WEEKLY UPDATES

DATE : 18th Nov- 24th Nov

POLITY & GOVERNANCE

Comptroller and Auditor General of India: Ensuring Accountability and Transparency

Syllabus: GS II - Polity (Constitutional Bodies)

Context: During the 4th Audit Diwas event, Lok Sabha Speaker Shri Om Birla emphasized the **pivotal role of the Comptroller & Auditor General (C&AG)** in promoting **accountability, transparency, and good governance**.

About the Comptroller and Auditor General of India (CAG)

Constitutional and Functional Role

1. **Independent Office**: Established under **Article 148**, CAG ensures public accountability in financial matters.
2. **Guardian of Public Purse**: Monitors **financial systems** at both **Central and State levels**.

Appointment and Tenure

1. **Presidential Appointment**: Appointed by the **President** via warrant under their hand and seal.
2. **Term: Six years or up to 65 years of age**, whichever is earlier.
3. **Salary and Conditions**: Determined by **Parliament** and charged to the **Consolidated Fund of India**.
4. **Post-Retirement Restrictions**: Cannot hold any office under **Central/State Governments** after retirement.

Relevant Constitutional Articles

1. **Article 149**: Outlines **duties and powers** of the CAG as defined by Parliament.
2. **Article 150**: Prescribes the **accounting format** of Union and State accounts on CAG's advice.
3. **Article 151**: CAG reports are submitted to the **President** and tabled before **Parliament**.
4. **Article 279**: Certifies **net tax proceeds**, which are binding on the government.

Powers and Responsibilities

1. **Financial Audits**:
    - Examines **expenditures** from the **Consolidated, Contingency, and Public Accounts**.
    - Audits **receipts, debts, and remittances** of governments.
2. **Revenue Scrutiny**: Ensures robust mechanisms for **revenue assessment and collection**.
3. **Local Body Audits**:Reviews **local authorities** and government-funded bodies upon request.
4. **Formulation of Accounts**: Advises on **Union and State account formats**.
5. **Legislative Reporting**: Submits reports for legislative scrutiny.

6. **Public Accounts Committee (PAC) Guidance**: Assists the PAC in analyzing government expenditures.

Challenges Faced by CAG

1. **Limited Powers**: Lacks authority to enforce **compliance** for timely information.
2. **Ambiguity in Audit Scope**: Undefined roles in auditing **Public-Private Partnerships (PPPs)** and power companies.
3. **Restricted Access**: Cannot audit **secret service expenditures**; relies on administrative certifications.
4. **Delayed Reporting**: Reduced number of audit reports in recent years.
5. **Transparency Concerns**: **Executive influence** in appointments undermines independence.
6. **Structural Debate**: Calls for converting the **single-member body** into a **multi-member entity** for better decision-making.

Recommendations for Reforms

1. **Wider Audit Coverage**: Include **PPPs, Panchayati Raj Institutions, and government-funded entities**.
2. **Transparent Appointment Process**: Introduce a **collegium-style mechanism** for selection.
3. **Enhanced Powers**: Amend the **CAG Act (1971)** to incorporate punitive measures for non-compliance.
4. **Timely Information Access**: Mandate access to records within **seven days** and penalize delays.
5. **Independence and Transparency**: Align with **global best practices** to ensure autonomy in functioning.
6. **Capacity Building**: Equip CAG to audit emerging areas like **SDGs** and **GST**.

Women in Urban Governance: Insights from India

Syllabus: GS II - Local Governance (Urban Bodies, Women's Empowerment)

Context: The **Janaagraha report** highlights the state of **urban governance** in India, with a special focus on **women's representation** in **Urban Local Bodies (ULBs)**, shedding light on progress and challenges in empowering women in urban decision-making.

Key Data from the Report

Women Representation in Urban Local Bodies (ULBs)

1. **National Representation**: Nearly **46% of councillors in India** are women.
2. **Capital Cities**: In **19 out of 21 capital cities** with active ULBs (e.g., Patna, Shimla, Ranchi, Bhubaneswar), **over 60% of councillors are women**, demonstrating significant representation.
3. **State Leaders**: **Top 10 States** with the highest number of women councillors exhibit strong compliance with reservation policies and active participation in governance.

Women's Quota in ULBs

1. **Constitutional Mandate**: The **74th Constitutional Amendment Act** mandates a **minimum 33% reservation** for women in ULBs.
2. **Exceeding Minimum Quotas**: **17 States** have legislated **50% women's reservation** in ULBs, promoting greater inclusivity in urban governance.

Significance of Women's Representation in Urban Governance

1. **Enhanced Representation**: Greater participation ensures **diverse perspectives** in urban planning and policymaking.
2. **Improved Governance Outcomes**: Studies suggest that women in governance focus more on **infrastructure**, **education**, and **social welfare**, leading to balanced development.

3. **Empowerment**: Encourages **political participation** and strengthens women's roles in public decision-making.

Challenges in Women's Urban Governance Participation

1. **Structural Barriers**: Gender norms and societal expectations often hinder women's full engagement in governance.
2. **Limited Leadership Roles**: Despite high representation, few women hold **executive roles** or positions of significant authority.
3. **Capacity Building Needs**: Lack of access to training and resources affects women councillors' **effectiveness** in governance.
4. **Underfunded ULBs**: Weak financial autonomy of ULBs reduces the impact councillors can have, regardless of gender.

Way Forward

1. **Strengthening Women's Participation**:
   - Enforce and expand **50% reservation** policies nationwide.
   - Ensure **effective implementation** of quotas, especially in states lagging behind.
2. **Capacity Building**: Provide **training programs** on governance, finance, and policy for women councillors.
3. **Leadership Development**: Encourage women to take up **executive roles** within ULBs.
4. **Public Awareness**: Promote campaigns to reduce stigma around women in governance roles.
5. **Financial Empowerment**: Strengthen ULBs' **financial autonomy**, enabling councillors to implement impactful policies.

Bail & Undertrials: Addressing India's Judicial Challenges

Syllabus: GS II - Polity and Governance; Justice System

About Bail

- **Definition**: Temporary release of an accused person awaiting trial, granted under specified conditions.
- **Types of Bail**:
  - **Regular Bail**: Granted to those in **police custody** (Sections 437 & 439 of CrPC).
  - **Interim Bail**: **Temporary relief** until a regular or anticipatory bail hearing.
  - **Anticipatory Bail**: **Pre-arrest bail** under Section 438 of CrPC for individuals fearing arrest.

Modifications in Bharatiya Nagarik Suraksha Sanhita (BNSS) Regarding Bail

1. **First-Time Offenders**: Eligible for bail after serving **one-third** of their maximum sentence (excluding life imprisonment or death penalties).
2. **Mandatory Bail**: Courts must **consider bail** upon charge sheet filing unless there are compelling reasons to deny it.
3. **Special Provisions**: Priority focus on **vulnerable groups** like women, children, and sick individuals.
4. **Timely Disposal**: Emphasis on **reducing delays** in bail application processes.

Recent Trends in Undertrial Prisoners in India

1. **Population Statistics**: **Undertrials** form **75.8%** of the prison population (4,34,302 out of 5,73,220 as of 2022).
2. **Gender Analysis**: **76.33%** of incarcerated women are undertrials.
3. **Duration**:
   - **8.6%** of undertrials have been imprisoned for over **three years**.
   - *(Source: NCRB Prison Statistics India, 2022)*

Key Supreme Court Judgments on Bail

1. **Satender Kumar Antil vs. CBI (2023)**: Established **timely disposal guidelines** for bail applications and reiterated "**bail, not jail**."
2. **Hussainara Khatoon vs. State of Bihar (1979)**: Ensured the right to **free legal aid** for fair trials.
3. **Charles Sobhraj vs. Superintendent, Central Jail, Tihar (1978)**: Highlighted **prisoner rights**, including humane living conditions.
4. **Shaheen Welfare Association vs. Union of India (1996)**: Allowed **bail for undertrials** with prolonged detention exceeding **two years**.
5. **Upendra Baxi vs. State of U.P. (1983)**: Stressed **dignity and humane treatment** for inmates.

Challenges in Bail and Undertrial Systems

1. **Implementation Gaps**: Delays in compliance with **bail conditions** despite legal provisions.
2. **Economic Barriers**: Many cannot afford **bail amounts** or arrange sureties.
3. **Judicial Discretion**: **Inconsistent application** of bail principles across cases.
4. **Administrative Delays**: Prolonged processing times for bail applications.
5. **Documentation Issues**: Lack of **identity proof** and legal representation hinders undertrial release.
6. **Social Barriers**: Marginalized individuals face **systemic biases** in accessing bail.

Measures to Address Challenges

1. **Reform Legislation**: Develop comprehensive laws to **streamline bail processes**.
2. **Focus on Rehabilitation**: Implement programs for **reintegration** and reduction of **recidivism**.
3. **Open Prison Models**: Expand systems like Rajasthan's **open prisons** for eligible inmates.
4. **Strengthen Legal Aid**: Enhance **legal aid services** for undertrials.
5. **Streamline Processes**: Ensure jail superintendents promptly notify courts about **eligible undertrials**.
6. **Political Will**: Prioritize reforms with sustained **funding** and **commitment**.

India's Gender Responsive Budgeting (GRB): UN Recognition and Recommendations

Syllabus: GS II - Governance (Gender Budgeting, Women Empowerment)

Context: A UN report titled *'Charting New Paths for Gender Equality and Empowerment: Asia-Pacific Regional Report on Beijing +30 Review'* commended **India's Gender Responsive Budgeting (GRB)** for demonstrating a strong commitment to **gender equality** through efficient resource allocation.

What is Gender Responsive Budgeting (GRB)?

- **Definition**: GRB is a **gender mainstreaming tool** that applies a **gender lens** to the entire policy process using the **Budget** as the entry point.
- **Key Features**:
  - **Not a Separate Budget**: It integrates gender considerations into the mainstream budget process.
  - **Not Equal Spending**: Focuses on **needs-based allocation**, rather than equal spending for women and men.

GRB in India

1. **Genesis**: Institutionalized by the **Ministry of Finance** in **2005–2006**.
2. **Gender Budget Statement (GBS)**: Presented annually during the **Budget session** by the Government.
3. **Nodal Agency**: **Ministry of Women and Child Development (MWCD)** coordinates GRB efforts.
4. **Structure**:
   - **Part A**: Schemes exclusively for **women**.

- **Part B**: Schemes allocating at least **30% of funds** towards women.

5. **Link to Mission Shakti**: Comes under **Samarthya**, a sub-scheme of **Mission Shakti**, aimed at women empowerment.

Key Challenges in GRB Implementation

1. **Exclusion of Key Programmes**: Many programmes benefiting women are excluded from GRB calculations.
2. **Lack of Sex-Disaggregated Data**: Absence of data categorized by gender limits the accurate assessment of resource impact.
3. **Limited Sectoral Integration**: GRB practices are not uniformly applied across sectors.
4. **Capacity Constraints**: Lack of technical expertise at the **subnational level** affects implementation.

UN Recommendations to Improve GRB Efficiency

1. **Stronger Monitoring Mechanisms**: Develop robust systems to evaluate **sectoral-level GRB** efforts.
2. **Integrate GRB in Budget Prioritization**: Incorporate **gender considerations** during the budget planning phase.
3. **Encourage Subnational Governments**: Promote adoption of GRB practices at **state and local levels**.
4. **Enhance Data Systems**: Ensure availability of **sex-disaggregated data** for better policy targeting.

Significance of GRB in India

1. **Empowerment of Women**: Directs resources to improve women's **health**, **education**, and **economic participation**.
2. **Accountability in Governance**: Demonstrates **government commitment** to gender equality and inclusive development.
3. **Global Leadership**: India's GRB practices serve as a **model for other nations**, particularly in the Asia-Pacific region.

WEP and Urban Company Collaboration: Empowering Women Entrepreneurs

Syllabus:

- **GS II**: Government policies and interventions for development in various sectors.
- **GS III**: Economic development, MSMEs' role in employment generation, and inclusive growth.
- **Essay**: Women empowerment and entrepreneurial inclusivity in India.

Context

NITI Aayog's **Women Entrepreneurship Platform (WEP)**, in collaboration with **Urban Company**, launched a pilot program to empower **women-led MSMEs** in the **beauty and wellness sector**.

Key Points

1. **Program Focus**:
   - Aims to train **women entrepreneurs** managing **salons and parlors** in six critical areas:
     - **Skilling**: Enhancing technical and managerial capabilities.
     - **Legal Compliance**: Ensuring adherence to regulatory requirements.
     - **Access to Finance**: Facilitating financial literacy and funding opportunities.
     - **Market and Business Development**: Expanding market reach and strengthening business models.

- **Mentorship**: Providing guidance from industry leaders.
- **Networking**: Building professional connections for growth.

2. **Objective**:
   - Enhance the **sustainability and scalability** of **women-led MSMEs** in the beauty and wellness sector.
   - Foster a robust **entrepreneurial ecosystem** tailored for women.
3. **Collaboration**:
   - A partnership between **NITI Aayog's WEP** and **Urban Company**, emphasizing **economic empowerment**and professional growth for women entrepreneurs.

Grievance Redressal Assessment and Index (GRAI) 2023: Enhancing Public Grievance Mechanisms

Syllabus: Governance and Accountability

Key Features of GRAI 2023

1. **Conceptualization**: Developed by **Department of Administrative Reforms and Public Grievances (DARPG)**, based on the **recommendations of the Parliamentary Standing Committee** of the Ministry of Personnel, Public Grievances, and Pensions.
2. **Assessment Dimensions**: Evaluates performance across **four key dimensions**:
   - **Efficiency**
   - **Feedback**
   - **Domain**
   - **Organizational Commitment**
3. **Indicators**: The four dimensions are divided into **11 specific indicators** to provide a comprehensive assessment of grievance redressal mechanisms.
4. **Data Source**: Data sourced from the **Centralized Public Grievance Redress and Monitoring System (CPGRAMS)** for the **calendar year 2023**.
5. **Objective**: The primary aim is to present a **comparative analysis** of grievance redressal mechanisms, highlighting **strengths** and areas for **improvement**, thus helping enhance **public service delivery**.

Ranking Highlights

1. **Group A Rankings**:
   - **Department of Agriculture and Farmers Welfare**: Secured the **top position**.
   - **Department of Posts**: Followed closely in ranking.
2. **Group B Rankings**:
   - **Office of the Comptroller & Auditor General of India**: Led the rankings.
   - **Department of Land Resources**: Ranked second.
3. **Group C Rankings**:
   - **Department of Investment & Public Asset Management**: Achieved **first position**.
   - **Ministry of Development of North Eastern Region**: Secured **second position**.

Performance Insights

1. **Growth in GRAI Scores**:
   - Out of **89 Ministries and Departments** assessed, **85** showed **positive growth** in their GRAI scores in **2023**compared to **2022**.
   - **10% of departments** achieved **over 50% growth** in their overall GRAI scores.
   - **28% recorded a growth of 25-50%** in their scores.

- **57% showed incremental growth** of up to **25%.**

2. **Impact of Improvements**:
   - These improvements demonstrate a **concerted effort** across various departments to **enhance grievance redressal mechanisms**, leading to **more responsive** and **efficient public service delivery**.

INTERNATIONAL RELATIONS

Russia's Revised Nuclear Doctrine (ND): Implications and Comparisons

Syllabus: GS II - International Relations (Nuclear Policies); GS III - Security Challenges and Strategic Dynamics

Context: Russia has revised its 2020 Nuclear Doctrine (ND)**, reaffirming nuclear weapons' role in deterring threats and expanding scenarios for potential use.**

About Nuclear Doctrine

- **Definition**: A framework outlining the **purpose, development, deployment**, and **use of nuclear weapons** by a nation.

Key Features of Russia's Revised Nuclear Doctrine

1. **Expanded Definition of Nuclear Attack**: Any aggression against Russia by a **non-nuclear state**, supported by a **nuclear state**, will be treated as a **joint attack**, justifying nuclear retaliation.
2. **Targeting Aggressor States**: Countries allowing their **territories to be used for aggression** against Russia are explicitly included as potential nuclear targets.
3. **Lowering Nuclear Response Threshold**: Nuclear use now includes threats to **sovereignty** and **territorial integrity**, in addition to threats to **state existence**.
4. **Belarus under Nuclear Umbrella**: Belarus is formally placed under **Russia's nuclear protection**.
5. **New Risks Triggering Nuclear Response**:
   - **Expansion of military coalitions** near Russian borders.
   - **Large-scale military exercises** by adversaries near Russian territory.
   - **Positioning of enemy infrastructure** closer to Russian borders.

Potential Impacts of Russia's Revised ND

1. **Increased Nuclear Escalation**: Raises the likelihood of **Tactical Nuclear Warfare** in conflict zones.
2. **Weakening the Non-Proliferation Regime**: Makes it harder to persuade other nations to abandon their **nuclear weapons programs**, undermining global non-proliferation efforts.
3. **Growing Distrust**: The lowered nuclear threshold and expanded definition of "extreme circumstances" may worsen distrust between **Russia and the US**, and within NATO.
4. **Regional Instability**: The formal inclusion of **Belarus** under Russia's nuclear umbrella could destabilize **Eastern Europe** further.

India's Nuclear Doctrine (2003)

1. **No First Use (NFU)**: India will not be the first to use nuclear weapons but retains the right to retaliate if attacked.
2. **Credible Minimum Deterrence**: Maintains a **minimum nuclear arsenal** to deter aggression.
3. **Massive Retaliation**: In response to a nuclear attack, India will retaliate with a **massive nuclear strike**.

4. **Civilian Control**: Ultimate authority over nuclear weapons rests with the **Nuclear Command Authority (NCA)**, led by civilian leadership.
5. **Non-Use Against Non-Nuclear States**: India pledges not to use nuclear weapons against **non-nuclear states**.

Comparative Analysis

Feature	*Russia's Doctrine*	*India's Doctrine*
First Use	No explicit "No First Use" policy.	Adheres to "No First Use".
Scope of Use	Expanded to include sovereignty threats.	Limited to state survival threats.
Targets	Includes non-nuclear states supporting attacks.	Excludes non-nuclear states.
Control	Likely centralized under military leadership.	Civilian control via NCA.
Non-Proliferation	Undermines regime with broader definitions.	Supports non-proliferation commitments.

Conclusion

Russia's revised ND reflects a **more aggressive posture**, lowering the threshold for nuclear weapon use and potentially escalating global tensions. In contrast, **India's doctrine** focuses on **deterrence and restraint**, reflecting a commitment to **peaceful coexistence** while ensuring robust national security. This divergence underscores the need for international dialogue and renewed efforts in **nuclear disarmament and non-proliferation**

India's Neighbourhood Policy: Balancing Aspirations and Regional Ties

Syllabus: GS II - International Relations (India and its Neighbourhood)

Context: India's **neighbourhood policy** is under scrutiny due to challenges in maintaining stable relations with several neighbouring countries. As a regional leader with deep historical and cultural ties, India must balance its **global aspirations** with the **sensitivities of its neighbours**.

Key Features of India's Neighbourhood Policy

1. **Neighbourhood First Policy**:
   - Prioritizes **strong ties with immediate neighbours**.
   - Aims for **economic integration**, development partnerships, and enhanced **cultural ties**.
2. **Gujral Doctrine**:
   - Advocates **non-reciprocity** and goodwill gestures towards smaller neighbours.
   - Emphasizes **non-interference**, respect for **sovereignty**, and peaceful resolution of disputes.
3. **Act East Policy**:
   - Expands India's outreach to **Southeast Asia** for trade, security, and cultural integration.
   - Focuses on strengthened ties with **Myanmar, Bangladesh, and ASEAN countries**.

Present Diplomatic Efforts to Handle Neighbours

1. **Economic Initiatives**:
   - **Trade agreements** and infrastructure projects (e.g., **BBIN, SAARC**).
   - Investments in **energy and connectivity projects** in Nepal, Bhutan, and Bangladesh.
2. **Security Cooperation**:
   - Joint exercises and counter-terrorism initiatives (e.g., **BIMSTEC, Quad**).
   - Border management agreements with Bhutan, Nepal, and Bangladesh.
3. **Cultural Diplomacy**:
   - Strengthening historical and religious ties with Nepal and Sri Lanka.
   - Promoting **soft power** through scholarships and cultural exchanges.

4. **Aid and Assistance**:
   - Humanitarian aid during crises (e.g., **earthquake relief in Nepal**).
   - Development assistance to Bhutan, Maldives, and Afghanistan.

Positive Impacts of India's Neighbourhood Policy

1. **Economic Growth**:
   - Enhanced **trade and energy cooperation** with neighbours like Bangladesh and Bhutan.
   - Cross-border projects such as the **Maitree Super Thermal Power Project** with Bangladesh.
2. **Regional Stability**:
   - Cooperation on **counter-terrorism** and maritime security in the **Indian Ocean region**.
   - Disaster management initiatives boost regional goodwill.
3. **Soft Power**:
   - Popularity of Indian **culture, films**, and **educational programs** in neighbouring nations.
   - Religious tourism initiatives like the **Ramayana Circuit**.

Challenges in India's Neighbourhood Policy

1. **Trust Deficit**:
   - Perception of India as a **"big brother"** in Nepal and Sri Lanka.
   - Allegations of interference in domestic politics (e.g., Maldives, Nepal).
2. **Chinese Influence**:
   - China's **Belt and Road Initiative (BRI)** provides economic alternatives to India's neighbours.
   - Strategic encirclement through projects like **Hambantota Port in Sri Lanka**.
3. **Security Concerns**:
   - Rising **anti-India sentiment** for political gains in Bangladesh and Maldives.
   - Border disputes with Nepal strain ties.

Measures to Strengthen Neighbourhood Relations

1. **Respect Sovereignty**:
   - Avoid overt interference in domestic politics.
   - Uphold **non-reciprocity** in bilateral agreements.
2. **Strengthen Economic Ties**:
   - Enhance cross-border infrastructure and connectivity projects.
   - Promote regional trade blocs like **BIMSTEC** and **BBIN**.
3. **Collaborate on Shared Challenges**:
   - Partner in addressing **climate change**, disaster management, and health crises.
   - Ensure **equitable water sharing** of transboundary rivers.
4. **Engage Strategically**:
   - Counter China's influence with **competitive investments** and aid.
   - Focus on **cultural and educational diplomacy**.
5. **Transparent Communication**:
   - Regular summits and bilateral dialogues to address grievances.
   - Encourage **people-to-people contact** to reduce misunderstandings.

Italy-India Joint Strategic Action Plan 2025-2029

Syllabus: GS II - International Relations (India and Bilateral Relations)

Context: On the sidelines of the **G20 Summit in Brazil**, India and Italy unveiled a **5-year Joint Strategic Action Plan (2025-2029)** aimed at fostering collaboration in key areas, including **defense, energy, and technology**.

Key Highlights of the Strategic Action Plan

1. **Economic Cooperation**:
   - **Trade and Investment**: Focus on **green technologies**, **pharmaceuticals**, and other emerging sectors.
   - **Mechanisms**: Strengthened through the **Joint Commission for Economic Cooperation** and the **Working Group on Food Processing**.
2. **Connectivity**:
   - Agreed to cooperate on the **India-Middle East-Europe Economic Corridor (IMEEC)** to enhance connectivity and facilitate trade between India, the Middle East, and Europe.
3. **Science and Technology**:
   - **Critical Technologies**: Expand cooperation in **artificial intelligence** and **digitalization**.
   - **Executive Programme**: Implementation of the **2025-27 Executive Programme for Scientific and Technological Cooperation**.
   - **Innovation Program**: Launch of the **Indo-Italian Innovation and Incubation Exchange Program** to foster academic and industrial collaboration.
4. **Energy Transition**:
   - **Summits**: Organize "Tech Summits" focusing on clean energy innovation.
   - **Global Alliances**: Strengthen partnerships in the **Global Biofuels Alliance** and the **International Solar Alliance (ISA)**.
5. **Defense Cooperation**:
   - **Consultative Mechanisms**: Annual **Joint Defense Consultative (JDC) Meetings** and **Joint Staff Talks (JST)**.
   - **Defense Manufacturing**: Proposal to establish a **Defense Industrial Roadmap** to promote joint production and technological collaboration.

India-Italy Relations

1. **Political Relations**: Established diplomatic relations in **1947**.
2. **Economic Relations**:
   - **Trade Partner**:
     - Italy is India's **4th largest trading partner in the EU**.
     - Bilateral trade in **2022-23** reached **US$ 14.253 billion**, with a **trade surplus in India's favor**.
   - **Indian Diaspora**: Approximately **2 lakh Indians** reside in Italy.
3. **Migration and Mobility**: **Agreement (2023)**: Signed to facilitate **safe and legal migration** between the two nations.

Significance of the Joint Action Plan

1. **Economic Growth**: Encourages investments in key sectors like green technology and pharmaceuticals, fostering mutual economic growth.
2. **Strategic Connectivity**: IMEEC enhances India's trade linkages with Europe and the Middle East, promoting regional integration.
3. **Technological Advancements**: Collaboration in artificial intelligence and digitalization aligns with global technological trends and innovation.
4. **Energy Security**: Partnerships in renewable energy and biofuels support energy transition goals and reduce carbon footprints.
5. **Defense Collaboration**: Strengthened mechanisms for defense cooperation enhance strategic trust and technological capability sharing.

China and Renewable Energy: Opportunities and Challenges

Syllabus: GS III - Renewable Energy; Climate Change and International Relations

Context: As the largest greenhouse gas emitter and a leader in **renewable energy**, China's actions are critical for achieving global climate goals. However, its dependence on fossil fuels poses challenges for global renewable energy supply chains and energy transitions.

China's Status in Renewable Energy

Solar Power Leadership

1. **Global Manufacturing Dominance**: Controls over **80% of global solar panel manufacturing** and **60% of wind turbine production**.
2. **Rapid Renewable Growth**:
   - Added **300 GW** of renewable energy capacity in 2023.
   - Expected to meet its **1,200 GW renewable energy target** six years ahead of schedule.
3. **Cost Competitiveness**: Solar PV production costs are **10–35% lower** than in India, the US, and Europe.

The China Paradox

Necessity of Emission Reductions

- Needs to reduce emissions by **66% by 2030** to align with the **Paris Agreement's 1.5°C target**.

Dependence on Fossil Fuels

- Despite renewables' growth, coal still accounts for over **50% of electricity generation**, supporting industries like solar and wind manufacturing.

Global Supply Chain Impact

- Rapid emission cuts could disrupt fossil fuel-dependent **manufacturing processes**, slowing global renewable energy deployment.

China's Unique Advantages in Renewable Energy

1. **Cost Leadership**: Significant price advantage in **solar PV manufacturing** over competitors like India, the US, and Europe.
2. **Manufacturing Scale**: Produces over 80% of the world's solar panels and 60% of wind turbines.
3. **Integrated Supply Chain**: Controls all steps of the solar PV supply chain, from raw materials to finished products.
4. **Government Support**: Proactive policies, subsidies, and incentives drive renewable energy growth and exports.
5. **Technological Edge**: Advanced manufacturing techniques and significant R&D investments in clean energy.
6. **Economies of Scale**: Large-scale production reduces costs and enhances global competitiveness.

Impact of China's Emission Reductions and Transition to Renewables

Impact on China

1. **Industrial Slowdown**: Phasing out fossil fuels too rapidly could hinder manufacturing, including renewable energy equipment.
2. **Economic Strain**: Industries heavily reliant on coal may face severe challenges.

Impact on India

1. **Supply Chain Vulnerability**: India imports **85% of its solar modules** from China. Disruptions could hinder its renewable energy goals.
2. **Cost Escalations**: Dependence on Chinese imports makes India vulnerable to rising prices of solar PV and wind equipment.

Impact on the World

1. **Global Renewable Targets**: Reduced Chinese production might delay the **2030 renewable energy tripling target**.
2. **Dependency Risks**: Highlights the need for diversifying supply chains to reduce over-reliance on China.

India's Potential as a Competitor to China

1. **Ambitious Renewable Energy Goals**: Plans to achieve **280 GW of solar energy** as part of its **500 GW renewable capacity target** by 2030.
2. **Domestic Manufacturing Push**:
   - Current annual solar module manufacturing capacity: **15 GW**.
   - Plans to scale up domestic production significantly.
3. **Government Support**: Policies and subsidies to promote renewable energy manufacturing and reduce dependency on imports.
4. **Geographical Advantage**: High **solar insolation** and vast land availability for renewable projects.

Chennai-Vladivostok Eastern Maritime Corridor (EMC): A Strategic Boost to India-Russia Maritime Ties

Syllabus: GS II - International Relations; GS III - Infrastructure and Economic Development

Context: The **Chennai-Vladivostok Eastern Maritime Corridor (EMC)**, operationalized recently, aims to strengthen maritime connectivity between **India and Russia**, marking a significant milestone in bilateral cooperation and regional trade.

About the Eastern Maritime Corridor (EMC)

- **Conceptualization**: Proposed during the **Eastern Economic Forum (2019)** in Vladivostok, Russia.
- **Route Details**: Connects the Indian port of **Chennai** to **Vladivostok** in Russia, covering a distance of **10,300 km**.
- **Time and Distance Advantage**: Reduces transportation time by **16 days** and distance by **40%** compared to the current **Mumbai-St. Petersburg route via the Suez Canal** (16,066 km, ~40 days).

Significance of the Corridor

1. **Economic and Trade Benefits**:
   - **Logistics Efficiency**: Reduces travel time and costs, enhancing trade competitiveness.
   - **Maritime Sector Growth**: Supports **India's maritime industry**, which handles **95% (by volume)** and **70% (by value)** of India's trade.
2. **Strategic Alignment**:
   - **India's Maritime Vision 2030**: Complements this initiative, which encompasses over **150 initiatives** aimed at developing the sector.
3. **Regional Influence and Geopolitics**:

- **China's Dominance**: Counters China's influence in the South China Sea and enhances India's presence in Northeast Asia.
- **Act Far East Policy**: Strengthens access to **Russian resources** and builds India's foothold in the **Pacific trade network**.

4. **Energy and Resource Access**: Facilitates access to **natural resources in Russia's Far East**, including hydrocarbons, minerals, and timber.

Comparison with Other Maritime Corridors

1. **India-Middle East-Europe Economic Corridor (IMEEC)**: Announced during the **G20 Leaders' Summit (2023)**and integrates global trade routes across **Asia, Europe**, and the **Middle East**.
2. **International North-South Transport Corridor (INSTC)**: Conceptualized in 2000 to link **Russia's Baltic Sea coast** to **India's Arabian Sea ports via Iran**.

Challenges and Opportunities

Challenges:

1. **Geopolitical Tensions**: Navigating through regions like the **South China Sea** involves potential political and strategic risks.
2. **Infrastructure Gaps**: Requires investment in port infrastructure at both ends and along intermediate ports.
3. **Operational Efficiency**: Needs robust coordination between multiple stakeholders and adherence to maritime security protocols.

Opportunities:

1. **Enhanced Bilateral Ties**: Strengthens the India-Russia partnership by expanding trade and economic cooperation.
2. **Diversified Supply Chains**: Reduces reliance on conventional routes like the Suez Canal, mitigating vulnerabilities.
3. **Regional Integration**: Positions India as a key player in the **Indo-Pacific trade network**.

Rio G20 Summit: Key Highlights and Analysis

Syllabus: GS II - Multilateral Institutions and Global Groupings

About G20 Overview

- **Host Country**: **Brazil**.
- **Theme**: **"Building a Just World and a Sustainable Planet."**
- **History**:
  - Formed in **1999** to address global economic challenges.
  - Now includes economic and social issues, representing **19 countries** and **two regional bodies** (African Union and European Union).
- **Troika (2024)**: **India** (2023 presidency), **Brazil** (2024 presidency), and **South Africa** (2025 presidency).
- **2025 Host**: **South Africa**.

Major Outcomes of the Rio G20 Summit Declaration

Global Alliance Against Hunger and Poverty

- **Aim**: Mobilize finance and knowledge-sharing for country-led programs to combat hunger and poverty.
- **Features**: Focus on **cash transfers**, **school feeding programs**, and **microfinance** initiatives.

Task Force on a Global Mobilization Against Climate Change (TF-CLIMA)

- **Aim**: Address structural barriers and foster **private capital** for climate action.
- **Features**: Integrates climate change into **financial agendas** and promotes **transparent credit rating systems**.

Tropical Forest Forever Facility (TFFF)

- **Aim**: Conserve forests using innovative financing mechanisms.
- **Features**: Mobilizes funds to support **developing countries** in combating deforestation.

G20 Bioeconomy Initiative (GIB)

- **Aim**: Promote sustainable growth through **bio-based innovations**.
- **Features**: Adoption of **10 voluntary principles** for bioeconomy development.

Principles for Just and Inclusive Energy Transitions

- **Aim**: Ensure **equitable energy transitions** globally.
- **Features**:
  - Triple **renewable energy capacity** by 2030.
  - Improve **energy efficiency**.

Voluntary Contributions for Pandemic Preparedness

- **Aim**: Strengthen **global health systems** and promote **universal health coverage**.
- **Features**: Emphasis on **vaccine access** and local **health innovation**.

Roadmap for Multilateral Development Banks (MDBs)

- **Aim**: Reform MDBs for **enhanced lending capacity** and **resource mobilization**.
- **Features**: Includes **capital adequacy reforms** and integration with **private capital**.

Digital Economy and AI Governance

- **Aim**: Promote **responsible AI use** while addressing associated risks.
- **Features**: Establishes **guidelines** for AI in workplaces and emphasizes **digital inclusion**.

Positives

1. **Focus on Inclusion**: Prioritizes reducing **inequalities** through **sustainable policies**.
2. **Climate Action Leadership**: Commits to **net-zero targets** and **biodiversity conservation**.
3. **Health and Education**: Strengthened investments in **health systems** and **digital education**.
4. **Global Collaboration**: Encourages better coordination for **global governance reforms**.

Limitations

1. **Ambiguity in Funding**: Lacks **concrete timelines** or clear financial commitments for key initiatives.
2. **Limited Consensus**: Divergences in national priorities slow progress on **climate action** and financial reforms.
3. **Exclusion of Certain Nations**: Framework favors **major economies**, leaving **smaller nations** underrepresented.
4. **Lack of Enforcement Mechanisms**: Most initiatives depend on **voluntary participation** without binding commitments.

India-Maldives Pact for Cross-Border Transactions in Local Currencies

Syllabus: GS III - Indian Economy; International Economic Relations

Context: The Reserve Bank of India (RBI) **and** Maldives Monetary Authority (MMA) **have signed a** Memorandum of Understanding (MoU) **to facilitate cross-border transactions using** local currencies**. This initiative aligns with India's broader strategy to** internationalize the rupee **and reduce** US dollar dependency**.**

About Internationalization of Currency (Rupee)

1. **Definition**: Currency internationalization refers to the global expansion of a **national currency's functions**, enabling it to act as a **unit of account**, **medium of exchange**, and **store of value** in cross-border transactions.
2. **Example**: Promoting the **rupee** for **current account transactions** and **foreign trade** settlements.

Significance of Internationalization of Rupee

1. **Counter Trade Risk**:
   - Reduces **exchange rate risks** by enabling firms to invoice and settle international trade in **local currency**.
2. **Broader Financial Access**:
   - Expands **financing options** and reduces the **cost of capital** for domestic entities in **international markets**.
3. **Reserve Management**:
   - Reduces dependence on **foreign exchange reserves**, lowering costs and minimizing external vulnerabilities.

Challenges in Internationalization of Rupee

1. **Currency Fluctuations**: Initial stages may witness **significant volatility** in currency exchange rates.
2. **Triffin Dilemma**: Global currency obligations may conflict with domestic **monetary control needs**.
3. **Exposure to International Shocks**: Increased **cross-border capital flows** can amplify India's vulnerability to global economic shocks.

Steps Taken Towards Internationalization of Rupee

1. **Rupee Invoicing and Payments**: RBI has allowed **invoicing and payments** for international trade in **Indian Rupee**.
2. **Special Rupee Vostro Accounts**: Promotes the rupee as an **international currency** by allowing foreign banks to maintain accounts in Indian banks.
3. **Currency Swap Agreements**: India has signed **currency swap agreements** with countries like **Japan, Sri Lanka**, and **Bhutan** to promote local currency usage.

Significance of the India-Maldives Pact

1. **Trade Efficiency**: Reduces dependence on **third-party currencies** like the US dollar, simplifying trade settlements.
2. **Cost Reduction**: Lowers transaction costs for businesses by avoiding **currency conversion fees**.
3. **Strengthened Bilateral Relations**: Enhances **economic integration** and deepens financial cooperation between India and the Maldives.

2nd India-Australia Annual Summit: Strengthening Strategic Partnership

Syllabus: International Relations, India-Australia Relations

Context and Overview

- **Event**: 2nd India-Australia Annual Summit
- **Location**: Rio de Janeiro, during the G20 Summit
- **Leaders**: Prime Ministers **Narendra Modi** (India) and **Anthony Albanese** (Australia)
- **Objective**: To **reinforce** and **expand** the **Comprehensive Strategic Partnership** between India and Australia.

Key Highlights of the Summit

1. **Extension of the Australia-India Business Exchange (AIBX) Programme**:
   - **Duration**: Extended for **4 more years** from **July 2024**.
   - **Purpose**: To provide businesses with **market insights** and foster **commercial partnerships** between India and Australia.
   - **Impact**: Strengthens **economic ties** by facilitating **business cooperation** and **trade opportunities**.
2. **Launch of the India-Australia Renewable Energy Partnership (REP)**:
   - **Focus Areas**: Solar photovoltaic (PV), **green hydrogen**, and **energy storage**.
   - **Objective**: To establish a **framework for practical cooperation** in **renewable energy**, aligning both countries' efforts to accelerate **climate action**.
   - **Significance**: Promotes **sustainable development**, leveraging both countries' strengths in **clean energy technologies**.

Additional Developments Discussed

1. **Defense and Maritime Security Cooperation**:
   - **Objective**: Enhance **defense ties** and **maritime security** cooperation between India and Australia.
   - **Emphasis**: Joint efforts and **future benefits** in maintaining **regional security**.
2. **Economic Collaboration**:
   - **Sectors**: Solar manufacturing, **battery production**, and **mineral processing**.
   - **Goal**: To **strengthen economic cooperation**, focusing on **investment** and **technology transfer**.

DEFENCE & INTERNAL SECURITY

RBI's 'Internal Risk Assessment Guidance' on Money Laundering and Terrorist Financing

Syllabus: GS III - Internal Security (Money Laundering and Terror Financing)

Context: The **Reserve Bank of India (RBI)** has issued **Internal Risk Assessment Guidance** to tackle **Money Laundering (ML)** and **Terrorist Financing (TF)** risks by adopting a **data-driven and risk-based approach**.

Key Focus of Guidelines

1. **Data-Driven Quantitative Approach**: Leverages data analytics to identify and mitigate risks related to financial fraud.
2. **Risk-Based Framework**: Emphasizes comprehensive compliance, due diligence, and continuous monitoring of financial systems to address risks effectively.

Relevance of Guidelines

1. **Rising Fraud Cases**:
   - As per the **RBI Annual Report (2023-24)**, fraud cases increased significantly:
     - **2022-23**: 13,564 cases.
     - **2023-24**: 36,075 cases.
2. **Global Economic Loss**: **UNODC** estimates annual laundering of **$800 billion to $2 trillion**, equivalent to **2–5% of global GDP**.

Risks Associated with Money Laundering and Terrorist Financing (ML/TF)

1. **Political Risks**: Undermines stability by **weakening national governance** and promoting corruption.
2. **Security Risks**: Funds **terrorist activities**, including those linked to groups like **ISIL or Al Qaeda**.
3. **Economic Risks**: **Credit frauds** divert funds from productive sectors, destabilizing the financial ecosystem.
4. **Social Risks**: Creates **social discord**, promotes **communal tensions**, and fuels crimes.

Global and Indian Initiatives Against ML/TF

Global Efforts

1. **Palermo Convention (2000)**: International treaty to combat **transnational organized crime**, including money laundering.
2. **FATF AML/CFT Framework**: Provides global standards to address **anti-money laundering (AML)** and **counter-terrorist financing (CFT)** issues.

India's Efforts

1. **The Prevention of Money Laundering Act, 2002 (PMLA)**: Primary legislation to combat money laundering and confiscate illicit assets.
2. **Financial Intelligence Unit (FIU-IND)**: Monitors and investigates suspicious financial transactions.
3. **Enforcement Directorate (ED)**: Enforces PMLA and other financial crime-related regulations.
4. **Foreign Exchange Management Act, 2000 (FEMA)**: Regulates cross-border financial transactions to prevent misuse for illicit purposes.

Parliamentary Standing Committee Reviews Indian Coast Guard's Role in Coastal Security

Syllabus: GS III - Internal Security (Role of Security Forces and Agencies)

Context: The **Parliamentary Standing Committee on Defence** reviewed the **Indian Coast Guard's (ICG)** operational capabilities and strategic initiatives, focusing on addressing India's coastal security challenges.

Security Concerns along India's Coastline

1. **Terrorist Maritime Infiltration**:
   - Threat of sea-based attacks, as seen in the **2008 Mumbai attacks**.
2. **Maritime Trafficking**:
   - Smuggling of **gold, luxury items, and drugs**.
   - Potential use of maritime routes for **illegal trade**.
3. **Industrial and Strategic Vulnerabilities**:
   - **Special Economic Zones (SEZs)** located along the coast.
   - Critical installations like:
     - **Oil and gas refineries**.
     - **Offshore platforms**.
     - **13 major ports**, handling **90% of India's maritime trade**.
4. **Strategic Installations at Risk**:
   - Naval commands at **Visakhapatnam, Mumbai, Kochi, and Port Blair**.
   - Nuclear power plants at **Tarapur, Kudankulam, and Kalpakkam**.
5. **Other Challenges**:
   - **Poor coordination** among agencies.
   - **Illegal fishing** and **marine pollution**.
   - Vulnerability to **natural disasters**.

Steps Taken to Strengthen Coastal Security

Organizational Initiatives

1. **NCSMCS (National Committee for Strengthening Maritime and Coastal Security)**: A national forum for reviewing **coastal security measures**.
2. **National Command Control Communications and Intelligence**: Ensures **enhanced surveillance** across coastal regions.
3. **Maritime Domain Awareness (MDA)**:
   - Strengthened through the **Coastal Surveillance Network (CSN)**, incorporating: **Radars, sensors**, and the **Automatic Identification System (AIS)**.

Procedural Initiatives

1. **SAGAR Initiative**: Focuses on ensuring security and growth in the region.
2. **Sea Vigil Exercise**: Biennial exercise to assess coastal security readiness.
3. **Coastal Security Scheme**: Implements infrastructure and logistical support for coastal states.

About the Indian Coast Guard (ICG)

1. **Legal Framework**: Established under the **Coast Guard Act of 1978**.
2. **Objective**: Safeguards **India's 11,098 km coastline** and ensures the security of **maritime trade routes**.

3. **Functions**:
   - Protecting offshore installations and assisting fishermen.
   - Preserving the marine environment and preventing pollution.
   - Supporting **anti-smuggling operations** and enforcing **maritime laws**.
4. **Ministry**: Functions under the **Ministry of Defence**.

ECONOMY

Intellectual Property Rights: India's Rising Innovation Power

Syllabus: GS III - Intellectual Property Rights and Related Issues

Context: The **World Intellectual Property Organization (WIPO)**, in its 2024 **World Intellectual Property Indicators (WIPI)** report, recognized **India's exceptional growth in patents, trademarks, and industrial designs**, solidifying its role as a global innovation leader.

Understanding Intellectual Property Rights (IPR)

***Definition: Intellectual Property Rights (IPR)**: Legal protections for the creations of the mind, such as innovations, designs, and artistic works.*

Objectives

1. **Encourage Innovation**: Grant exclusive rights to creators.
2. **Fair Competition**: Balance innovation with public interest.
3. **Protect Cultural Heritage**: Safeguard traditional knowledge and regional products.

Types of IPR

1. **Patents**: Protect inventions with novelty, industrial application, and non-obviousness.
2. **Copyrights**: Cover artistic and literary works (e.g., books, music, software).
3. **Trademarks**: Identify goods/services with distinctive signs or symbols.
4. **Industrial Designs**: Protect the functional and aesthetic design of products.
5. **Geographical Indications (GIs)**: Link products to specific regions (e.g., **Darjeeling Tea**).
6. **Trade Secrets**: Protect confidential business information.

International Conventions on IPR

1. **Paris Convention (1883)**: Protects industrial property globally.
2. **Berne Convention (1886)**: Focuses on international copyright protection.
3. **Patent Cooperation Treaty (1970)**: Simplifies global patent applications.
4. **Budapest Treaty**: Recognizes microorganism deposits in patent processes.
5. **Marrakesh Treaty**: Enhances access to works for visually impaired individuals.

IPR Laws in India

1. **Patents Act, 1970**: Governs patents and their protections.
2. **Designs Act, 2000**: Covers industrial designs.
3. **Trademarks Act, 1999**: Manages trademark registrations.
4. **Geographical Indications Act, 1999**: Protects region-specific products.

5. **Copyright Act, 1957**: Protects creative and literary works.
6. **CIPAM** (Cell for IPR Promotion and Management): Oversees IPR policy implementation.

India's Performance in the 2024 WIPO Report

1. **Patents**:
   - Ranked **6th globally** with **64,480 filings** (15.7% growth).
   - **55.2% filings by residents**, reflecting local innovation.
2. **Trademarks**:
   - Ranked **4th globally** with a **6.1% increase** in filings.
   - **90% of filings by residents**, indicating domestic brand awareness.
3. **Industrial Designs**:
   - Applications grew by **36.4%**, showcasing product innovation.
4. **Patent-to-GDP Ratio**:
   - Improved from **144 (2013)** to **381 (2023)**, reflecting an innovation-driven economy.

Advantages of IPR

1. **Promotes Innovation**: Provides exclusive rights to inventors, encouraging further development.
2. **Boosts Economic Growth**: Licensing IP assets contributes to national revenues.
3. **Encourages Fair Competition**: Protects unique business identities and builds consumer trust.
4. **Supports Research**: Patented information fosters advancements in technology and science.
5. **Preserves Culture**: Protects traditional knowledge and benefits indigenous communities.

Government Initiatives on IPR

1. **National IPR Policy, 2016**: Streamlines laws and simplifies processes.
2. **KAPILA Program**: Raises awareness about IP filing in academic institutions.
3. **Startup India**: Offers IP support to startups and reduces costs.
4. **Atal Innovation Mission (AIM)**: Encourages entrepreneurship through initiatives like Tinkering Labs.
5. **Digital Modernization**: Digitizes filing processes to enhance efficiency.
6. **SPRIHA Program**: Integrates IPR education into higher learning institutions.

Challenges in IPR

1. **High Costs**: Registration and enforcement are expensive for small businesses.
2. **Patent Evergreening**: Misuse of patents to extend monopolies, especially in pharmaceuticals.
3. **Piracy**: Unauthorized use or copying of IP despite legal protections.
4. **Global Disparities**: Variations in IPR laws hinder consistent global protection.
5. **Limited Awareness**: Lack of IPR knowledge, especially in rural areas, impacts utilization.

High-Performance Buildings (HPBs): A Sustainable Approach to Urban Resilience

Syllabus: GS III - Climate-Resilient Infrastructure

Context: **High-Performance Buildings (HPBs)** are emerging as essential tools for addressing challenges posed by **climate change**, rising **urbanization**, and increasing **energy demands**. These structures prioritize **resource conservation**, **energy efficiency**, and **resilience to extreme weather events**, making them integral to sustainable urban development.

High-Performance Buildings (HPBs)

Definition

- **HPBs** are designed to:
  - Maximize **energy efficiency**.
  - Minimize **resource consumption**.
  - Provide **resilience** against unpredictable climatic conditions.

Need for HPBs

1. **Carbon Emissions**:
   - Buildings contribute **28% of global energy-related emissions**.
   - In India, the sector accounts for **20% of national emissions**.
2. **Urbanization**: By **2030**, India's urban population is projected to reach **600 million**, increasing the demand for sustainable infrastructure.
3. **Global Goals**: Meeting the **UN goal** of a **30% energy efficiency improvement** in buildings by 2030 requires urgent adoption of HPBs.

Key Features of HPBs

1. **Integrative Design**:
   - Promotes **collaboration** among architects, engineers, and building owners to achieve measurable performance targets.
   - Uses **digital modeling** to predict outcomes and refine designs.
   - Example: **Passive design strategies** that utilize natural sunlight and thermal mass to reduce heating and cooling needs.
2. **Sustainable Materials**:
   - Prioritize materials with:
     - **Low embodied carbon**.
     - **High recycled content**.
   - Ensure **low-emission materials** to improve indoor air quality.
   - Example: **Indian Institute of Human Settlements (IIHS)** uses lifecycle assessments to select durable materials for its Bengaluru campus.
3. **Energy Efficiency**:
   - **Passive Strategies**: Utilize natural light, orientation, and thermal mass to minimize energy reliance.
   - **Active Strategies**: Employ energy-efficient HVAC systems, smart technologies, and renewable energy sources.
   - Example: **Infosys Hyderabad campus** uses radiant cooling systems and daylighting controls to reduce energy use.
4. **Water Conservation**:
   - Install **low-flow fixtures** and **dual-flush toilets**.
   - Incorporate **rainwater harvesting** and **wastewater recycling**.
   - Example: Infosys campuses recycle **100% of wastewater** using advanced treatment systems.
5. **Handling Climate Risks**:
   - Include features like **flood protection**, durable materials, and renewable energy systems.
   - Ensure **passive survivability** to maintain functionality during power outages.
   - Example: **Infosys Crescent building** in Bengaluru integrates advanced cooling systems to consume significantly less energy.

India's Initiatives for Energy-Efficient Buildings

1. **Eco-Niwas Samhita**: Focuses on energy efficiency in residential buildings.
2. **Energy Conservation Building Code (ECBC)**: Sets performance standards for **commercial buildings**.
3. **Energy Conservation (Amendment) Act, 2022**: Expands efforts to enhance energy efficiency across sectors.
4. **NEERMAN Awards**: Recognizes innovation in sustainable building practices.
5. **Green Rating for Integrated Habitat Assessment (GRIHA)**: Promotes **sustainable construction practices** and certifications.

Limitations of HPBs

1. **Operational Neglect**: Emphasis on **initial costs** often ignores long-term operational benefits.
2. **Diverse Typologies**: Variations across building types complicate **standardization** of energy efficiency metrics.
3. **Split Incentives**: Owners bear costs, while tenants reap benefits, reducing support for upgrades.
4. **Loss of Indigenous Knowledge**: Overreliance on foreign technologies sidelines **cost-effective local solutions**.
5. **Fragmented Systems**: Lack of integration between **design, construction, and operations** hinders optimal building performance.

Central Value Added Tax (CENVAT) Credit: Landmark Supreme Court Judgment

Syllabus: GS III - Indian Economy; Taxation Reforms

Context: The Supreme Court **has allowed** telecom companies **to claim** CENVAT credit **for the installation of** mobile towers **and** prefabricated buildings (PFBs)**, marking a significant precedent in tax jurisprudence.**

About Central Value Added Tax (CENVAT)

1. **What is CENVAT**:
   - A **tax credit system** enabling manufacturers or service providers to claim **set-offs** on **excise duty** or **service tax** paid on **inputs** or **input services** used for manufacturing or providing **output services**.
2. **Rules Governing CENVAT**:
   - Governed under the **CENVAT Credit Rules, 2004**, which replaced the **Modified Value Added Tax (MODVAT)**.
   - These rules define:
     - **Eligible goods** and **input services**.
     - **Conditions** for availing credit.
3. **Criteria for CENVAT Credit**:
   - **Inputs**: Goods used **directly or indirectly** in producing final products.
   - **Capital Goods**: Machinery or equipment integral to the manufacturing process.
   - **Output Services**: Taxable services where input credits offset service tax liability.
   - **Partial Processing**: Credits are allowed for **partially processed goods**.

Significance of CENVAT

1. **Avoids Double Taxation**: Prevents **repeated taxation** on the same value addition by ensuring seamless credit transfers.
2. **Simplifies Taxation**: Reduces the **tax burden** on manufacturers and service providers, streamlining compliance.
3. **Promotes Competitiveness**: Encourages businesses to reinvest savings in **production** and **innovation** by lowering operational costs.
4. **Consumer Benefit**: Reduces the overall cost of goods and services, eliminating **cascading taxes**.

Landmark Supreme Court Ruling

1. **Judgment**: Telecom companies can now claim **CENVAT credit** for **mobile tower installations** and **prefabricated buildings**, previously contested as non-eligible inputs.
2. **Implications**:
   - Expands the scope of CENVAT credit eligibility.
   - Reduces financial burdens on telecom service providers, potentially lowering costs for consumers.
   - Sets a precedent for other industries to claim broader input tax credits.

Work from Home (WFH) in the Indian Context: Key Findings from CII and FMS Joint Study

Syllabus: GS III - Indian Economy; Employment Trends and Organizational Practices

Benefits of WFH

Organizational Level

1. **Savings**: Over **25% savings** in **office rental costs**, travel for meetings, and other operational expenses.
2. **Productivity**: Reduced **commutation stress**, leading to higher **employee productivity** and energy levels.
3. **Macro-Environment**:
   - Reduced **carbon footprint**, aiding organizations in meeting their **ESG (Environment, Social, and Governance)** goals.
   - Broader talent pool with the ability to hire **spatially distant employees**.

Employee Level

1. **Savings**:
   - Significant reduction in **commuting time and costs**.
   - Flexibility to reside in **affordable peripheral areas**.
2. **Family Relationships**:
   - Strengthened **kinship ties**.
   - Beneficial for **parents with young children** and caregivers.
   - Improved **work-life balance**.

Implications of WFH

Organizational Level

1. **Communication**:
   - Less effective **communication**, impacting **teamwork**.
   - Challenges in maintaining and developing **organizational culture**.

Employee Level

1. **Work Environment**:
   - Frequent **disruptions** and lack of dedicated workspaces at home lead to **increased stress**.

Family Relationships

1. **Negative Impacts**:
   - Rise in **domestic violence incidents**.

- Increased pressure on **women** due to overlapping professional and domestic responsibilities.

Way Ahead

1. **Hybrid Work Model**:
   - Combine advantages of **face-to-face collaboration** with the flexibility of **WFH**.
   - Employees can work **in-office on certain days**, ensuring balance between productivity, culture-building, and individual flexibility.

Indian MSMEs: Key Highlights and Contributions

Syllabus: GS III - Indian Economy, Employment, and Industrial Growth

Context: The **Udyam Portal**, launched by the **Ministry of Micro, Small and Medium Enterprises (MSME)**, reveals significant growth in the MSME sector over the last **15 months**, creating **10 crore jobs**, including **5.23 crore jobs held by women**.

Status of MSME Sector

1. **High Growth in Registered MSMEs**: Growth from **2.33 crore** (August 2023) to **5.49 crore** enterprises.
2. **Employment Boost**:
   - Employment generated increased from **13.15 crore** to **23.14 crore** jobs.
   - **Women's Participation**: Women hold **5.23 crore** jobs in the sector.

Significance of MSMEs

1. **Economic Contribution**: MSMEs contribute **30% to India's GDP** and **46% of total exports**.
2. **Regional Development**: Decentralizes **economic activities**, promoting **balanced growth** in rural and semi-urban areas.
3. **Diversification**: Reduces dependence on single industries by operating across various sectors.
4. **Support to Large Industries**: Adds value with specialized **products and services** for large-scale industries.

Steps Taken by the Government

1. **Collateral-Free Loans**: Loans up to **₹500 lakh** with **85% guarantee coverage** under the **Credit Guarantee Scheme**.
2. **Unified Classification for MSMEs**: Removed the distinction between **manufacturing** and **service sectors**, introducing a **turnover criterion** for classification.
3. **Public Procurement Policy**: Mandates **25% of annual procurement** by Central Ministries from **Micro and Small Enterprises**.
4. **PM Vishwakarma Scheme**: Supports **traditional artisans and craftspeople**, integrating them into **domestic and global value chains**.

Challenges Faced by MSMEs

1. **Formalization and Inclusion**: Many MSMEs remain **unregistered** or lack formal structures.
2. **Limited Access to Credit**: High reliance on informal credit sources due to limited access to **affordable capital**.
3. **Technology Gap**: Lack of access to **digital tools** and **technological advancements**.
4. **Infrastructural Bottlenecks**: Poor infrastructure impedes the operational efficiency of MSMEs.

Definition of MSMEs (Post-Revised Classification)

Parameter	*Micro*	*Small*	*Medium*
Investment	≤ ₹1 Crore	≤ ₹10 Crore	≤ ₹50 Crore
Annual Turnover	≤ ₹5 Crore	≤ ₹50 Crore	≤ ₹250 Crore

Indian Gig Firms: Potential for Global Leadership

Syllabus: GS III - Employment, Startups, and Economic Growth

Context: **India's** Finance Minister **highlighted the transformative potential of** startups **and the** gig economy**, asserting their ability to establish** "Brand India" **globally.**

What is the Gig Economy?

1. **Definition**: A labor market characterized by **task-based**, **piece-work**, or short-term **gigs**.
2. **Features**:
   - **Temporary contracts** and **independent assignments**.
   - Flexible work timings, often mediated through **digital platforms**.

Status in India

1. **Worker Engagement**:
   - Approximately **77 lakh workers** engaged in 2020-2021.
   - Projected to expand to **2.35 crore by 2029-30** (NITI Aayog).
2. **Growth Drivers**:
   - Rapid **urbanization** and expanding **middle-class consumption demands**.
   - Emergence of **informal economies** and a tech-savvy, **aspirational workforce**.

Opportunities in the Gig Economy

1. **Emerging Markets**: Fast-growing markets offering **diverse services**.
2. **E-commerce and Delivery**: Potential for **diversification** and **massive growth** in delivery and digital commerce.
3. **Global Branding**: Platforms can position **India** as a leader in the **gig and startup ecosystem**.

Challenges Faced by the Sector

1. **Lack of Social Security**: No access to **paid leave**, **insurance**, or **benefits**.
2. **Employment Uncertainty**: Absence of formal contracts leads to **job instability**.
3. **Exploitation Risks**: Lack of **legal status** for employees exposes them to **low pay** and poor working conditions.
4. **Implementation Challenges**: Overlapping definitions of **gig** and **platform workers** hinder effective policy execution.

Steps to Strengthen the Gig Economy

1. **Role of Employers and EBMO**: Foster **social dialogue** and create policies promoting **worker protection** and **growth** (ILO).
2. **Platform India Initiative**: Inspired by **Startup India**, this initiative aims to promote **platformization** through funding and support (NITI Aayog).
3. **Extend Social Security**: Provision of **paid sick leave**, **insurance**, and other welfare measures for gig and platform workers.

India's Initiatives

1. **Code on Social Security, 2020**: Defines and categorizes **gig workers**, **platform workers**, and **unorganized workers**, recognizing their contributions.
2. **e-Shram Portal**: Creates a **comprehensive national database** of unorganized workers, including gig and platform workers.
3. **Open Network for Digital Commerce (ONDC)**: Aims to **democratize digital commerce** by moving from a platform-centric model to an **open network**, ensuring inclusivity.

SOCIETY & SOCIAL ISSUES

Improved Women Employment Indicators in Periodic Labour Force Survey (PLFS)

Syllabus: GS III - Economy (Employment); GS I - Society (Role of Women in Workforce)

Context: The latest **Periodic Labour Force Survey (PLFS)** data shows significant improvement in women's labor participation indicators over the last six years, reflecting better inclusion of women in the workforce.

Key Trends in Women Labor Participation (2017-18 to 2023-24)

1. **Worker Population Ratio (WPR) for Women**: **Doubled** from **22%** in **2017-18** to **40%** in **2023-24**.
2. **Labor Force Participation Rate (LFPR) for Women**: Increased from approximately **23%** to **41%**.
3. **Unemployment Rate (UR)**: Reduced from **~5.6%** in 2017-18 to **3.2%** in 2023-24.
4. **Rural Female LFPR**: Witnessed a **23-percentage point increase**, from **~25%** in 2017-18 to **~48%** in 2023-24.
5. **Educated Women in Workforce**: Proportion of **post-graduate and above** women in the workforce increased from **35%** in 2017-18 to **40%** in 2023-24.
6. **Earnings Growth for Self-Employed Women**: Steady improvement in earnings for **self-employed female workers**.

Key Indicators Used in PLFS

1. **Worker Population Ratio (WPR)**: Percentage of **employed persons** in the total population.
2. **Labor Force Participation Rate (LFPR)**: Percentage of persons in the **labor force** (working, seeking, or available for work) in the population.
3. **Unemployment Rate (UR)**: Percentage of **unemployed persons** among the labor force.

Barriers to Women's Labor Force Participation

1. **Social Barriers**:
   - **Childcare and household commitments**.
   - Influence of **fertility rates** and **age of marriage** on women's availability for work.
2. **Economic Factors**:
   - **Lack of suitable employment opportunities**.
   - Effect of **household income** on labor participation decisions.
3. **Educational Barriers**: Focus on **higher qualifications** delays entry into the workforce.
4. **Other Barriers**: **Poor infrastructure**, rural living conditions, and **inadequate care systems**.

Government Initiatives Promoting Women's LFPR

1. **Legislative Actions**:
   - **Maternity Benefit (Amendment) Act, 2017**: Enhances maternity leave and workplace facilities.
   - **Equal Remuneration Act, 1976**: Ensures gender equality in wages.
2. **Skill Development and Employment Programs**:
   - **Skill India Mission**: Promotes women's technical skill enhancement.
   - **Stand-Up India**: Facilitates credit access for women entrepreneurs.
   - **National Rural Livelihood Mission (NRLM)**: Encourages women's participation in rural enterprises.

GEOGRAPHY AND DISASTER MANAGEMENT

Panchachuli Mountain Range: A Glacial Marvel at Risk

Syllabus: GS I - Geography (Physical Features) and GS III - Environment (Climate Change and Conservation)

Context: **Environmental degradation** is intensifying in **Uttarakhand's Pithoragarh** district as increased tourism and emissions contribute to **accelerated glacier melting** in the **Panchachuli Mountain Range**.

About Panchachuli Mountain Range

Key Features

1. **Group of Five Peaks**: The **Panchachuli Range** comprises **five snow-capped peaks**, forming part of the **Kumaon Himalayas** in **Uttarakhand, India**.
2. **Altitude Range**:
   - Peaks range from **6,334 m (20,781 ft)** to **6,904 m (22,651 ft)**.
   - **Panchachuli II** is the tallest in the group.
3. **Geographical Location**:
   - Lies at the **watershed** between the **Gori Ganga** and **Darmaganga valleys**.
   - Located near **Munsiyari** on the **Gori Ganga-Lassar Yankti divide**.

Cultural and Historical Significance

1. **Mythological Legend**: The peaks are named after the **Pandavas' "Five Chulis" (cooking hearths)** from the Mahabharata.
2. **First Ascent**: **Panchchuli II** was first scaled by the **Indo-Tibetan Border Police (ITBP)**, led by **Mahendra Singh**, on **May 26, 1973**.

Tourism and Environmental Impact

Tourism Potential

1. **Accessibility**: Located **138 km from Pithoragarh**, the range attracts **trekkers**, **mountaineers**, and **pilgrims**.
2. **Natural Beauty**: Offers breathtaking views and serves as a hub for adventure tourism.

Environmental Concerns

1. **Glacier Melting**: Human activities, emissions, and global warming accelerate the melting of **Panchachuli glaciers**.

2. **Degradation from Tourism**: **Unregulated trekking and infrastructure development** harm the fragile ecosystem.

Indian Ocean Dipole (IOD): Impacts on Climate and Coastal Ecosystems

Syllabus: GS I - Geography (Climatic Phenomena); GS III - Environment (Climate Change)

Context: A study links **mangrove dieback in the Maldives** to **sea-level rise** and extreme **Indian Ocean Dipole (IOD)**events, underscoring the climate phenomenon's influence on regional ecosystems and weather patterns.

About the Indian Ocean Dipole (IOD)

1. **Definition**: The IOD refers to the **difference in sea surface temperatures (SSTs)** between the **Eastern Indian Ocean**(near Indonesia) and the **Western Indian Ocean** (near Africa).
2. **Phases of IOD**:

   Positive Phase:

   - **Warm waters** are pushed towards the **Western Indian Ocean**, and **cold deep waters** rise in the **Eastern Indian Ocean**.
   - Results:
     - **Heavy rains** along coastal Africa.
     - **Droughts** in Australia and Southeast Asia.

   Negative Phase:

   - SSTs and rainfall patterns are **reversed**:
     - **Warmer Eastern Indian Ocean** causes rains in Indonesia and Australia.
     - **Drier conditions** prevail in Africa.
3. **Impact on Sea Levels**:
   - Associated changes in **sea levels** increase the risk of **coastal flooding**, affecting vulnerable regions like the **Maldives**.

Key Impacts of IOD

1. **Weather Extremes**: Drives **heavy rainfall, droughts**, and **cyclones** in the Indian Ocean region.
2. **Coastal Ecosystems**: **Mangrove dieback** in low-lying islands like the Maldives due to sea-level rise during extreme IOD phases.
3. **Fisheries and Livelihoods**: SST fluctuations impact **marine biodiversity** and disrupt **fishing industries**.
4. **Global Climate Linkages**: The IOD interacts with other phenomena like **El Niño**, amplifying climate variability globally.

CDRI Announces 12 Projects for Resilient Infrastructure in SIDS

Syllabus: GS III - Disaster Management; Climate-Resilient Infrastructure

Context: The **Coalition for Disaster Resilient Infrastructure (CDRI)** announced funding for **12 projects** across **17 Small Island Developing States (SIDS)** under its **Infrastructure for Resilient Island States (IRIS)** initiative, launched at **COP26**.

About the Infrastructure for Resilient Island States (IRIS)

- **Launch**: Introduced during the **World Leaders Summit at COP26**, IRIS focuses on achieving **sustainable development** in SIDS.
- **Objective**: Promotes **resilient, sustainable, and inclusive infrastructure** through a **systemic approach** tailored to the unique vulnerabilities of SIDS.

About Small Island Developing States (SIDS)

1. **Geographical Spread**:
   - Located in three regions:
     - **Caribbean**
     - **Pacific**
     - **Atlantic, Indian Ocean, and South China Sea (AIS)**
2. **Recognition**:
   - Recognized as a distinct group at the **1992 United Nations Conference on Environment and Development (UNCED)**.
   - Comprises **39 States** and **18 Associate Members** of UN regional commissions.
3. **Vulnerability**:
   - Highly prone to disasters such as **cyclones, floods, droughts, sea-level rise, earthquakes, and tsunamis**.
   - **Disaster Mortality**: More than double the **global average** (Sendai Framework Monitor data).
   - **Economic Losses**:
     - Average **2.1% of GDP loss** annually due to disasters (global average: **0.3%**).

Need for Disaster-Resilient Infrastructure in SIDS

- **High Exposure**: Geographical isolation and small economies make them highly vulnerable to climate hazards.
- **Economic Impact**: Frequent disasters result in disproportionate losses in GDP and disrupt development gains.
- **Climate Change Threats**: Sea-level rise and extreme weather events exacerbate existing vulnerabilities.

About Coalition for Disaster Resilient Infrastructure (CDRI)

1. **Launch**: Established in **2019** during the **UN Climate Action Summit**.
2. **Objective**: Promotes resilience in **new and existing infrastructure systems** through partnerships.
3. **Membership**: Comprises **40 countries** and **7 international organizations**.
4. **Governance**: Governing Council is **co-chaired by representatives of two national governments**, with **India as the permanent co-chair**.

Significance of the IRIS Initiative

1. **Disaster Risk Reduction**: Builds **climate-resilient infrastructure** to mitigate vulnerabilities in disaster-prone SIDS.
2. **Economic Stability**: Reduces economic losses by protecting critical infrastructure.
3. **Sustainability**: Aligns with global frameworks like the **Sendai Framework for Disaster Risk Reduction** and the **Paris Agreement**.
4. **Inclusive Growth**: Enhances access to **sustainable infrastructure** in small and vulnerable economies.

Bomb Cyclone

Syllabus: GS I - Physical Geography (Weather Phenomena); GS III - Disaster Management

About Bomb Cyclone

- **Definition**: Also called **bombogenesis**, it refers to a **mid-latitude cyclone** (low-pressure system) that undergoes **rapid intensification**, with a **central air pressure drop of at least 24 millibars in 24 hours**.
- **Occurrence**: Majority form over **oceans**, and they can be either **tropical** or **non-tropical** in nature.
- **Weather Conditions**: Often accompanied by **blizzards**, **severe thunderstorms**, or **heavy precipitation**, depending on the location and season.

Recent Event

- **Region**: Struck the **Northwestern US** and **Western Canada**.
- **Impact**: Caused severe weather disruptions, including **snowstorms**, **strong winds**, and **heavy rainfall**.

Significance

- **Disaster Preparedness**: Such events highlight the need for **early warning systems** and **disaster mitigation measures**.
- **Understanding Climate Patterns**: Helps in studying **extreme weather phenomena** linked to **climate change** and its cascading effects.

Bomb cyclones underscore the increasing importance of robust **meteorological research** and **preparedness mechanisms**in mitigating their adverse impacts.

Cold Wave

Syllabus: GS III - Environmental Pollution and Climate Change; Disaster Management

About Cold Waves

- **Definition**: Weather phenomena characterized by **extremely low temperatures** in the **near-surface atmosphere**.
- **IMD Criteria for Cold Wave**:
  - **Plains**: Minimum temperature ≤ **10°C**.
  - **Hilly Regions**: Minimum temperature ≤ **0°C**.

Impacts of Cold Waves

1. **Health Risks**:
   - **Frostbite**, hypothermia, and other **cold-related illnesses**.
   - Exacerbation of respiratory and cardiovascular conditions.
2. **Economic Costs**:
   - Increased **heating costs** for households and public infrastructure.
3. **Impact on Vulnerable Sections**:
   - Greater risks for the **elderly**, **children**, and those without proper shelter.
   - Disproportionate impact on **homeless populations** and marginalized communities.

Recent Advisory

- **Issued By**: National Programme on Climate Change and Human Health (**NPCCHH**), under the **Ministry of Health and Family Welfare**.
- **Purpose**: To guide states on mitigating the health impacts of **cold wave conditions**.

Significance

- Cold waves highlight the importance of **preparedness strategies**, such as shelter provisions, public health advisories, and infrastructure adaptation to mitigate risks for vulnerable populations.

HISTORY, ART & CULTURE

Willingdon Island: Reviving a Historic Maritime Hub

Syllabus: GS I - Indian Heritage and Culture; GS III - Infrastructure and Economy

Context: **Willingdon Island**, once a key port hub in Cochin, has lost prominence since **container operations moved to Vallarpadam** in 2011. Stakeholders are now advocating for its revival through a blend of **tourism, commerce, and logistics**, while preserving its rich heritage.

About Willingdon Island

Historical Significance

1. **Built in the 1920s**: **Man-made marvel** constructed by **Sir Robert Bristow** and named after **Viceroy Lord Willingdon**.
2. **Port Hub**: Once the **nucleus of maritime activities** in Cochin, vital for trade and commerce.
3. **Strategic Establishments**:
    - Houses:
        - **Kochi Naval Base** of the Indian Navy.
        - **Central Institute of Fisheries Technology**.
        - **Port of Kochi**.

Decline in Operations

- **Container Terminal Relocation**: Shifted to **Vallarpadam** under a **build-operate-transfer (BOT) model** in **2011**, reducing the island's significance.

Potential for Revitalization

Commerce and Logistics

1. **Coastal and Defence Cargo**: Strategic location for handling **defence-related cargo** and **coastal freight**.
2. **Cold Storage and Freight**: Suitable for developing **cold storage facilities**, **godown networks**, and **container freight stations**.

Tourism Opportunities

1. **Waterfront Appeal**: Perfect setting for **cruise operations**, **luxury yachts**, and **water sports**.
2. **Wellness and Leisure**: Potential for **wellness retreats** and high-end tourism projects.

Challenges to Development

1. **Rigid Land Lease Policies**: Restrictive regulations discourage private investment.
2. **Infrastructural Deficits**: Inadequate **transportation and logistics facilities** impede modernization efforts.
3. **Underutilized Resources**: Lack of vision and coordination limits the island's economic and tourism potential.

Māori Group: Preservers of New Zealand's Indigenous Heritage

Syllabus: GS I - Art and Culture; Society

Context: In New Zealand's parliament, **Māori Party MPs** performed a **haka** to protest the **Treaty Principles Bill**, opposing changes to the historic **Treaty of Waitangi**.

About the Māori Group

Origins and Cultural Roots

1. **Indigenous Polynesian People**: Māori are the **indigenous people of New Zealand (Aotearoa)**, migrating from **East Polynesia** between **1320-1350**.
2. **Distinctive Culture**: Over centuries of isolation, the Māori developed unique traditions encompassing:
   - **Language**: Te Reo Māori.
   - **Mythology**: Rich narratives about gods, creation, and nature.
   - **Craftsmanship**: Includes intricate wood carvings and weaving.
   - **Performing Arts**: Songs, dances, and rituals like the haka.

The Treaty of Waitangi (1840)

1. **Historical Agreement**: Signed between the **Māori chiefs** and the **British Crown** to establish coexistence.
2. **Ongoing Issues**: While it promised **Māori rights and protections**, it has led to **centuries of disputes** over political and economic redress.

Population and Presence

1. **Ethnic Group in New Zealand**: Māori are the **second-largest ethnic group**, after European New Zealanders (**Pākehā**).
2. **Diaspora in Australia**: Over **170,000 Māori** reside in Australia, forming a significant cultural presence.

About Haka: Māori Ceremonial Dance

Definition and Origins

- **Haka**: A **ceremonial dance** in Māori culture symbolizing **pride, strength, and unity**.
- Traditionally an **ancient war dance**, performed by **both men and women**.

Purpose and Usage

1. **Social and Cultural Functions**: Celebrations, welcoming guests, and honoring events.
2. **War Cry/Challenge**: Historically used to **intimidate enemies** or prepare for battle.

Performance Style

- Involves:
  - **Vigorous body movements**.
  - **Rhythmic chanting**.
  - **Foot-stomping and body-slapping** to convey energy and emotion.

UNESCO Sites in News: Safeguarding Cultural Heritage Amid Crises

Syllabus: GS I - Indian Culture; GS III - International Relations (UNESCO Initiatives)

Context: Hundreds of cultural professionals and archaeologists have petitioned the **United Nations** to safeguard **war-torn Lebanon's heritage** ahead of a crucial **UNESCO meeting**, underscoring the vulnerability of global cultural sites amid conflicts.

UNESCO Places in News

Lebanon

1. **Baalbek**:
   - **Location**: Eastern Lebanon.
   - **Significance**: Ancient Roman ruins, showcasing impressive temples and architecture.
   - **UNESCO Status**: World Heritage Site.
2. **Tyre**:
   - **Location**: Southern Lebanon.
   - **Significance**: A historic **Phoenician city** renowned for its harbor and Roman ruins.
3. **Anjar**:
   - **Location**: Beqaa Valley, Lebanon.
   - **Significance**: An **early Islamic city** featuring **Umayyad ruins**, reflecting Islamic urban planning.

Ukraine

1. **Bakhmut**: **Threat**: Historic sites in Bakhmut face severe risks amid the ongoing **Ukraine-Russia conflict**.
2. **Lviv**:
   - **Significance**: A UNESCO World Heritage city known for its **medieval and Renaissance architecture**.
   - **Threat**: Endangered by the conflict, prompting international calls for protection.

About the Hague Convention, 1954

1. **Background**: Adopted under **UNESCO** after witnessing widespread destruction of cultural heritage during **World War II**.
2. **Objective**: Safeguards **cultural property** such as monuments, archaeological sites, artworks, manuscripts, and scientific collections.
3. **Scope**:
   - **During Armed Conflicts**: Protects heritage sites from deliberate destruction or damage.
   - **Peacetime Provisions**: Encourages preparation for safeguarding cultural sites against future threats.
4. **Symbol**: Introduced the **"Blue Shield" emblem** to identify and mark protected cultural heritage sites.
5. **India's Role**: **Signatory** to the convention and actively supports its implementation through initiatives to preserve cultural heritage globally.

Salt Chimneys at Dead Sea: Rare Geological Phenomenon

Syllabus: GS I - Geography (Landforms and Physical Features); GS III - Science and Technology (Environmental Research)

About Salt Chimneys

1. **Formation**: Created by the **upward flow of hypersaline brine** from **aquifers**, causing the crystallization of **halite** (salt) when it contacts the highly saline Dead Sea water.
2. **Characteristics**:
   - Structures measure **1-7 meters** in height and **2-3 meters** in diameter.
   - Grow rapidly, expanding by **several centimeters per day**.
3. **Significance**: Serve as **early indicators of sinkhole risks**, identifying areas prone to **karstification** and ground collapse.
4. **Applications**: Potential use in **autonomous mapping systems** to predict regions at risk of sinkhole formation.

About the Dead Sea

1. **Geographical Location**:
   - Lies between **Jordan**, **Israel**, and the **West Bank**.
   - Found at **430.5 meters below sea level**, making it the **lowest land-based elevation on Earth**.
2. **Salinity**:
   - Contains **34.2% salinity**, making it one of the **saltiest water bodies globally**.
   - Supports only **microorganisms** and **algae**.
3. **Physical Dimensions**: Covers **605 sq. km**, is **50 km long**, and **15 km wide** at its broadest point.
4. **Hydrology**: Fed by the **Jordan River** with no outlet; water is lost primarily through **evaporation**.
5. **Environmental Concerns**:
   - Rapidly **declining water levels** (approx. **1 meter per year**) due to evaporation and reduced tributary flow.
   - Impacts **regional groundwater dynamics**, contributing to the formation of sinkholes and salt chimneys.

Kanhirapoil Megalithic Site: Insights into Prehistoric Heritage

Syllabus: GS I - Art and Culture, Ancient Indian History

Context: Recent excavations at Kanhirapoil**, located in** Kasaragod, Kerala**, unearthed** Megalithic carvings**, shedding light on India's prehistoric rituals and cultural practices.**

About Kanhirapoil Megalithic Site

1. **Discovery Details**:
   - Unearthed on **private property** in **Madikkai Grama Panchayat**, Kasaragod, Kerala.
   - Features **24 pairs of carved footprints** and a **human figure** accompanied by **circular pits**.
2. **Artistic Features**:
   - **Footprints** vary in size (6–10 inches), suggesting representations of **children** and **adults**.
   - Human figure and accompanying carvings reflect **ritualistic significance**.
3. **Cultural Parallels**:
   - Resemble prehistoric **rock art** at **Avalakki Pera** in Udupi.
   - Comparable to carvings in **Edakkal Caves** and **Erikulam Valiyapara**, other notable sites in Kerala.

About Megaliths

1. **Definition**: **Megaliths** are monuments made of **large stones**, often used as **burial sites** located away from settlements.
2. **Chronology**: Dates to the **3rd century BCE to 1st century CE**, as evidenced by **Brahmagiri excavations**.
3. **Geographical Spread**: Found across **Deccan**, **Punjab Plains**, **Indo-Gangetic Basin**, **Rajasthan**, **Gujarat**, and **Burzahom** in Jammu and Kashmir.
4. **Iron Usage**:
   - Characterized by the introduction of **iron tools** for **agriculture** and **weaponry**.
   - Significant findings at **Junapani (Vidarbha)** and **Adichanallur (Tamil Nadu)**.
5. **Cultural Elements**:
   - **Subsistence Practices**: Agriculture, hunting, and animal husbandry.
   - **Rock Paintings**: Depict **hunting scenes**, **cattle raids**, and **group dances**, reflecting social and cultural practices.

Significance of the Findings

1. **Ritualistic Insights**: Carvings suggest possible **ritual practices** involving **footprints** and **human figures**, offering a glimpse into **belief systems**.
2. **Cultural Continuity**: Connections to similar **Megalithic sites** in South India demonstrate **regional cultural unity**.
3. **Archaeological Value**: Enriches understanding of **Megalithic culture**, emphasizing the **importance of rituals** and **artistic expressions** in prehistoric societies.

Excavations at Ramgram for Buddha's Eighth Relic

Syllabus: Ancient History, Cultural Heritage

About Buddha's Relics

1. **Mahaparinirvana and Division of Relics**: After **Lord Buddha's Mahaparinirvana** (final passing) in **Kushinagar**, his cremated remains were divided into **eight parts** and enshrined in **stupas** across different locations.
2. **Locations of Buddha's Relics**:
   - **Rajagaha (Rajgir)**: Capital of the Magadha kingdom.
   - **Vesāli (Vaishali)**: Prominent city in ancient India.
   - **Kapilavatthu (Kapilavastu)**: Buddha's birthplace.
   - **Allakappa**: An ancient republic.
   - **Rāmagāma (Ramgram)**: Capital of the Koliya kingdom.
   - **Veṭhadīpa (Vethadipa)**: A Brahmin settlement.
   - **Pāvā (Pava)**: City of the Malla republic.
   - **Kusinārā (Kushinagar)**: Site of Buddha's Mahaparinirvana.
   - **Moriya of Pipphalivana**: Received the remaining ashes of the funeral pyre.

Significance of Ramgram Stupa

1. **Unique Relic Preservation**: The **Ramgram Stupa**, located in **present-day Nepal**, is the **only intact and original stupa** containing Buddha's relics.
2. **Legend of Emperor Ashoka**: Emperor **Ashoka**, after redistributing Buddha's relics for stupa construction, **refrained** from opening the Ramgram Stupa after being deterred by a **serpent king** guarding the stupa.

Current Excavations at Ramgram

1. **ASI Excavations**: The **Archaeological Survey of India (ASI)** has initiated **excavations** at **Ramgram**, **Uttar Pradesh**, to uncover evidence of **Buddha's eighth relic**, believed to be buried at the site.
2. **Significance**: These efforts contribute to a deeper understanding of **Buddhist heritage** and preserve **historical and spiritual sites** associated with Lord Buddha's life and teachings

AGRICULTURE

FAO Statistical Yearbook 2024: Insights on Global and Indian Agriculture

Syllabus: GS III - Agriculture (Food Security, Employment, and Production)

Context: The **Food and Agriculture Organization (FAO)** released its **Statistical Yearbook 2024**, providing a comprehensive analysis of the state of food and agriculture globally, including key observations on **India's agricultural landscape**.

Key Global Observations

1. **Agriculture's Contribution to Global GDP**:
   - **Stable at ~4%** since 2000.
2. **Global Workforce in Agriculture**:
   - Declined significantly from **40% (2000)** to **26% (2022)**, equating to **892 million workers**.
   - Agriculture remains the **second-largest employment source** after the services sector.
3. **Global Hunger**:
   - Affected **9.1% of the global population in 2023**, a sharp rise from the pre-COVID-19 level of **7.5%**.

Key Findings About India

1. **Cropland Area per Capita**: Decreased from **0.16 ha (2000)** to **0.12 ha (2022)** due to population growth.
2. **Agriculture's Share in GDP**: Dropped from **27.9% (2000)** to **15.9% (2022)**, below:
   - **World Average**: 4.3%.
   - **China's Share**: 7.7%.
3. **Agricultural Employment**: India has the **largest agricultural workforce** globally:
   - **226 million workers** (2022).
   - Followed by **China (170 million)**.
4. **Women's Participation**: Share of women in agriculture increased from **32.2% (2000)** to **36% (2022)**.
5. **Agricultural Production**:
   - **2nd Largest Sugar Producer**: Contributed **19% of global sugar** (after Brazil).
   - **Largest Milk Producer**: Accounted for **23% of global milk production** (2022).
6. **Organic Farming**: **6% of India's area** is under organic farming, making it the **2nd largest globally** after Australia (46%).
7. **Irrigation Infrastructure**:
   - India has the **largest equipped area for irrigation**: **76 million ha**, ahead of **China (75 million ha)**.

Significance of Findings

1. **Global Trends**:
   - Highlights **stagnation in agriculture's GDP contribution** despite its crucial role in employment and food security.
   - Points to the **persistent hunger challenge**, worsened by the pandemic and global crises.
2. **India's Role**:
   - **Largest workforce** in agriculture and significant contributions to **milk and sugar production** underline its pivotal role in global agriculture.
   - **Increasing women's participation** indicates a shift toward gender inclusion in the sector.
   - **Organic farming and irrigation capacity** showcase India's potential for sustainable agricultural practices.

Biofloc Technology (BFT) and Recirculating Aquaculture Systems (RAS): Innovations in Modern Aquaculture

Syllabus: GS III - Science and Technology (Applications in Agriculture); Economy (Fisheries and Aquaculture)

Context: India has emerged as a **global leader in fish production**, driven by advancements like **Biofloc Technology (BFT)** and **Recirculating Aquaculture Systems (RAS)**. These technologies represent sustainable and efficient approaches to aquaculture.

About Biofloc Technology (BFT)

- **What It Is**: A **closed-tank aquaculture method** that uses **beneficial bacteria** to convert organic waste into microbial biomass, which fish can consume.
- **How It Works**:

1. **Beneficial Heterotrophic Bacteria**: Convert waste materials like uneaten feed and fish excreta into microbial biomass.
2. **Aeration**: Maintains dissolved oxygen levels and promotes bacterial activity.
3. **Water Quality**: Ensures quality without reliance on chemicals or antibiotics.

About Recirculating Aquaculture Systems (RAS)

- **What It Is**: A **tank-based farming system** that **recycles water** through mechanical and biological filtration to create a controlled environment.
- **How It Works**:

1. **Water Filtration**: Removes waste products and pathogens using mechanical and biofilters.
2. **Controlled Conditions**: Maintains optimal temperature, oxygen levels, and water cleanliness.
3. **Biosecurity**: Minimizes the use of antibiotics and reduces disease risks.

Comparison Between BFT and RAS

Feature	*BFT*	*RAS*
Cost-effectiveness	Cost-effective feed through **recycled waste**.	Controlled environment enables **optimal fish growth**, but with higher costs.
Advantages	- Reduces chemical and antibiotic use. - Suitable for small farmers and backyard	- High biosecurity with minimal disease risk. - Can operate in areas without natural water

	farming. - Promotes freshwater conservation.	sources. - Achieves higher production rates.
Limitations	- Requires regular monitoring of water quality and microbial growth. - Limited success with species like Indian Major Carps.	- High setup costs (~₹4-5 lakh). - Requires constant power supply and skilled management.

Advantages of Modern Aquaculture Technologies

1. **Environmental Benefits**: **BFT** and **RAS** conserve freshwater and minimize discharge of harmful pollutants into natural water bodies.
2. **Sustainable Growth**: Reduces dependence on antibiotics and chemical inputs, making aquaculture environmentally friendly.
3. **Improved Production**: Achieves higher yields compared to traditional methods while optimizing resource usage.
4. **Adaptability**: Can be implemented in areas with limited water resources or urban spaces.

Limitations and Challenges

1. **High Initial Costs**: Both systems require significant **capital investment**, which can be a barrier for small-scale farmers.
2. **Skilled Management**: RAS demands **technical expertise** for system maintenance and troubleshooting.
3. **Species-Specific Limitations**: **BFT** may not work well with all fish species, such as **Indian Major Carps**, in certain regions.
4. **Energy Dependence**: Both systems rely on **constant electricity**, making them vulnerable to power outages.

Potential for Adoption in India

1. **Government Support**: Subsidies and financial aid under initiatives like the **Blue Revolution Scheme** and **Pradhan Mantri Matsya Sampada Yojana (PMMSY)**.
2. **Export Opportunities**: Increasing global demand for sustainable seafood makes India well-positioned for export growth.
3. **Training Programs**: Capacity-building initiatives to equip farmers with the necessary skills for operating these systems.
4. **Integration with Other Systems**: Combining BFT or RAS with **integrated fish farming** (e.g., aquaponics) for diversified income streams.

Regenerative Agriculture

Syllabus: GS III - Agriculture, Environmental Conservation

Context: The Government of Odisha**, in collaboration with** ICRISAT (International Crops Research Institute for the Semi-Arid Tropics)**, has launched a** 'Compendium of Regenerative Agriculture' **to promote and scale up regenerative agricultural practices.**

About Regenerative Agriculture (RA)

1. **Definition**: A farming approach that prioritizes **soil health** to restore and enhance natural ecosystems.
2. **Key Principles**:
   - **Minimizing Soil Disturbance**: Reduces ploughing, retains **CO2 in the soil**, and enhances water absorbency.
   - **Maximizing Crop Diversity**: Promotes **biodiversity** to improve soil resilience and productivity.
   - **Maintaining Soil Cover**: Protects soil from erosion and moisture loss with continuous cover.
   - **Living Roots Year-Round**: Keeps soil active and nutrient-rich with live roots in all seasons.

- **Integrating Livestock**: Adds natural manure, reduces reliance on synthetic inputs, and improves soil structure.

3. **Significance**:
   - **Improved Crop Yields**: Enhanced productivity through nutrient-rich soil.
   - **Water Retention**: Better absorption and reduced dependency on irrigation.
   - **Reduction in Soil Erosion**: Protects topsoil, maintaining land fertility.
   - **Lower Greenhouse Gas Emissions**: Reduces **carbon release** and increases **carbon sequestration**.

Benefits for Odisha

- **Climate Resilience**: Aids in mitigating the impacts of erratic weather patterns.
- **Sustainable Agriculture**: Ensures long-term productivity and food security for farmers.
- **Economic Growth**: Boosts farmers' income through enhanced yields and reduced input costs.

ENVIRONMENT & ECOLOGY

Global Energy Efficiency Alliance: A Step Towards Sustainable Development

Syllabus: GS III - Environment (Energy Conservation and Climate Change)

Context: During **COP29 in Azerbaijan**, the **UAE announced the establishment** of the **Global Energy Efficiency Alliance** (GEEA), aiming to enhance **global energy efficiency** and tackle carbon emissions effectively.

About Global Energy Efficiency Alliance (GEEA)

- ***Objective: Double annual global energy efficiency rates by 2030*** *and significantly* ***reduce carbon emissions***.
- ***Vision:*** *Aligns with the* ***UAE Consensus from COP28****, focusing on* ***resource optimization*** *and* ***sustainable energy solutions***.

Leadership and Key Role of UAE

1. **Sharing Best Practices**: UAE leads by disseminating successful strategies.
2. **Knowledge Transfer**: Facilitates learning across nations through expertise sharing.
3. **Public-Private Partnerships**: Strengthens cooperation between governments and the private sector.

Key Actions

1. **Investment Promotion**: Encourages funding for **energy efficiency projects** globally.
2. **Policy and Technology Development**: Supports innovative technologies and robust policies for **sustainability goals**.
3. **Standardization**: Advocates uniform energy standards across member nations.
4. **Focus on Africa**: Targets **financial and technological solutions** to improve energy efficiency in African countries.
5. **Global Collaboration**: Invites partnerships with governments, organizations, and private sector stakeholders.

Also in News: International Energy Efficiency Hub (IEEH)

Why in News?

- **India joined the International Energy Efficiency Hub (IEEH)** following approval from the Union Cabinet, chaired by the Prime Minister.

About IEEH

1. **Global Platform**: Established in **2020**, succeeding the **International Partnership for Energy Efficiency Cooperation (IPEEC)**.
2. **Membership**: Includes **16 members**, such as the USA, UK, China, Germany, and Japan, along with international organizations and private entities.
3. **Mission** Aims to advance **global energy efficiency** by fostering **knowledge sharing**, **innovation**, and **best practices**.

India's Role in IEEH

1. **Representation**: Represented by the **Bureau of Energy Efficiency (BEE)**, a statutory body aligned with national energy goals.
2. **Access to Global Expertise**: Strengthens India's **domestic energy efficiency initiatives** by leveraging international knowledge and resources.

Significance of Energy Efficiency Initiatives

1. **Climate Action**: Energy efficiency is a crucial component of global efforts to mitigate **climate change**.
2. **Economic Benefits**: Reduces energy costs, leading to savings for industries and households.
3. **Sustainability Goals**: Supports achieving **SDG 7 (Affordable and Clean Energy)** and **SDG 13 (Climate Action)**.
4. **Technological Advancement**: Promotes innovation in energy-efficient technologies.
5. **Equity Focus**: Assists **developing nations**, especially in Africa, with technological and financial solutions.

Methane Emissions and Climate Change: UNEP's Fourth 'An Eye on Methane' Report

Syllabus: GS III - Environment (Climate Change and Pollution Control)

Context: The **United Nations Environment Programme's (UNEP) International Methane Emissions Observatory (IMEO)** launched the **fourth edition of 'An Eye on Methane: Invisible but not unseen'** report, highlighting the urgent need to address **methane emissions**.

About the Report

1. **Publisher**: Released by **UNEP's International Methane Emissions Observatory (IMEO)**.
2. **Objective**: Provides **open, reliable, and actionable data** on methane emissions.
3. **Data Collection Methods**:
   - **OGMP 2.0**: Industry reporting through the **Oil and Gas Methane Partnership 2.0**.
   - **Satellites**: Monitored via the **Methane Alert and Response System (MARS)**.
   - **Global Studies**: Research-based emissions data.
   - **National Inventories**: Data from countries' methane inventories.

Key Findings of the Report

1. **Methane and Global Warming**: **Human-caused methane emissions** contribute to **one-third of current global warming**.
2. **Oil and Gas Sector Emissions**: OGMP 2.0 covers only **42% of global oil and gas production**, leaving significant emissions untracked.
3. **Methane in Steel Production**: **Metallurgical coal** used in steelmaking accounts for **10% of energy sector methane emissions**, which can be reduced **cost-effectively**.
4. **Poor Emissions Response**: Only **1% of alerts** issued by **MARS** received substantial action from countries.

Global and Indian Efforts to Mitigate Methane Emissions

Global Initiatives

1. **Global Methane Pledge**: Aims to reduce **30% of methane emissions** by 2030 compared to 2020 levels.
2. **Climate and Clean Air Coalition**: Works on reducing **Short-Lived Climate Pollutants (SLCPs)**, including methane.
3. **Global Methane Alliance**: Focuses on targeted reductions in oil and gas methane emissions.

India's Initiatives

1. **National Innovations in Climate Resilient Agriculture (NICRA)**: Researches and implements **climate-resilient agricultural practices**.
2. **National Livestock Mission**: Encourages **sustainable livestock management** to reduce methane emissions.
3. **Gobar-Dhan Scheme**: Promotes **biogas production** from animal waste, reducing agricultural methane.
4. **National Biogas and Organic Manure Programme**: Facilitates adoption of **biogas plants** to curb emissions and provide renewable energy.

About Methane

1. **Nature**: A potent **greenhouse gas** with **86 times more warming potential than CO_2** over a short term.
2. **Short-Lived Climate Pollutant (SLCP)**: Atmospheric lifetime: **12 years**, easier to mitigate than CO_2.
3. **Environmental and Health Impacts**: Precursor for **tropospheric ozone**, leading to:
    - **Respiratory illnesses**.
    - **Crop yield losses**.
4. **Sources**: Over **60% of methane emissions** are human-induced, primarily from:
    - **Agriculture**: Enteric fermentation in livestock.
    - **Fossil Fuels**: Leakage during extraction and processing.
    - **Waste**: Decomposition in landfills.

Impact of Atmospheric Microplastics on Weather and Climate

Syllabus: GS III - Environment (Pollution and Climate Change)

Context: New research highlights that **microplastics in the atmosphere** act as **ice nucleating particles**, influencing **cloud formation, precipitation patterns**, and contributing to **climate change**.

Key Findings

Microplastics as Ice Nucleating Particles

1. **Ice Formation in Clouds**:

- Microplastics serve as nuclei for **ice crystals** in clouds, similar to **dust and bacteria**.
- These microscopic particles cause **water droplets to freeze at higher temperatures**, impacting cloud formation.

2. **Cloud Formation Process**:
   - Clouds form when **water vapor condenses** on particles and turns into droplets or ice crystals.
   - Microplastics introduce **defects in water droplets**, triggering freezing and altering cloud characteristics.

Impact of Atmospheric Microplastics

1. **Precipitation Patterns**:
   - Increased aerosols like microplastics spread water across **smaller droplets**, reducing rainfall frequency.
   - When it rains, precipitation tends to be **heavier** due to delayed water release.
2. **Global Warming**:
   - The ratio of **liquid water to ice** in clouds determines their **warming or cooling effect** on the climate.
3. **Other Effects**:
   - **Weather forecasting and climate modeling**: Affected by unpredictable cloud behavior.
   - **Aviation safety**: Influences how **ice crystals form** in the atmosphere, posing risks to flight operations.

Initiatives to Reduce Microplastics

Global Efforts

1. **Global Partnership on Plastic Pollution and Marine Litter**: Collaborative approach to address plastic pollution.
2. **UN Environment Assembly Resolution**: Aims to forge an **International Legally Binding Agreement** to end plastic pollution.
3. **IAEA's NUTEC Plastics**: Promotes **nuclear techniques** to combat plastic pollution.

India's Efforts

1. **Ban on Single-Use Plastics**: Targets commonly littered plastic items.
2. **Plastic Waste Management Rules, 2016**: Focus on **extended producer responsibility** and waste segregation.
3. **KVIC's Project REPLAN**: Converts plastic waste into **usable resources**, promoting eco-friendly alternatives.

Guru Ghasidas-Tamor Pingla Tiger Reserve: India's 56th Tiger Reserve

Syllabus: GS III - Environment and Biodiversity (Conservation Initiatives)

Context: On the advice of the **National Tiger Conservation Authority (NTCA)**, the **Chhattisgarh government** has notified the **Guru Ghasidas National Park** and **Tamor Pingla Wildlife Sanctuary** as the **56th Tiger Reserve (TR)** in India.

Key Details

1. **Chhattisgarh's Tiger Reserves**: With this notification, Chhattisgarh now has **four Tiger Reserves**:
   - **Indravati TR**
   - **Udanti-Sitanadi TR**

- **Achanakmar TR**
- **Guru Ghasidas-Tamor Pingla TR**

2. **Legal Framework**: TRs are notified by **State Governments** under the **Wildlife (Protection) Act, 1972**, based on NTCA's recommendations.
3. **Ranking**: It is the **third-largest Tiger Reserve** in India, after:
   - **Nagarjunasagar-Srisailam TR** (Andhra Pradesh).
   - **Manas TR** (Assam).

Structure of a Tiger Reserve

1. **Core/Critical Area**:
   - Must remain **inviolate**, ensuring no disturbance to wildlife.
   - Forest dwellers' rights are protected under the **Forest Rights Act, 2006**.
2. **Buffer/Peripheral Area**:
   - Promotes **human-wildlife coexistence** with lesser protection.
   - Local community rights are acknowledged, determined by the **Gram Sabha**.

Location and Features of Guru Ghasidas-Tamor Pingla TR

1. **Geography**: Lies in the **Chota Nagpur Plateau** and partly in the **Baghelkhand Plateau**.
2. **Key Fauna**: **Leopards, hyenas, jackals, wolves**, and **sloth bears** inhabit the reserve.
3. **Rivers**: Includes rivers such as **Hasdeo Gopad** and **Baranga**.
4. **Landscape Connectivity**: Contiguous with:
   - **Sanjay Dubri TR** (Madhya Pradesh).
   - Connected to **Bandhavgarh TR** (Madhya Pradesh) and **Palamau TR** (Jharkhand).

Landscape Approach to Tiger Conservation

1. **Concept**: Views protected areas as a **network of interconnected tiger populations** through **corridors**.
2. **Meta-populations**: Interconnected tiger populations are referred to as **meta-populations**.
3. **Significance**: Ensures:
   - **Habitat connectivity**.
   - **Gene flow**, reducing **inbreeding depression**.
   - Avoids the need for **translocation of tigers**.
4. **Guidance Framework**: Aligned with the **National Wildlife Action Plan (2017-31)**.

Technologies to Resolve Stubble Burning

Syllabus: GS III - Science and Technology; Environmental Pollution and Degradation

Context: Stubble burning, particularly in **Punjab, Haryana**, and **Uttar Pradesh**, significantly contributes to air pollution in northern India during October and November. Despite policy measures, economic and logistical challenges compel farmers to rely on this practice.

What is Stubble Burning?

- **Definition**: Stubble burning is the deliberate setting of fire to crop residue after harvest to quickly prepare fields for the next cropping cycle.
- **Primary States Affected**: Predominantly practiced in **Punjab, Haryana**, and **Uttar Pradesh** for clearing **paddy straw**.

Reasons for Stubble Burning

1. **Short Crop Cycles**: Limited time between **paddy harvest** and **wheat sowing**.
2. **Economic Constraints**: High costs of alternative residue management practices.
3. **Lack of Awareness**: Insufficient knowledge about **sustainable agricultural practices**.
4. **Inadequate Mechanization**: Limited access to **crop residue management machinery**.
5. **Policy Gaps**: Ineffective enforcement of regulations and insufficient **incentives for farmers**.

Consequences of Stubble Burning

1. **Air Pollution**: Emits **PM2.5, PM10**, **CO2**, and other pollutants, worsening air quality.
2. **Health Hazards**: Leads to **respiratory issues** and increases healthcare burdens.
3. **Soil Degradation**: Destroys essential nutrients and reduces **soil organic matter**.
4. **Climate Impact**: Contributes to **greenhouse gas emissions**, exacerbating climate change.
5. **Economic Costs**: Burdens public health systems and causes **fertility loss** in soil.

Technologies to Resolve Stubble Burning

Large-Scale Technologies

1. **Direct Combustion**: Controlled burning of rice straw to generate **heat for cooking** and **industrial purposes**.
2. **Pyrolysis and Gasification**: Converts rice straw into **syngas** or **bio-oil** through controlled heating for energy production.
3. **Biochar Production**: Produces **biochar** as a soil conditioner, enhancing fertility and reducing emissions.
4. **Power Generation**: Uses **biomass-based power plants** to convert rice straw into electricity.
5. **Pellet Production**: Compresses rice straw into **compact fuel pellets** for transportation and energy use.
6. **Biofuels**: Processes rice straw into **bioethanol** or **biogas**, reducing reliance on fossil fuels.
7. **Paper Production**: Utilizes rice straw's **cellulose content** to produce **sustainable pulp and paper**.

Small-Scale Technologies

1. **Composting**: Converts rice straw into **nutrient-rich compost** for agricultural applications.
2. **Mushroom Cultivation**: Uses rice straw as a **substrate** for growing edible mushrooms, providing an additional income source for farmers.
3. **Silica Extraction**: Extracts **silica particles** from rice straw for use in **construction** and **electronics industries**.
4. **Fodder for Ruminants**: Enhances the digestibility of rice straw through **chemical treatments**, turning it into viable animal feed.
5. **As an Adsorbent**: Employs rice straw for **removal of heavy metals** and toxins from contaminated water.
6. **Soil Incorporation**: Incorporates rice straw into the soil to improve **fertility, moisture retention**, and **aeration**.

Delhi Govt. Seeks Permission for Cloud Seeding Amid Air Quality Crisis

Syllabus: GS III - Environmental Pollution and Mitigation; Science and Technology

Cloud Seeding

- **About**: A weather modification technique aimed at enhancing **precipitation** (artificial rain generation).
- **Method**: Uses chemicals like **silver iodide**, **potassium iodide**, and **dry ice**. These are dispersed into the sky via **airplanes or helicopters**, attracting water vapor and forming rain clouds.
- **Types**:
  - **Hygroscopic Cloud Seeding**: Accelerates the merging of droplets in liquid clouds.

- **Glaciogenic Cloud Seeding**: Induces ice formation in supercooled clouds.

Cloud Seeding as a Solution to Climate Change

Arguments in Favor

1. **Regulates Prevailing Weather Conditions**: Helps manage water vapor, preventing damage by hailstorms and promoting more **winter snowfall**.
2. **Enhances Natural Water Supply**: Supports **drier areas**, making them more livable and aiding local communities.
3. **Disperses Air Pollutants**: Reduces **dust, smoke, and smog** concentrations; aids in controlling wildfires.
4. **Benefits Agriculture**: Provides **moisture to crops**, improving agricultural productivity.

Arguments Against

1. **Lack of Research**: Insufficient data to conclusively prove its **effectiveness** in addressing pollution like Delhi's smog.
2. **Suitability**: Requires the presence of **moisture-filled clouds**, limiting its applicability.
3. **Impact of Chemicals Used**: **Silver iodide**, the most common material, can cause **iodism** (iodine poisoning) and harm **terrestrial and aquatic ecosystems**.
4. **Economic Viability**: High operational cost of approximately **₹1 lakh per square kilometer**.

Conclusion

- While **cloud seeding** offers potential for mitigating air pollution and enhancing precipitation, its **effectiveness and feasibility** remain debated due to technical, environmental, and economic challenges.
- Complementary approaches, such as:
  - **Nature-based Solutions**: Urban vegetation and green infrastructure.
  - **Construction-based Methods**: Carbon capture and storage, bio-based building materials.
- These options should also be explored to address **Delhi's air quality crisis** sustainably.

WHO Report on Climate Change and Health: Key Insights from COP-29

Syllabus: GS III - Climate Change and Environmental Issues; GS II - Health Policies

Impact of Climate Change on Health

Direct Impacts

1. **Noncommunicable Diseases (NCDs)**: Climate change and air pollution contribute to **85% of NCD deaths** globally.
2. **Heat Stress**: In 2023, people experienced **50 additional days of health-threatening heat** due to climate change.
3. **Maternal & Reproductive Health**: Adverse effects include **preterm births**, **low birth weight**, **maternal deaths**, and **decreased fertility**.

Indirect Impacts

1. **Increased Poverty and Marginalization**: Vulnerable populations face greater risks of **economic instability**.
2. **Threat to Food & Water Security**: Climate disruptions exacerbate **scarcity** and reduce availability.

3. **Rise in Conflicts and Migration**: In 2023, **20.3 million people** were internally displaced due to **weather-related disasters**.

Key Recommendations

1. **Adopt One Health Approach**: Recognize the interconnectedness of **human, animal, and ecosystem health**.
2. **Shift to Circular Economy**: Transition from **extractive economic systems** to sustainable, **resource-efficient models**.
3. **Ensure Substantial Climate Financing**: Adequately fund the **New Collective Quantified Goal (NCQG)** on climate finance and the **Loss and Damage Fund**.
4. **Integrate Health into National Climate Action**: Embed health considerations in **Nationally Determined Contributions (NDCs)** and **National Action Plans (NAPs)** for climate adaptation.

Initiatives Taken in India

1. **National Programme on Climate Change and Human Health**: Implemented by the **Ministry of Health & Family Welfare**, focusing on building resilience in health systems.
2. **The Network on Climate Change & Health**: A program under the **Department of Science & Technology**, fostering research on climate-health linkages.

Global Nitrous Oxide (N_2O) Assessment Report: Key Insights

Syllabus: GS III - Climate Change and Environmental Issues; GS II - International Organizations

Context: The Climate and Clean Air Coalition (CCAC) **and** FAO **launched the** Global Nitrous Oxide (N_2O) Assessment Report **at** COP29 in Baku, Azerbaijan**, marking the first international report on N_2O in over a decade.**

Key Findings of the Report

1. **Global Warming Impact**: If **N_2O emissions** continue at current rates, there is **no plausible pathway** to limit global warming to **1.5° Celsius**.
2. **Increase in Anthropogenic Emissions**: Emissions have risen **40% since 1980**, with approximately **75%** originating from agricultural use of **synthetic fertilizers** and **manure**.
3. **Ozone Depletion**: N_2O is the leading **ozone-depleting substance**, contributing to:
    - **Increased UV exposure**, raising risks of cataracts (**0.2–0.8%**) and skin cancer (**2–10%**).

Measures to Abate N_2O Emissions

1. **Agriculture**: Use of **enhanced-efficiency fertilizers**, **nitrification inhibitors**, and **slow-release formulations**.
2. **Industry**: Implementing **thermal destruction** or **catalytic processes** to treat emissions from:
    - **Adipic acid** (used in synthetic fibers and foam).
    - **Nitric acid** (used in fertilizer production).
3. **Fossil Fuel Reduction**: Transition to **renewable resources** in **transportation** and **energy production**.
4. **Manure Management**:
    - **Balancing nutrient inputs** in animal feed.
    - **Reducing grazing intensity**.
    - **Anaerobic digestion** of manure to minimize emissions.
5. **Multilateral Options**: Implementing measures under the **Gothenburg Protocol** targeting **ammonia** and **nitrogen oxides** through the **Convention on Long-Range Transboundary Air Pollution**.

About Nitrous Oxide (N_2O)

1. **Characteristics**:
   - Long-lived **greenhouse gas**, **270 times** more powerful than CO_2.
   - Atmospheric lifetime of about **114 years**.
   - Commonly known as **'laughing gas'**: clear, colorless, odorless, and soluble in water.
2. **Sources**:
   - **Natural**: Microbial activity in **soils** and **oceans**.
   - **Anthropogenic**: Fertilizers, wastewater, industrial emissions, etc.

About CCAC

1. **Founded**: In **2012**, convened within **UNEP**.
2. **Membership**: A voluntary partnership of over **160 governments**, intergovernmental organizations, and NGOs.
3. **Objective**: Focuses on reducing **short-lived climate pollutants** like **methane**, **black carbon**, and **N_2O**, which drive **climate change** and **air pollution**.
4. **India's Role**: Joined CCAC in **2019** to contribute to global efforts in mitigating short-lived climate pollutants.

Phytoplankton Bloom: Insights and Implications

Syllabus: GS III - Environmental Science and Biodiversity

Context: Recent research highlights that **desertification** contributes to the deposition of **nutrient-rich dust** into the **Indian Ocean**, southeast of Madagascar, leading to **phytoplankton blooms**.

About Phytoplankton

1. **Definition**: **Microscopic, single-celled plants** that thrive in the **ocean** and form the foundation of the **marine food web**.
2. **Ecological Role**:
   - Regulate the **carbon sink** by absorbing carbon dioxide.
   - Serve as **primary producers**, supporting diverse marine ecosystems.

Phytoplankton Bloom

1. **Definition**: Refers to the **exponential growth** of phytoplankton in aquatic ecosystems.
2. **Favorable Conditions**:
   - **Warm sea surface temperatures**.
   - **Calm waters**.
   - Abundant **nutrient availability** (e.g., through nutrient-rich dust or upwelling).
3. **Impact**:
   - **Biosafety Concerns**: Production of **biotoxins** that accumulate in the **marine food web**, affecting aquatic and human health.
   - **Dead Zones**: Depletes **oxygen levels** in the ocean, creating hypoxic areas unsuitable for marine life.

Significance of Desertification in Phytoplankton Blooms

1. **Nutrient Deposition**: Dust from desertified regions adds **iron, nitrogen, and phosphorus**, essential nutrients for phytoplankton growth.
2. **Regional Implications**: Areas like the **Indian Ocean** and regions near **Madagascar** see increased blooms due to dust deposition.
3. **Climate Feedback**: Alteration in **carbon cycles** as phytoplankton blooms influence **CO_2 absorption**.

King Cobra

Syllabus: Environment & Ecology, Biodiversity

Key Updates

- **Local Name:** In Karnataka, the **king cobra** is referred to as **'Kaalinga Sarpa.'**
- **Scientific Naming:** It will be officially named **Ophiophagus Kaalinga** to reflect its regional identity.

About King Cobra

1. **Habitat**: Found in **thick forests** and plains across **India**, **China**, and **Southeast Asia**.
2. **Characteristics**:
    - **Size**: It is the **longest venomous snake**, reaching lengths of up to **18 feet**.
    - **Lifespan**: Approximately **20 years** in the wild.
3. **Diet**: Prefers **cold-blooded animals**, particularly **other snakes** (hence the name **Ophiophagus**, meaning "snake-eater").
4. **Threat Display**: When threatened, the king cobra can:
    - **Raise its body** 3–4 feet off the ground.
    - **Follow its enemy** while maintaining an upright posture over considerable distances.

Ecological Significance

- As a **top predator** in its habitat, the king cobra plays a crucial role in **maintaining ecological balance**, especially in controlling snake populations.

Conservation Status

- **Threats**: Habitat destruction, human-wildlife conflict, and illegal wildlife trade.
- **Protection**: Listed under **Schedule II** of the **Wildlife Protection Act, 1972** in India, offering it legal protection.

Compressed Biogas (CBG)

Syllabus: GS III - Environment, Renewable Energy

Context

- **India's First Modern Gaushala:** A self-sufficient **gaushala** with a **state-of-the-art Compressed Biogas (CBG) plant** has been launched in **Gwalior, Madhya Pradesh**.
- **Feedstock:** CBG will be produced using **cattle dung** and **organic waste**, promoting circular economy and sustainable practices.

About Compressed Biogas (CBG)

1. **Composition:** Predominantly **Methane (CH4)**, accounting for **>90% of its content**.
2. **Source:** Derived from **organic waste materials**, such as agricultural residue, cattle dung, and municipal waste, through **anaerobic decomposition** (microbial digestion in the absence of oxygen).
3. **Characteristics as a Green Fuel:**
    - **Comparable to CNG:** Has similar calorific value and properties, making it a viable **renewable automotive fuel**.

- **Environmentally Friendly:** Helps reduce greenhouse gas emissions and waste.

4. **Estimated Potential in India:** India has an estimated potential of **62 million metric tons of CBG production annually**.

Policy Support for CBG in India

1. **SATAT Scheme:**
   - **Full Form:** Sustainable Alternative Towards Affordable Transportation.
   - Encourages the establishment of **CBG plants** for production and utilization as an **alternative fuel** for transportation.
2. **GOBAR-DHAN Scheme:**
   - **Full Form:** Galvanizing Organic Bio-Agro Resources Dhan.
   - Promotes the conversion of **cattle dung and organic waste** into biogas and organic manure to improve waste management and generate additional income for rural households.

Significance of CBG

- **Environmental Benefits:**
  - Reduces **methane emissions** from organic waste.
  - Supports **waste-to-energy** initiatives.
- **Economic Benefits:**
  - Provides an additional **income source for farmers**.
  - Reduces reliance on imported **fossil fuels**.
- **Energy Security:**
  - Enhances India's renewable energy portfolio and reduces dependency on conventional fuels.

Ashtamudi Lake

Syllabus: Environment and Ecology

Context

- **Ashtamudi Lake**, a **Ramsar site**, faces serious ecological threats due to **pollution** and **habitat degradation**. Recent **fish deaths from algal blooms** are harming biodiversity and the livelihoods of local communities.

Issues Facing Ashtamudi Lake

1. **Pollution**: Rampant **sewage discharge**, **plastic dumping**, and **illegal waste disposal** are severely degrading water quality.
2. **Encroachments**: **Illegal constructions** block water flow and degrade natural habitats, impacting aquatic ecosystems.
3. **Microplastics**: High levels of **microplastic contamination** in **fish**, **shellfish**, and **sediments**, posing a serious threat to the **aquatic ecosystem**.
4. **Water Hyacinth**: The spread of this **invasive plant** limits **fishing activities**, disrupting the local economy and biodiversity.
5. **Algal Bloom Impact**:
   - Excessive **nutrients** cause **oxygen depletion**, suffocating aquatic life.
   - **Sewage pollution** results in the contamination of water with **Streptococci** and **E. coli**, endangering public health.
   - These issues have led to **significant economic losses** for **fishers** and **cage farmers** in the region.

About Ashtamudi Lake

1. **Location**: Located in **Kollam district**, **Kerala**, named after its **eight interconnected arms** (Ashtamudi means "eight arms").
2. **Significance**:
   - **Second-largest lake** in Kerala, crucial for the region's **ecosystem** and **livelihoods**.
   - Designated a **Ramsar Wetland of International Importance** in **2002**.
3. **Hydrology**: Fed by the **Kallada River**, and connects to the **Arabian Sea** through the **Neendakara estuary**, making it vital for **fishing** and **shipping activities**.
4. **Historical Importance**: Once a key **port city** in the **14th century**; mentioned by the Moroccan explorer **Ibn Battuta** in his travel records.
5. **Biodiversity**: Home to a rich variety of **mangrove species**, including endangered species like **Syzygium travancoricum**and **Calamus rotang**.

BIOTECHNOLOGY & HEALTH

'One Day One Genome' Initiative: Accelerating Microbial Genomics

Syllabus: GS III - Science and Technology (Biotechnology)

Context: The **Department of Biotechnology (DBT)** and the **Biotechnology Research and Innovation Council (BRIC)**have launched the **'One Day One Genome'** initiative, aiming to **publicly release a fully annotated bacteriological genome** daily. This will enhance **scientific knowledge** and **innovation** while making microbial genomics data accessible to researchers and the community.

Key Objectives of the Initiative

1. **Genome Accessibility**: Provides an **annotated bacteriological genome** for public use.
2. **Boost to Innovation**: Drives advancements in **microbial genomics**, aiding research across sectors.
3. **Knowledge Dissemination**: Facilitates a **shared repository** of microbial genome data for researchers worldwide.

About Genome and Genome Sequencing

1. **Genome**:
   - The complete set of **genetic material (DNA/RNA)** in an organism, containing all hereditary information.
   - Composed of **unique sequences of nucleotide bases**:
     - **DNA**: Adenine (A), Cytosine (C), Guanine (G), Thymine (T).
     - **RNA**: A, C, G, Uracil (U).
2. **Genomic Sequencing**:
   - A process to determine the **precise order of nucleotide bases** within an organism's genetic material.

Applications of Genome Sequencing (GS)

1. **Disease Detection**: Identifies **rare genetic disorders** (e.g., cystic fibrosis, thalassemia) and preconditions for diseases.
2. **Pharmacogenomics**: Personalizes drug efficacy and safety based on an individual's genetic profile.
3. **Metagenomic Sequencing**: Explores collective genomes in environmental niches for **species identification** and **ecosystem analysis**.
4. **Agriculture**:
   - Accelerates the development of **disease-resistant and drought-tolerant crops**.

- Analyzes **host-pathogen interactions** in plants.

5. **Microbial Sequencing**: Enables innovations such as:
   - **Biofuel development.**
   - **Advanced vaccines.**
   - **Environmental cleanup tools.**

Significance of Microbes

1. **Environmental Roles**: Crucial in **biogeochemical cycles**, soil formation, and oxygen production (e.g., **algae**).
2. **Human Health**: Support **digestion**, **immunity**, and even **mental health**.
3. **Household Applications**: Used in **fermentation** for foods and beverages (e.g., **Lactic Acid Bacteria (LAB)**).
4. **Industrial Applications**:
   - **Baker's yeast** for bread and beverages like beer.
   - Microbes for **biofuel production** and **sewage treatment.**

Jeddah Commitments on Antimicrobial Resistance (AMR): A Global Framework for Action

Syllabus: GS III - Health (AMR and One Health Approach); International Relations (Global Cooperation)

Context: The **Jeddah Commitments**, adopted at the **Fourth Global High-Level Ministerial Conference on Antimicrobial Resistance (AMR)**, outline a comprehensive framework to combat AMR using a **One Health approach**. These commitments aim to transform the **UNGA High-Level Meeting Political Declarations on AMR** into actionable and urgent measures.

What is AMR?

- **Definition**: **Antimicrobial Resistance (AMR)** occurs when pathogens such as **bacteria, viruses, fungi, and parasites**evolve to resist the effects of antimicrobial drugs, rendering treatments ineffective.

Key Highlights of the Jeddah Commitments

1. **One Health AMR Learning Hub**:
   - Establishes a platform for **sharing best practices** and building capacities to implement **multi-sectoral National Action Plans (NAPs)** on AMR.
   - **One Health Approach**: Integrates human, animal, and ecosystem health for sustainable management.
2. **Independent Panel for Evidence on Action Against AMR (by 2025)**: Ensures coordination and avoids duplication of efforts to combat AMR globally.
3. **National AMR Coordinating Mechanisms**: Facilitates implementation, monitoring, and **sustainable financing** of **National Action Plans (NAPs)**.
4. **Global Data Sharing Platforms**: Promotes data sharing through:
   - **GLASS AMR/AMC**: Global AMR Surveillance System.
   - **ANIMUSE**: Antimicrobial Use in Animals Database.
   - **INFARM**: Integrated Farm-to-Table Surveillance.
5. **Adherence to Codex Alimentarius Guidelines**: Encourages **responsible and prudent use** of antimicrobials to ensure food safety and public health.
6. **Support for Quadripartite Organizations**: Aligns with goals of **FAO, WHO, WOAH (World Organisation for Animal Health)**, and **UNEP** to achieve the 2030 AMR objectives outlined by UNGA.

Global and Indian Initiatives to Combat AMR

Global Initiatives

1. **GLASS (Global Antimicrobial Resistance and Use Surveillance System)**: Monitors antimicrobial resistance and use trends worldwide.
2. **ReAct (Action on Antibiotic Resistance)**: Promotes awareness and action against AMR.
3. **Global Action Plan on AMR**: Provides a framework for member states to develop national strategies.

Indian Initiatives

1. **National Program on AMR Containment**: Launched during the **12th Five-Year Plan (FYP)** to address AMR threats.
2. **Red Line Campaign**: Educates the public on avoiding unnecessary antibiotic usage.
3. **National AMR Surveillance Network (NARS-Net)**: Operates through state medical colleges to monitor and analyze AMR trends.

Significance of the Commitments

1. **Strengthening AMR Management**: Facilitates the **development and execution of National Action Plans** worldwide.
2. **Global Collaboration**: Encourages **data sharing** and evidence-based policymaking.
3. **Environmental Impact**: Integrates ecological health to address AMR in **agriculture and animal husbandry**.
4. **Sustainable Financing**: Ensures long-term funding for AMR mitigation initiatives.

Bioleaching: Eco-Friendly Metal Extraction from E-Waste and Minerals

Syllabus: GS III - Science and Technology (Biotechnology Applications); Environment (Waste Management)

Context: Miners are increasingly utilizing **bioleaching** techniques to extract **gold and other valuable metals** from discarded electronics, offering an environmentally sustainable alternative to traditional methods.

What is Bioleaching?

- **Definition**:
  - A biological method for extracting **metals** (e.g., **copper, gold**) from minerals and waste materials using **microorganisms**.
  - These microorganisms facilitate the **dissolution of metals** from ores or waste into a solution, making them recoverable.
- **Microorganisms Involved**:
  - **Heterotrophic Bacteria**:
    - E.g., **Pseudomonas sp., Bacillus sp.**
  - **Autotrophic Bacteria**:
    - E.g., **Thiobacilli sp.**
  - **Heterotrophic Fungi**:
    - E.g., **Aspergillus sp., Penicillium sp.**

Advantages of Bioleaching

1. **Environmentally Friendly**:
   - **Reduces air pollution** compared to smelting.
   - Minimizes **greenhouse gas emissions**, supporting sustainable practices.
2. **Cost-Effective**: Particularly suited for **low-grade ores** that are uneconomical to process using traditional methods.
3. **Energy-Efficient**: Requires significantly less energy than:
   - **High-temperature pyrometallurgy**.
   - **Chemical-intensive hydrometallurgy**.
4. **Waste Management**: A sustainable way to process **e-waste**, recovering valuable metals from discarded electronics.

Applications of Bioleaching

1. **E-Waste Recycling**: Recovery of **gold, silver**, and other metals from electronics.
2. **Mining Industry**: Extraction of metals like **copper, nickel**, and **zinc** from ores.
3. **Environmental Remediation**: Removal of heavy metals from contaminated soils and water.

Polio Eradication in India: A Landmark Achievement

Syllabus: GS II - Health (Eradication of Diseases); GS III - Science and Technology (Vaccination Initiatives)

Context: In **March 2014**, the **World Health Organization (WHO)** declared India **polio-free**, a monumental success after decades of focused efforts under the **Global Polio Eradication Initiative (GPEI)** and the **Universal Immunization Programme (UIP)**.

About the Universal Immunization Programme (UIP)

1. **Overview**:
   - Among the world's largest public health programs.
   - Provides **free vaccines** for **12 vaccine-preventable diseases**.
2. **History**:
   - Initiated in **1985**, renamed from the **Expanded Programme on Immunization**, and expanded to **rural areas**beyond urban centers.

Steps to Maintain India's Polio-Free Status

1. **Annual Polio Campaigns**: **National Immunization Days (NID)** and **Sub-National Immunization Days (SNID)** are conducted yearly to ensure high immunity levels and no missed children.
2. **Surveillance and Border Vaccination**: **Vaccination at international borders** mitigates the risk of re-importation from polio-endemic regions.
3. **Introduction of Inactivated Polio Vaccine (IPV)**: **IPV (introduced in 2015)** provides additional protection, especially against **type 2 poliovirus**, complementing the oral polio vaccine (OPV).
4. **Mission Indradhanush**: Launched in **2014** to increase immunization coverage to **90%**, focusing on **hard-to-reach areas** with low immunization rates.

About Poliomyelitis (Polio)

1. **Nature of the Disease**:
   - **Highly infectious viral disease** affecting children under 5 years of age.
   - Attacks the **nervous system**, potentially causing paralysis.
2. **Transmission**: Spread primarily via the **faecal-oral route** or, less frequently, through contaminated water or food.

3. **Vaccine-Derived Polio**: Occurs when the weakened strain in **oral polio vaccine (OPV)** mutates, regaining the ability to cause paralysis in **under-vaccinated populations**.

Global Status of Wild Poliovirus Strains

1. **Type 1**: Still **endemic** in **Pakistan** and **Afghanistan** (as of 2022).
2. **Type 2**: Declared **eradicated in 1999**.
3. **Type 3**: Declared **eradicated in 2020**.

Significance of India's Polio-Free Status

1. **Public Health Milestone**: A remarkable achievement in one of the world's most populous nations with diverse healthcare challenges.
2. **Global Contribution**: India's success is a model for **global polio eradication initiatives**, especially in high-risk regions.
3. **Sustainability**: Continued focus on **vaccination, surveillance, and cross-border collaboration** ensures the maintenance of polio-free status.

SCIENCE & TECHNOLOGY

Swiss Physicists Develop First Fully Mechanical Qubits

Syllabus: GS III - Science and Technology (Quantum Computing and Innovation)

Context: **Swiss physicists** have developed the world's first **fully mechanical qubits**, addressing challenges such as **quantum errors** and the **shorter lifespan of virtual qubits**, which hinder the advancement of quantum computers.

Significance of Mechanical Qubits

1. **Addressing Quantum Errors**:
   - Quantum errors arise due to the **sensitivity of qubits** (quantum bits), causing calculation inaccuracies.
   - Mechanical qubits offer greater **stability**, reducing errors compared to traditional **electromagnetic qubits**.
2. **Longevity**: Mechanical qubits overcome the **short lifespan of virtual qubits**, enhancing the feasibility of **large-scale quantum computing**.
3. **Scalability**: They provide a more robust alternative, crucial as the size and complexity of quantum computers grow.

About Quantum Computers

Foundations

1. **Quantum Mechanics**:
   - Explains the behavior of **subatomic particles** with principles differing from classical physics.
   - Central to phenomena like **wave-particle duality**, where particles exhibit properties of both waves and particles.
2. **Key Principles**:
   - **Superposition**:
     - Each qubit can represent **both 1 and 0 simultaneously**, unlike classical bits, which represent either 0 or 1.

- **Entanglement**:
  - Correlates qubits such that the **state of one qubit** depends on the state of another, enabling complex computations.

Benefits

- Solves problems exponentially faster than classical computers in fields like cryptography, drug discovery, and material science.

India's Quantum Computing Initiatives

1. **National Quantum Mission (2023)**: Aims to position **India as a global leader** in quantum technology by fostering research and development.
2. **Quantum Enabled Science and Technology (QuEST)**: A program to **build quantum capabilities** in the country.
3. **MeitY Quantum Computing Applications Lab (QCAL)**: Provides access to **quantum computing tools and resources** for researchers and developers.
4. **Quantum Computer Simulator (QSim) Toolkit**: Offers a **simulated platform** for researchers to explore quantum systems, reducing reliance on scarce quantum hardware.
5. **Quantum-backed Green Hydrogen Technology**: Developed at **BHU, Varanasi**, this initiative demonstrates **quantum computing applications** in sustainable energy production.

DRDO Successfully Tests India's First Long-Range Hypersonic Missile

Syllabus: GS III - Science and Technology; Internal Security

Context: The **Defence Research and Development Organisation (DRDO)** successfully test-fired India's first **long-range hypersonic missile** with a range of over **1,500 km** off the Odisha coast. This achievement places India among the few nations—**US, Russia, and China**—to possess this cutting-edge technology.

Technologies Demonstrated During the Test

1. **Aerodynamic Configuration**: Optimized for **hypersonic manoeuvres**, ensuring **stability and control** at extreme speeds.
2. **Scramjet Propulsion**:
   - Utilizes **scramjet engines**, which are air-breathing jet engines.
   - These engines compress incoming air using the missile's **forward motion** and enable **sustained combustion**at hypersonic speeds.
3. **Thermo-Structural Characterisation**: Designed to **withstand extreme aerothermal environments** during hypersonic flight.
4. **Separation Mechanism**: Ensures reliable **stage separation** even at hypersonic velocities.

About Hypersonic Missiles

1. **Definition**: Hypersonic missiles travel at speeds of **Mach 5 or above** (five times the speed of sound).
2. **Speed Range**:
   - **Mach 1**: Speed of sound.
   - **Mach 1 to Mach 5**: Supersonic speeds.
   - **Above Mach 5**: Hypersonic speeds.
3. **Key Features**:

- **High Speed and Manoeuvrability**: Enables the missile to change course mid-flight, making **detection and interception highly difficult**.

India's Other Missile Systems

Inducted Systems

1. **AKASH**: Surface-to-Air Missile System.
2. **BRAHMOS**: Long-Range Supersonic Cruise Missile (jointly developed with Russia).

Under Advanced Induction

1. **NAG**: Anti-Tank Guided Missile.
2. **ASTRA**: Air-to-Air Missile.
3. **Agni Series**: Long-Range Ballistic Missiles.

About DRDO

1. **Formation**: Established in **1958**, functioning as the **R&D wing of the Ministry of Defence**.
2. **Mission**: Develop **state-of-the-art defence technologies** to ensure India's **self-reliance in defence capabilities**.
3. **Infrastructure**:
   - Operates a network of **41 laboratories** specializing in: **Aeronautics, combat vehicles, missiles, advanced computing**, and more.

Doppler Radar

Syllabus: GS III - Science and Technology; Applications in Meteorology and Defense

About Doppler Radar

- **Definition**: A radar system that uses the **Doppler Effect** to determine an object's **location, speed**, and **distance**.
- **Doppler Effect**: Refers to the **change in wave frequency** observed when there is **relative motion** between the wave source and the observer.

Applications of Doppler Radar

1. **Meteorology**: Tracks **weather patterns**, including precipitation, wind speeds, and storms.
2. **Aviation**: Monitors **air traffic** and ensures safe navigation.
3. **Military**: Tracks **aircraft**, **missiles**, and other moving targets for defense purposes.
4. **Automotive Systems**: Used in **collision avoidance systems** and adaptive cruise control.
5. **Health Sector**: Applied in **medical imaging**, such as Doppler ultrasound, to measure blood flow.

Significance

- Enhances **real-time tracking** of objects and conditions.
- Plays a critical role in **safety, security**, and **disaster preparedness**.
- Enables **early warnings** for extreme weather events, reducing risks to life and property.

India's First Artificial Intelligence (AI) Data Bank

Syllabus: GS III - Science and Technology; Applications of Artificial Intelligence

Context: **India launched its first** Artificial Intelligence (AI) Data Bank **during the** 7th Edition of the ASSOCHAM AI Leadership Meet 2024**, marking a significant step in leveraging AI for national development.**

About the AI Data Bank

1. **Launched By**: **Minister of Science and Technology**.
2. **Event**: Introduced at the **ASSOCHAM AI Leadership Meet 2024**.
3. **Purpose**:
   - Provide **high-quality, diverse datasets** for researchers, startups, and developers.
   - Enable **scalable and inclusive AI solutions**.
   - Enhance **national security** through real-time analytics of satellite, drone, and IoT data.

Applications of the AI Data Bank

1. **National Security**: Strengthens **real-time surveillance** capabilities and **cyber defense** mechanisms.
2. **Disaster Management**: Supports **predictive analytics** for risk mitigation and disaster preparedness.
3. **Public Service Delivery**: Optimizes governance systems and improves **citizen-centric services**.
4. **Sectoral Impact**: Drives innovation in **governance, healthcare, business, education**, and **space exploration**.
5. **Ethical Use**: Develops frameworks to address **algorithmic bias**, ensure **data privacy**, and promote **equitable access**.

Vision

1. **Bridging Societal Divides**: Ensures AI empowers marginalized communities and fosters **digital inclusion**.
2. **Economic Growth**: Positions India as a global leader in **AI-driven innovations** to boost economic productivity.
3. **Citizen Empowerment**: Democratizes access to AI technologies for **public welfare** and developmental purposes.

Piezoresponsive Nanomaterials (PN): A New Frontier in Energy Harvesting

Syllabus: GS III - Science and Technology; Applications in Energy and Devices

Context: Indian researchers have developed **peptide-based piezoresponsive nanomaterials**, marking advancements in **energy harvesting** and **biodevice applications**.

About Piezoresponsive Nanomaterials (PN)

1. **Definition**: Materials that **change their physical properties**, such as **electrical resistance**, when subjected to **mechanical stress**.
2. **Electric Charge Generation**: Generate an **electric charge** when pressure or stress is applied, a phenomenon central to **energy harvesting**.
3. **Enhanced Sensitivity**: Composed of **nanostructured materials**, which amplify their **sensitivity** and **responsiveness** to external forces.

Applications of Piezoresponsive Nanomaterials

1. **Sensors**: Used in **pressure**, **touch**, and **motion sensors** for precise measurements.
2. **Actuators**: Enable **mechanical motion** in response to electrical stimuli, useful in robotics and automation.

3. **Energy Harvesting**: Capture energy from **mechanical movements** (e.g., walking, vibrations) for powering low-energy devices.
4. **Biodevices**: Facilitate advancements in **implantable medical devices** and health monitoring tools.

Significance of Peptide-Based Piezoresponsive Nanomaterials

1. **Adjustability**: The peptide-based structure offers **tunable properties**, allowing customization for specific applications.
2. **Biocompatibility**: Ideal for **biomedical applications**, such as implantable sensors or drug delivery systems.
3. **Eco-Friendly Energy Solutions**: Supports **sustainable energy harvesting** with reduced environmental impact.
4. **Enhanced Performance**: Nanostructuring increases **sensitivity**, making them suitable for **precision technologies**.

Telecommunications (Telecom Cyber Security) Rules, 2024: Key Highlights

Syllabus: GS III - Science and Technology; Cyber Security

Context

The **Telecommunications (Telecom Cyber Security) Rules, 2024** were notified by the government under the **Telecommunications Act, 2023**, replacing the **Prevention of Tampering of Mobile Device Equipment Identification Number Rules, 2017**.

Provisions of the Rules

1. **Definitions**:
   - **Telecom Cyber Security**: Cybersecurity for **telecom networks and services**, including tools, policies, and procedures to mitigate cyber risks.
   - **Telecommunication Entity**: Any entity providing, maintaining, or operating telecom networks or services.
   - **Security Incident**: Events posing real or potential risks to telecom cybersecurity.
2. **Data Collection and Sharing**:
   - The **Central Government** or its designated agency may seek **traffic data** and other information from telecom entities.
   - Data can be shared with **law enforcement** and **telecom entities** to bolster security measures.
   - Telecom entities must set up infrastructure for **data collection, processing, and storage** at designated points.
3. **Obligations for Cyber Security**:
   - **For Individuals**:
     - Prohibition on actions or messages that endanger or harm telecom cybersecurity.
   - **For Entities**:
     - Develop and implement a **telecom cyber security policy** addressing risks, audits, and incident responses.
     - Establish **Security Operations Centres (SOCs)** to monitor and address cybersecurity incidents.
     - Mandatory appointment of a **Chief Telecommunication Security Officer (CTSO)**, with details shared with the government.
4. **Incident Reporting**:
   - **Timeline for Reporting**:
     - Within **6 hours** of becoming aware of a security incident, entities must notify the Central Government.

- Detailed information (e.g., users affected, area impacted, remedial measures) must be furnished within **24 hours**.

Significance of the Rules

1. **Enhanced Security**: Provides a framework for safeguarding **telecom networks and services** from cyber threats.
2. **Accountability**: Enforces timely reporting and response to **cybersecurity incidents**, ensuring proactive mitigation.
3. **Regulatory Oversight**: Empowers the **government** to oversee data flows and implement preventive measures against potential risks.
4. **Technological Infrastructure**: Mandates infrastructure development, enabling **data collection** and **real-time analysis** for better security.

WTO Report: "Trading with Intelligence: How AI Shapes and is Shaped by International Trade"

Syllabus: GS III - Science and Technology; International Trade

Context

The **World Trade Organization (WTO)** released a report highlighting the **implications of Artificial Intelligence (AI)**on global trade and vice versa, emphasizing the need for policies to address challenges and opportunities at the AI-trade nexus.

Implications of AI on Trade

1. **Regulation Fragmentation**: Differences in **AI regulatory approaches** across countries may hinder trade, especially for **MSMEs** seeking global market access.
2. **Industry Concentration**: **AI technology development** and control are concentrated in large economies and companies, creating a significant **trade divide** between advanced and developing nations.
3. **Data Governance Challenges**: Restrictions on **cross-border data flows** increase costs and impede trade, affecting the efficiency of global commerce.

Opportunities from AI in Trade

1. **Cost Reduction**: AI **streamlines customs clearance**, border controls, and risk prediction, reducing trade-related costs.
2. **Growth Potential**: Universal AI adoption could increase **global real trade growth by 14% by 2040**, provided high productivity growth is achieved.
3. **Transformation in Trade Patterns**: Enhances **digitally delivered services** and replaces manual processes, boosting efficiency and innovation in trade sectors.

Impact of Trade on AI

1. **Increasing Costs**: **Tariffs** on Information Technology equipment raise the costs of essential AI hardware, impeding its accessibility.
2. **Cross-Border Restrictions**: Limits on the movement of **experts** and **data** negatively impact AI innovation and development.
3. **Treaty Provisions**: **Regional Trade Agreements** with privacy and personal information clauses influence data usage in AI development.

WTO's Role in AI-Trade Convergence

1. **Promoting Global Convergence**: Ensures **transparency** through WTO agreements and fosters **dialogue** on AI-related trade issues.
2. **AI Development**: The **General Agreement on Trade in Services (GATS)** facilitates AI development and adoption by enabling service-related trade.
3. **Minimizing Spillovers**: Implements principles like **non-discrimination** and the **Agreement on Trade-Related Investment Measures (TRIMS)** to reduce international trade barriers.
4. **Inclusiveness**: Provides **special and differential treatment** and **technical assistance** to developing economies for equitable AI-trade integration.

Cis-Regulatory Elements (CREs)

Syllabus: GS III - Science & Technology, Biotechnology

Context

- Researchers have leveraged **Artificial Intelligence (AI)** to design new **Cis-Regulatory Elements (CREs)** or DNA switches.
- These CREs can precisely control **gene expression** in different cell types, offering significant potential for **human health** and **scientific research**.

About Cis-Regulatory Elements (CREs)

1. **Definition:** CREs are **regulatory DNA sequences** that are **not part of genes** but regulate the expression of nearby genes.
2. **Function:**
   - Although all cells in an organism contain the **same genetic material**, not all genes are active in every cell or at all times.
   - **CREs regulate gene expression** by determining **when**, **where**, and **how much** a gene is expressed.
3. **Role in Biological Processes:**
   - **Cellular Identity:** Determines which genes are active in specific cell types (e.g., liver vs. brain cells).
   - **Developmental Processes:** Guides proper organ formation and function during embryogenesis.
   - **Stimulus Responses:** Activates or represses genes in response to external factors like stress, light, or nutrients.
4. **Application of AI in Designing CREs:**
   - **AI Models:** AI predicts how DNA sequences interact with cellular machinery to control gene expression.
   - **Custom DNA Switches:** AI-designed CREs allow precise control over **when** and **where** genes are expressed in the human body.

Significance of CREs

1. **Medical Research:** Enables the development of **gene therapies** to treat genetic disorders by controlling specific genes.
2. **Drug Development:** Assists in creating targeted **biopharmaceuticals** that interact with specific cells or tissues.
3. **Understanding Diseases:** Helps in studying how changes in CREs contribute to diseases like cancer, where gene regulation is disrupted.
4. **Synthetic Biology:** Supports the development of synthetic organisms with **customized genetic functions**, such as biofuel production or waste degradation.

MeerKAT Radio Telescope

Syllabus: GS III - Science & Technology, Space Technology

Context: Astronomers have used the MeerKAT radio telescope **to investigate** giant radio galaxies **within the** Cosmological Evolution Survey (COSMOS) **field, advancing our understanding of cosmic phenomena.**

About MeerKAT Radio Telescope

1. **Location**: Situated in the **Northern Cape province of South Africa**.
2. **Features**:
   - **Connected Array**: Comprises **64 interlinked receptors**, each including:
     - **Main Reflector**: Captures radio signals from space.
     - **Sub-Reflector**: Refines and redirects signals to receivers.
     - **Receivers and Electronics**: Process and convert signals into usable data.
   - **Wide Field of View**: Covers vast areas of the sky in a single observation.
   - **Extremely High Sensitivity**: Detects faint cosmic radio emissions.
   - **Imaging Capabilities**: Produces high-resolution images of celestial phenomena.
3. **Benefits**:
   - **Unprecedented Sensitivity**: Enables the study of faint, distant radio galaxies.
   - **Wide Applicability**: Facilitates research in galactic evolution, black holes, and large-scale cosmic structures.
4. **Relation to Square Kilometer Array (SKA)**:
   - **Precursor Instrument**: Functions as a prototype for the **mid-frequency component** of the **Square Kilometer Array (SKA)** telescope, which will be the world's largest radio telescope.

Significance of MeerKAT

1. **Cosmological Research**: Advances our understanding of the **formation and evolution of galaxies** and **cosmic magnetic fields**.
2. **Technological Advancement**: A step toward the development of the **SKA telescope**, enhancing global scientific collaboration.
3. **Contribution to Astrophysics**: Provides insights into **giant radio galaxies**, black holes, and other cosmic phenomena.
4. **Boost to South Africa's Science**: Establishes South Africa as a hub for cutting-edge **astronomical research**.

Centrifugal Process & Uranium Enrichment

Syllabus: GS III - Science and Technology, Nuclear Technology

Context

- **Iran's Announcement**: Iran plans to launch advanced centrifuges in response to a **censure resolution** by the **International Atomic Energy Agency (IAEA)**, escalating tensions regarding its nuclear program.

About Centrifugal Process

1. **Definition**: Centrifuges spin uranium gas at high speeds to **enrich uranium** by increasing the concentration of the fissile isotope **U-235**.
2. **Uses**:
   - **Low-enriched uranium (LEU)**: Used for **nuclear reactors**.
   - **Highly enriched uranium (HEU)**: Can be used for **nuclear weapons**.

3. **Efficiency**: **Advanced centrifuges** enrich uranium **faster** and require **fewer machines** compared to older centrifuge designs.
4. **Origins**: Iran's centrifuge program began in the **1980s** with designs and components acquired from **A.Q. Khan's proliferation network**.
5. **International Concerns**: The process raises **fears of nuclear weapons development** due to its **dual-use** nature (can be used for both energy production and weapons manufacturing).

About Uranium Enrichment

1. **Definition**: **Uranium enrichment** is the process of increasing the proportion of **U-235** isotope in uranium to make it suitable for nuclear reactors or weapons.
2. **Natural Uranium Composition**: Natural uranium contains **0.7% U-235** (fissile isotope) and **99.3% U-238** (non-fissile).
3. **Purpose**: **Enhances U-235 concentration** from **0.7% to 3-5%** for standard **nuclear reactors** (LEU) or up to **20% for specialized reactors** (HALEU).
4. **Fission Process**: U-235 undergoes **nuclear fission**, producing **heat for energy generation** in reactors.
5. **Methods of Enrichment**: **Gas centrifuges** and **gaseous diffusion** are commonly used **isotope separation techniques** in uranium enrichment.

WELFARE SCHEMES AND POLICIES

Rationalising the Public Distribution System (PDS) in India

Syllabus: GS II - Welfare Schemes and Policies; GS III - Food Security and Inclusive Growth

Context: A policy brief by **ICRIER** highlights **persistent leakages in the Public Distribution System (PDS)** and suggests measures to rationalize the system for improved **food and nutritional security**.

Key Findings

Leakages in PDS

1. **Extent of Leakages**:
   - **28% of grains** allocated by the **Food Corporation of India (FCI)** and State Governments fail to reach intended beneficiaries.
   - Financial loss amounts to approximately **₹69,108 crores**.
2. **Efficacy of Recent Reforms**:
   - **Linking ration cards with Aadhaar** and installation of **Point of Sale (PoS) machines** in **95% of Fair Price Shops (FPS)** have improved distribution but **failed to eliminate leakages entirely**.
3. **Regional Variations**:
   - States like **Bihar** and **West Bengal** have shown significant progress in curbing leakages.
   - High leakages persist in **North-eastern states** like **Arunachal Pradesh**, **Nagaland**, and **Gujarat**, primarily due to limited **PDS digitization**.

Recommendations for Rationalising PDS

1. **Effective Targeting of Beneficiaries**:
   - Reduce coverage under PDS from the current **57%** of the population to the **bottom 15%** for **free food distribution**.
   - Provide the remaining population **grains at 50% of MSP**, reducing subsidy costs.
2. **Adopting Direct Benefit Transfer (DBT)**:
   - Transition to **DBT** to:
     - Minimize leakages.
     - Lower administrative costs.
     - Empower citizens with **dietary flexibility**.
3. **Transforming FPS into Nutrition Hubs**:
   - Introduce a **Food Coupon Approach** in selected FPSs to combat grain diversion.
   - Promote nutritional awareness and availability.

About the Public Distribution System (PDS)

1. **Scale and Coverage**: World's largest food distribution program, covering millions of households.
2. **Operational Responsibility**:
   - **Centre (via FCI)**: Procurement, storage, transportation, and bulk food grain allocation.
   - **States**: Distribution within states, **identifying eligible families**, issuing ration cards, and supervising FPSs.
3. **Evolution**:
   - **Revamped PDS (1992)**: Focus on poor areas.
   - **Targeted PDS (TPDS) (1997)**: Categorized beneficiaries based on income.
   - **Antyodaya Anna Yojana (AAY) (2000)**: Targeted the poorest families.
   - **National Food Security Act (2013)**: Ensured food security for vulnerable groups.
   - **Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY) (2020)**: Free grains during the COVID-19 pandemic.

UNICEF's State of the World's Children 2024 Report

Syllabus: GS II - Welfare Schemes and Child Development; GS III - Environmental Pollution and Climate Change

Major Findings of the Report

1. **Demographic Transition**:
   - **Global Trends**: The global child population is expected to **stabilize at 2.3 billion** by the 2050s.
   - **India's Projection**: India is projected to have **350 million children** by 2050, accounting for **15% of the global child population**.
2. **Climate Risks**:
   - **Global Impact**: Nearly **1 billion children** live in countries with **high climate and environmental hazards**.
   - **India's Rank**: India ranks **26th in the Children's Climate Risk Index (2021)**, with children facing **acute climate risks**.
3. **Frontier Technologies**:
   - **Digital Divide**:
     - **High-Income Countries**: Over **95% connectivity** to the internet.
     - **Low-Income Countries**: Only **26% connectivity**, limiting access to **frontier technologies** like artificial intelligence (AI).

Recommendations by UNICEF

1. **Planning**: Integrate **climate resilience** into **local planning** and infrastructure development, including schools and healthcare systems.
2. **Renewable Energy**: Invest in **renewable energy solutions** to cut emissions by **43% by 2030**.
3. **Policy Reforms**:
    - Enact laws to protect **children's rights in digital environments**, addressing issues like new cybercrimes.
    - Develop **ethical guidelines** for technology usage and development to ensure child safety.

PM Vidyalaxmi Scheme: Empowering Higher Education through Financial Assistance

Syllabus: GS II - Government Policies and Interventions in Education Sector

Context

The Union Cabinet approved the **PM Vidyalaxmi Scheme** on **November 6, 2024**, a **Central Sector Scheme** to provide **collateral-free and guarantor-free loans** for students pursuing higher education in top-ranking institutions.

About PM Vidyalaxmi Scheme

1. **Objective**: Provide **financial assistance** to **meritorious students**, eliminating financial constraints for accessing **quality higher education**.
2. **Eligibility**:
    - Covers students admitted to **860 top HEIs** (Higher Education Institutions) in India, ranked by the **National Institutional Ranking Framework (NIRF)**.
    - Benefits **22 lakh students annually**.
3. **Loan Features**:
    - **Collateral-free** and **guarantor-free education loans**.
    - Digital, user-friendly application process via the **Vidyalaxmi portal**.
4. **Credit Guarantee**: Government provides a **75% credit guarantee** on loans up to **₹7.5 lakhs**, encouraging banks to expand loan disbursement.
5. **Interest Subvention**: Families with annual incomes:
    - Up to **₹8 lakhs**: **3% interest subvention** on loans up to ₹10 lakhs.
    - Up to **₹4.5 lakhs**: **Full interest subvention** under the **PM-USP scheme**.
6. **Complementary Schemes**: Aligns with existing schemes like **CSIS** and **CGFSEL** under PM-USP, focusing on **technical and professional courses** in approved HEIs.

How PM Vidyalaxmi Differs from Other Schemes

1. **Broader Income Coverage**: Extends benefits to **middle-income families** (income cap of ₹8 lakh), unlike earlier schemes targeting only low-income groups.
2. **Interest Subvention**: Offers **3% interest subvention** during the moratorium period for loans up to ₹10 lakh, aiding **1 lakh students annually**.
3. **Institution Eligibility**: Targets **top NIRF-ranked colleges and universities**, unlike earlier schemes requiring **NAAC** or **NBA accreditation**.
4. **Focus on Quality**: Reduces eligible institutions to **860**, emphasizing **quality over quantity**.
5. **Simplified Loan Process**: Employs the **Vidyalaxmi portal** for streamlined applications, tracking, and linkage with major banks.
6. **Outlay and Reach**: Allocates **₹3,600 crore (2024–2031)** to benefit **22 lakh students**.

Significance

1. **Enhanced Access**: Expands opportunities for **middle-income families**, promoting **inclusive higher education**.
2. **Focus on Merit and Quality**: Encourages students to enroll in **high-ranking institutions**, driving competitiveness and standards in higher education.
3. **Economic Support**: Reduces financial burden on students, fostering **educational and economic empowerment**.
4. **Ease of Implementation**: Streamlined digital application system ensures transparency and efficiency.

VISION Portal: Fostering Innovation and Outreach

Syllabus: GS II - Government Policies and Interventions; GS III - Education and Innovation

Context

The **Union Minister of Science and Technology** inaugurated the **Viksit Bharat Initiative for Student Innovation and Outreach Network (VISION) portal** to enhance education, skills, and innovation among **underprivileged children**.

About the VISION Portal

1. **Objective**: Focused on **education**, **skill development**, and **innovation** targeting children from marginalized and remote areas.
2. **Access to Mentorship**: Acts as a gateway for students in **remote areas** to access **mentorship** and **training** in various fields.
3. **Vision India 2047 Alignment**: Integral to achieving India's aspirations under **Vision India 2047**, which envisions a **developed and self-reliant India**.
4. **Technology Integration**: Utilizes digital platforms to provide **learning opportunities**, bridging gaps in accessibility and resource availability.

Significance

1. **Empowering Underprivileged Children**: Provides equitable access to **quality education** and skill-building resources.
2. **Innovation Ecosystem**: Encourages **grassroots innovation** and skill development, fostering a **knowledge-driven economy**.
3. **Skill Development**: Enhances employability and prepares children for **future challenges** in technology and entrepreneurship.
4. **Reducing Disparities**: Bridges the urban-rural divide in **education** and **training opportunities**.