient**: In **2018**, **Prime Minister Narendra Modi** received the award for **Policy Leadership** for championing climate action and solar energy initiatives.

Madhav Gadgil's Contributions

1. Western Ghats Conservation:

- **Chairperson of Western Ghats Ecology Expert Panel (2011)**:
  - Authored the **"Gadgil Report"**, a landmark document highlighting the **ecological fragility** of the Western Ghats.
  - Proposed **community-centric conservation strategies** emphasizing the involvement of **local communities** in decision-making.
- **Environmentally Sensitive Area (ESA)** Recommendation:
  - Suggested declaring **75% of the 129,037 sq. km Western Ghats** as ecologically sensitive due to its unique biodiversity.
  - Faced **state resistance**, leading to diluted recommendations in subsequent **Kasturirangan Report**.
  - **Current Status**:
    - The **Union Environment Ministry** has issued five draft notifications since 2014 to declare parts of the Western Ghats as ecologically sensitive, but a **final notification remains pending** due to state objections.

2. Grassroots Environmental Engagement:

- Advocated for **community-driven conservation**, enabling **marginalized communities** to safeguard local ecosystems, including **forests and wetlands**.

3. Academic Contributions:

- Authored **seven books** and **over 225 scientific papers**, influencing public discourse and **biodiversity policies**.
- Advocated for integrating **science with grassroots activism** to foster **ecological awareness**.

4. Advocacy and Vision:

- Promotes **collective environmental action** through enhanced **communication** and **grassroots participation**.
- Inspires **collaborative efforts** to address biodiversity and ecological crises.

5. Awards and Recognition:

- **Padma Shri** and **Padma Bhushan** for contributions to science and environment.
- **Tyler Prize for Environmental Achievement** and **Volvo Environment Prize**.
- Known as the **"People's Scientist"** for his dedication to **inclusive environmental practices**.

Ratapani Wildlife Sanctuary and Madhav National Park

Context

The **Ratapani Wildlife Sanctuary** in Madhya Pradesh has officially been designated as a **Tiger Reserve**, becoming India's **57th Tiger Reserve**, while **Madhav National Park** has received **in-principle approval** to become the **58th Tiger Reserve**.

Tiger Reserves in India

- **Definition**: Tiger reserves are areas designated under the **Project Tiger** initiative of 1973 to conserve tigers and their habitats.
- **Structure**:
  - **Core Area**: Protected as a National Park or Wildlife Sanctuary.
  - **Buffer Zone**: Mixed-use area for sustainable development.
- **Objective**: To protect tigers, maintain biodiversity, and restore ecological balance.
- **Current Status**:
  - **57 tiger reserves**, covering **82,000 sq km** (2.3% of India's geographical area).
  - India is home to **3,167 tigers** (2022 Tiger Estimation), constituting **70% of the world's tiger population**.

Ratapani Tiger Reserve

- **Location**: Spread across **Raisen and Sehore districts**, Madhya Pradesh.
- **Significance**:
  - Crucial tiger habitat and **migration corridor** connecting Satpura ranges.
  - Enhances Madhya Pradesh's status as the **"Tiger State of India."**
- **Declared**: India's **57th Tiger Reserve** on **December 2, 2024**.
- **Flora and Fauna**:
  - Forest Type: Dry and moist deciduous, with **55% teak cover**.
  - Wildlife: Tigers, leopards, sloth bears, hyenas, spotted deer, and sambar.
- **Tiger Population**: Approximately **90 tigers**.

Madhav National Park

- **Location**: Situated in the **Shivpuri district**, Madhya Pradesh.
- **Declared**: Granted **in-principle approval** as India's **58th Tiger Reserve** on **December 1, 2024**.
- **Area**: Covers approximately **1,751 sq km**.
- **Flora**:
  - Dry deciduous forests with species like **teak, sal**, and mixed vegetation.
- **Fauna**:
  - Mammals: Tigers, leopards, sambar, chital, nilgai, chinkara, and sloth bears.
  - Avifauna: Over **200 bird species**, including migratory birds during winter.
- **Tiger Reintroduction Success**:
  - Tigers reintroduced in 1990.
  - Recent **birth of tiger cubs in September 2024**, marking a milestone in restoration efforts.

Significance of Madhya Pradesh

- Known as the **"Tiger State of India"**, Madhya Pradesh now has **eight tiger reserves**.
- Home to a **thriving tiger population** and diverse wildlife, further solidifying its ecological importance.

Bordoibam-Bilmukh Bird Sanctuary (BBBS)

Context

The **Bordoibam-Bilmukh Bird Sanctuary (BBBS)** in Assam has witnessed a **72% decline in bird species** over the past 27 years, primarily due to **anthropogenic activities**.

Key Findings from the Study

- **Sharp Decline in Avian Diversity**:
  - 1997: Recorded **167 bird species**.
  - 2022-2024: Only **47 species** identified, indicating a **71.85% decline**.
- **Primary Causes**:
1. **Anthropogenic Activities**:
   - Overfishing and excessive harvesting of aquatic plants.
   - Poaching of wild birds and collection of bird eggs.
2. **Disturbances**:
   - Use of high-decibel farming equipment near the sanctuary.
   - Conversion of sanctuary land into pastureland.

About Bordoibam-Bilmukh Bird Sanctuary

- **Location**: Situated on the boundary of **Dhemaji and Lakhimpur districts**, Assam.
- **Origin**: Formed after the **1950 earthquake**, which altered the region's hydrology.
- **Declared**: Wildlife sanctuary in **1996** by the Government of Assam.
- **Hydrology**:
  - Initially connected to the **Subansiri River**, a tributary of the Brahmaputra.
  - Currently, the **Subansiri River** flows 7 km away from the sanctuary.
- **Climate**: Moist tropical climate with an **average rainfall of 2,000 mm** annually.
- **Vegetation**: Characterized by **flooded valley grasslands** and wetlands.

Fauna and Conservation Significance

- **Migratory Waterfowl**: Attracts large numbers of **migratory birds during winter**.
- **Globally Threatened Species**:
  1. **Spot-billed Pelican** (*Pelecanus philippensis*): **Near Threatened**.
  2. **Lesser Adjutant** (*Leptoptilos javanicus*): **Endangered**.
  3. **Swamp Francolin** (*Francolinus gularis*): **Vulnerable**.

Threats to BBBS

1. **Human Activities**: Overfishing, poaching, and unsustainable resource harvesting.
2. **Habitat Degradation**: Conversion to pastureland and encroachment by agriculture.
3. **Climate Change**: Changes in rainfall patterns affecting wetland ecosystems.

Way Forward

1. **Strengthen Protection Measures**:
   - Enforce stricter regulations against **poaching** and illegal resource extraction.
2. **Community Participation**:
   - Involve local communities in **conservation efforts** and provide alternative livelihoods.
3. **Restoration of Hydrology**:
   - Reconnect the sanctuary with the **Subansiri River** to restore the wetland ecosystem.
4. **Promote Ecotourism**:
   - Develop sustainable tourism initiatives to generate revenue for conservation.
5. **Scientific Monitoring**:
   - Regularly monitor avian diversity and ecological health using **GIS and satellite data**.

IPBES Nexus Report

Context

The **Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)** has released the **Nexus Report** assessing the **interlinkages between biodiversity, water, food, and health**.

Key Highlights of the Nexus Report

1. **Interconnected Global Challenges**:
   - The report assesses the **nexus** of five major challenges:
     - **Climate Change**
     - **Biodiversity Loss**
     - **Food Insecurity**
     - **Water Scarcity**
     - **Health Risks**
   - These challenges **interact, cascade, and compound**, making isolated solutions ineffective.
2. **Decline in Biodiversity**:
   - **Rate of Decline**: Biodiversity is reducing by **2-6% per decade** over the last 50 years.
   - **Drivers**:
     - **Direct**: Land- and sea-use changes, unsustainable exploitation, invasive species, pollution.
     - **Indirect**: Overconsumption, population growth, and waste generation.
3. **Economic Cost of Inaction**:
   - **Dependency on Nature**: Over **50% of global GDP ($58 trillion annually)** is nature-dependent.
   - **Unaccounted Costs**: The economic cost of biodiversity neglect is estimated at **$10-25 trillion annually**.
4. **Inequality and Human Impact**:

- o **Areas Affected**:
  - ▪ **41%** of people live in regions with strong biodiversity declines (2000–2010).
  - ▪ **9%** in regions with high health burdens.
  - ▪ **5%** in areas with high malnutrition levels.
5. **Policy Recommendations**:
   - o **Integrated Approaches**: Address challenges collectively rather than in silos to maximize co-benefits.
   - o **Sustainable Practices**: Promote nature-based solutions, circular economies, and ecosystem restoration.
   - o **Equity Focus**: Address inequalities to ensure inclusive environmental benefits.

About IPBES

1. **Establishment**:
   - o Created in **2012** in **Panama City** by 94 governments.
   - o Independent, intergovernmental body (not a UN body).
2. **Governance**:
   - o **Plenary**: Governing body made up of member state representatives.
   - o **Secretariat**: Supported by the **United Nations Environment Programme (UNEP)**.
3. **Key Functions**:
   - o **Assessments**:
     - ▪ Thematic (e.g., "Pollinators, Pollination and Food Production").
     - ▪ Global ("Global Assessment of Biodiversity and Ecosystem Services").
   - o **Policy Support**:
     - ▪ Development of tools and methodologies for sustainable biodiversity management.

Way Forward

1. **Integrated Policies**:
   - o Develop unified policies addressing biodiversity, water, food, and health challenges.
   - o Strengthen multilateral frameworks to tackle interconnected global issues.
2. **Economic Valuation of Biodiversity**:
   - o Quantify the ecological and economic value of biodiversity in policy-making processes.
3. **Community Engagement**:
   - o Enhance grassroots participation to foster inclusive conservation strategies.
4. **Global Cooperation**:
   - o Leverage platforms like IPBES for cross-border collaboration to address shared challenges.

Sacred Groves in India

Context

The Supreme Court of India has directed the Rajasthan government and the Union government to take comprehensive measures to identify, protect, and manage **sacred groves** across India, emphasizing their **ecological and cultural importance**.

About Sacred Groves

1. **Definition**:
   - o Defined by **UNESCO** as areas of **natural vegetation** preserved through local **taboos** and **customary sanctions** due to their **spiritual** and **ecological significance**.
2. **Ecological Significance**:
   - o Sacred groves act as **biodiversity hotspots**, often harboring **rare, endangered, and endemic species** of flora and fauna.
   - o Protect natural features like **streams** and **waterbodies**, aiding in water conservation.
3. **Cultural Importance**:
   - o Revered for their **connection to the divine** in Indian traditions.
   - o Embody the **human-nature relationship**, fostering environmental conservation through **religious beliefs**.
4. **Community Involvement**:
   - o **Local communities** maintain sacred groves through **strict taboos** and **customary laws**, ensuring minimal human interference.

Sacred Groves Across India

State	Sacred Grove Name	Key Features
Rajasthan	Orans, Rundhs	Natural pastures revered for their water and grazing resources.
Himachal Pradesh	Dev-vans	Associated with local deities and worship.
Uttarakhand	Bugyals	Alpine meadows in high altitudes, revered for their pristine beauty.
Meghalaya	Mawphlang	Known for diverse plant species, maintained by Khasi tribes.
Kerala	Sarpa Kavu	Snake groves linked with serpent worship.

Legal Framework for Sacred Groves Protection

1. **Wildlife Protection Act, 1972**:
   o Enables the **declaration of sacred groves** as **community reserves**, offering **legal protection**.
2. **Forest Rights Act, 2006**:
   o Recognizes the **rights of tribal and forest-dwelling communities** to conserve and manage forest resources.
3. **National Forest Policy, 1988**:
   o Emphasizes **community participation** in the sustainable management and protection of forest ecosystems.
4. **Supreme Court Judgments**:
   o Landmark cases like the **TN Godavarman case** and the recent Rajasthan ruling reinforce the need for **conservation measures**.

Way Forward

1. **Identification and Mapping**:
   o Comprehensive surveys to **identify and document** sacred groves across all states.
   o Develop a **national database** for sacred groves.
2. **Community Engagement**:
   o **Empower local communities** by integrating their **traditional knowledge** into conservation efforts.
   o Promote **awareness campaigns** about the ecological significance of sacred groves.
3. **Strengthening Legal Safeguards**:
   o Declare sacred groves as **protected areas** under existing laws.
   o Enforce stricter penalties for **illegal encroachments** and resource exploitation.
4. **Integration with National Programs**:
   o Align sacred grove conservation with initiatives like **Compensatory Afforestation Fund Management and Planning Authority (CAMPA)** and **National Biodiversity Mission**.
5. **Research and Restoration**:
   o Promote **scientific studies** on the **biodiversity** and **ecosystem services** of sacred groves.
   o Encourage **restoration projects** for degraded groves.

Ganges River Dolphin: A Conservation Milestone

Context

The first-ever Ganges River Dolphin (*Platanista gangetica*) was tagged in Assam, marking a major step forward for its conservation under **Project Dolphin**, initiated by the **Ministry of Environment, Forest and Climate Change (MoEFCC)** in 2021.

Key Highlights of the Tagging Initiative

1. **Implementation and Collaboration**:
   o Spearheaded by **Wildlife Institute of India (WII)** in collaboration with:
     ▪ **Assam Forest Department**
     ▪ **Aaranyak (NGO)**
   o Funded by the **National CAMPA Authority** under MoEFCC.
2. **Objective**:
   o To study the **movement patterns**, **habitat preferences**, and **threats** faced by the species.
   o Enhance the implementation of **Project Dolphin**, focused on conservation and restoration of aquatic habitats.
3. **Significance**:
   o First-ever tagging for the species in India and globally.
   o A pivotal move to safeguard India's **National Aquatic Animal**.

About Ganges River Dolphin

Taxonomy and Identity

- **Scientific Name**: *Platanista gangetica*
- **Common Name**: "Susu" (due to the sound emitted while breathing)
- **Status**:
  o **National Aquatic Animal of India** (since 2009)
  o **State Aquatic Animal of Assam**

Ecological Significance

- Known as the **"Tiger of the Ganges"** for its role as a **top predator**.
- Acts as an **indicator species** for riverine ecosystems, reflecting the health of freshwater systems.

Habitat and Distribution

- Found in the **Ganga-Brahmaputra-Meghna** and **Karnaphuli river systems**.
- Requires **freshwater environments** to survive.
- **India hosts 90% of the global population**, primarily in the Ganges and Brahmaputra basins.

Unique Adaptations

1. **Blindness**:
   o Nearly blind due to poorly developed eyes.
   o Relies on **echolocation** for navigation and hunting.
2. **Physical Traits**:
   o Long snout, rounded belly, stocky body, and large flippers.
   o Females are larger than males.
3. **Breathing**:
   o Surfaces every **5–30 seconds** to breathe through a blowhole.

Protection Status

- **IUCN Red List**: Endangered
- **Wildlife Protection Act, 1972**: Schedule I
- **CITES**: Appendix I
- **CMS (Bonn Convention)**: Appendix I

Threats to the Ganges River Dolphin

1. **Habitat Degradation**:
   o Pollution from industries, agriculture, and domestic waste.
   o Construction of dams and barrages disrupting river flow and migration.
2. **Fishing Practices**:
   o Accidental entanglement in fishing nets (bycatch).
   o Use of destructive fishing methods like dynamite and poison.
3. **Climate Change**:
   o Alterations in river systems due to fluctuating rainfall and temperature patterns.
4. **Poaching**:
   o Hunted for oil (used as a fish attractant) and meat.

Conservation Efforts

1. **Project Dolphin**:
   o Launched in 2021 to enhance the survival and habitat of freshwater dolphins.
   o Aims to integrate conservation efforts with local livelihoods.
2. **Community Engagement**:
   o Collaboration with riverside communities for sustainable fishing practices.
3. **Monitoring and Research**:
   o Tagging programs to track movement and behavior.
4. **Pollution Control**:
   o Efforts to reduce industrial and agricultural runoff into rivers.

Way Forward

1. **Strengthen Habitat Conservation**:
   o Restore natural flow regimes by optimizing dam operations.
   o Establish **dolphin conservation zones** in critical habitats.
2. **Community Participation**:
   o Incentivize eco-friendly livelihoods for riverside communities.
   o Educate local populations about the ecological importance of dolphins.
3. **Policy Integration**:
   o Integrate conservation programs with **Namami Gange** and other river rejuvenation initiatives.
4. **International Collaboration**:
   o Partner with neighboring countries sharing dolphin habitats for a transboundary conservation approach.

Baby Mammoth "Yana" Discovery

Context

Researchers in Russia's Siberian region unveiled the 50,000-year-old remains of a **baby mammoth**, nicknamed **Yana**, marking it as one of the best-preserved mammoth discoveries.

Key Highlights

1. **About "Yana"**:
   o **Preservation**: Remarkably well-preserved due to **permafrost** conditions.
   o **Size**: Weighs over **100 kilograms**, stands **120 cm tall**.
   o **Significance**: Provides valuable insights into the biology, behavior, and environment of mammoths during the **Pleistocene Epoch**.
2. **Role of Climate Change**:
   o **Permafrost Melting**: Accelerated by global warming, exposing prehistoric animal remains like mammoths.
   o Raises concerns about the release of **ancient pathogens** and **greenhouse gases** trapped in the permafrost.

About Mammoths

1. **Classification**:
   o **Scientific Name**: *Mammuthus primigenius* (Woolly Mammoth).
   o Belongs to the **elephantid family**, related closely to **modern Asian elephants**.
2. **Physical Features**:
   o **Cold Adaptations**:
      ▪ Thick **fur coat** and **fat layers** for insulation.
      ▪ Smaller **ears** and **tails** to reduce heat loss.
      ▪ Long, curved **tusks** for foraging beneath snow.
   o **Size**: Similar to modern-day elephants, but more robust and adapted to **Ice Age climates**.
3. **Habitat and Range**:
   o Inhabited **Africa, Asia, Europe**, and **North America** during the **Pleistocene** and early **Holocene Epochs**.
   o Thrived in **steppe-tundra ecosystems** with cold, arid climates.
4. **Extinction**:
   o **Timeline**: Most mammoths disappeared around **10,000 years ago**, with isolated populations surviving until **4,000 years ago**.
   o **Causes**:
      ▪ **Climate Change**: Warming trends post-Ice Age reduced suitable habitats.
      ▪ **Human Activity**: Overhunting by prehistoric humans.
      ▪ **Habitat Changes**: Decline in grasslands due to forest expansion.

Significance of the Discovery

1. **Scientific Insights**:
   o Offers clues into the **genetics**, **physiology**, and **diet** of mammoths.
   o Provides information on **prehistoric climate conditions**.
2. **Relation to Asian Elephants**:
   o **Genetics**: Asian elephants are the closest living relatives of mammoths.
   o Studies may help understand **evolutionary links** between extinct and existing species.
3. **Conservation Lessons**:
   o Highlights the impact of **climate change** and **human activity** on species survival.
   o Serves as a warning for **modern species** facing extinction.

Interesting Fact

Scientists are exploring the possibility of **"de-extincting" woolly mammoths** using genetic editing technologies like **CRISPR**, leveraging their similarity to Asian elephants.

Lion-Tailed Macaque

About Lion-Tailed Macaque (*Macaca silenus*)

1. **Classification**:
   - **Family**: Cercopithecidae (Old World monkeys).
   - Often referred to as **bearded monkeys**.
2. **Physical Features**:
   - **Mane**: A distinctive **grey mane** around their face.
   - **Tail**: Long, thin, and tufted, resembling a **lion's tail** (hence the name).
   - **Vocal Communication**: Males produce **territorial calls** and use **17 distinct vocalizations** for social interactions.
3. **Habitat**:
   - **Endemic to India**, specifically the **rainforests of the Western Ghats** in **Karnataka, Kerala, and Tamil Nadu**.
   - Prefer **dense, evergreen rainforests** and thrive in **small, fragmented forest patches**.

Conservation Status

1. **IUCN Red List**: **Endangered** (population decreasing).
2. **CITES**: Listed in **Appendix I** (highest level of international protection).
3. **Indian Wildlife (Protection) Act, 1972**: Included under **Schedule I**, granting the highest level of protection in India.

Key Threats

1. **Habitat Loss**:
   - **Deforestation** for agriculture, plantations, and urban development.
   - Fragmentation of rainforest habitats, isolating populations.
2. **Human Interaction**:
   - Increased contact with humans leading to **competition for resources**.
   - Risk of **road kills** due to highways through forested areas.
3. **Limited Range**:
   - Restricted to **small patches**, making them vulnerable to local extinctions.
4. **Invasive Species**:
   - Introduction of non-native plants and animals disrupting their ecosystem.

Conservation Efforts

1. **Protected Areas**:
   - Found in **Silent Valley National Park**, **Anamalai Tiger Reserve**, and other protected reserves in the Western Ghats.
2. **Habitat Restoration**:
   - Efforts to reconnect fragmented forests to enable genetic flow between populations.
3. **Community Involvement**:
   - Engaging local communities to reduce human-wildlife conflict.
4. **Eco-sensitive Development**:
   - Restricting infrastructure projects in critical habitats.
5. **Captive Breeding Programs**:
   - Initiatives to breed the species in captivity and reintroduce them into the wild.

Significance of Conservation

- **Ecological Role**: Act as seed dispersers, playing a critical role in maintaining rainforest biodiversity.
- **Cultural Importance**: Symbol of India's rich wildlife heritage.
- **Indicator Species**: Health of the lion-tailed macaque population reflects the overall health of Western Ghats ecosystems.

Indian Star Tortoise

Syllabus Mapping

Prelims:

- **Environment: Biodiversity and conservation.**
- **Current Affairs: Wildlife protection and laws.**

Mains:

- **GS Paper III: Environment and Ecology – Conservation, Environmental Pollution, and Degradation.**
- **GS Paper II: Government policies and interventions for the conservation of wildlife.**

About Indian Star Tortoise (*Geochelone elegans*)

1. **Physical Features**:
   o **Shell**: Obsidian-colored with **yellow, star-like patterns** resembling a radiant sun.
   o **Size**: Small to medium-sized tortoise species.
2. **Habitat**:
   o Found in **dry and open environments** such as scrub forests, grasslands, and rocky areas.
   o Adapted to survive in arid and semi-arid regions.
3. **Geographic Distribution**:
   o **India**: Central and southern parts.
   o **Pakistan**: Western regions.
   o **Sri Lanka**: Specific localities.
4. **Food Habits**:
   o **Diet**: Herbivorous; primarily consumes grasses, fruits, flowers, and leaves.
5. **Activity Pattern**:
   o **Diurnal**: Active during the day.

Conservation Status

1. **IUCN Red List**: **Vulnerable**.
2. **CITES**: Listed in **Appendix I** (prohibits international trade except for scientific purposes).
3. **Wildlife (Protection) Act, 1972**: Included under **Schedule IV**, offering legal protection in India.

Key Threats

1. **Habitat Fragmentation and Loss**:
   o **Urbanization** and **agriculture** disrupt natural habitats.
   o Fragmented landscapes limit their ability to find food and mates.
2. **Illegal Wildlife Trade**:
   o Highly sought after in the **international exotic pet market**.
   o **Wildlife Crime Control Bureau** estimates that 90% of the trade is for export.
3. **Loss of Genetic Diversity**:
   o **Hybridization** with other tortoise species weakens genetic integrity, posing risks to the survival of pure populations.
4. **Climate Change**:
   o Altered rainfall patterns and rising temperatures impact their arid habitat.

Conservation Measures

1. **Habitat Protection**:
   o Protect and restore natural habitats to prevent further fragmentation.
   o Enforce strict zoning laws in ecologically sensitive areas.
2. **Stronger Regulation Against Trade**:
   o Strengthen **wildlife monitoring networks** to curb illegal trade.
   o Collaborate with international organizations to prevent smuggling.
3. **Awareness Campaigns**:
   o Educate the public about the **ecological role** of the Indian star tortoise.
   o Highlight the **ethical concerns** of keeping them as pets.
4. **Ex-Situ Conservation**:

- o Develop **captive breeding programs** in wildlife sanctuaries and zoological parks.
- o Reintroduce bred individuals into secure habitats.
5. **Research and Monitoring**:
  - o Conduct detailed studies on their **population dynamics** and **genetic diversity**.
  - o Monitor the impact of climate change on their habitats.

Significance of Conservation

- **Ecological Role**: Act as seed dispersers, aiding in vegetation growth and ecosystem balance.
- **Cultural Heritage**: Revered in some communities, emphasizing their protection.
- **Indicator Species**: Reflect the health of arid and semi-arid ecosystems.

Nano-Plastics as Agents of Antimicrobial Resistance (AMR)

- **UPSC Syllabus Mapping**

GS Paper III:

- **Science and Technology: Advances in nanotechnology and their applications.**
- **Environment: Issues related to pollution and its impact on health.**
- **Health: Challenges of antimicrobial resistance (AMR).**

Prelims:

- **Basics of nanoplastics, horizontal gene transfer, and AMR mechanisms.**

Context

A recent study by the **Institute of Nano Science and Technology (INST), Mohali**, highlights the role of **nanoplastics** in facilitating **antibiotic resistance (AR)** through **horizontal gene transfer (HGT)** within the **human gut microbiota**.

Key Highlights of the Study

1. **Nanoplastics in Gene Transfer**:
   - o **Polyethylene terephthalate bottle-derived nanoplastics (PBNPs)** promote the horizontal gene transfer of AR genes among bacteria, including gut microbiota like **Lactobacillus acidophilus**.
   - o This HGT is facilitated through direct transformation and membrane vesicles (OMVs).
2. **Gut Microbiota as Reservoirs**:
   - o Beneficial bacteria may act as reservoirs for AR genes, potentially transferring resistance to pathogens, posing risks to human health.
3. **Emphasis on Plastic Policy**:
   - o Findings call for stricter **plastic usage policies** and improved **waste management** to minimize risks to human microbiome health.

What are Nano-Plastics?

1. **Definition**:
   - o **Nanoplastics** are plastic particles smaller than 1 micrometer, often resulting from the **degradation** of larger plastics.
2. **Sources**:
   - o **Single-Use Plastics**: Breakdown of PET bottles and packaging materials.
   - o **Industrial Processes**: Microplastic by-products.
   - o **Environmental Fragmentation**: Plastic waste in ecosystems.
3. **Entry Pathways in Humans**:
   - o **Ingestion**: Contaminated food and water.
   - o **Inhalation**: Airborne particles.
   - o **Dermal Absorption**: Prolonged exposure to contaminated environments.

Impact of Nano-Plastics on Bacterial Cells

1. **Oxidative Stress**:
   - o Triggers **reactive oxygen species (ROS)**, causing cellular damage and activating stress-response genes in bacteria.
2. **Membrane Damage**:
   - o Physical damage to bacterial membranes enhances **outer membrane vesicle (OMV)** secretion, aiding gene transfer.
3. **Gene Transfer Mechanisms**:
   - o **Direct Transformation**: Nanoplastics act as carriers of **AR plasmids**, facilitating direct gene transfer.
   - o **OMV Pathway**: Nanoplastics promote OMV secretion, carrying AR genes between bacterial species.

Antimicrobial Resistance (AMR)

1. **Definition**:
   o AMR occurs when microorganisms develop mechanisms to **resist antibiotics**, rendering treatments ineffective.
2. **Drivers of AMR**:
   o **Misuse**: Overprescription and misuse of antibiotics in healthcare and livestock.
   o **Environmental Contamination**: Antibiotic residues in water and soil.
   o **Nanoplastics**: Enhance the mobility and transfer of AR genes.
3. **Impacts on Public Health**:
   o **Reduced Antibiotic Efficacy**: Ineffective treatments for infections.
   o **Rising Multidrug-Resistant Infections**: Hard-to-treat infections increasing mortality rates.
   o **Economic Burden**: Higher healthcare costs due to prolonged treatments.

Findings from INST Study

1. **Role of Nanoplastics in AMR**:
   o Facilitates HGT, making **beneficial bacteria reservoirs** for AR genes.
   o Highlights **cross-species gene propagation**, especially from **E. coli to Lactobacillus acidophilus**.
2. **Implications for Gut Health**:
   o Risk of **antibiotic resistance spread** in human microbiota, affecting overall health.
3. **Recommendations**:
   o Stricter **plastic waste management policies**.
   o Awareness about **nanoplastic-induced health risks**.

Way Forward

1. **Policy Initiatives**:
   o **Ban on Single-Use Plastics (SUPs)**: Strict enforcement of existing bans.
   o **Regulation of Industrial Microplastics**: Implement standards for waste disposal in industries.
2. **Public Awareness**:
   o Educate people on the dangers of nanoplastics and AMR through **campaigns** and **outreach programs**.
3. **Research and Innovation**:
   o Develop **biodegradable alternatives** to plastics.
   o Study the impact of nanoplastics on **gut microbiota and AMR mechanisms**.
4. **International Collaboration**:
   o Share knowledge and resources through platforms like the **WHO AMR Action Plan**.
   o Formulate global treaties to regulate **plastic waste** and address AMR.

BIOTECHNOLOGY & HEALTH

Athlete Biological Passport (ABP)

(GS Paper 2: Governance – Health and Sports Ethics)

Context:

The **World Anti-Doping Agency (WADA)** approved India's **National Dope Testing Laboratory (NDTL)** as an **Athlete Passport Management Unit (APMU)** on **6th December 2024**.

About Athlete Biological Passport (ABP):

1. **Definition:**
   o ABP is an advanced **anti-doping tool** that tracks an athlete's **biological markers** over time, rather than testing for specific prohibited substances.
2. **Functionality:**
   o **Blood Profile Monitoring:** Identifies anomalies in blood variables that may suggest doping.
   o **Steroid Profile Analysis:** Tracks steroid levels to detect deviations from normal patterns.
3. **Goal:**
   o To ensure **fair competition** and protect **clean athletes** from unfair practices.

Significance for India:

1. **Global Recognition:**
   o India becomes one of **17 APMUs worldwide** approved by WADA, placing NDTL in an elite group of global anti-doping facilities.
2. **Support for Indian and Regional Athletes:**
   o The APMU will cater to **Indian athletes** and assist **neighboring countries** in anti-doping measures.
3. **Boost to Anti-Doping Initiatives:**
   o Strengthens India's commitment to **fair play in sports** and enhances the credibility of Indian athletes in international competitions.
4. **Global Credibility for NDTL:**
   o Enhances NDTL's standing as a leading anti-doping institution, aligning India with international standards in sports ethics.

Way Forward:

1. **Awareness Campaigns:**
   o Educate athletes about ABP and anti-doping rules.
2. **Capacity Building:**
   o Train personnel and upgrade infrastructure for effective management of ABP.
3. **Regional Cooperation:**
   o Collaborate with neighboring countries to promote anti-doping measures and share expertise.
4. **Technology Integration:**
   o Leverage advanced analytics and AI to improve detection and monitoring.

Conclusion:

The inclusion of NDTL as an **APMU** is a milestone for India in promoting **integrity in sports**. It highlights India's proactive approach in **anti-doping measures** and positions the country as a regional leader in fostering fair play and ethical sports practices.

Extrachromosomal DNA (ecDNA) and its Role in Cancer

Context

Recent studies published in the journal *Nature* by the **eDyNAmiC team** explored how ecDNA is formed and its role in the progression of cancer, drug resistance, and patient outcomes.

Findings from the Study

1. **Data Analysis**:
   o Samples from **15,000 cancer patients** across 39 tumor types were analyzed under the **U.K.'s 100,000 Genomes Project**.
   o ecDNA was present in about **17%** of tumor samples and was predominantly found in:
      ▪ **Liposarcomas**
      ▪ **Brain tumors**
      ▪ **Breast cancers**
2. **Impact of Treatments**:
   o The prevalence of ecDNA increased after treatments such as chemotherapy.
   o Its presence correlated with:
      ▪ **Metastasis**
      ▪ **Poor patient outcomes**
3. **"Jackpot Effect"**:
   o Clustering of ecDNA in daughter cells supports cancer growth and enhances genetic interactions.
   o This discovery overturns the notion that gene inheritance is entirely random, especially when genes are not linked by DNA strands.
4. **Drug Discovery**:
   o A drug called **BBI-2779** was used to block the **CHK1 Protein**, selectively killing cancer cells with ecDNA.
   o In mice with stomach cancer, the drug significantly reduced tumor growth, presenting a new treatment avenue for ecDNA-driven cancers like:
      ▪ **Glioblastoma**

- ▪ **Ovarian cancer**
- ▪ **Lung cancer**

What is DNA?

- **DNA (Deoxyribonucleic Acid)**: The molecule carrying genetic instructions for growth, development, and functioning.
- Types of DNA:
  1. **Autosomal DNA**: Found in 22 pairs of chromosomes, inherited from both parents.
  2. **Chromosomal DNA**: Tightly coiled around histones, containing numerous genes.
  3. **Mitochondrial DNA**: Found in mitochondria, inherited only from the mother.
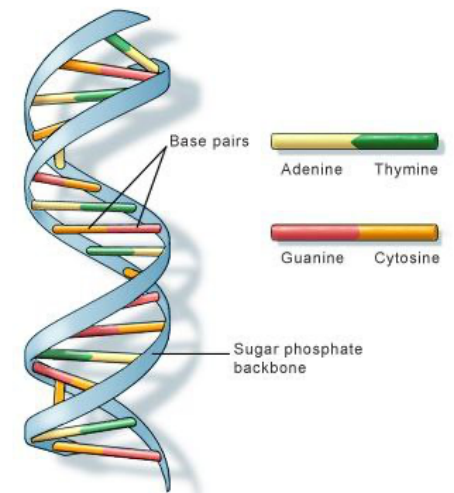
What is ecDNA?

- **Definition**:
  Extrachromosomal DNA (ecDNA) is a type of DNA existing **outside of chromosomes** in the nucleus of a cell.
- **Discovery**:
  - First identified in the **1960s**, initially found in **1.4% of tumors**.
  - Later studies revealed its presence in up to **40% of cancer cell lines** and **90% of patient-derived brain tumors**.
- **Structure**:
  - ecDNA is large (≥500 kilobases), mobile, and circular.
  - Unlike chromosomal DNA, ecDNA lacks centromeres, leading to **random segregation** during cell division.
- **Types**:
  Based on sequence and size, ecDNA is classified into:
1. **Small polydispersed DNA (spcDNA)**
2. **MicroDNA**
3. **T-circle/C-circle**
4. **Extrachromosomal circular DNA (ERC)**
5. **ecDNA**

Role of ecDNA in Cancer Biology

1. **Oncogenes**:
   - ecDNA is a hotspot for **amplified oncogenes** (mutated genes that cause cancer).
   - Tumors with ecDNA often contain multiple copies of oncogenes, enhancing tumor growth.
2. **ecDNA Hubs**:
   - Unlike chromosomal DNA fixed within specific regions, ecDNA interacts freely to form **hubs** where oncogenes are highly expressed.
3. **Cancer Progression**:
   - ecDNA transcription into mRNA significantly increases oncogene expression, accelerating:
     - ▪ **Tumor evolution**
     - ▪ **Drug resistance**
4. **Treatment Resistance**:
   - The clustering of ecDNA enables cancer cells to preserve favorable genetic combinations, leading to treatment resistance and poor outcomes.

Key Findings from Recent Studies

- **Enhanced Oncogene Presence**:
  - ecDNA amplifies specific oncogenes, leading to **fourfold increases** in certain gene expressions.
  - This causes aggressive tumor growth and resistance to therapies.
- **Evolutionary Advantage**:
  - ecDNA enables rapid genetic adaptations, making tumors more resilient to drugs.

Implications for Cancer Treatment

- **ecDNA-Specific Drugs**:
  - Drugs like **BBI-2779** target cancer cells with ecDNA.
  - This represents a **precision oncology approach**, focusing on cancers with high ecDNA prevalence.
- **Potential Cancer Targets**:
  - **Glioblastoma**
  - **Ovarian cancer**
  - **Lung cancer**

Future Research Directions

1. **ecDNA Mechanisms**:
   o Understanding how ecDNA forms, segregates, and drives oncogene expression.
2. **Therapeutic Applications**:
   o Developing more drugs targeting ecDNA-driven cancers.
3. **Early Detection**:
   o Screening ecDNA presence to identify aggressive cancers at earlier stages.
4. **Drug Resistance Studies**:
   o Investigating how ecDNA contributes to therapy resistance in various cancer types.

Gene Therapy for Hemophilia A

UPSC Syllabus Mapping

GS Paper II:

- **Government policies and interventions for health.**
- **Issues related to health and human resources.**

GS Paper III:

- **Science and Technology: Developments and their applications in health.**
- **Biotechnology: Gene therapy and its applications.**

Context

Scientists in India have successfully utilized **gene therapy** to treat severe **Hemophilia A**, a hereditary condition characterized by spontaneous and life-threatening bleeding episodes due to a defective gene.

About Hemophilia A

1. **Definition**:
   o Hemophilia A, also known as **classical hemophilia**, is a **rare genetic bleeding disorder** caused by insufficient levels of **Factor VIII**, a protein essential for blood clotting.
2. **Cause**:
   o Hemophilia A results from mutations in the **F8 gene** located on the **X chromosome**, leading to reduced or absent production of **Factor VIII**.
3. **Affected Individuals**:
   o **Males** are predominantly affected due to their **XY chromosome composition**:
      ▪ A defective **X chromosome** leads to the condition as there is no second X chromosome to compensate.
   o **Females** are typically carriers:
      ▪ Symptoms are rare unless both X chromosomes are defective (a rare scenario).
4. **Symptoms**:
   o Prolonged bleeding from minor injuries.
   o Internal bleeding in joints and muscles.
   o Life-threatening hemorrhages.

Why is Hemophilia A More Prevalent in Males?

1. **Genetic Basis**:
   o Males inherit one **X chromosome** from their mother and a **Y chromosome** from their father.
   o A defective **X chromosome** causes hemophilia A as males lack a second X chromosome to compensate.
2. **Carrier Females**:
   o Females have two **X chromosomes**, and the unaffected X chromosome typically compensates for the defective one.
   o Rarely, if both X chromosomes are defective, females may exhibit symptoms of hemophilia.

Gene Therapy for Hemophilia A

1. **Overview**:
   o **Gene therapy** involves introducing a functional copy of the defective **F8 gene** into the patient's cells to restore Factor VIII production.
2. **Mechanism**:
   o A **therapeutic gene** is delivered into the body using a **modified adenovirus** as a vector (carrier).
   o The gene targets the **liver**, which then produces **Factor VIII**.
3. **FDA-Approved Therapy**:

- o **Roctavian**, the first gene therapy for Hemophilia A, was approved by the **U.S. Food and Drug Administration (FDA)** in **2023** for commercial use.
4. **Benefits**:
   - o Long-term relief from bleeding episodes.
   - o Reduces the need for regular injections of Factor VIII.
   - o Improves the quality of life for patients.
5. **Challenges**:
   - o High cost of treatment.
   - o Risk of immune system rejection.
   - o Uncertainty about long-term efficacy.

Significance of Gene Therapy

1. **For Patients**:
   - o Provides a potential **one-time cure** for Hemophilia A.
   - o Reduces dependency on clotting factor replacement therapies.
2. **For Science and Technology**:
   - o Marks a milestone in **biotechnology** and **genetic engineering**.
   - o Paves the way for treating other genetic disorders.
3. **Economic Impact**:
   - o Cost-saving in the long run due to reduced hospital visits and medication needs.
4. **Global Relevance**:
   - o Applicable worldwide for managing rare genetic disorders.

Way Forward

1. **Research and Development**:
   - o Focus on reducing the cost of gene therapy.
   - o Enhance the safety and efficacy of gene therapies.
2. **Policy and Regulation**:
   - o Develop guidelines for ethical gene therapy applications.
   - o Ensure accessibility to advanced treatments.
3. **Awareness and Education**:
   - o Promote understanding of genetic conditions like Hemophilia A.
   - o Encourage early diagnosis and carrier testing in high-risk families.
4. **Global Collaboration**:
   - o Collaborate internationally for clinical trials and knowledge sharing.

Snakebite Cases as "Notifiable Disease"

UPSC Syllabus Mapping

GS Paper II:

- **Issues related to health, government policies, and interventions.**
- **Role of international organizations like WHO.**

GS Paper III:

- **Public health concerns under Disaster Management and Environment and Biodiversity (human-wildlife conflict).**

Context

The **Central Government** has directed states to classify **snakebite cases and deaths** as **notifiable diseases**, aligning with the **National Action Plan for Prevention and Control of Snakebite Envenoming (NAPSE)**.

Key Highlights of the Directive

1. **Mandatory Reporting**:
   - o Both **government** and **private healthcare facilities**, including **medical colleges**, must report **suspected and probable snakebite cases** and **deaths**.
   - o Reporting is mandated under provisions of the **State Public Health Act** or other legislation.
2. **Alignment with NAPSE**:
   - o Supports the **National Action Plan for Prevention and Control of Snakebite Envenoming** to reduce mortality and morbidity.
3. **Key Goals of NAPSE**:
   - o Reduce **snakebite deaths and disabilities** by **50% by 2030**.
   - o Incorporates:

- **Awareness campaigns**: Educate the public on prevention and first aid.
- **Capacity building**: Train healthcare professionals.
- **Anti-venom supply**: Ensure timely availability.
- **R&D**: Research on snakebite toxins and treatment.
- **Community engagement**: Involve locals in preventive measures.

Notifiable Diseases: Definition and Significance

1. **What Are Notifiable Diseases?**
   - Diseases **legally mandated** to be reported to authorities.
   - Aims:
     - Enable rapid **public health responses**.
     - Prevent **outbreaks and fatalities**.
2. **State Responsibility**:
   - States determine notifiable diseases based on **regional health concerns**.
3. **Global Mandate**:
   - WHO's **International Health Regulations (IHR)** require reporting specific diseases for **global health security**.
4. **Examples of Notifiable Diseases**:
   - Tuberculosis, HIV, cholera, malaria, dengue, hepatitis.

Snakebites: A Public Health Challenge

1. **Epidemiology**:
   - India records the **highest global snakebite cases**:
     - **3–4 million cases annually**.
     - Over **58,000 deaths**, according to WHO.
2. **Neglected Tropical Disease (NTD)**:
   - WHO classified **snakebite envenoming** as an NTD in **2017**, highlighting its significant health burden.
3. **High-Risk States**:
   - **Bihar, Jharkhand, Uttar Pradesh, Odisha, Andhra Pradesh, Gujarat**.
4. **Human-Wildlife Conflict**:
   - Snakebites often result from **rural agriculture practices** or **habitat overlap** with venomous snakes.

Significance of Making Snakebite a Notifiable Disease

1. **Enhanced Surveillance**:
   - Accurate **data collection** on snakebite incidence and fatalities.
   - Improved allocation of **anti-venom stocks** to high-risk areas.
2. **Timely Public Health Measures**:
   - Enables **early interventions** to reduce fatalities and complications.
3. **Awareness and Prevention**:
   - Facilitates **community-based awareness campaigns** on first aid and prevention.
4. **Global Commitments**:
   - Aligns with **WHO's goal** of halving snakebite-related deaths by **2030**.

Challenges in Implementation

1. **Underreporting**:
   - Cases often remain unreported in rural areas due to **lack of awareness** or **poor healthcare access**.
2. **Inadequate Healthcare Facilities**:
   - Shortage of **trained professionals** and **anti-venom supplies** in remote regions.
3. **Cultural Beliefs**:
   - Reliance on **traditional healers** delays timely medical intervention.
4. **High Treatment Costs**:
   - Anti-venom treatment can be **expensive**, limiting access for low-income populations.

Measures to Address Snakebite Incidence

1. **Strengthen Healthcare Infrastructure**:
   - Equip rural health centers with **anti-venom** and **trained personnel**.
2. **Education and Awareness**:
   - Launch campaigns on **first aid**, **snakebite prevention**, and the importance of seeking **immediate medical care**.
3. **Encourage Collaboration**:
   - Partner with **international organizations** like WHO for technical and financial support.
4. **Innovate Anti-Venom Supply Chain**:

o Use **technology-driven solutions** to track demand and ensure timely delivery.

Advanced Facility for Pashmina Certification and Next-Generation DNA Sequencing Facility

UPSC Syllabus Mapping

GS Paper III:

- **Science and Technology: Applications of modern technologies in wildlife conservation.**
- **Environment and Biodiversity: Role of innovations in biodiversity preservation.**
- **Economy: Geographical Indications (GI) and their significance in promoting local products.**

Prelims:

- **Science and Technology: Next-Generation DNA Sequencing (NGS).**
- **Culture and Economy: GI-tagged products like Pashmina.**

Context

The **Union Minister for Environment, Forest, and Climate Change** inaugurated:

1. **Advanced Facility for Pashmina Certification**.
2. **Next-Generation DNA Sequencing (NGS) Facility** at the Wildlife Institute of India (WII), Dehradun.

About Next-Generation DNA Sequencing (NGS) Facility

- **Technology**: Allows simultaneous decoding of **millions of DNA sequences**, enabling rapid and detailed genome analyses.
- **Applications in Wildlife Conservation**:
  - **Genetic Health**: Identifies population genetic health and diversity.
  - **Barriers and Disease**: Detects genetic barriers and studies disease outbreaks.
  - **Illegal Trade**: Tracks and identifies illegal wildlife trade.
  - **Climate Change Effects**: Assesses the impact of climate change on biodiversity.
  - **Evolutionary Studies**: Examines relationships between species and genetic markers.

About Pashmina Certification Centre (PCC)

- **Purpose**: Ensures the authenticity of **Pashmina shawls**, preventing the use of mixed fibers.
- **Established by**: Public-Private Partnership (PPP) between **WII** and **Export Promotion Council for Handicrafts (EPCH)**.
- **Features**:
  - Equipped with **Scanning Electron Microscope (SEM)** and **Energy Dispersive Spectroscopy (EDS)** for precise testing.
  - Certified over **15,000 Pashmina shawls annually** to ensure quality and authenticity.

About Pashmina

1. **Origin**:
   - Derived from the undercoat of the **Changthangi goat (Capra aegagrus hircus)**, native to **Ladakh** and Himalayan regions.
   - Known as **"soft gold"** in local language.
2. **Characteristics**:
   - Renowned for **softness**, **warmth**, and **luxury**.
   - **Natural Shedding**: Goats shed **80–170g** of winter undercoat naturally each spring, collected during the moulting season.
3. **GI Tag**:
   - Received **Geographical Indication (GI)** certification in **2019**, protecting its authenticity and promoting Ladakhi craftsmanship.

Significance of These Facilities

1. **For Pashmina Industry**:
   - Enhances global trust in **authenticity**.
   - Strengthens **export potential** by ensuring high-quality certification.
   - Promotes **sustainable livelihoods** for artisans in Ladakh and nearby regions.
2. **For Wildlife Conservation**:
   - Advances research in **biodiversity preservation** and **wildlife management**.
   - Strengthens tools to counter illegal activities like **poaching** and **wildlife trade**.

3. **Scientific and Economic Growth**:
   - o Encourages **research and innovation** in modern technologies.
   - o Promotes India's soft power through **local handicrafts** and **scientific contributions**.

Way Forward

1. **Boosting Local Economies**:
   - o Expand certification facilities to other **GI-tagged products** to enhance authenticity and market value.
2. **Research Expansion**:
   - o Leverage **NGS** for studying other endangered species, aligning with **India's biodiversity goals**.
3. **Global Branding**:
   - o Promote **Pashmina** globally as a premium product, showcasing India's craftsmanship and sustainability.

Mirror Microbes

UPSC Syllabus Mapping

GS Paper III:

- **Science and Technology: Biotechnology and synthetic biology.**
- **Environment: Impact of microbial innovations on ecosystems.**
- **Health: Potential risks and ethical concerns in biotechnology.**

Context

Recent advancements in synthetic biology have led to the creation of **mirror microbes**, which are synthetic bacteria made from **mirror-image molecular building blocks**. These microbes hold both **promising applications** and **serious risks**.

About Mirror Microbes

1. **Definition**:
   Mirror microbes are **synthetic bacteria** whose molecular components are **chiral enantiomers**—mirror images of natural biological molecules.
2. **Key Concept of Chirality**:
   - o **Chirality** refers to the property of asymmetry, where molecules exist in two forms: **left-handed (L)** and **right-handed (D)**.
   - o These two forms are non-superimposable, like left and right hands.
3. **Examples of Chiral Molecules**:
   - o **Proteins**: Composed of L-amino acids.
   - o **DNA/RNA**: Composed of D-sugars.
   - o **Thalidomide Example**:
     - ▪ **Right-handed enantiomer**: A sedative.
     - ▪ **Left-handed enantiomer**: Caused severe birth defects.
4. **Synthetic Creation**:
   Scientists create mirror microbes by assembling **right-handed amino acids** and **left-handed sugars**, opposite to their natural forms.

Applications of Mirror Microbes

1. **Industrial Use**:
   - o **Decomposition and Fermentation**: More **resilient to natural microbial attacks**, making them efficient for waste management or chemical production.
2. **Drug Development**:
   - o Potential use in **studying immune responses** or developing **mirror drugs** that evade degradation by natural enzymes.
3. **Bioremediation**:
   - o Can be tailored to clean up environmental pollutants without being attacked by natural microbes.
4. **Research**:
   - o Studying the origins of chirality in biology and exploring possibilities of **life forms with reversed chirality**.

Risks of Mirror Microbes

1. **Evading Natural Defenses**:
   - o Mirror microbes may **bypass immune responses** that rely on recognizing the chirality of natural pathogens.
2. **Lethal Infections**:
   - o In humans, animals, and plants, these microbes could cause **untreatable infections**, as mirror antibiotics are not yet feasible.
3. **Environmental Impact**:
   - o Mirror microbes could disrupt ecosystems if released, **outcompeting natural microbes** and altering ecological balances.

4. **Evolution and Diversification**:
   - Once released, these microbes could **mutate and diversify**, making their control impossible.
5. **Ethical Concerns**:
   - Risks of **misuse** in biological warfare or accidental release.

Scientific Opposition to Mirror Microbes

1. **Immune Evasion**:
   - Mirror bacteria can bypass **immune recognition**, leading to **uncontrolled infections**.
2. **Spread and Diversification**:
   - These synthetic organisms may escape containment and **evolve**, impacting ecosystems globally.
3. **Inadequacy of Countermeasures**:
   - Mirror antibiotics or other counter-strategies are unlikely to match the complexity of mirror bacterial evolution.

Way Forward

1. **Regulation and Oversight**:
   - Establish international guidelines for **synthetic biology research** and **biosecurity** to prevent misuse or accidental release.
2. **Containment Strategies**:
   - Develop advanced containment technologies and **fail-safe mechanisms** for synthetic organisms.
3. **Public Awareness and Ethical Discussions**:
   - Engage the public and policymakers in understanding the **risks and benefits** of such innovations.
4. **Risk-Reward Analysis**:
   - Carefully weigh potential industrial and scientific benefits against the **ecological and health risks**.
5. **Global Cooperation**:
   - Collaborate through bodies like the **Convention on Biological Diversity (CBD)** to regulate the development of mirror microbes.

Varmam Therapy: Traditional Healing in Siddha Medicine

UPSC Syllabus Mapping

- **GS Paper I: Indian culture - traditional knowledge systems.**
- **GS Paper II: Health and education - alternative medicine systems in India.**
- **GS Paper III: Science and technology - role in healthcare.**

Context

The **National Institute of Siddha (NIS), Chennai**, achieved a **Guinness World Record** by organizing the **largest session of Varmam Therapy**, highlighting this ancient Siddha practice on the global stage.

What is Varmam Therapy?

1. **Definition**:
   Varmam Therapy is a **traditional Siddha medical practice** that manipulates **vital points (Varmam)** in the body to regulate **energy flow** and **treat ailments**.
2. **Principles**:
   - The body has **108 vital energy points**, and disturbances in these points can lead to diseases.
   - By applying controlled pressure on these points, energy blockages are cleared, restoring balance and health.
3. **Applications**:
   - **Neurological Disorders**: Addresses conditions like paralysis and migraines.
   - **Musculoskeletal Disorders**: Treats back pain, arthritis, and joint stiffness.
   - **Chronic Pain**: Effective for managing persistent pain conditions.
4. **Treatment Methodology**:
   - Practitioners use fingers, elbows, or specialized tools to stimulate specific Varmam points.

Significance of the Achievement

1. **Global Recognition**:
   - Elevates **Siddha Medicine** on the international stage, increasing its visibility and acceptance.
2. **Cultural Heritage**:
   - Reinforces the importance of preserving **India's ancient healing systems** like Siddha.
3. **Public Awareness**:
   - Promotes **Varmam Therapy** as a **complementary healthcare approach**, encouraging people to explore traditional healing methods.
4. **Boost to AYUSH Sector**:

o Strengthens the **AYUSH (Ayurveda, Yoga, Unani, Siddha, and Homeopathy)** mission by showcasing Siddha medicine's potential globally.

About Siddha Medicine

1. **Origins**:
   o Siddha Medicine is one of the oldest traditional medicine systems in the world, originating in **Tamil Nadu**, India.
2. **Philosophy**:
   o Focuses on achieving **harmony between the body, mind, and environment**.
3. **Unique Features**:
   o Emphasis on prevention rather than cure.
   o Holistic approach integrating **diet, lifestyle, and natural remedies**.
4. **Key Components**:
   o Use of **herbal, mineral, and animal-based formulations**.
   o Techniques like **Varmam Therapy**, yoga, and dietary regulations.

Way Forward

1. **Research and Documentation**:
   o Encourage **scientific validation** of Siddha practices like Varmam Therapy to integrate them into mainstream healthcare.
2. **Training and Certification**:
   o Develop **certification programs** to train more practitioners in Varmam Therapy.
3. **Global Promotion**:
   o Collaborate with international organizations to promote Siddha medicine as a **complementary and alternative therapy**.
4. **Awareness Campaigns**:
   o Conduct **health awareness programs** to educate people about Siddha medicine's benefits.

HISTORY, ART & CULTURE

Mahaparinirvan Diwas: Honoring Dr. B.R. Ambedkar

UPSC Syllabus Relevance

- **GS Paper 1**: Modern Indian History – Social Reform Movements
- **GS Paper 2**: Polity – Constitution and Rights

Key Points

1. **Context**:
   o **Mahaparinirvan Diwas** is observed annually on **December 6** to honor **Dr. Bhimrao Ramji Ambedkar** on his **death anniversary**.
2. **Meaning of 'Mahaparinirvan'**:
   o **Origin**: Derived from **Buddhist texts**, signifying **nirvana after death** and liberation from the **cycle of birth and rebirth**.
   o **Dr. Ambedkar and Buddhism**:
     ▪ Adopted **Buddhism in 1956**, seeing it as a path to escape **caste-based oppression**.
     ▪ Deeply influenced by **Buddha's teachings**, regarded as a **spiritual and social reformer**.
3. **About Dr. Bhimrao Ambedkar**:
   o **Born**: **1891**, in Mhow, Central Province (now Madhya Pradesh).
   o **Roles**: Social reformer, jurist, economist, polyglot, author, orator, scholar, and thinker of comparative religions.
4. **Contributions of Dr. B.R. Ambedkar**:
   o **Focus on Marginalized Communities**:
     ▪ Advocated for the **upliftment of Dalits, women, and laborers** facing systemic discrimination.
   o **Key Reforms**:
     ▪ Founded **Bahishkrit Hitkarini Sabha (1923)** to promote education and welfare of marginalized groups.
     ▪ Launched the **Mooknayaka newspaper** to amplify the voices of the oppressed.
   o **Major Movements**:
     ▪ **Mahad March (1927)**: Asserted **Dalit rights** to access public water.
     ▪ **Kalaram Temple Entry Movement (1930)**: Challenged caste-based temple entry restrictions.
     ▪ **Poona Pact (1932)**: Negotiated reserved seats for Dalits in place of separate electorates.
   o **Economic and Infrastructure Vision**:
     ▪ Influenced the creation of the **Reserve Bank of India (RBI)** and the **Finance Commission of India**.
     ▪ Proposed the **National Power Grid System** and initiated **Employment Exchanges**.
   o **Role in Constitution Framing**:

- As **Chairman of the Constitution Drafting Committee**, drafted provisions for **social and economic justice**.
  - o **Literary Contributions**:
    - Writings include **"The Untouchables," "Who Were the Shudras?" and "The Annihilation of Caste"**.
  - o **Awards and Recognition**:
    - **Bharat Ratna (1990)**: Posthumously honored for his contribution to nation-building.

100 Years of the Communist Party of India

UPSC Syllabus Relevance

- **GS Paper 1: Modern Indian History – Role of Different Ideologies in Freedom Struggle**
- **GS Paper 2: Governance – Role of Political Parties and Pressure Groups**

Context:

- o The **Communist Party of India (CPI)** celebrates its **centenary year in 2025,** marking 100 years since its formation on **December 26, 1925**.

What Is Communism?

- o **Definition**: A **political and economic ideology** opposing liberal democracy and capitalism, advocating for a **classless system** with communal ownership of the **means of production**.
- o **Examples**: Practiced in **China, Cuba, Laos, North Korea, and Vietnam**.

Contributions of the Communist Party of India (CPI):

Pre-Independence

- o **Freedom Struggle**: Played a key role in opposing British rule.
- o **Kanpur Bolshevik Conspiracy Case (1924)**:
  - Targeted prominent communists like **M.N. Roy, Muzaffar Ahmad**, and others.
  - Charged for conspiring to overthrow British rule through a **violent revolution**.
- o **Demand for Poorna Swaraj**:
  - **First to demand complete independence**, influencing leaders like **Mahatma Gandhi**, **Jawaharlal Nehru**, and **Subhas Chandra Bose**.
- o **Call for Constituent Assembly**:
  - Advocated for a **sovereign people's assembly**, reflected in the **Preamble's invocation** of "We, the People of India."
  - Influenced debates on **land reforms**, **workers' rights**, and **backward classes' protection**.
  - **Example**: **Telangana Rebellion**, a peasant uprising in Hyderabad, showcased CPI's commitment to **social justice**.
- o **Labor Rights**:
  - Secured the **right to form labor unions** and influenced the **Industrial Disputes Act**.
- o **Impact on Indian Constitution**:
  - **Preamble** ideals like **justice, equality, and fraternity** reflect communist values.
  - Provisions for **social justice** and **economic equality** stem from CPI's contributions.

Post-Independence

- o **Principal Opposition Party**:
  - Emerged as the **main opposition** in early **Lok Sabha elections (1951, 1957, 1962)**.
- o **First Non-Congress Government**:
  - Formed **Kerala's government in 1957**, defeating the Congress Party.
- o **Governance Contributions**:
  - Played a role in legislations like the **Forest Rights Act** and **Right to Information Act (RTI)** during **UPA-I rule**.

Challenges Faced by the CPI

- o **Split in 1964**:
  - **Ideological differences** over the **Soviet-China conflict** led to the formation of the **Communist Party of India (Marxist)** [CPI(M)].
- o **Electoral Decline**:
  - **2024 Lok Sabha elections**: CPI won only **2 seats**, and CPI(M) won **4 seats**—their lowest since 1967.
  - The decline began in the **2014 elections**, with CPI winning **1 seat** and CPI(M) **9 seats**.

Conclusion:

o The CPI has consistently fought for **social and economic justice**, resisting efforts to undermine **constitutional safeguards**. Its role remains crucial in protecting **India's democratic framework** against threats like **communal fascism** and **exploitative capitalism**.

Legacy of the CPI

The CPI's centenary underscores its historical significance in India's **freedom struggle**, **labor rights movement**, and **constitutional development**, despite contemporary challenges in electoral relevance.

Belgaum Congress Session 1924

UPSC Syllabus Relevance

- **GS Paper 1**: Modern Indian History – Indian National Movement
- **GS Paper 2**: Governance – Role of NGOs and Social Reformers

Context:

o The **centenary celebrations** of the **39th Indian National Congress (INC) session** are being held in **Belagavi, Karnataka**, on **December 26–27, 2024**.

About the Belgaum Congress Session:

o **Year**: The session was held in **1924** at **Belgaum (now Belagavi)**, Karnataka.
o **Significance**:
  ▪ It was the **only session presided over by Mahatma Gandhi**, adding a unique milestone in Congress history.
o **Venue**: The session took place at a site named **Vijayanagara**.

Significance of the 1924 Belgaum Session:

o **Social Reform**:
  ▪ Focused on **untouchability eradication**, promotion of **khadi**, and support for **village industries**.
  ▪ Key Resolutions:
    ▪ Made **khadi spinning mandatory** for Congress members, with a **monthly submission of 2,000 yards** of khadi cloth.
    ▪ Reduced Congress **membership fees by 90%** to make it accessible to all.
o **Hindu-Muslim Unity**:
  ▪ Advocated **communal harmony** as a prerequisite for the **freedom movement**.
o **Economic and Social Upliftment**:
  ▪ Emphasized **sanitation** and **town planning**.
  ▪ Promoted **cow protection** for its economic benefits, avoiding religious bias and violence.
o **Equality in Congress**:
  ▪ Criticized excessive expenditure by VIPs.
  ▪ Stressed equitable treatment for **all Congress members**.

UNESCO Recognition for Abathsahayeswarar Temple

UPSC Syllabus Relevance

- **GS Paper 1**: Indian Heritage and Culture – Art and Architecture
- **GS Paper 2**: International Relations – Role of UNESCO

Key Points

1. **Context**:
   - The **Abathsahayeswarar Temple** in Thukkatchi village, Tamil Nadu, has received the **UNESCO Asia-Pacific Award for Cultural Heritage Conservation**.
2. **Historical Significance**:
   - **Age**: The temple is a **1,300-year-old structure**.
   - **Constructed By**: Built by **Kings Vikrama Chola** and **Kulothunga Chola** of the Chola dynasty.
3. **Temple Features**:
   - **Structure**: Originally had **five prakarams (enclosures)**.
   - **Shrines**: Houses notable shrines, including:
     - **Soundaryanayaki Ambal**
     - **Ashtabhuja Durga Parameshwari**
     - **Aadhi Sarabeshwarar**
     - **Pillayar, Murugan, Chandikeswarar**
     - **Two Bhairavars, two Suryas, two Naagars**
4. **Restoration and Renovation**:
   - **Restoration Works**:
     - Cleared vegetation and structurally strengthened the temple.
     - Repainted the **gopurams** and restored **two prakarams**.
   - **Consecration**: The temple was consecrated in **September 2023**.
5. **Architectural and Cultural Value**:
   - **Architecture**: Represents **Chola architectural style**, featuring **intricate carvings** and traditional design.
   - **Cultural Importance**: Acts as a **living temple**, significant for cultural and religious heritage.
6. **UNESCO Asia-Pacific Awards**:
   - **Established**: In **2000**, to honor efforts in **heritage conservation** in the Asia-Pacific region.
   - **Purpose**: Recognizes contributions by **private sectors** and **public-private partnerships** in preserving heritage.

The 80-Pillar Hall of Kumhrar

UPSC Syllabus Relevance

- **GS Paper 1**: Indian History – Ancient India and Art & Architecture
- **GS Paper 1**: Culture – Mauryan Contributions

Key Points

1. **Context**:
   - The **Archaeological Survey of India (ASI)** is excavating the **Kumhrar site** in Patna to uncover the **80-Pillar Assembly Hall**, a significant part of **Mauryan history**.
2. **Historical Significance**:
   - **Era**: Dates back to the **Mauryan empire** (321–185 BCE).
   - **Function**: Served as a **political and cultural hub** in **Pataliputra**, the Mauryan capital.
   - **Ashoka's Role**:
     - Emperor **Ashoka (268–232 BCE)** convened the **3rd Buddhist Council** here.
     - Aimed at unifying the **Buddhist sangha** and propagating **Dhamma globally**.
3. **Architectural Importance**:
   - **Structure**:
     - Featured **80 sandstone pillars** supporting a **wooden roof and floor**.

- Material transportation via the **Sone-Ganga river route** highlights advanced Mauryan-era **planning** and **resource management**.
4. **Archaeological Discoveries**:
   o **First Excavation (1912–1915)**:
      - Found one intact **sandstone pillar**, **80 pillar pits**, and signs of **fire destruction**, possibly due to invasions.
   o **Second Excavation (1961–1965)**:
      - Unearthed **four additional pillars**, offering further insights into the structure.
5. **The Mauryan Empire**:
   o **Establishment**: Founded by **Chandragupta Maurya** in **321 BCE**.
   o **Expansion**:
      - At its peak, extended from **Afghanistan** to the **Deccan Plateau**.
      - **Capital**: The empire was governed from **Pataliputra** (modern-day Patna).

Maha Kumbh Mela 2025

UPSC Syllabus Relevance

- **GS Paper 1**: Indian Culture – Festivals and Traditions
- **GS Paper 2**: Governance – Government Initiatives

Key Points

1. **Context**:
   o The Prime Minister inaugurated **167 development projects** worth **₹5,500 crore** in Prayagraj, Uttar Pradesh, as part of preparations for the **Maha Kumbh Mela 2025**.
   o A multilingual **AI-powered chatbot, Sah'AI'yak**, was launched to assist devotees in **11 Indian languages**.
2. **About Maha Kumbh Mela**:
   o **Description**: The **Maha Kumbh Mela** is celebrated four times in **12 years**, making it the **world's largest peaceful gathering**.
   o **Historical Background**:
      - Rooted in the **Puranas**, which contain ancient legends.
      - **Mythology**: Lord **Vishnu**, as 'Mohini,' secured the **Kumbh** (nectar pot) from demons during the churning of the ocean.
      - **Transcription**: Origin attributed to **Adi Shankaracharya**, the 8th-century philosopher.
3. **Types of Kumbh Melas in India**:

Kumbh Mela	Frequency	Locations
Maha Kumbh Mela	Every **144 years**	Prayagraj
Purna Kumbh Mela	Every **12 years**	Prayagraj, Haridwar, Ujjain, Nashik
Ardh Kumbh Mela	Every **6 years**	Prayagraj, Haridwar
Magh Mela	**Annually**	Prayagraj

4. **Cultural and International Recognition**:
   o Declared an **intangible cultural heritage** by **UNESCO in 2017**, the Kumbh Mela symbolizes **India's enduring cultural traditions**.
5. **Significance of the 2025 Mela**:
   o Expected to attract **millions of devotees**, the event underscores the **religious, cultural, and economic vibrancy** of India.
   o Preparatory projects aim to enhance **infrastructure, crowd management**, and **devotee assistance**.

GI Tag for Narsapur Crochet Lace

(GS Paper 1: Indian Culture - Art Forms and Craftsmanship)

Context:

The **Narsapur Crochet Lace Craft**, from Andhra Pradesh, has been awarded the prestigious **Geographical Indication (GI)** tag, recognizing its unique heritage and craftsmanship.

About Narsapur Crochet Lace Craft:

1. **Origin:**
   o Introduced in **1844** by a Scottish couple associated with a Christian missionary at **Dummugudem** (now in Telangana).
2. **Location:**
   o Practiced across **19 mandals** in **West Godavari** and **Dr. B.R. Ambedkar Konaseema** districts, Andhra Pradesh.
   o **Major Trade Points:** Narsapur and Palacole in the West Godavari district.
3. **The Craft:**

- o Created using **fine cotton threads**, woven with **thin crochet needles** of varying sizes.
  - o Products include **garments**, **home furnishings**, and **accessories.**
4. **Women-Led Craft:**
  - o Nearly **15,000 women artisans** are directly involved, with **60% of the workforce comprising women.**

Significance of GI Tag:

1. **Recognition and Protection:**
   - o Prevents unauthorized use of the name "Narsapur Crochet Lace" and ensures authenticity.
2. **Economic Impact:**
   - o Boosts the livelihood of artisans by enhancing product value in both **domestic and international markets.**
3. **Preservation of Heritage:**
   - o Promotes and preserves traditional craftsmanship.
4. **Empowerment of Women:**
   - o Enhances opportunities for women artisans in rural Andhra Pradesh.