IQRA IAS
An Institute for Civil Services

WEEKLY UPDATES

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POLITY & GOVERNANCE

Lokpal of India: Celebrating its 1st Foundation Day

Relevant for: GS-II (Governance, Transparency, and Accountability)

Establishment:

- o Lokpal of India celebrated its **1st Foundation Day** on **16th January** to commemorate its establishment in **2014** under the **Lokpal and Lokayuktas Act, 2013**.

Concept Origin:

- o Introduced in **1966** by the **Administrative Reforms Commission (ARC)**.
- o The idea stems from the Swedish **Ombudsman system** of the **19th century**, aiming to promote transparency and accountability.

About Lokpal and Lokayukta

1. **Purpose**:
   - o Establishes a **Lokpal** (Union level) and **Lokayukta** (State level) to address **corruption** and promote **public accountability**.
2. **Composition**:
   - o **Chairperson**: Chief Justice of India, a Supreme Court Judge, or an eminent individual.
   - o **Members**: Up to **8 members** with:
     - ▪ **50% judicial members**.
     - ▪ Representation from **SC/ST/OBC, minorities, and women**.
3. **Selection Committee**:
   - o **Prime Minister** (Chairperson).
   - o **Lok Sabha Speaker**.
   - o **Leader of Opposition in Lok Sabha**.
   - o **CJI or a Supreme Court Judge**.
   - o **Eminent jurist**.
4. **Tenure**:
   - o **5 years** or until **70 years of age**.
5. **Jurisdiction**:
   - o Covers:
     - ▪ **Prime Minister** (with safeguards).
     - ▪ **Union Ministers**, MPs, **Group A/B/C/D officers**, and entities funded by the **central government**.
   - o Investigates **corruption complaints** filed by whistleblowers or referred by **CVC**.
6. **Prosecution Wing**:
   - o Empowers Lokpal to establish a **prosecution wing** to handle cases independently.
7. **Timelines for Cases**:
   - o **Preliminary inquiry**: 90 days.
   - o **Full investigation**: 6 months (extendable).

India's Anti-Corruption Framework

1. **Institutional Measures**:
   - o **Lokpal**: Union level accountability.
   - o **Lokayukta**: State-level accountability.
2. **Legislative Acts**:
   - o **Prevention of Corruption Act, 1988**: Criminalizes corruption.
   - o **Whistleblower Protection Act, 2014**: Ensures protection to informants.
3. **Supporting Institutions**:
   - o **Central Vigilance Commission (CVC)**.
   - o **Comptroller and Auditor General (CAG)**.

Challenges Faced by Lokpal

1. **Complaints Timeframe**:
   - o Does not entertain cases older than **7 years**.

2. **Rejected Complaints**:
   - Nearly **90% of complaints** were rejected in 5 years due to incorrect formats or procedural lapses.
3. **Delayed Appointments**:
   - Appointment delays weaken its operational efficiency.
4. **Limited Awareness**:
   - Lack of public awareness affects the **utilization of Lokpal's powers**.

Reports and Data

- **Transparency International Report**: India ranks **85th out of 180** countries in the **Corruption Perception Index (2024)**.
- **Statistics**: Lokpal handled **over 1,800 complaints in 2024**, with only a **10% success rate** in actionable outcomes.

Major Dhyan Chand Khel Ratna Award 2024

Relevant for: GS-II (Government Policies - Social Sectors) and GS-IV (Ethics in Sportsmanship)

Key Highlights

1. **Context**:
   - The **Major Dhyan Chand Khel Ratna Award**, India's **highest sporting accolade**, was conferred upon outstanding sportspersons at **Rashtrapati Bhavan** in 2024.
2. **About the Award**:
   - **Started in**: 1991-1992 (initially named **Rajiv Gandhi Khel Ratna Award**).
   - **Renamed in**: 2021 to honor the legendary hockey player **Major Dhyan Chand**.
   - **Aim**: To recognize **outstanding international sports performances**, motivate athletes, and inspire **future generations**.
   - **Administered by**: Ministry of Youth Affairs and Sports, **Government of India**.

Eligibility Criteria

1. **Performance**:
   - Exceptional international achievements over the **past four years**.
2. **Clean Record**:
   - Must maintain a **clean anti-doping record**.
3. **Eligible Competitions**:
   - Achievements in major events like the **Olympics**, **Commonwealth Games**, **Asian Games**, and **World Championships**.

Nomination and Selection Process

1. **Nominating Authorities**:
   - **National Sports Federations**.
   - **Sports Authority of India (SAI)**.
   - **State Governments**.
   - **Indian Olympic Association**.
   - In case of no nominations, the **Government** can nominate up to **two sportspersons**.
2. **Selection Committee**:
   - Composed of **government officials**, **Olympians**, **sports journalists**, and **experts**.
   - **Points-based system** evaluates performance in international events (e.g., **Olympics, Commonwealth Games**).
   - Recommendations are finalized by the **Union Minister of Youth Affairs and Sports**.

Winners of 2024 Major Dhyan Chand Khel Ratna Award

Recipient	Sport
Manu Bhaker	Shooting
D Gukesh	Chess
Harmanpreet Singh	Hockey
Praveen Kumar	Paralympic High Jump

Significance of the Award

1. **Recognition and Motivation**:
   - Acknowledges sportspersons for bringing **global recognition** to India.
   - Acts as a **motivational tool** for young athletes.
2. **Cultural Impact**:
   - Builds a sense of **national pride** and promotes the values of **sportsmanship** and **dedication**.
3. **Encouraging Diversity in Sports**:
   - Covers a wide range of sports, fostering growth beyond traditional games.

Additional Insights

1. **Major Dhyan Chand's Legacy**:
   o Widely regarded as one of the **greatest hockey players**, Dhyan Chand led India to **three Olympic golds (1928, 1932, 1936)**.
2. **Paralympic Inclusion**:
   o Recognition of **Paralympic athletes**, like **Praveen Kumar**, reflects India's commitment to **inclusive sports development**.
3. **Global Competitiveness**:
   o Highlights India's growing presence in **non-traditional sports** like **chess** and **shooting** on the world stage.

Pay Commission: Revising Compensation for Central Government Employees

Relevant for: GS-II (Governance - Government Policies and Interventions)

Context

- The **Union Cabinet**, chaired by the Prime Minister, approved the establishment of the **8th Pay Commission** to revise salaries and allowances for nearly **50 lakh central government employees** and **65 lakh pensioners**.

About the Pay Commission

1. **What is a Pay Commission?**
   o A **body established by the Central Government** to review and recommend changes to:
     ▪ **Salaries**.
     ▪ **Allowances**.
     ▪ **Pension structures** for central government employees and pensioners.
2. **Established By**:
   o The **Department of Expenditure**, under the **Ministry of Finance**, Government of India.
3. **Aim**:
   o Ensure **fair compensation** for government employees.
   o Recommend **Dearness Allowance (DA)** and **Dearness Relief (DR)** formulas to counter inflation.
4. **Functions**:
   o **Review Salaries and Allowances**: Assess and suggest revisions to pay structures.
   o **Propose Structural Changes**: Enhance **governance efficiency** through changes in employee compensation.
   o **Financial Sustainability**: Ensure salary revisions are fiscally feasible.

History of Pay Commissions

1. **1st Pay Commission**:
   o **Year**: 1946.
   o **Chairperson**: **Srinivasa Varadachariar**.
   o Focused on setting fair pay scales post-independence.
2. **7th Pay Commission**:
   o **Year Established**: 2014.
   o **Implemented**: January 1, 2016.
   o **Key Changes**:
     ▪ Fitment factor of **57**, increasing minimum basic pay from **₹7,000 to ₹18,000**.
     ▪ Maximum salary revised to **₹2,50,000**.
     ▪ **Expenditure Impact**: Added **₹1 lakh crore** to the financial burden for FY 2016-17.

About the 8th Pay Commission

1. **Purpose**:
   o Review and adjust the **pay scales and benefits** of central employees and pensioners to align with **current economic conditions**.
2. **Beneficiaries**:
   o Approximately **50 lakh employees** and **65 lakh pensioners** across the central government.
3. **Expected Changes**:
   o Revised **salary structures**, **allowances**, and **pension benefits** to address:
     ▪ **Inflation impacts**.
     ▪ **Changing economic needs** of employees.

Significance of Pay Commissions

1. **Fair Compensation**:
   o Ensures government employees receive salaries **commensurate with inflation** and market conditions.
2. **Economic Impact**:
   o Boosts **domestic consumption** through increased purchasing power.

3. **Motivation and Efficiency**:
   o Improved compensation leads to higher employee **morale and productivity**.
4. **Administrative Reforms**:
   o Recommendations often include **structural changes** for improving public service delivery.

Challenges

1. **Fiscal Burden**:
   o Significant financial implications for the government.
   o Example: The 7th Pay Commission increased annual expenditure by **₹1 lakh crore**.
2. **State Government Implications**:
   o Central pay revisions often pressure states to adjust pay scales, further **straining state finances**.
3. **Implementation Delays**:
   o Recommendations may face delays in **approval and execution**.

QS World Future Skills Index 2025: India's Position and Performance

Relevant for: GS-II (International Reports and Rankings), GS-III (Education and Skill Development)

Context

- India ranked **25th globally** in the **QS World Future Skills Index 2025**, with a notable **2nd rank** in the **"Future of Work"** category, just behind the United States.

About QS World Future Skills Index

1. **Definition**:
   o A global ranking system evaluating countries' **preparedness for evolving job markets** by analyzing skill development, education systems, and economic transformation.
2. **Released By**:
   o **Quacquarelli Symonds (QS)**, a London-based organization renowned for its **education and skills-related rankings**.
3. **Aim**:
   o To assess how countries are preparing their workforce for **future skills**, including:
     ▪ **Digital competencies**.
     ▪ **Artificial Intelligence (AI)**.
     ▪ **Green technologies**.
     ▪ **Sustainability**.

India's Performance

1. **Overall Rank**:
   o **25th globally** in the QS World Future Skills Index 2025.
2. **Category Excellence**:
   o **2nd Rank** in **Future of Work**, indicating high preparedness for:
     ▪ **Tech-driven roles**.
     ▪ Integration of **AI** and other emerging technologies.

Key Criteria in the Index

1. **Skills Fit**:
   o Evaluates alignment between **graduate skills** and **employer demands**.
2. **Academic Readiness**:
   o Assesses how well **higher education systems** prepare students for evolving job markets.
3. **Future of Work**:
   o Measures readiness for roles requiring skills in:
     ▪ **AI**.
     ▪ **Digital technologies**.
     ▪ **Green innovations**.
4. **Economic Transformation**:
   o Analyzes capacity for:
     ▪ **Sustainable growth**.
     ▪ **Innovation**.
     ▪ **Workforce efficiency**.

Key Insights

Strengths

1. **Tech Integration**:
   o High readiness in **AI adoption** and attracting **venture capital** for tech innovations.
2. **Demographic Dividend**:
   o Robust **youth population** and a **dynamic startup ecosystem**, positioning India as a global leader in **innovation-driven growth**.

Weaknesses

1. **Sustainability Innovation**:
   o Poor scores in **sustainability-oriented innovation** and aligning higher education with industry needs.
2. **Skill Gaps**:
   o Deficits in fostering **creativity**, **problem-solving**, and **entrepreneurial thinking**.

Opportunities

1. **Policy Leveraging**:
   o Utilize the **National Education Policy (NEP) 2020** to bridge skill gaps and align curricula with **industry demands**.
2. **Industry-Academia Collaborations**:
   o Expand collaborations to foster **research and innovation**, particularly in emerging fields like **green technologies**.

Significance of India's Rank

1. **Global Competitiveness**:
   o Highlights India's potential to become a **global skills hub**, especially in the **Future of Work**.
2. **Economic Growth Driver**:
   o Skill development aligns with national initiatives like **Skill India** and **Digital India**, contributing to sustainable economic growth.
3. **Geopolitical Edge**:
   o Strengthened global position in tech-driven sectors such as **AI**, **renewable energy**, and **digital transformation**.

Way Forward

1. **Education Reforms**:
   o Accelerate **NEP 2020 implementation** to revamp higher education and skill training.
2. **Sustainability Focus**:
   o Invest in **green innovation** and improve alignment of economic growth with **sustainability goals**.
3. **Skill Enhancement**:
   o Focus on **creativity, problem-solving**, and **entrepreneurial skills** through targeted programs.
4. **Global Collaboration**:
   o Strengthen partnerships with global institutions to improve **research capabilities** and **technological adoption**.

Fast Track Immigration – Trusted Traveller Programme (FTI-TTP

Relevant for: GS-II (Governance - E-Governance and Security)

Context

- The **Union Home Minister** inaugurated the **Fast Track Immigration – Trusted Traveller Programme (FTI-TTP)** at **Mumbai, Chennai, Kolkata, Bengaluru, Hyderabad, Cochin**, and **Ahmedabad airports**, following its initial launch at Delhi's IGI Airport.

About Fast Track Immigration – Trusted Traveller Programme (FTI-TTP)

1. **Definition**:
   o FTI-TTP is an **advanced immigration clearance system** leveraging **automated e-gates** to reduce wait times and streamline international travel.
2. **Launch Timeline**:
   o **June 2024**: First introduced at Delhi's IGI Airport.
   o **January 16, 2025**: Expanded to seven additional airports.
3. **Ministry Involved**:
   o Implemented by the **Ministry of Home Affairs** through the **Bureau of Immigration**.
4. **Aim**:
   o Ensure **faster immigration clearance**, enhance **security**, and provide **seamless international travel** for passengers.

Key Features

1. **Automated E-Gates**:
   - Passengers complete immigration clearance without manual intervention.
2. **Biometric Authentication**:
   - Secure and efficient identification through biometric validation.
3. **Online Registration**:
   - Travelers register on the FTI-TTP portal, uploading required documents.
4. **Validity**:
   - Registration remains valid for the **passport's duration** or **five years**, whichever is earlier.

Required Documents

1. **Passport**:
   - Scanned copy with at least **six months validity**.
2. **Passport-size Photograph**:
   - Recent photo (taken within six months) meeting **Indian passport standards**.
3. **OCI Card (if applicable)**:
   - Scanned copies of biographic and family information pages for **OCI cardholders**.

How it Works

1. **Registration**:
   - Travelers register on the **FTI-TTP portal** and complete verification.
2. **Immigration at Airport**:
   - Travelers scan their **boarding pass** and **passport** at automated e-gates.
3. **Biometric Validation**:
   - Biometric data is authenticated, and upon successful validation, the **e-gates open**, granting clearance.

Phases of Implementation

1. **Phase 1**:
   - Targets **Indian citizens** and **OCI cardholders** at **21 major airports**.
2. **Phase 2**:
   - Expansion to include **foreign travelers**.

Significance

1. **Enhanced Efficiency**:
   - Drastically reduces immigration wait times for international travelers.
2. **Security Augmentation**:
   - Biometric authentication ensures **secure and foolproof identity validation**.
3. **Ease of Travel**:
   - Facilitates seamless movement for passengers, especially frequent travelers.
4. **E-Governance Initiative**:
   - Aligns with India's push toward **digital governance** and efficient public service delivery.
5. **Tourism and Business Boost**:
   - Streamlined immigration processes attract international tourists and business professionals.

Challenges

1. **Technological Infrastructure**:
   - Ensuring robust systems to prevent failures during peak travel times.
2. **Digital Literacy**:
   - Travelers unfamiliar with online registrations may face difficulties.
3. **Integration with Global Standards**:
   - Ensuring compatibility with international immigration systems for seamless global travel.

Draft Digital Personal Data Protection (DPDP) Rules

Relevant for: GS-II (Governance - Transparency, Accountability, and Rights)

Context

- The **Ministry of Electronics and Information Technology (MeitY)** has released draft rules for implementing the **Digital Personal Data Protection Act, 2023 (DPDP Act)**, aimed at safeguarding personal data and enhancing user autonomy.

Key Features of Draft DPDP Rules

1. **Principles-Based Framework**:
   - Focus on **simplicity and clarity** in notice and consent mechanisms to address "**consent fatigue.**"
2. **User Rights**:
   - Empowers users with rights to:
     - **Access**, **correct**, **update**, and **erase** their data.
3. **Children's Data Protection**:
   - Requires **verifiable parental consent** for handling data of individuals under **18 years**, with exceptions for industries like **education** and **healthcare**.
4. **Data Localisation and Transfers**:
   - **Restricts cross-border data flows**, particularly for **Significant Data Fiduciaries (SDFs)** handling large volumes of sensitive data.
5. **Grievance Redressal**:
   - Establishes the **Data Protection Board (DPB)** to address breaches and disputes, though its independence is limited.

Need for DPDP Rules

1. **Data Security**:
   - Rising **cyber threats** and frequent **data breaches** necessitate robust personal data protection.
2. **Global Compliance**:
   - Aligns India with **global data privacy standards**, enhancing **credibility** and attracting **foreign investments**.
3. **User Autonomy**:
   - Strengthens **individual control** over personal data, fostering trust in **digital interactions**.
4. **Economic Growth**:
   - Provides businesses with clear guidelines, driving **innovation** and **growth** in the tech sector.
5. **Sectoral Adaptability**:
   - Enables **tailored regulations** for critical industries like **healthcare** and **education**.

Limitations of DPDP Rules

1. **Ambiguities in Implementation**:
   - Lack of clarity in processes for exercising user rights like **data erasure** and **correction**.
2. **Insufficient Protection for Children**:
   - Vague guidelines for verifying **parental consent** and age claims create inconsistencies.
3. **Centralized Oversight**:
   - Absence of an **independent regulator**, centralizing authority with the government.
4. **Data Localisation Issues**:
   - Strict mandates could deter **investments** and create **uneven regulatory burdens**.
5. **Limited Grievance Redressal**:
   - The **Data Protection Board (DPB)** lacks independence and has restricted powers, undermining its impartiality.

Way Ahead

1. **Clarify Implementation Mechanisms**:
   - Develop detailed guidelines for:
     - **User rights enforcement**.
     - **Data breach notifications**.
     - **Consent verification**.
2. **Establish an Independent Regulator**:
   - Create a **Data Protection Authority (DPA)** with independent powers for **fair adjudication** and **transparency**.
3. **Tailored Localisation Policies**:
   - Implement **sector-specific rules** to balance security needs with economic growth.
4. **Public Consultation and Transparency**:
   - Ensure **inclusive consultations** and publish feedback to involve all stakeholders in policy-making.
5. **Future-Proof Regulations**:
   - Address **emerging technologies** like **AI**, **IoT**, and **5G** to ensure relevance and adaptability.

Election Commission of India's Advisory on Artificial Intelligence in Elections

Relevant for: GS-II (Governance, Elections, and Technology)

Context

- The **Election Commission of India (ECI)** has issued advisories to regulate the use of **Artificial Intelligence (AI)** in electoral campaigns to ensure transparency and protect voters from misinformation.

Advisory Details

1. **Labeling AI-Generated Content**:
   o All **images, videos, audio, or other materials** generated or significantly altered by **AI technologies** must be **clearly labeled**.
2. **Disclosure in Campaign Materials**:
   o **Disclaimers** must accompany campaign materials using synthetic or AI-generated content to inform voters.
3. **Social Media Monitoring**:
   o **Delhi Police** has appointed a **nodal officer** to monitor social media for potential misuse of AI during **Delhi's assembly election**.

Impact of AI in Elections

1. **Positive Impacts**:
   o **Enhanced Outreach**: AI helps political parties connect with voters through targeted campaigns.
   o **Data-Driven Insights**: AI provides real-time analysis of voter sentiments and preferences.
   o **Efficient Communication**: Enables personalized and cost-effective communication.
2. **Negative Impacts**:
   o **Spread of Misinformation**: AI-generated content like deepfakes can mislead voters.
   o **Polarization**: Amplification of divisive content can harm social cohesion.
   o **Manipulation**: Micro-targeting based on user data may influence voter behavior unethically.
   o **Erosion of Trust**: Synthetic content may undermine trust in democratic processes.

Steps to Address AI Challenges in Elections

1. **Research and Assess Impact**:
   o Investigate how AI affects **freedom of speech** and **electoral integrity**.
2. **Independent Verification**:
   o Verify claims made by social media platforms regarding their **transparency and accountability measures**.
3. **Algorithmic Filters**:
   o Develop regulated **algorithmic filters** to detect and flag **harmful or misleading content**.
4. **Global AI Standards**:
   o Collaborate with international bodies to establish **AI norms** for safeguarding democracy.
5. **Capacity Building**:
   o Train election officials to understand and address the misuse of AI in electoral processes.
6. **Voter Awareness Campaigns**:
   o Educate citizens about **AI-generated content** and the risks of misinformation.

INTERNATIONAL RELATIONS

Global South and India: Championing Inclusive Development

Relevant for: GS-II (International Relations)

Context

- The **Union Minister for Commerce & Industry**, at the **World Congress on Disaster Management**, highlighted India's pivotal role in aiding **neighboring and Global South countries** through initiatives like **Vaccine Maitri**.

What is the Global South?

1. **Definition**:
   o The **Global South** refers to **developing and less-developed nations**, primarily in **Asia**, **Africa**, and **Latin America**.

- o These nations face challenges such as **poverty**, **income inequality**, and **limited resources**, in contrast to the **Global North** (wealthier, industrialized nations).
2. **Historical Context**:
    - o The term gained traction as a neutral alternative to the outdated "**Third World**," emphasizing shared histories of **colonialism** and **economic marginalization**.

Significance of the Global South

1. **Economic Growth Potential**:
    - o **Shifting Wealth**: Nations like **India** and **China** are driving growth, with **BRICS** surpassing **G7** in combined GDP.
2. **Demographic Advantage**:
    - o **Younger Populations**: With a growing workforce, nations in the Global South are poised for economic contributions.
    - o Example: **Skill India** taps into India's demographic dividend.
3. **Geopolitical Influence**:
    - o **Multipolarity**: Global South nations are reshaping international relations, reducing dominance of the Global North.
    - o Example: **Voice of Global South Summit 2023** showcased India's leadership.
4. **Innovation Hubs**:
    - o Rapid advancements in **AI**, **renewable energy**, and **digital solutions**.
    - o Example: India's **Chandrayaan-3** and **UPI** systems are globally recognized.
5. **Addressing Global Challenges**:
    - o Key roles in **climate change**, **poverty eradication**, and **sustainable development**.
    - o Example: India's **International Solar Alliance (ISA)** promotes renewable energy.

Challenges Facing the Global South

1. **Green Energy Funding Gap**:
    - o Developed nations fail to fulfill climate finance commitments.
    - o Example: India highlights this at **COP conferences**.
2. **Economic Dependency**:
    - o Many nations rely on **external aid or loans**, creating dependency.
    - o Example: China's **Belt and Road Initiative** often traps smaller nations in debt.
3. **Limited Access to Resources**:
    - o Historical disparities hinder equitable development.
    - o Example: African nations struggle to access **healthcare and vaccines**.
4. **Global Conflicts**:
    - o Wars like **Russia-Ukraine** exacerbate food and energy insecurities.
    - o Example: Rising **wheat prices** impacted South Asian and African nations.
5. **Post-COVID-19 Aftershocks**:
    - o Fragile economies like **Sri Lanka** and **Pakistan** struggle to recover.
    - o Example: India's **Vaccine Maitri** mitigated global vaccine inequity.

India's Role and Way Ahead

1. **Collaborative Frameworks**:
    - o Strengthen **South-South Cooperation** in trade, technology, and healthcare.
    - o Example: India's **Global South Centre of Excellence** shares best practices.
2. **Sustainable Development**:
    - o Invest in **green technologies** and **climate-resilient infrastructure**.
    - o Example: India's **National Green Hydrogen Mission** serves as a model.
3. **Equitable Resource Distribution**:
    - o Advocate for fair access to global resources and funding mechanisms.
    - o Example: India's leadership at **COP28** for adequate climate finance.
4. **Economic Diversification**:
    - o Reduce dependence on external powers by diversifying economies.
    - o Example: India's **Atmanirbhar Bharat** promotes self-reliance.
5. **Capacity Building**:
    - o Focus on education, healthcare, and skill development to harness demographic advantages.
    - o Example: **NEP 2020** and **Skill India** target future-ready talent.

Entity List: Recent Developments and Implications

Relevant for: GS-II (International Relations - Bilateral Relations)

Context

- The **United States** has removed three Indian nuclear entities—**Bhabha Atomic Research Centre (BARC)**, **Indira Gandhi Atomic Research Centre (IGCAR)**, and **Indian Rare Earths (IRE)**—from its **restrictive Entity List**, a significant development in India-US bilateral relations.

About the Entity List

1. **What It Is**:
   - Published by the **U.S. Bureau of Industry and Security (BIS)**, the **Entity List** includes **foreign entities**(businesses, institutions, or organizations) subject to **strict licensing requirements** for exports, re-exports, or transfers of certain items.
2. **Purpose**:
   - Entities are listed if suspected of engaging in activities that threaten:
     - **U.S. national security**.
     - **Foreign policy interests**.
3. **Impacted Areas**:
   - Often targets **high-tech sectors**, such as **nuclear energy**, **aerospace**, and **artificial intelligence**.

Impact of Entity Listing

1. **Stringent Licensing Requirements**:
   - Listed entities must secure **individual licenses** for any transaction involving **U.S. goods, technologies**, or services.
2. **Hindered International Cooperation**:
   - Limits access to **advanced technologies** and complicates partnerships with global players.
   - Example: Collaboration in nuclear technology or defense becomes challenging.
3. **Economic and Strategic Limitations**:
   - Curtails participation in **global supply chains**, particularly in **high-tech industries**.
   - Stifles opportunities for technological growth and development.

Significance of the U.S. Decision

1. **Strengthened Bilateral Relations**:
   - Reflects improved trust between India and the U.S., particularly in **defense and strategic sectors**.
2. **Boost to Nuclear Research**:
   - Facilitates greater access to advanced nuclear technologies and **international collaboration** for India's nuclear entities.
3. **Economic and Strategic Benefits**:
   - Enhances India's position in **global supply chains**.
   - Promotes **self-reliance** in critical sectors like **nuclear energy** and **rare earths**.

India-Bangladesh Border Dispute: Key Issues and Agreements

Relevant for: GS-II (International Relations - Bilateral Relations and Border Management)

Context

- The **Border Security Force (BSF)** of India and the **Border Guard Bangladesh (BGB)** recently held a coordination meeting at the **Petrapole-Benapole border**, emphasizing their commitment to **maintaining border sanctity** and addressing contentious issues, including **fencing**.

Disputed Places Along the India-Bangladesh Border

1. **Sukdebpur, West Bengal (Malda District)**:
   - **Location**: Lies along the international border in **West Bengal's Malda district**.
   - **Issue**: Disagreement over constructing border fences within the **150-yard limit** stipulated by the **1975 border guidelines**.
2. **Dahagram-Angarpota Enclave (West Bengal)**:
   - **Location**: A Bangladeshi enclave near **Cooch Behar**, surrounded by Indian territory.
   - **Issue**: Connectivity and movement rights between the enclave and **mainland Bangladesh** remain contentious.
3. **Comilla-Tripura Stretch**:
   - **Location**: Along the **Tripura border**.
   - **Issue**: A **6.5 km stretch** remains **undemarcated**, leading to ambiguity in border enforcement and occasional disputes.

1975 Indo-Bangladesh Joint Agreement

1. **What It Is**:
   - A **bilateral guideline** for **border management**, ensuring peace and avoiding disputes.
2. **Key Features**:
   - **Prohibition of Defense Structures**: No construction allowed within **150 yards** of the international border.
   - **Bilateral Discussions**: Encourages peaceful resolution of disputes through **dialogue** and **cooperation**.

Reasons for Disputes

1. **Fencing Definition**:
   - **India's View**: Wire fencing is not considered a **defense structure**.
   - **Bangladesh's View**: Considers it a **violation** of the 1975 agreement.
2. **Security Concerns**:
   - India highlights the need for fencing to address:
     - **Cattle smuggling**.
     - **Human trafficking**.
     - **Illegal immigration**.
   - Bangladesh views fencing as a **disruption** to **local livelihoods**.
3. **Smart Fencing Opposition**:
   - Bangladesh opposes **CCTV** and **electronic surveillance systems**, citing **privacy concerns**.

Status of Fencing

1. **Total Fenced**:
   - As of 2023, **3,141 km** of the **4,156 km border** is fenced (Ministry of Home Affairs).
2. **Pending Issues**:
   - **Non-Cooperation**: Resistance from local authorities in **West Bengal**.
   - **Land Acquisition Delays**: Hinder progress in certain areas.
   - **Difficult Terrain**:
     - Includes **900 km of riverine border**, complicating fencing efforts.

Significance of Border Dispute Resolution

1. **Strengthening Bilateral Relations**:
   - Resolving disputes fosters trust and improves ties between **India and Bangladesh**.
2. **Enhanced Security**:
   - Proper demarcation and fencing ensure better management of:
     - **Cross-border crime**.
     - **Illegal immigration**.
3. **Economic Development**:
   - Peaceful borders encourage **trade**, **tourism**, and **regional cooperation**.
4. **Geopolitical Stability**:
   - Resolving disputes reinforces India's leadership in maintaining **regional peace** and stability.

Way Forward

1. **Diplomatic Engagement**:
   - Strengthen **bilateral dialogue** under the **1975 agreement** to resolve contentious issues.
2. **Joint Border Patrols**:
   - Enhance collaboration between **BSF and BGB** for effective border management.
3. **Sustainable Fencing Solutions**:
   - Explore **riverine fencing technologies** and address **privacy concerns** raised by Bangladesh.
4. **Economic Packages**:
   - Offer economic support to **border communities** to reduce resistance to fencing projects.

Diego Garcia Island: Strategic and Disputed Territory

Relevant for: GS-II (International Relations - Global Maritime Disputes, Territorial Claims)

Context

- **Fifteen fishermen** from **Kanniyakumari, Tamil Nadu**, were detained near **Diego Garcia Island**, a part of the **British Indian Ocean Territory (BIOT)**, for allegedly crossing maritime boundaries.

About Diego Garcia Island

1. **Location**:
   - Situated in the **Central Indian Ocean** and part of the **Chagos Archipelago**.
   - Located **south of the equator**.
2. **Controlled By**:
   - Falls under the **British Indian Ocean Territory (BIOT)**.
   - **Leased to the United States** for operating a **military base**.
3. **Features**:

- o   A **coral atoll** with a V-shaped cay and an open lagoon at its northern end.
- o   **Discovered** by the Portuguese in the **16th century**.
- o   Hosts a **strategic U.S. air and naval base**, making it vital for global military operations.

About Chagos Archipelago

1. **Location**:
   - o   Found in the **Central Indian Ocean**, south of the **Maldives**, and **south of the equator**.
2. **Controlled By**:
   - o   Governed as part of the **British Indian Ocean Territory (BIOT)**.
3. **Disputed Claims**:
   - o   Disputed between the **United Kingdom** and **Mauritius**.
   - o   **International Court of Justice (ICJ)** in **2019** ruled in favor of Mauritius, stating that the archipelago should be decolonized and handed over to Mauritius.
4. **Features**:
   - o   Comprises over **50 islands**, including **Diego Garcia**.
   - o   Known for its **ecological significance** and **strategic military value**.

Significance of Diego Garcia

1. **Strategic Military Hub**:
   - o   **U.S. Base**: Key location for air and naval operations in the **Indian Ocean Region (IOR)**.
   - o   Supports **global military surveillance** and **counterterrorism efforts**.
2. **Ecological Importance**:
   - o   Home to diverse **marine ecosystems**, including coral reefs and lagoons.
   - o   A critical site for **biodiversity conservation**.
3. **Geopolitical Importance**:
   - o   Central to disputes involving **sovereignty** and the **decolonization process**.
   - o   Provides leverage in maintaining control over **IOR maritime routes**.

Key Challenges

1. **Maritime Disputes**:
   - o   Detentions like the **Kanniyakumari fishermen case** underscore ongoing tensions regarding **maritime boundaries**.
2. **Sovereignty Dispute**:
   - o   Continued **UK-Mauritius disagreement** over territorial claims affects regional diplomacy.
3. **Environmental Concerns**:
   - o   Military activities pose risks to the **fragile ecosystem** of the archipelago.
4. **Human Rights Issues**:
   - o   Controversy surrounding the **forced relocation** of Chagossians during the 1960s and 1970s.

Way Forward

1. **Resolution of Sovereignty Disputes**:
   - o   The **UK and Mauritius** should engage in **bilateral negotiations** to honor the **ICJ ruling**.
2. **Maritime Cooperation**:
   - o   Strengthen **India-UK-Mauritius partnerships** for effective maritime boundary management.
3. **Environmental Conservation**:
   - o   Promote **sustainable practices** to protect the region's **marine biodiversity**.
4. **Humanitarian Measures**:
   - o   Address **Chagossian grievances** through compensation and the right to return.
5. **Fishermen Awareness**:
   - o   Conduct **awareness programs** for fishermen about **international maritime boundaries** and regulations.

UN Committee of Experts on Big Data and Data Science for Official Statistics: India Joins the Global Initiative

Relevant for: GS-II (International Relations, Technology and Governance)

Context

- In a significant development, **India** has become a member of the **UN Committee of Experts on Big Data and Data Science for Official Statistics**, marking its active participation in global efforts to leverage **big data and data science** for official statistics.

About the UN Committee of Experts on Big Data and Data Science for Official Statistics

1. **What It Is**:
   o A **specialized UN body** established to explore the integration of **big data** and **data science techniques** into **official statistical systems** globally.
2. **Established In**:
   o Formed in **2014** under the **United Nations Statistical Commission (UNSC)**.
3. **Aim**:
   o **Enhance official statistical systems** by leveraging big data.
   o Support **monitoring and reporting** of **Sustainable Development Goals (SDGs)**.
   o Address challenges related to **non-traditional data sources**.
4. **Functions**:
   o **Develop Global Standards**: Create **best practices** and **frameworks** for integrating big data into national statistical systems.
   o **Facilitate Collaboration**: Encourage **international cooperation** among member countries to share expertise and resources.
   o **Innovative Data Use**: Promote the use of **non-traditional data sources** such as:
     ▪ **Satellite imagery**.
     ▪ **Internet of Things (IoT)**.
     ▪ **Private sector data**.
   o **Technical Support**: Provide **capacity-building** and technical guidance to countries for modernizing statistical processes.

Significance of India's Membership

1. **Boost to Data-Driven Governance**:
   o Enhances India's ability to **modernize its statistical systems** for more **accurate policy-making**.
2. **Global Collaboration**:
   o Allows India to share its expertise, such as the use of **Aadhaar** and **digital platforms**, while learning from global best practices.
3. **Monitoring SDGs**:
   o Strengthens India's efforts in **tracking and achieving SDGs** by integrating **big data analytics**.
4. **Innovation in Statistics**:
   o Provides access to **innovative tools** and methodologies, such as AI-based **data analysis** and **real-time monitoring**.
5. **Leadership in Data Science**:
   o Positions India as a **global leader** in using data science for governance and development.

Challenges in Implementing Big Data for Statistics

1. **Data Privacy and Security**:
   o Ensuring **protection of personal data** while using non-traditional sources.
2. **Data Integration**:
   o Harmonizing **traditional** and **non-traditional data** sources for consistent results.
3. **Infrastructure Gaps**:
   o Developing the required **technical and human resource capabilities** for advanced data analytics.
4. **Quality Assurance**:
   o Maintaining the **accuracy** and **reliability** of big data for official use.
5. **Digital Divide**:
   o Addressing disparities in access to **digital infrastructure** among countries and regions.

Way Forward

1. **Capacity Building**:
   o Train statisticians and policymakers in **big data tools** and **data science techniques**.
2. **Strengthen Data Governance**:
   o Develop robust **privacy frameworks** and **cybersecurity protocols**.
3. **Invest in Infrastructure**:
   o Enhance **computing capabilities**, data storage, and analytical tools.
4. **Encourage Public-Private Partnerships**:
   o Collaborate with the **private sector** to access new data sources like **social media insights** and **IoT data**.
5. **Promote International Cooperation**:
   o Actively participate in **UN-led initiatives** to share knowledge and adopt global standards.

INTERNAL SECURITY & DEFENCE

World Economic Forum Reports: Global Cybersecurity Outlook 2025 & Global Risks Report 2025

Relevant for: GS-III (Security and Cybersecurity), GS-II (International Relations - Global Issues)

Context

- The **World Economic Forum (WEF)** recently released two key reports:
    1. **Global Cybersecurity Outlook 2025**.
    2. **Global Risks Report 2025**.

About Global Cybersecurity Outlook 2025

1. **Published By**:
    o **World Economic Forum** in collaboration with **Accenture**.
2. **Objective**:
    o Examines **cybersecurity trends** affecting **economies, societies**, and **organizations** globally.
3. **Key Features**:
    o **Escalating Cyber Threats**:
        ▪ Rise in **sophistication of cybercrimes** due to **geopolitical tensions** and emerging technologies.
    o **Cyber Resilience Gap**:
        ▪ Smaller organizations face **7 times higher challenges** compared to 2022.
        ▪ Larger organizations show improved **resilience**.
    o **Regional Disparities**:
        ▪ **42% in Latin America** and **36% in Africa** lack confidence in cybersecurity, compared to **15% in Europe and North America**.
    o **Public vs. Private Sector Resilience**:
        ▪ **38% of public-sector entities** report inadequate resilience versus **10% in private organizations**.
    o **Workforce Shortage**:
        ▪ Nearly **49% of public-sector organizations** report insufficient **cybersecurity talent**.

About Global Risks Report 2025

1. **Published By**:
    o **World Economic Forum**.
2. **Objective**:
    o Analyzes and prioritizes **global risks** across **immediate**, **short-to-medium**, and **long-term** horizons to enable **informed decision-making**.
3. **Key Features**:
    o **Global Risks Perception Survey (GRPS)**:
        ▪ Insights from **over 900 global experts**.
    o **Timeframe Analysis**:
        ▪ **Immediate Risks (2025)**: Focus on **cyber threats** and **geopolitical instability**.
        ▪ **Short-to-Medium Term (2027)**: Risks tied to **technological adoption** and **resource scarcity**.
        ▪ **Long Term (2035)**: Emphasis on **climate resilience** and **demographic shifts**.
    o **Sectoral Impact**:
        ▪ Highlights vulnerabilities in **public infrastructure**, **supply chains**, and **critical services**.
    o **Regional Variances**:
        ▪ Differentiates risk preparedness across continents, stressing **localized strategies**.
    o **In-depth Risk Themes**:
        ▪ Focused analyses on high-priority risks like **climate change**, **technology misuse**, and **economic fragmentation**.

Additional Insights

1. **Cybersecurity Context**:
    o Global economic losses due to **cybercrimes** are projected to exceed **$10.5 trillion annually by 2025**.
    o **India** alone recorded over **2.12 lakh cybersecurity incidents in 2024**, reflecting the urgent need for robust resilience.
2. **Global Risks**:

- o Climate-related risks remain the **top concern**, with **natural disasters** and **extreme weather events** becoming more frequent.
- o Technology adoption challenges such as **AI misuse** and **digital divide** are rising concerns.

ECONOMY

National Broadband Mission (NBM) 2.0

Relevant for: GS-III (Infrastructure - Digital Infrastructure and Communication)

Key Highlights

1. **Launch**:
   - o **NBM 2.0** unveiled by the **Ministry of Communications** in January 2025.
   - o Accompanied by the launch of the **Sanchar Saathi Mobile App** to enhance telecom **accessibility, security**, and **user empowerment**.
2. **Significance**:
   - o Builds upon the achievements of **NBM 1.0** launched in **2019** as part of the **National Digital Communications Policy, 2018**.
   - o Aims to **bridge the digital divide** and provide affordable **broadband access** for all.

About National Broadband Mission 2.0

1. **Achievements of NBM 1.0**:
   - o Telecom towers increased to **8.17 lakh** (2024).
   - o Broadband subscribers reached **941 million**.
2. **Objectives of NBM 2.0**:
   - o **Accelerate Digital Infrastructure Growth**:
     - ▪ Extend **Optical Fiber Cable (OFC)** to **2.70 lakh villages** by **2030** (from ~50,000 villages currently).
   - o **Bridge the Digital Divide**:
     - ▪ Provide broadband to **90% of anchor institutions**, including schools, PHCs, Anganwadi centers, and Panchayat offices by **2030**.
   - o **Enhance Broadband Speed**:
     - ▪ Ensure a minimum fixed broadband **download speed of 100 Mbps**.
   - o **Facilitate Next-Gen Networks**:
     - ▪ Support the rollout of **5G networks** and prepare for **6G technology**.
   - o **Disaster-Resilient Connectivity**:
     - ▪ Leverage **Optical Ground Wire (OPGW)** from the power sector to ensure connectivity during **emergencies, wars, and disasters**.

Sanchar Saathi Mobile App

1. **Purpose**:
   - o Empowers users to secure telecom resources and prevent **frauds**.
2. **Key Features**:
   - o **Chakshu**: Enables reporting of **Suspected Fraud Communications (SFC)**.
   - o **Know Mobile Connections in Your Name**: Allows users to track active mobile connections linked to their identity.

Additional Insights

1. **Digital Divide**:
   - o India still has significant gaps in rural digital connectivity, with only **37% rural internet penetration** as per 2024 statistics.
   - o Urban broadband access is over **67%**, indicating a wide urban-rural disparity.
2. **Global Connectivity Index**:
   - o India ranks **43rd** globally in broadband penetration as of **2024**.
3. **Economic Potential**:
   - o Improved digital infrastructure is projected to add **$1 trillion** to India's GDP by **2030** through enhanced productivity and employment opportunities.
4. **Sustainability Focus**:
   - o Use of **renewable energy** and **green towers** to promote sustainability in telecom infrastructure.

Challenges

1. **Fiber Connectivity**:
   - o Currently, only **30% of towers** are connected via OFC; this needs significant scaling up.
2. **Cost of Rollout**:
   - o High financial burden in connecting remote and rural areas.
3. **Data Security**:

o Increased digital dependence raises concerns over **data privacy** and **cybersecurity threats**.

Conclusion

NBM 2.0 represents a transformative step towards building a **digitally inclusive India**, fostering **economic growth** and enabling the country to emerge as a **global leader in telecom infrastructure**. However, addressing challenges like funding, rural penetration, and cybersecurity will be crucial for its success.

Revised Open Market Sale Scheme (Domestic) Policy for 2024-25

Relevant for: GS-III (Economic Development - Food Security and Agricultural Policies)

Key Highlights

1. **Announcement**:
   o The **Ministry of Consumer Affairs, Food & Public Distribution** announced the revised **Open Market Sale Scheme (Domestic)** policy for **2024-25**.
   o Focused on **enhancing food security** and **boosting ethanol production**.
2. **Revised Reserve Prices**:
   o **Rice Reserve Price**: Set at **₹2,250 per quintal** for sale to:
     ▪ **State Governments**, **Corporations**, and **Community Kitchens** (no e-auction required).
   o **For Ethanol Distilleries**: Price reduced by **₹550 per quintal** to promote **ethanol production**.

About Open Market Sale Scheme (Domestic)

1. **Definition**:
   o A mechanism under which the **Food Corporation of India (FCI)** sells **surplus food grains** (wheat and rice) in the open market.
2. **Objective**:
   o **Control Market Prices**: Prevent inflation by stabilizing food grain prices.
3. **Eligibility**:
   o **Processors, Atta Chakki Units**, and **Flour Millers** of wheat products are eligible.
   o **Traders and bulk buyers** are excluded from e-auctions.
   o States are permitted to procure food grains without e-auctions.

About Food Corporation of India (FCI)

1. **Establishment**:
   o A statutory body formed under the **Food Corporation Act, 1964**.
2. **Ministry**:
   o Operates under the **Ministry of Consumer Affairs, Food & Public Distribution**.
3. **Key Objectives**:
   o **Price Support**: Safeguard farmers' interests through effective **Minimum Support Price (MSP)** operations.
   o **Food Distribution**: Ensure equitable food grain distribution under the **Public Distribution System (PDS)**.
   o **Buffer Stocks**: Maintain operational and buffer stocks for **National Food Security**.

Impact of Revised Policy

1. **Food Security Enhancement**:
   o Reduced reserve prices make food grains more accessible to **state governments** and **community kitchens**, strengthening food security programs.
2. **Boost to Ethanol Production**:
   o Lower prices for ethanol distilleries align with the government's push for **biofuel adoption** under the **National Bio-Energy Policy**.
   o Contributes to achieving the **20% ethanol blending target by 2025**.
3. **Market Stabilization**:
   o Open market sales help **moderate prices** during supply shortages or inflationary trends.
4. **Support for Farmers**:
   o Ensures farmers benefit from **price support operations** while reducing wastage of surplus stocks.

Challenges

1. **Limited Beneficiaries**:
   o Exclusion of **traders and bulk buyers** from e-auctions may restrict market participation.
2. **Logistical Constraints**:
   o Transport and storage of surplus food grains remain a challenge for timely distribution.
3. **Fiscal Burden**:
   o Subsidized prices may increase the **fiscal pressure** on the government.

Additional Insights

1. **National Food Security Act, 2013**:
   o Ensures subsidized food grains for **67% of the population** through the **PDS**.
2. **Ethanol Blending Program (EBP)**:
   o Promotes **ethanol-blended petrol** to reduce crude oil dependency and greenhouse gas emissions.
3. **Global Food Price Index (FAO)**:
   o India's food price control mechanisms are critical amid rising global food inflation, as reflected in the **2024 FAO index**.

RBI's Measures to Boost Cross-Border Transactions in Rupee

Relevant for: GS-III (Indian Economy – Banking and Currency)

Context

- The **Reserve Bank of India (RBI)** has revised regulations under the **Foreign Exchange Management Act (FEMA), 1999**, to promote **cross-border transactions** in **Indian Rupee (INR)** as part of its efforts toward the **internationalization of the rupee**.

Recent Changes Made in FEMA Regulations

1. **For Non-Residents**:
   o **Opening INR Accounts Overseas**:
      - People residing outside India can open **INR accounts** in overseas branches of **Authorized Dealer (AD) banks**.
      - These accounts can settle permissible **current** and **capital account transactions** with residents in India.
   o **Transactions Among Non-Residents**:
      - Non-residents can settle transactions with other non-residents using balances in their **repatriable INR accounts** such as **Special Non-Resident Rupee Accounts (SNRR)** and **Special Vostro Rupee Accounts (SVRA)**.
   o **Foreign Investment**:
      - Balances in **repatriable INR accounts** can be used for **foreign investments**.
2. **For Indian Exporters**:
   o **Foreign Currency Accounts**:
      - Exporters can open **foreign currency accounts** overseas to:
         - Receive export proceeds.
         - Use these proceeds to pay for imports.

Internationalization of the Rupee

1. **Definition**:
   o The process of increasing the use of the **Indian Rupee** in **cross-border transactions**.
   o Progresses from promoting INR for **trade settlements** (imports and exports) to its use in **capital account transactions**.
2. **Steps Toward Internationalization**:
   o Encouraging foreign entities to hold and use **INR accounts**.
   o Promoting bilateral trade agreements denominated in **rupees**.
   o Expanding the use of **INR in investment and borrowing**.

Benefits of Internationalizing the Rupee

1. **Financial Independence**:
   o Reduces dependence on the **US dollar**, insulating India from **external shocks**.
2. **Efficient Trade**:
   o Simplifies **cross-border trade settlements**, reducing **transaction costs**.
3. **Strengthening INR**:
   o Reduces demand for the dollar, potentially **stabilizing and strengthening the rupee**.
4. **Lower Forex Reserves Requirement**:
   o Less reliance on maintaining high **foreign exchange reserves** to manage external trade and payments.

Key Concepts

1. **Special Vostro Rupee Accounts (SVRAs)**:
   o **Definition**: Accounts held by foreign banks in Indian banks, denominated in INR.
   o **Usage**:
      - Enables **non-residents** to hold **INR balances** for trade or other permissible transactions.
      - For instance, an Indian importer pays in INR to an SVRA for goods bought from a foreign exporter.
2. **Special Non-Resident Rupee (SNRR) Accounts**:
   o **Definition**: Current accounts for non-residents with business interests in India.
   o **Usage**:

▪ Facilitates **trade settlements**, **foreign investments**, **external commercial borrowings (ECBs)**, and other specified transactions.

Way Forward

1. **Strengthen Bilateral Agreements**:
   o Expand trade agreements promoting **INR-denominated trade**.
2. **Promote INR Acceptance Globally**:
   o Build partnerships with nations dependent on imports from India to **encourage INR usage**.
3. **Incentivize INR-Based Transactions**:
   o Provide **incentives** for exporters and importers to settle payments in rupees.
4. **Awareness Campaigns**:
   o Educate foreign entities about the benefits of holding **SVRAs** or **SNRR accounts**.
5. **Technological Infrastructure**:
   o Enhance systems for **seamless INR transactions**, including digital platforms for trade and settlements.

SOCIETY AND SOCIAL JUSTICE

Blood Money: Legal and Ethical Perspectives

Relevant for: GS-II (Governance and Social Justice - Legal Systems and Justice)

Context

• The concept of **blood money (diya)** has drawn attention following the case of **Nimisha Priya**, an Indian nurse sentenced to death in Yemen for murder.

About Blood Money

1. **What It Is**:
   o **Blood money**, or **diya**, is a provision under **Islamic Sharia law** allowing a perpetrator to compensate the victim's family in cases of:
      ▪ **Unintentional murder**.
      ▪ **Culpable homicide**.
      ▪ **Intentional murder** (if the family forgives retribution, or **qisas**).
   o It aims to **alleviate the family's loss and suffering**, rather than placing a price on life.
2. **Purpose**:
   o Promotes **reconciliation** and provides financial aid to the victim's family.

How It Works

1. **Reconciliation**:
   o The perpetrator negotiates with the victim's family under **judicial oversight** to ensure fairness.
2. **Amount Determination**:
   o Factors like the **gender**, **religion**, and **nationality** of the victim often influence the compensation amount in many Islamic countries.
3. **Legal Duality**:
   o Even if blood money is accepted, the **state may impose punitive measures** like imprisonment or fines to maintain public order.

Consequences and Criticisms

Positive Aspects

1. **Path to Reconciliation**:
   o Encourages **restorative justice** by prioritizing reconciliation over retribution.
2. **Financial Support**:
   o Provides **monetary relief** to the victim's family, which may be crucial for their livelihood.
3. **Avoids Prolonged Trials**:
   o Offers an **expedited resolution** compared to lengthy legal processes.

Concerns

1. **Inequality**:
   o **Disparities in Compensation**: Factors like gender, religion, or nationality may result in **unequal diya amounts**, perpetuating discrimination.
2. **Coercion and Abuse**:
   o Risk of **pressure or exploitation** during negotiations, especially in vulnerable families.

3. **Undermining Justice**:
   - o May dilute the **deterrent effect** of punitive justice, leading to potential misuse.

Broader Implications

1. **Cultural Context**:
   - o Rooted in Islamic legal traditions, blood money reflects **community-centric approaches** to justice.
2. **Global Perspective**:
   - o Raises questions about the **universality of justice systems** and the balance between **retributive** and **restorative justice**.
3. **India's Engagement**:
   - o Cases like Nimisha Priya's highlight the **importance of diplomacy** and **legal assistance** for Indians abroad in navigating such frameworks.

Conclusion

Blood money (diya), while aimed at reconciliation and financial relief, presents complex **ethical and legal dilemmas**, particularly regarding **equality** and **justice**. Balancing restorative justice with the principles of **fairness and deterrence** remains a challenge, especially in cross-cultural contexts like that of **Nimisha Priya**. International cooperation and **judicial diplomacy** are crucial in ensuring equitable outcomes in such cases.

Intersection of Culture and Innovation: Opportunities and Challenges

Relevant for: GS-I (Indian Society), GS-III (Science and Technology)

Context

- **Dr. Chintan Vaishnav**, former Mission Director of the **Atal Innovation Mission (AIM)**, emphasized the critical relationship between **culture and innovation**, drawing insights from his tenure.

Relationship Between Culture and Innovation

Culture Boosts Innovation

1. **Encouraging Risk-Taking**:
   - o **Innovative Societies** celebrate **risk-taking**, fostering **creativity** and **entrepreneurship**.
   - o **Example**:
     - ▪ The **USA** thrives on a culture where **failure is a stepping stone** to success.
2. **Collaborative Mindset**:
   - o Cultures that promote **collaboration** across academia, industries, and governments achieve **breakthrough technologies**.
   - o **Example**:
     - ▪ **Silicon Valley** thrives due to strong **academia-industry partnerships**.
3. **Freedom to Experiment**:
   - o Environments that remove the **fear of failure** encourage **grassroots innovation**.
   - o **Example**:
     - ▪ **Atal Tinkering Labs (ATL)** have enabled **rural India** to produce more innovations than urban centers.
4. **Inclusivity**:
   - o **Diverse cultural settings** bring varied perspectives, leading to cross-sector innovations.

Culture Hinders Innovation

1. **Risk Aversion**:
   - o Societal norms that prioritize **secure jobs** over **entrepreneurship** discourage innovative pursuits.
   - o **Example**:
     - ▪ Indian families often push students toward **government jobs** rather than starting ventures.
2. **Siloed Thinking**:
   - o **Lack of trust** and collaboration between academia, industries, and government slows innovation.
   - o **Example**:
     - ▪ Limited **R&D investments** by profit-driven corporations.
3. **Rigid Education Systems**:
   - o Exam-focused education systems **stifle creativity** and limit exposure to **problem-solving**.
4. **Fear of Failure**:
   - o **Societal stigma** around failure discourages experimentation, hindering progress.

De-Notified Tribes (DNTs): Addressing Historical Injustice

Relevant for: GS-I (Society), GS-II (Governance, Welfare Policies)

Context

- The **denotified tribes (DNTs)**, **semi-nomadic tribes (SNTs)**, and **nomadic tribes (NTs)** in India continue to face challenges due to delays in implementing the **Idate Commission recommendations** for their welfare and inclusion.

About De-Notified Tribes (DNTs)

1. **Who They Are**:
   - Communities classified as **"criminal tribes"** under the **Criminal Tribes Act, 1871**, during British rule.
   - **Denotified** after the **Act's repeal in 1952**.
2. **Population**:
   - **1,526 communities** identified as DNTs, of which **269 remain uncategorized** as **SC, ST, or OBC**.
3. **Criteria for Classification**:
   - Historical branding as **criminal tribes**.
   - Predominantly **nomadic or semi-nomadic lifestyles**.
   - **Socio-economic deprivation** and lack of access to mainstream resources.
4. **Key Issues**:
   - Lack of **formal categorization** under SC, ST, or OBC for welfare benefits.
   - Limited access to **education**, **healthcare**, and **livelihood opportunities**.
   - Persistent **stigma** from colonial-era labeling.

Idate Commission

1. **Committee**:
   - Established in **2015**, chaired by **Bhiku Ramji Idate**.
2. **Recommendations** (submitted in 2017):
   - Formation of a **permanent commission** for DNTs.
   - Inclusion of a **caste census column** for DNT population enumeration.
   - Creation of a **sub-quota** for DNTs under SC/ST/OBC categories.
   - Comprehensive efforts to address their **socio-economic challenges**.
3. **Status**:
   - **Implementation delayed**, affecting welfare measures for these marginalized communities.

About the SEED Scheme

1. **What It Is**:
   - **SEED (Scheme for Economic Empowerment of DNTs/SNTs/NTs)** is a flagship welfare program for **socio-economic upliftment**.
2. **Ministry**:
   - Administered by the **Ministry of Social Justice and Empowerment**.
3. **Launched In**:
   - February 2022.
4. **Aims**:
   - Provide **livelihood opportunities**, **education support**, **healthcare**, and **housing assistance** to DNT/NT/SNT communities.
5. **Key Features**:
   - **Livelihood Support**: Financial aid for **skill development** and **self-employment**.
   - **Education Assistance**: Scholarships for **school** and **higher education**.
   - **Healthcare Access**: Subsidized **healthcare services**.
   - **Housing Support**: Assistance for building or improving **housing facilities**.

Challenges Faced by DNTs

1. **Socio-Economic Deprivation**:
   - Low levels of **literacy**, **employment**, and **income**.
   - Marginalization from mainstream development initiatives.
2. **Stigma and Discrimination**:
   - Continued **social exclusion** due to historical branding as "criminal tribes."
3. **Implementation Gaps**:
   - Delay in adopting the **Idate Commission recommendations**.
   - Lack of **targeted policies** and resource allocation.
4. **Lack of Representation**:
   - Inadequate political and institutional representation in **decision-making bodies**.
5. **Limited Awareness**:

o DNT communities often lack awareness about **welfare schemes** and their entitlements.

Way Forward

1. **Implementation of Recommendations**:
   o Expedite the adoption of the **Idate Commission's proposals**, including the establishment of a **permanent DNT commission**.
2. **Caste Census Inclusion**:
   o Include a **dedicated column** for DNTs in the **upcoming caste census** for accurate data.
3. **Strengthening SEED Scheme**:
   o Enhance **outreach** and ensure effective implementation of the **SEED scheme**.
4. **Awareness Campaigns**:
   o Conduct **awareness programs** to inform communities about their **rights** and **available benefits**.
5. **Policy Integration**:
   o Integrate DNT welfare into broader **government policies**, ensuring **intersectional benefits** across education, health, and employment.
6. **Monitoring and Evaluation**:
   o Establish mechanisms for **regular monitoring** and **evaluation** of welfare programs.

AGRICULTURE

National Turmeric Board: Enhancing India's Turmeric Potential

Relevant for: GS-III (Agriculture, Food Processing, and Export Promotion)

Context

- The **National Turmeric Board** was recently launched by the **Union Minister of Commerce & Industry** to boost **turmeric production**, research, and global trade.

About the National Turmeric Board

1. **What It Is**:
   o A **dedicated body** established to promote turmeric cultivation, **research**, and **exports**.
2. **Headquarters**:
   o Located in **Nizamabad, Telangana**.
3. **Ministry**:
   o Functions under the **Ministry of Commerce and Industry**.
4. **Aim**:
   o Enhance turmeric production.
   o Support farmers across **20 turmeric-growing states**.
   o Boost global exports.
5. **Headed By**:
   o **Shri Palle Ganga Reddy** serves as its first Chairperson.
6. **Functions**:
   o **Research and Development**: Promote high-yield and **value-added turmeric products**.
   o **Awareness**: Highlight turmeric's **medicinal** and **essential properties**.
   o **Farmer Support**: Provide assistance to turmeric farmers in cultivation and logistics.
   o **Export Promotion**: Focus on improving **quality assurance** and enhancing **global trade**.
   o **Policy Collaboration**: Work with ministries like **AYUSH**, **Agriculture**, and **Commerce** for strategic alignment.

About Turmeric

1. **Top Exporting Nations**:
   o **India**: Leads with **67% of global turmeric exports** (2023).
   o Others: **Myanmar**, **Fiji**, **Indonesia**, and **Vietnam**.
2. **Top Importing Nations**:
   o **USA**: Largest importer with **18.98% share in 2023**.
   o **EU Countries**: Major importers include **Netherlands** and **Germany**.
3. **India's Turmeric Production**:
   o **Top Producing States**:
     ▪ **Telangana**, **Tamil Nadu**, **Andhra Pradesh**, **Maharashtra**, and **Meghalaya**.
     ▪ Noteworthy: **Lakadong turmeric** from Meghalaya, known for its **high curcumin content**.
4. **India's Turmeric Imports**:
   o **Major Sources**: **Vietnam**, **Indonesia**, and **Myanmar**.

- o **Import Form**: Primarily **dry turmeric** for value addition and domestic consumption.

Trends in Turmeric Industry

1. **Global Demand**:
   - o Rising interest in turmeric due to its **medicinal properties** (e.g., curcumin for anti-inflammatory uses).
2. **Domestic Consumption**:
   - o India is both the largest **producer** and a **significant consumer**, importing dry turmeric for **processing** and **value addition**.
3. **Export Growth**:
   - o India's share in global turmeric exports is expected to increase with enhanced **R&D** and **quality control measures** led by the Turmeric Board.

Urea Production in India: Growth, Challenges, and Future Path

Relevant for: GS-III (Agriculture, Economic Development, Environment)

Context

- India has experienced a **surge in domestic urea production**, supported by **significant investments in new plants** under the government's **Atmanirbhar Bharat initiative**, aimed at achieving self-reliance in fertiliser manufacturing.

India's Urea Capacity and Production

1. **Production Capacity**:
   - o **2023-24**: Over **31.4 million tonnes (MT)**, up from **22 MT** in **2011-12**.
2. **Reduction in Imports**:
   - o **Imports Declined**: From a peak of **9.8 MT in 2020-21** to **7 MT in 2023-24**, reducing dependence on international markets.
3. **Major Plants**:
   - o New contributors include plants by:
     - ▪ **Hindustan Urvarak & Rasayan Ltd (HURL)**.
     - ▪ **Chambal Fertilisers**.
     - ▪ **Matix Fertilisers**.

Recent Growth in Urea Production

1. **New Plants**:
   - o Six **greenfield plants** commissioned since **2019**, adding **7.55 MT** to production.
   - o Additional plant under development in **Talcher, Odisha**.
2. **Energy Efficiency**:
   - o New plants require **5 GCal/tonne** compared to **5.5–6.5 GCal/tonne** for older facilities.
3. **Strategic Locations**:
   - o Focused in **eastern and northern India** (e.g., **West Bengal**, **Uttar Pradesh**, **Bihar**) to cater to **regional agricultural demands**.

Significance of Urea Production in India

1. **Agricultural Dependence**:
   - o Urea is vital for enhancing **agricultural productivity** and ensuring **food security**.
2. **Reduced Imports**:
   - o Saves **foreign exchange** and reduces dependency on **volatile international markets**.
3. **Employment Generation**:
   - o Creates jobs and boosts **rural economic activity**.
4. **Environmental Benefits**:
   - o Energy-efficient technologies reduce **carbon emissions**.
5. **Balanced Development**:
   - o Drives **industrial growth** in underdeveloped regions like **eastern India**.

Government Schemes for Urea Production

1. **Nutrient-Based Subsidy (NBS)**:
   - o Promotes **balanced fertilisation** by optimising subsidy allocation for **nitrogen, phosphorus, and potassium**.
2. **Neem-Coated Urea**:
   - o Introduced in **2015** to:
     - ▪ Curb **diversion** for industrial uses.
     - ▪ Improve **nitrogen use efficiency**.
3. **Nano Urea**:
   - o Launched in **2021** to:
     - ▪ Reduce **overuse of conventional urea**.

- Enhance **crop productivity**.
4. **Energy Efficiency Norms**:
    o Mandates the use of **energy-efficient technologies** in new plants.
5. **Atmanirbhar Bharat Initiative**:
    o Aims to boost **domestic manufacturing capacity** to achieve **self-reliance**.

Challenges in Urea Production

1. **High Production Costs**:
    o Domestic urea production costs are higher due to **energy prices**.
2. **Environmental Concerns**:
    o Excessive application leads to **soil degradation** and **water pollution**.
3. **Overdependence on Subsidies**:
    o Heavy subsidies strain **fiscal resources**.
4. **Diversion Issues**:
    o Despite neem coating, urea is often **diverted for industrial use**.
5. **Limited Technological Adoption**:
    o Slow adoption of **advanced farming practices** hinders balanced fertilisation.

Way Forward

1. **Encourage Balanced Fertilisation**:
    o Promote eco-friendly alternatives like **Nano Urea** to reduce overuse.
2. **Boost Technological Advancements**:
    o Invest in **energy-efficient technologies** and improve production processes.
3. **Strengthen Regulation**:
    o Implement stricter measures to prevent **diversion** and ensure **targeted subsidy delivery**.
4. **Promote Regional Balance**:
    o Expand production in **underdeveloped regions** to address local agricultural demands.
5. **Public Awareness**:
    o Educate farmers on sustainable fertiliser use through campaigns.

GEOGRAPHY AND DISASTER

Yala Glacier in the Himalayas: Projected to Vanish by 2040s

Relevant for: GS-I (Geography - Physical Features), GS-III (Environment and Climate Change)

Key Highlights

1. **Yala Glacier Retreat**:
    o Located in **Nepal**, the Yala Glacier has:
        - Retreated by **680 meters** between **1974 and 2021**.
        - Lost **36% of its area** in the same period.
2. **Significance**:
    o It is the **only glacier** in the Himalayas included in the **Global Glacier Casualty List (GGCL)**, launched in **2024**.
    o Highlights the accelerating **impact of climate change** on the **Himalayan cryosphere**.
3. **Cryosphere Definition**:
    o Represents the **frozen parts of the Earth**, including snow, ice, glaciers, and permafrost.

About Glacier Retreat

1. **Definition**:
    o A process where glaciers **shrink in size and mass** due to **melting**, **evaporation**, or other climatic and geological factors.
2. **Examples of Glacier Loss**:
    o **Pico Humboldt Glacier (Venezuela)**: Disappeared in **2024**.
    o **Sarenne Glacier (France)**: Vanished in **2023**.
    o **Dagu Glacier (China)**: Predicted to disappear by **2030**.

Impacts of Melting Glaciers and Cryosphere

1. **Disruption of Ecosystems and Livelihoods**:
    o Glaciers and ice sheets hold **70% of the world's freshwater**.

- o Essential for **240 million people** in the **Hindu Kush Himalaya** region relying on glacier-fed systems for survival.
2. **Increased Risk of Glacial Lake Outburst Floods (GLOFs)**:
   - o Melting glaciers form unstable glacial lakes that can breach, causing **catastrophic floods**.
3. **Climate Feedback Loop**:
   - o Reduced **albedo** (Earth's reflectivity) due to glacier loss absorbs more heat, accelerating **global warming**.

Initiatives to Protect the Cryosphere

1. **Global Efforts**:
   - o **UN Designation**:
     - ▪ **2025** marked as the **International Year of Glaciers' Preservation**.
     - ▪ **March 21** to be observed annually as **World Day for Glaciers**.
   - o Other Programs:
     - ▪ **Himalayan Adaptation Network** (IUCN).
     - ▪ **Living Himalayas Initiative** (WWF).
2. **India's Efforts**:
   - o **National Mission for Sustaining the Himalayan Ecosystem (NMSHE)**: Focuses on conserving the Himalayan environment.
   - o **Indian National Centre for Ocean Information Services (INCOIS)**: Monitors glacier-related events and issues **GLOF alerts**.
   - o **Arctic and Antarctic Missions**:
     - ▪ **IndARC (2014)**: A research observatory in the Arctic.

Additional Insights

1. **Himalayan Cryosphere**:
   - o Home to the **third-largest ice mass** globally after Antarctica and Greenland.
   - o **Glacier retreat** is occurring at a rate of **20–30 meters annually** in some regions.
2. **Global Glacier Monitoring Service (GGMS)**:
   - o Tracks glacier trends globally, collaborating with **UNESCO** and other institutions.
3. **Economic Impacts**:
   - o Rapid glacier retreat threatens **hydropower projects** and **agriculture** in glacier-fed river basins.

# Planet Parade: A Rare Celestial Phenomenon

Relevant for: GS-I (Geography - Celestial Phenomena), GS-III (Space Technology and Awareness)

Key Highlights

1. **Context**:
   - o In **January 2025**, the planets **Venus**, **Saturn**, **Jupiter**, and **Mars** aligned in the night sky, creating a rare **"planet parade"**.
   - o This phenomenon includes other planets such as **Uranus** and **Neptune**, forming a **curved arc** across the sky.
2. **Definition**:
   - o **Planet Parade**:
     - ▪ Occurs when **multiple planets** in the solar system are visible **simultaneously** in the night sky.
     - ▪ Though not an official astronomical term, it describes the **alignment** of planets along the **ecliptic plane**.

About Planet Parade

1. **What is a Planet Parade?**
   - o A celestial event where **several planets appear aligned** in the sky.
   - o Visible during specific periods in either the **morning or evening sky**.
2. **How Does it Occur?**
   - o Planets orbit the Sun on the **ecliptic plane**, making alignments possible when viewed from Earth.
   - o Due to different **orbital speeds** and **distances**, these alignments are temporary.
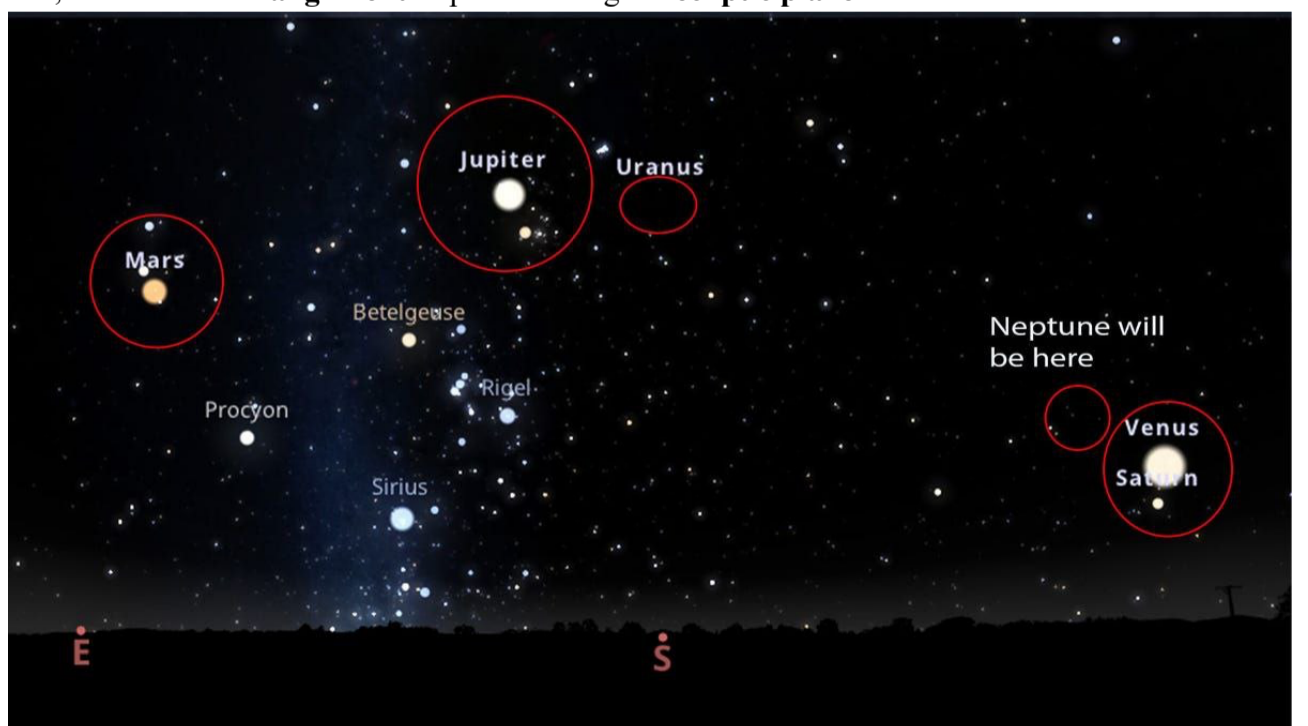
Significance of a Planet Parade

1. **Astronomical Education**:
   - o Encourages public interest in **astronomy** and understanding **celestial mechanics**.
2. **Cultural Relevance**:
   - o Historically interpreted as **omens** or inspiration for **mythology and folklore**.

3. **Visibility of Planets**:
   o Unique chance to observe **multiple planets**, including distant ones like **Uranus** and **Neptune**, which are usually difficult to spot.
4. **Scientific Exploration**:
   o Provides opportunities to study:
      ▪ **Planetary light emissions**.
      ▪ **Orbital trajectories** and other phenomena.
5. **Public Engagement**:
   o Used as a tool for **astronomical outreach**, sparking curiosity and promoting **space science** awareness.

Additional Insights

1. **Notable Events in 2025**:
   o This planetary alignment is part of a series of **rare celestial events**, further emphasizing 2025 as a significant year for **astronomy enthusiasts**.
2. **Historical Importance**:
   o Alignments have been observed since antiquity, inspiring **astronomical studies** in civilizations like Mesopotamia and India.
3. **Future Visibility**:
   o Similar alignments are predicted for the coming decades, but each has **unique characteristics** depending on the number and position of planets.

Conclusion

The **Planet Parade** of January 2025 is a spectacular reminder of the **dynamic nature of the cosmos**, offering opportunities for **education**, **scientific study**, and **public engagement**. As a celestial rarity, it bridges the gap between **ancient wonder** and **modern exploration**, inspiring curiosity about our solar system.

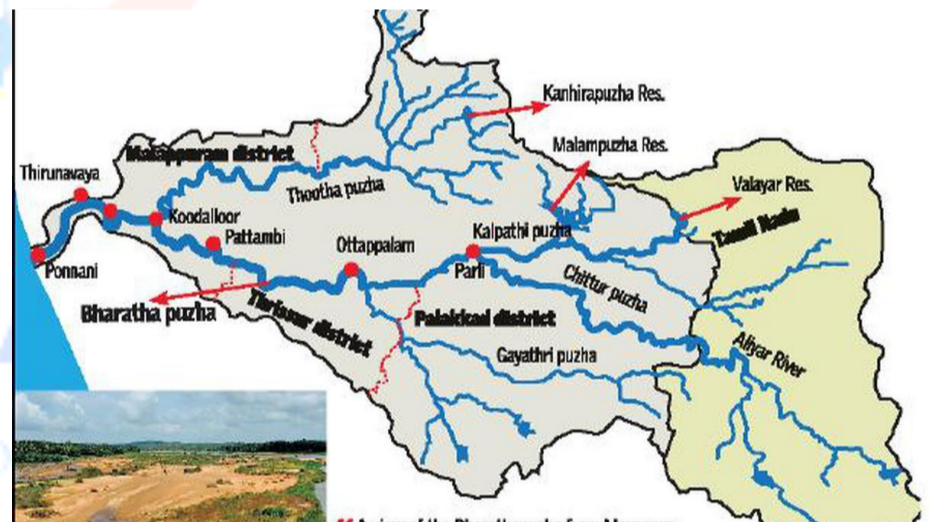# Bharathapuzha River: A Lifeline of Kerala and Tamil Nadu

Relevant for: GS-I (Geography - Physical Features of India)

Context

- **Bharathapuzha River**, also known as the **Nila River** or **Ponnani River**, was the site of a tragic drowning incident involving four family members in **Cheruthuruthy, Kerala**.

About Bharathapuzha River

1. **Location and Length**:
   o Also called **Nila River** or **Ponnani River**, it is one of the prominent rivers in **South India**.
2. **Origin and Flow**:
   o **Origin**: Rises from the **Anaimalai Hills** in Tamil Nadu.
   o **Flow**: Travels westward through the **Palakkad Gap** in the **Western Ghats**, before emptying into the **Arabian Sea**.
3. **Tributaries**:
   o Includes **Kannadipuzha**, **Kalpathipuzha**, **Gayathripuzha**, and **Thuthapuzha**, which enrich its basin.
4. **Geographical Spread**:
   o The river flows through the states of **Kerala** and **Tamil Nadu**, playing a vital role in agriculture and ecology.
5. **Reservoirs and Dams**:
   o The **Malampuzha Dam**, built across Bharathapuzha, is:
      ▪ The **largest reservoir in Kerala**.
      ▪ Serves purposes like **irrigation** and **hydroelectric power generation**.

Significance of Bharathapuzha River

1. **Agricultural Importance**:
   o Supports irrigation, particularly in the **Palakkad** region, known as the **rice bowl of Kerala**.
2. **Cultural and Historical Value**:
   o Associated with **Kerala's literary heritage** and the **Nila tradition** in art and literature.
3. **Biodiversity**:
   o Hosts unique **flora and fauna**, contributing to the region's ecological balance.
4. **Hydropower and Water Resources**:
   o Dams like **Malampuzha** provide **electricity** and manage **water resources** effectively.

Challenges

1. **Declining Water Levels**:
   o Overuse and climate variability have led to **reduced flow**, impacting agriculture and ecosystems.
2. **Pollution**:
   o Discharge of **domestic and industrial waste** into the river affects water quality.
3. **Sand Mining**:
   o Excessive sand extraction has disrupted the **riverbed ecology** and flow patterns.
4. **Disaster Risks**:
   o Incidents like **flooding** and **drownings** highlight the need for safety measures and awareness.

Kumani Bank Mud Volcano: A "Ghost Island" Phenomenon

Relevant for: GS-I (Geography - Landforms, Physical Features), GS-III (Environment - Geological Processes)

Context

- The **Kumani Bank mud volcano**, located off Azerbaijan's eastern coast, erupted in **2023**, forming a temporary **"Ghost Island"** in the Caspian Sea. By late **2024**, the island had largely eroded back into the sea, highlighting the ephemeral nature of such phenomena.

About Kumani Bank Mud Volcano

1. **Location**:
   o Situated **25 km off the eastern coast** of Azerbaijan in the **Caspian Sea**.
2. **What Is a Ghost Island?**
   o Refers to a **temporary landmass** created by volcanic activity, particularly **mud volcanoes**.
   o These islands often **erode back into water** due to their fragile composition.
3. **Ephemeral Nature**:
   o Formed in **2023**, the island initially measured **400 meters (1,300 feet) across**.
   o By late **2024**, it had nearly **disappeared** into the sea.
4. **Significance**:
   o **Geological Insights**:
     ▪ Enhances understanding of **tectonic processes** and **subsurface pressure dynamics**.
   o **Martian Analogs**:
     ▪ Provides clues for interpreting similar features on **Mars**, aiding planetary exploration.
   o **Environmental Impact**:
     ▪ Linked to the **South Caspian Basin's hydrocarbon system**, contributing to **methane emissions**.
   o **Regional Importance**:
     ▪ Azerbaijan hosts **300+ mud volcanoes**, the **largest concentration globally**, showcasing its unique geological landscape.

About the Caspian Sea

1. **Geography**:
   o The **Caspian Sea** is the **world's largest inland water body**, spanning approximately **386,400 sq. km**.
   o Located between **Asia** and **Europe**, east of the **Caucasus Mountains**, and west of **Central Asia's steppe**.
2. **Bordering Countries**:
   o **Russia**, **Azerbaijan**, **Kazakhstan**, **Turkmenistan**, and **Iran**.
3. **Rivers Draining into the Caspian Sea**:
   o **Volga River**: Largest contributing river.
   o **Ural River**.
   o **Terek River**.

Significance of the Kumani Bank Mud Volcano

1. **Geological Research**:
   o Offers a **natural laboratory** for studying mud volcanoes and their connection to **tectonic activity**.
2. **Planetary Science**:
   o Analogous to **Martian features**, supporting studies on **extraterrestrial geology**.
3. **Environmental Awareness**:
   o Highlights the **impact of methane emissions** from mud volcanoes, relevant to climate studies.
4. **Cultural and Regional Importance**:
   o Showcases Azerbaijan's **geological heritage**, promoting scientific tourism and global recognition.

Mission Mausam: Enhancing Weather and Climate Resilience

Relevant for: GS-III (Science and Technology - Weather and Climate Monitoring, Disaster Management)

Context

- On the **150th Foundation Day** of the **India Meteorological Department (IMD)**, the **Prime Minister** launched **Mission Mausam**, a transformative initiative aimed at enhancing India's **weather forecasting** and **climate resilience capabilities**.

About Mission Mausam

1. **What It Is**:
   o **Mission Mausam** is a comprehensive program designed to **modernize India's weather and climate monitoring infrastructure** using advanced technologies for **atmospheric observations** and **data analysis**.
2. **Ministry/Department**:
   o Implemented by the **Ministry of Earth Sciences (MoES)** in collaboration with the **India Meteorological Department (IMD)**.
3. **Aim**:
   o To transform India into a **weather-ready** and **climate-smart nation**.
   o Enhance **weather forecasting accuracy** to support **climate change mitigation** and **disaster preparedness**.

Key Features

1. **Advanced Infrastructure**:
   o Deployment of:
      - **Next-generation radars**.
      - **Satellites** for real-time monitoring.
      - **High-performance computing systems** for advanced atmospheric analysis.
2. **Improved Forecasting**:
   o Integration of **high-resolution data** to improve the accuracy of:
      - **Short-term weather forecasts**.
      - **Long-term climate predictions**.
3. **Air Quality Monitoring**:
   o Enhanced systems for **air quality data collection** to inform:
      - Environmental interventions.
      - Weather management strategies.
4. **Sectoral Benefits**:
   o Directly supports:
      - **Agriculture**: Timely weather updates for improved crop planning.
      - **Disaster Management**: Early warnings for extreme weather events.
      - **Aviation and Defence**: Real-time atmospheric data for operational safety.
      - **Energy**: Forecasts for renewable energy optimization.
      - **Health**: Insights into weather-related diseases and public health risks.
5. **Vision-2047 Alignment**:
   o Complements the **IMD Vision-2047 roadmap**, focusing on:
      - **Climate adaptation**.
      - **Resilience-building initiatives**.

Significance of Mission Mausam

1. **Enhanced Disaster Preparedness**:
   o Accurate weather predictions reduce **response times** and improve **disaster mitigation** efforts.
2. **Agricultural Productivity**:
   o Reliable forecasts enable **precision farming**, helping farmers plan crop cycles and irrigation.
3. **Climate Resilience**:
   o Strengthens India's ability to **adapt to climate change** through improved monitoring and early warning systems.
4. **Environmental Management**:
   o Provides data to address **air quality issues**, benefiting both urban and rural areas.
5. **Global Leadership**:
   o Establishes India as a leader in **weather and climate technology**, enhancing international collaborations.

Challenges

1. **Infrastructure Deployment**:

o   Timely implementation of **advanced technologies** across a vast geography.
2. **Data Integration**:
    o   Ensuring **real-time data sharing** between multiple sectors for effective utilization.
3. **Awareness and Outreach**:
    o   Disseminating weather updates to **remote and vulnerable communities**.
4. **Resource Management**:
    o   Balancing **financial investments** with returns in terms of resilience-building.

Way Forward

1. **Technological Investments**:
    o   Continued funding for **radars**, **satellites**, and **AI-based prediction models**.
2. **Capacity Building**:
    o   Training personnel to handle advanced systems and engage in **community outreach**.
3. **International Collaborations**:
    o   Partnering with global meteorological organizations to adopt **best practices**.
4. **Public Awareness Campaigns**:
    o   Educating communities on interpreting and utilizing weather forecasts for **decision-making**.

HISTORY, INDIAN HERITAGE & CULTURE

Kuka Rebellion: A Defiant Uprising Against British Rule

Relevant for: GS-I (Modern Indian History - Freedom Struggle)

Key Highlights

1. **Context**:
    o   On **January 17, 2025**, the **Punjab Chief Minister** commemorated **Kuka Martyrs' Day** at the **Namdhari Shaheed Smarak** in Malerkotla.
2. **What is the Kuka Rebellion?**
    o   An **anti-British uprising** led by the **Namdhari sect** (Kukas) in Punjab, combining **religious reform** with **resistance to colonial authority**.
    o   Reached its **peak in January 1872** with pivotal clashes in **Malerkotla** and **Malaudh Fort**.
3. **Leaders of the Movement**:
    o   **Satguru Ram Singh**: Founder of the Namdhari sect and leader of the rebellion.
    o   Other notable leaders: **Kuka Hira Singh** and **Lehna Singh**.

Reasons Behind the Movement

1. **Religious Reform**:
    o   Opposed social vices like **meat consumption**, **alcohol**, and the use of **foreign goods**.
2. **Colonial Oppression**:
    o   Resentment against **British policies** and **native collaborators** loyal to the colonizers.
3. **Cow Slaughter**:
    o   The Kukas were deeply offended by cow slaughter and protested vehemently against it, leading to clashes.

Key Events of the Kuka Rebellion

1. **Attack on Malerkotla (January 13, 1872)**:
    o   Kukas clashed with officials following an incident of **cow slaughter**.
2. **Assault on Malaudh Fort (January 15, 1872)**:
    o   Kukas attacked the fort under a **pro-British ruler**, facing **strong resistance**.
3. **Mass Executions**:
    o   **January 17, 1872**: 49 Kukas were executed by being **blown up with cannons**.
    o   **January 18, 1872**: 17 more Kukas met the same fate.
    o   **John Lambert Cowan** (British officer) ensured public executions to serve as a **deterrent**, forcing thousands to witness the brutality.

Changes After the Revolt

1. **Exile of Leaders**:
   o **Satguru Ram Singh** and key leaders were exiled to **Rangoon, Burma**, marking the suppression of the movement.
2. **Legacy of Martyrdom**:
   o Stories of bravery, such as the sacrifice of **12-year-old Bishan Singh** and **Waryam Singh**, inspired future **resistance movements** against British rule.

Significance

1. **Religious and Social Reform**:
   o Strengthened **cultural identity** and **moral values** through opposition to social evils.
2. **Inspiration for Nationalism**:
   o The Kukas' martyrdom became a **symbol of resistance** and influenced future movements like the **Ghadar Movement**.
3. **Localized Revolt with Global Relevance**:
   o Highlighted the role of **regional uprisings** in the larger freedom struggle.

Conclusion

The **Kuka Rebellion** was a testament to the courage and resilience of **ordinary people** standing against **colonial oppression**. While it was brutally suppressed, its legacy of **sacrifice and resistance** inspired the **freedom struggle**, symbolizing the enduring spirit of defiance against injustice.

Bharat Ranbhoomi Darshan: Promoting Battlefield and Border Tourism

Relevant for: GS-I (Indian History and Culture), GS-III (Tourism and Regional Development)

Context

- On the **77th Army Day**, the **Defence Minister** launched **Bharat Ranbhoomi Darshan**, a dedicated website to promote **battlefield tourism** and **border tourism**.

About Bharat Ranbhoomi Darshan

1. **Definition**:
   o A **comprehensive website** offering information on India's **significant battlefields** and **border areas**, providing:
      ▪ **Virtual tours**.
      ▪ **Historical narratives**.
      ▪ **Travel assistance**.
2. **Ministry**:
   o Launched under the **Ministry of Defence**, in collaboration with the **Ministry of Tourism**.
3. **Aim**:
   o **Promote Battlefield and Border Tourism**: Highlight India's military history and valor.
   o **Raise Awareness**: Educate citizens about key historical events and sites.
   o **Socio-Economic Development**: Boost tourism in **border regions** to support local economies.

Key Locations Included

1. **Galwan Valley (Ladakh)**:
   o Site of the **2020 India-China clash**, symbolizing India's border defense efforts.
2. **Doklam**:
   o Strategic **tri-junction** between **India, Bhutan, and China**, notable for the **2017 standoff**.
3. **Line of Control (LoC) and Line of Actual Control (LAC)**:
   o Key sites include:
      ▪ **Nathu La Pass (Sikkim)**.
      ▪ **Longewala (Rajasthan)**, a pivotal location in the **1971 Indo-Pak War**.
      ▪ Locations from the **1962 Indo-China War**.

Features

1. **Virtual Tours**:
   o **Interactive Experiences**: Visitors can explore historical battlefields through **immersive online tours**.
2. **Travel Guidance**:
   o Provides detailed information on **permits**, **travel arrangements**, and accessibility to these locations.
3. **Collaborative Infrastructure**:
   o Joint efforts by the **Indian Army** and **civil authorities** ensure:
      ▪ **Visitor access** without compromising **operational preparedness**.
      ▪ Maintenance of **local infrastructure**.
4. **Tourism Integration**:

- o Incorporated into the **Incredible India campaign** to attract both **domestic** and **international tourists**.

Significance

1. **Cultural and Historical Awareness**:
   - o Enhances understanding of India's **military history**, promoting **patriotism** and respect for the armed forces.
2. **Regional Development**:
   - o Tourism can drive **economic growth** in remote and border regions, creating opportunities for **local communities**.
3. **Boost to Tourism**:
   - o Encourages niche tourism like **heritage travel** and **military tourism**, attracting a diverse range of visitors.
4. **Strengthened Civil-Military Relations**:
   - o Creates a platform for citizens to connect with the Indian Army's **sacrifices and contributions**.

Challenges

1. **Accessibility**:
   - o Remote border regions pose logistical challenges in terms of travel and infrastructure.
2. **Operational Sensitivities**:
   - o Ensuring **security and confidentiality** in active or sensitive military zones.
3. **Sustainability**:
   - o Balancing tourism development with **environmental preservation** in ecologically fragile areas.

ENVIRONMENT & ECOLOGY

DDT-Contaminated Soils: New Biochar-Based Remediation Method

Relevant for: GS-III (Environment - Pollution, Agriculture, and Climate Change)

Context

- Researchers at **Sweden's Chalmers University of Technology** have developed an innovative method to address **DDT-contaminated soils** using **biochar**, offering a sustainable solution to restore soil health.

About Di-chloro-di-phenyl-tri-chloro-ethane (DDT)

1. **What It Is**:
   - o **DDT** is a synthetic **insecticide** introduced in **1939**, used for:
     - ▪ Controlling **agricultural pests**.
     - ▪ Reducing disease vectors like **malaria-causing mosquitoes**.
2. **Features**:
   - o Effective against a **broad range of pests**.
   - o Highly **persistent in the environment**, taking decades to degrade.
   - o **Fat-soluble**, leading to **bioaccumulation** in food chains.
3. **Functions**:
   - o Extensively used in **agriculture** and **forestry**.
   - o While it reduced **vector-borne diseases**, prolonged use led to:
     - ▪ **Soil degradation**.
     - ▪ Harmful impacts on ecosystems.

Binding DDT-Infused Soil with Biochar

1. **What It Is**:
   - o A method that mixes **biochar**—a charcoal-like substance—into **DDT-contaminated soils** to **bind the toxin**, reducing its bioavailability.
2. **Process**:
   - o Contaminated soil is mixed with biochar.
   - o **Crops** like **pumpkins**, **legumes**, and **willows** are planted to assess soil health.
   - o Biochar binds **DDT**, preventing its entry into **plants** and **soil organisms**.
3. **Significance**:
   - o **Restores fertility** to DDT-contaminated lands, making them cultivable.
   - o Reduces **ecological risks** by limiting DDT exposure to organisms.
   - o Provides a cost-effective and sustainable alternative to conventional methods like **soil removal** or **chemical treatments**.

Additional Benefits of Biochar-Based Remediation

1. **Improves Soil Health**:
   o Enhances soil structure, nutrient retention, and water holding capacity.
2. **Carbon Storage**:
   o Biochar stores **carbon long-term**, aiding **climate change mitigation**.
3. **Supports Renewable Energy**:
   o Enables growth of **bioenergy crops**, addressing energy needs sustainably.
4. **Economic Viability**:
   o Lower costs compared to traditional soil remediation techniques.

Significance

1. **Environmental Restoration**:
   o Provides an effective solution for reclaiming **contaminated lands**.
   o Reduces **toxic exposure** in ecosystems, ensuring safer environments for organisms.
2. **Sustainable Agriculture**:
   o Restored soils can be repurposed for cultivating food and energy crops.
3. **Climate Resilience**:
   o Combines soil remediation with **carbon sequestration**, contributing to **global climate goals**.

Challenges

1. **Scaling Up**:
   o Adapting the method for large-scale implementation in highly contaminated regions.
2. **Long-Term Impact Assessment**:
   o Monitoring biochar's long-term interaction with toxins and soil systems.
3. **Accessibility**:
   o Ensuring availability of biochar and knowledge dissemination to affected regions.

Global Warming and India: Trends, Impacts, and Solutions

Relevant for: GS-III (Environment - Climate Change and Mitigation)

Context

- **2024** has been declared the **warmest year on record globally**, exceeding the critical **1.5°C threshold** above pre-industrial levels. India also recorded its **warmest year**, though the extent of warming was relatively lower compared to the global average.

Global Warming Trends in 2024

1. **Temperature Records**:
   o Global temperatures in 2024 were **1.28°C higher** than NASA's baseline (1951–1980), surpassing previous records.
2. **Warming Rates**:
   o **Land temperatures** rose by over **1.6°C**.
   o **Ocean temperatures** increased by approximately **0.9°C**.
3. **El Niño Impact**:
   o A **strong El Niño phenomenon** amplified global temperature surges.
4. **Decadal Warmth**:
   o The last **decade** has been the **warmest in recorded history**, with each year breaking past temperature averages.
5. **Regional Variations**:
   o The **Arctic** and **high-altitude regions** experienced the most significant warming due to **polar amplification** and the **albedo effect**.

Factors Leading to 2024 Being the Warmest Year

1. **Greenhouse Gas Emissions**:
   o Record-high emissions of CO_2 and **methane** from fossil fuel use intensified global warming.
2. **El Niño Effect**:
   o Amplified **ocean temperatures**, pushing global averages higher.
3. **Volcanic Eruption Impacts**:
   o The **2022 Tonga eruption** altered atmospheric circulation, influencing warming trends.
4. **Decreased Aerosol Pollution**:
   o Reduced pollution led to less cloud cover, allowing more **solar radiation** to be absorbed.
5. **Loss of Arctic Ice**:
   o Accelerated melting reduced the **albedo effect**, causing higher heat absorption and temperature increases.

Why India Experienced Comparatively Lower Warming

1. **Tropical Location**:
   - Proximity to the equator reduces temperature variability compared to polar and temperate regions.
2. **Aerosols and Particulate Matter**:
   - High aerosol concentrations scatter sunlight, creating a **cooling effect**.
3. **Monsoon Dynamics**:
   - Seasonal rainfall from the **monsoon system** helps regulate surface temperatures.
4. **Ocean Influence**:
   - Surrounding **oceans** act as **heat sinks**, moderating temperature increases.
5. **Landmass Proportion**:
   - India's smaller landmass compared to global land surfaces results in less pronounced warming.

Challenges in Controlling Global Warming

1. **Rising Emissions**:
   - Fossil fuel consumption and greenhouse gas emissions remain persistently high.
2. **Economic Dependencies**:
   - Nations like India rely heavily on **coal and oil** for energy needs.
3. **Global Inequity**:
   - Disparities in responsibilities and capacities hinder unified climate action.
4. **Insufficient Funding**:
   - Developing nations face financial constraints in climate **adaptation** and **mitigation** efforts.
5. **Climate Denial**:
   - Resistance from interest groups and **misinformation campaigns** slow progress on climate agreements.

Solutions to Control Global Warming

1. **Renewable Energy Transition**:
   - Accelerate adoption of **solar**, **wind**, and **hydropower** to reduce dependency on fossil fuels.
2. **Afforestation**:
   - Implement large-scale **tree-planting initiatives** to act as carbon sinks and combat deforestation.
3. **Climate Policies**:
   - Strengthen international agreements like the **Paris Accord** to enforce emissions reductions.
4. **Technology Integration**:
   - Invest in **carbon capture and storage** and other **green technologies**.
5. **Public Awareness**:
   - Educate communities about climate change to foster **grassroots action** and policy support.

Global Warming and India: Causes, Impacts, and Solutions

Relevant for: GS-III (Environment - Climate Change and Adaptation)

Context

- The year **2024** has been declared the **warmest year on record globally**, exceeding the critical **1.5°C threshold** above pre-industrial levels. India, while recording its warmest year, experienced relatively **lower warming** compared to the global average.

Global Warming Trends in 2024

1. **Temperature Records**:
   - **Global temperatures** in 2024 were **1.28°C higher** than NASA's baseline (1951–1980), surpassing all previous records.
2. **Warming Rates**:
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3. **El Niño Impact**:
   - A **strong El Niño phenomenon** further amplified global temperature surges.
4. **Decadal Warmth**:
   - The past decade has been the **warmest on record**, with each year breaking previous temperature averages.
5. **Regional Variations**:
   - The **Arctic** and **high-altitude regions** witnessed the highest temperature increases due to **polar amplification** and the **albedo effect**.

Factors Contributing to 2024 Being the Warmest Year

1. **Greenhouse Gas Emissions**:
   o Record-high emissions of CO_2 and **methane** from fossil fuel use intensified global warming.
2. **El Niño Effect**:
   o Amplified **ocean temperatures**, significantly pushing global averages upward.
3. **Volcanic Eruption Impacts**:
   o The **2022 Tonga eruption** altered atmospheric circulation, contributing to subsequent warming.
4. **Decreased Aerosol Pollution**:
   o Reduced pollution resulted in less **cloud cover**, allowing more **solar radiation** to be absorbed by Earth.
5. **Loss of Arctic Ice**:
   o Accelerated Arctic melting reduced **albedo**, causing more heat absorption and increased temperatures.

Why India Experienced Comparatively Lower Warming

1. **Tropical Location**:
   o India's proximity to the **equator** results in less temperature variability compared to **polar and temperate regions**.
2. **Aerosols and Particulate Matter**:
   o High aerosol concentrations **scatter sunlight**, creating a **cooling effect**.
3. **Monsoon Dynamics**:
   o The **Indian monsoon system** regulates surface temperatures through **seasonal rainfall**.
4. **Ocean Influence**:
   o Surrounding **oceans** act as **heat sinks**, moderating India's temperatures.
5. **Landmass Proportion**:
   o India's smaller **landmass** compared to global land areas results in less pronounced warming.

Challenges in Controlling Global Warming

1. **Rising Emissions**:
   o Persistent consumption of **fossil fuels** continues to elevate greenhouse gas levels.
2. **Economic Dependencies**:
   o Heavy reliance on **coal** and **oil** for energy in developing nations like India.
3. **Global Inequity**:
   o Disparities in **responsibilities and capacities** hinder unified climate action.
4. **Insufficient Funding**:
   o Financial constraints limit **adaptation** and **mitigation** efforts in developing countries.
5. **Climate Denial**:
   o Resistance from **interest groups** and **misinformation campaigns** slows international progress.

Solutions to Control Global Warming

1. **Renewable Energy Transition**:
   o Accelerate adoption of **solar**, **wind**, and **hydropower** to reduce reliance on fossil fuels.
2. **Afforestation**:
   o Implement **large-scale tree-planting initiatives** to act as **carbon sinks** and combat deforestation.
3. **Climate Policies**:
   o Strengthen global agreements like the **Paris Accord** to enforce emissions reduction targets.
4. **Technology Integration**:
   o Invest in **carbon capture**, **storage**, and other **green technologies** to reduce atmospheric CO_2.
5. **Public Awareness**:
   o Educate communities to promote **grassroots action** and support for climate policies.

Rat-Hole Mining: Causes, Consequences, and Solutions

Relevant for: GS-III (Environment, Resources, and Economic Development)

Context

- A recent **tragedy in Assam's Dima Hasao district**, where a **flooded rat-hole coal mine** led to multiple casualties, has reignited the debate on **illegal mining practices** and their consequences.

About Rat-Hole Mining

1. **What It Is**:
   o A **primitive mining technique** where **narrow tunnels** or pits are dug to extract **coal seams**.
   o Types:

- Side-Cutting Mining: Carried out on **hill slopes** to follow visible coal seams.
- Box-Cutting Mining: Involves **deep pits** and horizontal tunnels.
2. **Why It Persists in India**:
   o **Economic Incentives**:
      - Workers earn significantly more compared to other jobs like **farming** or **construction**.
   o **Local Control**:
      - In **Sixth Schedule areas** (e.g., Meghalaya), landowners also own **mineral rights**, complicating regulation.
   o **Lack of Modern Techniques**:
      - **High costs** and **terrain complexities** deter mechanized mining.
   o **Poor Governance**:
      - Weak enforcement and **alleged official complicity** enable illegal mining.
   o **NGT Ban**:
      - The **National Green Tribunal** (NGT) imposed a ban in **2014** to prevent **environmental degradation** and protect lives, but illegal mining persists.

Why Northeast India Has More Rat-Hole Coal Mines

1. **Sixth Schedule Land Rights**:
   o In states like **Meghalaya**, tribal communities own **land and minerals**, making government regulation and enforcement challenging.
2. **Thin Coal Seams**:
   o The coal deposits are **narrow and shallow**, making **mechanized mining** economically unviable, favoring **manual rat-hole techniques**.
3. **Challenging Terrain**:
   o The **hilly and rugged topography** restricts the use of **modern machinery**, forcing reliance on **primitive methods**.
4. **High Demand and Local Economy**:
   o Driven by demand from **cement** and **thermal power plants**, rat-hole mining provides **quick profits** and employment for local communities.

Consequences of Rat-Hole Mining

1. **Environmental Degradation**:
   o Leads to:
      - **Deforestation**.
      - **Water contamination** due to coal runoff.
      - **Soil erosion** in mining areas.
2. **Health Hazards**:
   o Miners suffer from:
      - **Respiratory diseases** like pneumoconiosis.
      - Exposure to toxic **coal dust** and gases.
3. **Loss of Lives**:
   o Frequent **accidents** in unsafe mines due to flooding, collapses, or lack of safety measures.
4. **Economic Exploitation**:
   o Miners, often children, are subjected to **low wages** and **poor working conditions**.
5. **Legal and Governance Issues**:
   o Undermines **rule of law** and exacerbates **corruption** in local governance.

Challenges in Addressing Rat-Hole Mining

1. **Regulatory Gaps**:
   o The **Sixth Schedule** limits state authority over tribal lands, making it difficult to enforce mining standards.
2. **Economic Dependence**:
   o Local communities rely heavily on mining for **livelihoods**.
3. **Lack of Alternatives**:
   o Absence of other employment opportunities forces communities to engage in illegal mining.
4. **Weak Implementation**:
   o Poor enforcement of the **NGT ban** due to corruption and logistical issues.

Way Forward

1. **Alternative Livelihoods**:
   o Promote **sustainable employment** options like:
      - **Eco-tourism**.
      - **Horticulture** and **handicrafts**.

2. **Technological Interventions**:
    o   Develop low-cost and terrain-specific **mechanized mining technologies**.
3. **Regulatory Reforms**:
    o   Strengthen enforcement of the **NGT ban** and implement strict penalties for violations.
4. **Public Awareness**:
    o   Conduct campaigns on the **hazards** of rat-hole mining and promote **sustainable practices**.
5. **Skill Development**:
    o   Initiate programs to train locals in **alternative industries**.
6. **Community Engagement**:
    o   Work with tribal communities to **balance mining needs** with environmental protection and safety measures.

Parbati-Kalisindh-Chambal (PKC) River Link Project

Relevant for: GS-III (Environment, Infrastructure, Conservation, and Resources Management)

Context

*   The **PKC River Link Project**, a **flagship inter-state irrigation initiative**, promises to benefit **23 districts in Rajasthan**, but faces environmental concerns due to the **submergence of 37 sq km** within the **Ranthambore Tiger Reserve**.

About the PKC River Link Project

1. **What It Is**:
    o   An **inter-state river-linking project**, integrating the **Parbati-Kalisindh-Chambal (PKC) Link** and the **Eastern Rajasthan Canal Project (ERCP)**.
2. **Launched In**:
    o   Conceived in **2017** and modified in **2023**.
3. **Aim**:
    o   To **optimize water resources** for:
        ▪   **Irrigation**.
        ▪   **Drinking water** supply.
        ▪   **Industrial use**, benefiting people in **Rajasthan** and **Madhya Pradesh**.
4. **Features**:
    o   **Total Cost**: ₹72,000 crore (90% funded by the Central Government).
    o   **Water Allocation**:
        ▪   **4,100 MCM** for Rajasthan.
        ▪   **3,000 MCM** for Madhya Pradesh.
    o   **Rivers Involved**: Chambal, Parbati, Kalisindh, Banas, and their tributaries.

Rivers Involved

1. **Chambal River**:
    o   **Origin**: Singar Chouri Peak, Vindhya Mountains, Madhya Pradesh.
    o   **Tributaries**: Banas, Kali Sindh, Parbati, Sipra, Mej Rivers.
2. **Parbati River**:
    o   **Origin**: Vindhya Range, Sehore District, Madhya Pradesh.
    o   **Tributaries**: Kuno, Parwan, Seep Rivers.
3. **Kali Sindh River**:
    o   **Origin**: Bagli, Dewas District, Madhya Pradesh.
    o   **Tributaries**: Newaj, Ahu, Parwan Rivers.

Environmental Concerns

1. **Impact on Ranthambore Tiger Reserve**:
    o   **Submergence**: 37 sq km of the tiger reserve will be submerged.
    o   **Habitat Loss**: Threatens critical tiger habitats and biodiversity.
    o   **Flora and Fauna Affected**: May disrupt ecosystems supporting tigers, leopards, wild boars, and other species.
2. **Hydrological Impact**:
    o   Changes in the water flow may affect downstream ecosystems, especially in the Chambal Basin.
3. **Deforestation**:
    o   The project may involve clearing tropical **dry deciduous and thorn forests** near the Aravallis and Vindhyas.

About Ranthambore Tiger Reserve

1. **Location**:
    o   Situated at the junction of the **Aravalis** and **Vindhyas** in Eastern Rajasthan.

2. **Features**:
   o **Boundaries**: Chambal River (south) and Banas River (north).
   o **UNESCO Site**: Includes the iconic **Ranthambore Fort**.
3. **Flora**:
   o Dominated by **Dhok trees**, interspersed with grasslands and lush vegetation near water bodies.
4. **Fauna**:
   o Hosts **tigers**, **leopards**, **wild boars**, **sloth bears**, **striped hyenas**, and **rhesus macaques**.
5. **Geological Uniqueness**:
   o Known for the **'Great Boundary Fault'**, where the **Vindhyas and Aravallis** meet.

Benefits of the PKC Project

1. **Agricultural Growth**:
   o Enhances irrigation for water-scarce districts, ensuring **crop productivity**.
2. **Drinking Water Supply**:
   o Provides drinking water to **millions of people** in Rajasthan and Madhya Pradesh.
3. **Industrial Growth**:
   o Supports industries with reliable water resources, boosting regional economies.
4. **Flood Mitigation**:
   o Efficient water management reduces the risk of **floods** in the region.
5. **Regional Development**:
   o Stimulates **socio-economic growth**, especially in underdeveloped areas.

Challenges and Way Forward

1. **Challenges**:
   o **Environmental Concerns**: Habitat loss and biodiversity threats.
   o **High Costs**: ₹72,000 crore demands significant fiscal allocation.
   o **Inter-State Coordination**: Balancing water-sharing agreements between Rajasthan and Madhya Pradesh.
2. **Way Forward**:
   o **Sustainable Practices**: Minimize environmental damage through **eco-friendly construction**.
   o **Compensatory Measures**: Implement **afforestation programs** to offset deforestation.
   o **Stakeholder Engagement**: Consult local communities and environmentalists for sustainable execution.
   o **Technological Solutions**: Use **GIS-based monitoring** for efficient water usage and minimal environmental impact.

Pink Fire Retardant: A Key Tool in Wildfire Suppression

Relevant for: GS-III (Environment and Disaster Management)

Context

- Amid raging **wildfires in Southern California**, authorities are deploying **pink fire retardant**, an **ammonium phosphate-based solution**, to curb the spread of flames and protect vegetation.

What is Pink Fire Retardant?

1. **Scientific Name**:
   o Ammonium Polyphosphate-based slurry.
2. **Common Brand**:
   o **Phos-Chek**, widely recognized for **wildfire suppression**.
3. **Features**:
   o **Composition**:
     ▪ Contains **ammonium polyphosphate salts** that coat vegetation, preventing combustion.
     ▪ Includes **pink dyes** for enhanced visibility against natural landscapes.
   o **Functionality**:
     ▪ Creates a **long-lasting barrier** that blocks oxygen from feeding fires.
     ▪ Prevents vegetation from igniting, unlike water, which evaporates quickly.
   o **Application**:
     ▪ Sprayed via **planes or helicopters** ahead of active fires to create **protective fire lines**.

How is Pink Fire Retardant Better Than Other Fire Suppressants?

1. **Durability**:
   o Forms a **long-lasting coating** on vegetation compared to water-based suppressants.
2. **Visibility**:
   o The **pink dye** aids in **accurate application**, enabling firefighters to establish effective fire barriers.

3. **Proactive Effectiveness**:
   o Reduces fire fuel **preemptively**, unlike water, which is reactive and evaporates quickly.

Concerns About Pink Fire Retardant

1. **Environmental Impact**:
   o Contains **toxic metals** like **chromium** and **cadmium** that can harm:
     ▪ **Aquatic life** if it enters water streams.
     ▪ **Ecosystems**, disrupting soil health and biodiversity.
2. **Health Risks**:
   o Long-term exposure to toxic metals may lead to **cancer**, **kidney diseases**, and **liver ailments**.
3. **Dependence on Environmental Conditions**:
   o Effectiveness varies with **terrain**, **weather**, and **fuel type**, reducing its reliability in certain conditions.
4. **Cost and Resource Intensive**:
   o High costs and significant resource requirements may limit its use during **large-scale fires**.

Way Forward

1. **Improving Formulations**:
   o Develop **environmentally friendly alternatives** with fewer toxic components.
2. **Regulating Usage**:
   o Ensure **controlled applications** in ecologically sensitive areas to minimize environmental damage.
3. **Integrated Fire Management**:
   o Combine **fire retardants** with **controlled burns**, **firebreaks**, and **community preparedness** for effective wildfire management.
4. **Monitoring and Research**:
   o Study long-term environmental and health impacts to develop safer and more efficient solutions.
5. **Awareness Campaigns**:
   o Educate communities about wildfire risks and **fire retardant usage** to foster cooperation in firefighting efforts.

Plasticizers Degradation Using Bacterial Enzymes

Relevant for: GS-III (Environment, Science and Technology - Biotechnology)

Context

- **IIT Roorkee researchers** have developed a novel method to degrade **plasticizers**, specifically **diethyl hexyl phthalate (DEHP)**, using bacterial enzymes, addressing a critical environmental issue.

About Plasticizers Degradation Using Bacterial Enzymes

1. **What It Is**:
   o A **biodegradation method** leveraging **bacterial enzymes** to break down **high molecular weight plasticizers**like DEHP, commonly found in **plastics** and **personal care products**.
2. **Bacterial Enzymes Involved**:
   o **Esterase Enzyme**: From **Sulfobacillus acidophilus**, breaks down DEHP into less harmful byproducts.
   o Additional enzymes from **Comamonas testosteroni**: Aid in complete conversion to **water** and **carbon dioxide**.
3. **How It Works**:
   o **Step 1**:
     ▪ DEHP is broken into **mono-(2-ethylhexyl) phthalate (MEHP)** and **2-ethyl hexanol** by the **esterase enzyme**.
   o **Step 2**:
     ▪ Sequential enzymes convert MEHP into **phthalate**, then into intermediate compounds.
     ▪ Final products are **water** and **carbon dioxide** via bacterial metabolic pathways.
   o **Gene Integration**:
     ▪ Researchers aim to integrate all **five enzyme genes** into a single bacterial strain for enhanced degradation efficiency.

Significance

1. **Environmental Impact**:
   o Offers a **sustainable solution** to degrade **carcinogenic plasticizers**, reducing long-term ecological harm.
2. **Pollution Control**:
   o Mitigates **plasticizer contamination** in **water sources**, protecting aquatic ecosystems and human health.
3. **Scalability**:
   o Enzyme production using **E. coli bacteria** makes large-scale applications feasible.
4. **Advancements in Biotechnology**:
   o Represents significant progress in **enzyme engineering** to tackle **environmental challenges**.

Limitations

1. **Current Lab Scale**:
   o The method has been tested only in **controlled environments**; field applications require further optimization.
2. **Enzyme Stability**:
   o Without bacterial integration, enzymes **degrade quickly** and need frequent replenishment, reducing efficiency.
3. **Time-Intensive Process**:
   o Degradation rates are **slow** for large-scale applications, posing challenges for commercial adoption.

Way Forward

1. **Field Trials**:
   o Conduct **extensive field tests** to optimize enzyme performance in real-world conditions.
2. **Enzyme Stability Enhancement**:
   o Develop methods to improve the **stability** and **reusability** of enzymes in environmental settings.
3. **Integrated Bacterial Strains**:
   o Accelerate the development of **genetically engineered bacteria** with integrated enzyme genes for efficient degradation.
4. **Collaboration with Industry**:
   o Partner with **plastic manufacturing** and **waste management** industries to scale up the technology.
5. **Awareness Campaigns**:
   o Educate stakeholders about the **environmental risks of plasticizers** and the benefits of sustainable degradation solutions.

BIOTECHNOLOGY & HEALTH

PM-Ayushman Bharat Health Infrastructure Mission (PM-ABHIM)

Relevant for: GS-II (Health, Welfare Schemes, and Governance)

Context

- The **Supreme Court** stayed the **Delhi High Court's directive** requiring the Delhi government to sign an MoU with the Centre for implementing **PM-ABHIM**.

What is PM-Ayushman Bharat Health Infrastructure Mission (PM-ABHIM)?

1. **Definition**:
   o A **Centrally Sponsored Scheme (CSS)** with **Central Sector (CS)** components, designed to **strengthen healthcare infrastructure** across India.
2. **Launched By**:
   o **Ministry of Health and Family Welfare**, **Government of India**, in **2021-22**.
3. **Budget Allocation**:
   o Allocated **₹64,180 crore** for implementation from **2021-22 to 2025-26**.
4. **Aim**:
   o Address **critical gaps** in healthcare infrastructure.
   o Strengthen **surveillance systems** and **health research capabilities**.
   o Ensure robust **primary**, **secondary**, and **tertiary care services**.

Key Features

4) **National Components**

- **Critical Care Infrastructure**:
   o **12 Central Institutions** with **150-bedded Critical Care Blocks**.
- **Disease Surveillance**:
   o Strengthening the **National Centre for Disease Control (NCDC)**.
   o Establishment of **regional NCDCs** and **metropolitan health surveillance units**.
- **Integrated Health Information Portal**:
   o Expansion to link all **public health labs** for better coordination.
- **Health Emergency Preparedness**:
   o **15 Health Emergency Operation Centres**.
   o Mobile hospitals and public health units at **airports**, **seaports**, and **land crossings**.

2) State Support Components

- **Rural Health Accessibility**:
    o Construction of **17,788 Health and Wellness Centres (HWCs)** in rural and hard-to-reach areas.
- **Urban Healthcare for Slums**:
    o Development of **11,024 HWCs** focusing on slum-like areas.
- **District-Level Healthcare**:
    o Creation of **3,382 Block Public Health Units (BPHUs)**.
    o Establishment of **Integrated Public Health Labs (IPHLs)** in **730 districts**.
- **Critical Care Infrastructure**:
    o **Critical Care Hospital Blocks (CCBs)** in **602 districts** with populations over **5 lakh**.

3) Pandemic Preparedness

- Establishment of **One Health institutions**, new **National Institutes of Virology**, and **Biosafety Level III labs** for research and **disaster readiness**.

4) Focus on Urban and Rural Areas

- Specific infrastructure targeting **slum populations** and **remote rural regions**.

Significance

1. **Strengthened Health Infrastructure**:
    o Comprehensive development of health facilities at **primary**, **secondary**, and **tertiary levels**.
2. **Pandemic Readiness**:
    o Focus on **One Health Approach** ensures preparedness for future **public health emergencies**.
3. **Health Accessibility**:
    o Enhances access to healthcare in **rural and underprivileged urban areas**, reducing disparities.
4. **Integrated Disease Surveillance**:
    o Facilitates coordinated response through enhanced **data collection** and **health information systems**.
5. **Public-Private Partnerships**:
    o Encourages **collaboration** between the government and private entities for improved healthcare delivery.

Challenges

1. **Implementation Issues**:
    o States may face difficulties in meeting **compliance requirements**, as seen in Delhi's case.
2. **Financial Constraints**:
    o States with weaker finances may struggle to match **CSS funding** requirements.
3. **Human Resource Shortage**:
    o Lack of skilled personnel, especially in **rural and remote areas**, hampers effective utilization of infrastructure.
4. **Monitoring and Accountability**:
    o Ensuring **timely implementation** and **effective monitoring** at district and state levels is critical.

Hoollongapar Gibbon Wildlife Sanctuary

Relevant for: GS-III (Environment, Biodiversity and Conservation)

Context

- The **National Board for Wildlife (NBWL)** has approved exploratory drilling for oil and gas in the **eco-sensitive zone (ESZ)** of the **Hoollongapar Gibbon Wildlife Sanctuary**, raising environmental concerns.

About Hoollongapar Gibbon Wildlife Sanctuary

1. **Location**:
    o Situated in **Jorhat district**, Assam.
    o Lies in a secluded region of **evergreen forest**.
2. **Habitat**:
    o **Altitude**: Ranges between **100–120 meters (330–390 ft)**.
    o **Terrain**: Gently slopes downward from southeast to northwest.
    o **Waterlogged Areas**:
        ▪ Created by the **Bhogdoi River**, which borders the sanctuary.
        ▪ Dominated by **semi-hydrophytic plants**.
3. **Fauna**:
    o **Primates**:
        ▪ India's only **Hoolock Gibbons** (after which the sanctuary is named).

- Northeast India's only **nocturnal primate**, the **Bengal Slow Loris**.
  - o **Other Species**:
    - **Mammals**: Indian elephants, tigers, leopards, jungle cats, wild boars, and civets.
    - **Primates**: Stump-tailed macaques, northern pig-tailed macaques.
    - **Rodents**: Four types of squirrels.
4. **Uniqueness**:
  - o **Primatological Importance**:
    - The **only sanctuary in India named after a primate species**.
    - Known for its **dense gibbon population**.
  - o **Biodiversity Hotspot**:
    - Rich in **flora** and **fauna**, making it ecologically significant.

Environmental Concerns

1. **Exploratory Drilling Impact**:
  - o **Habitat Disturbance**: Potential loss of biodiversity due to habitat fragmentation.
  - o **Water Contamination**: Risk of pollution in waterlogged areas from drilling operations.
  - o **Noise Pollution**: Disruption to sensitive species like gibbons and Bengal Slow Lorises.
2. **Eco-Sensitive Zone (ESZ) Vulnerability**:
  - o Approvals in ESZs risk encroachment into **critical wildlife habitats**, undermining conservation efforts.

Conservation Importance

1. **Primates Conservation**:
  - o Acts as a **safe haven** for endangered species like the **Hoolock Gibbons**.
2. **Ecosystem Services**:
  - o Supports **water retention**, **carbon sequestration**, and **biodiversity preservation**.
3. **Cultural and Scientific Value**:
  - o Provides opportunities for **ecotourism** and **scientific research** in primate behavior and conservation.

Way Forward

1. **Regulation of Activities in ESZs**:
  - o Ensure strict environmental impact assessments before approvals.
2. **Strengthen Conservation Efforts**:
  - o Enhance resources for protecting **Hoollongapar's biodiversity**.
3. **Promote Sustainable Practices**:
  - o Encourage eco-friendly alternatives to oil and gas exploration.
4. **Public Awareness**:
  - o Engage local communities in conservation programs.
5. **Monitoring Mechanisms**:
  - o Implement real-time monitoring to mitigate potential damages.

SCIENCE & TECHNOLOGY

ISRO's Space Docking Experiment (SpaDeX)

Relevant for: GS-III (Science and Technology – Space Technology)

Context

- On **January 16, 2025**, India achieved a significant milestone in space technology with the successful execution of ISRO's **Space Docking Experiment (SpaDeX)**.

About ISRO's Space Docking Experiment (SpaDeX)

1. **Definition**:
  - o **SpaDeX** is an advanced mission aimed at demonstrating **satellite docking technology**, crucial for:
    - **Space station operations**.
    - **Interplanetary missions**.
    - **Satellite servicing** and in-orbit repairs.
2. **Mission Framework**:
  - o Conducted under **PSLV C60** as part of ISRO's strategy to develop **Next-Generation Space Technologies**.

3. **Aim**:
- o Demonstrate **docking and undocking** of satellites in orbit.
- o Enable the **transfer of power** and control between docked satellites.
- o Support future missions, including **human spaceflight**, **moon landings**, and **space station assembly**.

Key Features

1. **Satellites Involved**:
- o **SDX01 (Chaser)** and **SDX02 (Target)**, each weighing **220 kg**.
2. **Post-Docking Rigidization**:
- o Ensures stability during and after docking.
3. **Electric Power Transfer**:
- o Docked satellites can share power, ensuring operational readiness.
4. **Mission Life**:
- o Expected to last **two years**, enabling long-term studies.

How It Works

1. **Maneuvering**:
- o Satellites approach from **15m to a 3m hold point** for precision docking.
2. **Automated Docking**:
- o Uses **sensors**, **alignment systems**, and **thrusters** for autonomous operations.
3. **Post-Docking Operations**:
- o Include **power checks** and **payload activation** to ensure system functionality.

Global Context

1. **Nations That Achieved Docking Technology**:
- o **United States**: First demonstrated during the **Gemini program (1966)**.
- o **Russia**: Perfected docking in **Soyuz missions**.
- o **China**: Achieved docking with modules for the **Tiangong space station**.
- o **India**: Became the **4th nation** to demonstrate this technology in **2025** with **SpaDeX**.

Significance

1. **Technological Advancement**:
- o Marks a leap in **space engineering capabilities**, particularly in **autonomous operations**.
2. **Support for Human Spaceflight**:
- o Paves the way for future **Gaganyaan missions**, **lunar exploration**, and the development of a **space station**.
3. **In-Orbit Servicing**:
- o Enables **refueling**, **repairs**, and **upgrades** of satellites, enhancing their lifespan and reducing costs.
4. **Strategic Positioning**:
- o Positions India as a global leader in **space technology**, fostering collaboration opportunities.

Challenges

1. **Precision and Coordination**:
- o Docking requires **highly precise alignment** and control, which are technically challenging.
2. **Infrastructure Development**:
- o Advanced ground systems and autonomous technologies are essential for seamless operations.
3. **Global Competition**:
- o Competing with nations like the US, Russia, and China to maintain technological parity.

Union Cabinet Approves 'Third Launch Pad' (TLP) Project

Relevant for: GS-III (Science and Technology - Space Technology)

Context

- The **Union Cabinet** approved the establishment of the **Third Launch Pad (TLP)** at **Satish Dhawan Space Centre (SDSC), Sriharikota, Andhra Pradesh**, enhancing India's launch capacity and readiness for future space missions.

About Third Launch Pad (TLP)

1. **Key Features**:
   - Configured to support launches of:
     - **Next-Generation Launch Vehicles (NGLVs)**.
     - **Launch Vehicle Mark-3 (LVM3)** vehicles with **semi-cryogenic stages**.
   - Supports **horizontal and tilted integration** of NGLVs.
2. **Significance**:
   - Enables **higher launch frequencies**.
   - Enhances capacity for **future human spaceflight** and **space exploration missions**.

Existing Launch Pads in India

1. **First Launch Pad (FLP)**:
   - Primarily designed for **Polar Satellite Launch Vehicle (PSLV)**.
   - Supports launches for **PSLV** and **Small Satellite Launch Vehicle (SSLV)**.
2. **Second Launch Pad (SLP)**:
   - Primarily used for **Geosynchronous Satellite Launch Vehicle (GSLV)** and **LVM3**.
   - Serves as a **standby for PSLV** launches.
   - Key missions launched:
     - **Chandrayaan-3**.
     - Upcoming **Gaganyaan missions**.

Reasons for Selecting Sriharikota for TLP

1. **Strategic Location**:
   - Situated on the **eastern coast**, ideal for **easterly launches** to utilize Earth's rotation.
2. **Proximity to Equator**:
   - **Earth's rotation is fastest at the equator**, giving launch vehicles an additional push.
   - Increases **payload capacity** while reducing **operational costs**.
3. **Safety**:
   - Minimal risk from **maritime and airline routes**.
   - Uninhabited area and proximity to the sea ensure **safe flight paths** for launch vehicles.
4. **Geographical Advantage**:
   - The area is largely **uninhabited**, minimizing risks to human settlements.

New Generation Launch Vehicles (NGLV) Programme

1. **What It Is**:
   - ISRO's program to develop a **new rocket**, also known as **Soorya Rocket**, for launching satellites, spacecraft, and other payloads.
2. **Key Features**:
   - **3-stage vehicle** with a **reusable first stage**, ensuring:
     - **Low-cost access to space**.
     - Use of **modular green propulsion systems**.
   - **Semi-cryogenic propulsion**:
     - Uses **refined kerosene** as fuel and **liquid oxygen (LOX)** as oxidizer.
   - **Enhanced Payload Capability**:
     - **Three times** the payload of LVM3 at **1.5 times the cost**.

Significance of TLP and NGLV

1. **Increased Launch Capacity**:
   - Addresses growing demand for satellite launches and India's **space exploration ambitions**.
2. **Support for Gaganyaan**:
   - Crucial for **human spaceflight missions** and future endeavors like **space stations**.
3. **Global Competitiveness**:
   - Positions India as a **preferred launch destination**, competing with space agencies like **NASA**, **ESA**, and **SpaceX**.
4. **Economic and Strategic Gains**:
   - Boosts India's **space economy** and aligns with the vision of becoming a **global space leader**.

Challenges

1. **Cost Implications**:
   - High initial investment for infrastructure and technology development.
2. **Technology Readiness**:
   - Ensuring seamless execution of reusable launch systems and **semi-cryogenic stages**.
3. **Global Competition**:

o   Competing with advanced private players like **SpaceX** requires continuous innovation.

US AI Export Rule: Impact on India and Global AI Ecosystem

Relevant for: GS-II (International Relations - Technology Diplomacy), GS-III (Science and Technology)

Context

- In the final days of the **Biden administration**, the US introduced the **"Framework for Artificial Intelligence Diffusion"**, regulating the export of advanced AI technologies like **GPUs**, citing **national security concerns**.

About the US AI Export Rule

1. **What It Is**:
   o   A regulatory framework to **control the export of advanced AI hardware**, particularly **GPUs**, ensuring that these technologies remain accessible primarily to the **US and its closest allies**.
2. **Objective**:
   o   Protect **national security interests** by preventing misuse of **cutting-edge AI capabilities**.
   o   Retain **technological superiority** in **AI development** and deployment.

Categories and India's Placement

1. **Tier 1**:
   o   Includes **18 closest US allies** such as **Australia**, **Japan**, **South Korea**, and the **UK**.
   o   Minimal export restrictions, allowing free deployment of **AI technology** by US companies.
2. **Tier 2**:
   o   Covers the majority of countries, including **India**.
   o   Restrictions:
     ▪   **Cap on computing power imports** unless hosted in trusted environments.
     ▪   Limited to **50,000 advanced AI chips through 2027**, extendable via bilateral agreements.
3. **Tier 3**:
   o   Includes **Russia**, **China**, and **North Korea**.
   o   Near-total **prohibition on importing US AI technology**.

Special Provisions for India and China

1. **India**:
   o   Authorized firms can use exported AI technology for both **civilian** and **military purposes** (excluding **nuclear use**).
2. **China**:
   o   Exported technology is restricted to **civilian applications only**, with no scope for military use.

Implications for India

1. **IndiaAI Mission**:
   o   **Potential Delays**: The cap on **advanced GPUs** may slow progress in achieving **computing power targets**.
   o   **Data Center Development**: Large-scale AI data centers may face hurdles, although smaller firms might remain unaffected.
2. **Strategic Alliances**:
   o   Reflects India's growing importance in **US foreign policy** but highlights its exclusion from **Tier 1**, requiring **bilateral negotiations** for relaxed restrictions.
3. **Domestic AI Ecosystem**:
   o   Limited access to **cutting-edge GPUs** could slow **AI research and innovation**.
   o   Pushes India towards **self-reliance** in **AI hardware manufacturing**, aligning with the **Atmanirbhar Bharat initiative**.
4. **Global Competitiveness**:
   o   India's ability to compete with **Tier 1 nations** in **AI-driven industries** may be hindered.
   o   Could slow progress in emerging areas like **autonomous systems**, **AI-based healthcare**, and **smart manufacturing**.

Significance of the Rule

1. **National Security**:
   o   Prevents misuse of **US-origin AI technologies** by adversarial nations.
2. **Technology Diplomacy**:
   o   Reinforces the strategic alignment of **US allies** while signaling caution toward nations like **China**.
3. **AI Innovation Leadership**:
   o   Retains US leadership in the **AI domain** by controlling access to **critical hardware**.

Challenges for India

1. **Dependence on Imports**:
   - India lacks domestic manufacturing of advanced GPUs, increasing reliance on imports.
2. **Need for Bilateral Agreements**:
   - Negotiating agreements with the US for increased access will require significant **diplomatic effort**.
3. **Skill Development**:
   - Restricted hardware may impact **AI training programs** and the ability to scale **AI startups**.

Way Forward for India

1. **Bilateral Negotiations**:
   - Engage with the US to seek **relaxations** in restrictions under Tier 2, emphasizing India's role as a **strategic partner**.
2. **Domestic Hardware Development**:
   - Strengthen initiatives for **semiconductor and GPU manufacturing** under the **Semicon India Program**.
3. **Research Partnerships**:
   - Foster collaborations with **US firms** and **academic institutions** to bridge technology gaps.
4. **Focus on AI Software**:
   - Leverage India's strengths in **AI software and algorithms** while building hardware capabilities.

One Rocket, Two Missions: A Milestone in Private Lunar Exploration

Relevant for: GS-III (Science and Technology - Space Technology)

Context

- A **SpaceX Falcon 9 rocket** successfully launched two lunar spacecraft, **Blue Ghost** and **Resilience**, in a groundbreaking **"rideshare" mission** involving U.S. and Japanese private companies. This highlights the **growing role of private players** in space exploration.

About "One Rocket, Two Missions"

1. **What It Is**:
   - A **dual-mission launch** demonstrating how **commercial partnerships** can reduce costs and enhance **scientific exploration**.
   - Involves two spacecraft:
     - **Blue Ghost** (U.S.) under NASA's **CLPS program**.
     - **Resilience** (Japan) developed by private-sector company **ispace**.
2. **Launch Provider**:
   - Rocket: **SpaceX Falcon 9**.
3. **Purpose**:
   - Deliver **scientific payloads**.
   - Demonstrate **technologies** crucial for future lunar operations.

Nations Involved

1. **United States**:
   - NASA's **Commercial Lunar Payload Services (CLPS)** program supports cost-effective lunar exploration through **private-sector partnerships**.
2. **Japan**:
   - **ispace**, a Tokyo-based private company, contributes to lunar exploration with **innovative technologies** like the **Tenacious micro rover**.

Satellites and Payloads

Blue Ghost

1. **Developer**:
   - **Firefly Aerospace** (U.S.).
2. **Payloads**:
   - Carries **10 NASA scientific instruments** to study:
     - **Earth's magnetosphere**.
     - **Lunar dust dynamics**.
     - The Moon's **thermal and structural properties**.
3. **Technology Focus**:
   - Advanced **navigation and computing systems** for harsh lunar environments.

Resilience

1. **Developer**:
   o **ispace-Europe**, a Luxembourg subsidiary of Japan's **ispace**.
2. **Payloads**:
   o Features **Tenacious**, a micro rover equipped with:
     ▪ **High-definition cameras**.
     ▪ **Regolith-scooping technology**.
3. **Exploration Site**:
   o Targets the **Moon's far north**, specifically **Mare Frigoris**.

Significance

1. **Technological Advancements**:
   o Tests **navigation, computing, and robotic systems**, laying the groundwork for **sustainable lunar exploration**.
2. **Global Collaboration**:
   o Highlights **partnerships** between private companies and government agencies, exemplifying **international cooperation** in space.
3. **Sustained Lunar Economy**:
   o A stepping stone toward establishing a **long-term human presence** on the Moon under NASA's **Artemis program**.
4. **Innovation in Space Exploration**:
   o Demonstrates **cost-effective approaches** to achieve complex space missions, leveraging **private-sector efficiencies**.

Broader Implications

1. **Commercial Space Expansion**:
   o Showcases the **viability of private-sector contributions** in advancing space exploration.
2. **Lunar Resource Utilization**:
   o Investigations by micro rovers like **Tenacious** pave the way for **resource extraction**, such as regolith and water ice, for future missions.
3. **Space Diplomacy**:
   o Strengthens ties between **nations and private enterprises**, fostering **global unity in space exploration**.

India's First Private Satellite Constellation: A Landmark Achievement

Relevant for: GS-III (Science and Technology - Space Technology, Private Sector Involvement)

Context

- India achieved a historic milestone with the launch of its **first private satellite constellation**, developed by Bengaluru-based startup **Pixxel**, backed by **Google**.

About India's First Private Satellite Constellation

1. **What It Is**:
   o A constellation of **six hyperspectral imaging satellites** launched by **Pixxel**, focusing on high-resolution **data acquisition and monitoring**.
2. **Organizations Involved**:
   o Developed by **Pixxel** with **Google's backing**.
   o **Launch Partner**: **SpaceX**, which facilitated the launch.
3. **Launch Location**:
   o **Vandenberg Space Force Base**, California, USA.
4. **Aim**:
   o Provide advanced **hyperspectral imaging** to improve:
     ▪ **Agriculture insights**.
     ▪ **Mining and environmental monitoring**.
     ▪ **Defense applications**.
     ▪ **Resource management**.

Features of the Satellite Constellation

1. **Hyperspectral Imaging Technology**:
   o Captures detailed data across **hundreds of light bands**, offering superior precision compared to traditional imaging.
2. **Applications**:
   o **Agriculture**: Improve **crop yields** and assess soil health.
   o **Environmental Monitoring**: Track **oil spills**, deforestation, and pollution.
   o **Mining**: Monitor natural resource extraction and optimize processes.
   o **Geographic Boundaries**: Survey terrain and track geographic changes.
3. **Expansion Plans**:

o Plan to launch **18 additional satellites** by 2029 to enhance capabilities and cater to rising demand.
4. **Client Base**:
   o Secured **65 clients**, including:
      ▪ **British Petroleum (BP)**.
      ▪ **India's Ministry of Agriculture**, leveraging data for national agricultural insights.

Significance

1. **Private Sector Contribution**:
   o Marks a major milestone in India's **private space sector**, complementing ISRO's achievements.
2. **Global Competitiveness**:
   o Positions India as a key player in the global **space-tech and imaging market**.
3. **Economic Boost**:
   o Expands India's **space economy**, encouraging **private investments** in satellite development.
4. **Sustainability**:
   o Provides actionable insights for **sustainable resource management** and environmental protection.

Challenges

1. **Technological Hurdles**:
   o Maintaining **hyperspectral imaging precision** in real-world conditions.
2. **Market Competition**:
   o Competing with established players in the global imaging market.
3. **Regulatory Framework**:
   o Need for streamlined **space policies** to encourage innovation and ensure compliance.

Atomic Energy Commission (AEC)

Relevant for: GS-III (Science and Technology - Nuclear Technology, Policy Making)

Context

- The **Indian government** recently **reconstituted the Atomic Energy Commission (AEC)**, including prominent members such as **T.V. Somanathan**, **Manoj Govil**, and **Pankaj Kumar Mishra**, along with other eminent personalities from diverse fields.

About the Atomic Energy Commission (AEC)

1. **What It Is**:
   o The **Atomic Energy Commission (AEC)** is India's **apex policy-making body** for:
      ▪ **Atomic energy research**.
      ▪ **Nuclear applications** for peaceful and strategic purposes.
2. **Established In**:
   o Initially set up in **August 1948** under the **Department of Scientific Research**.
   o Formally reconstituted on **March 1, 1958**, within the **Department of Atomic Energy (DAE)**.
3. **Ministry**:
   o Functions directly under the **Department of Atomic Energy**, which is under the **Prime Minister's direct charge**.
4. **Headquarters**:
   o Located in **Mumbai, Maharashtra**.
5. **Aim**:
   o To advance **nuclear science, research**, and **energy initiatives** in India for peaceful and strategic applications.

Structure of AEC

1. **Chairperson**:
   o **Secretary of the Department of Atomic Energy** serves as the chairperson.
2. **Ex-Officio Members**:
   o **National Security Adviser (NSA)**.
   o **Principal Secretary to the Prime Minister**.
   o **Foreign Secretary**.
   o **Cabinet Secretary**.
   o **Expenditure Secretary**.
3. **Eminent Scientists**:
   o Includes notable scientists and **former chairpersons** of the commission.

Functions of the AEC

1. **Policy Formulation**:
   o Shapes India's **nuclear energy** and **research policies**.
2. **R&D Oversight**:
   o Promotes research in **nuclear science**, focusing on applications in:
     ▪ **Energy generation**.
     ▪ **Medicine** (e.g., cancer treatment).
     ▪ **Agriculture** (e.g., radiation-induced crop improvements).
3. **International Collaboration**:
   o Engages in **global nuclear agreements** and fosters partnerships in nuclear science.
4. **Energy Production**:
   o Supports initiatives for **nuclear power generation** and the transition to **clean energy**.
5. **Regulation and Safety**:
   o Ensures strict adherence to **safety standards** across nuclear facilities.

Significance of the AEC

1. **Strategic Importance**:
   o Strengthens India's **nuclear deterrence** and **energy security**.
2. **Clean Energy Goals**:
   o Contributes to India's commitment to **reduce carbon emissions** by promoting **nuclear power**.
3. **Global Leadership**:
   o Positions India as a key player in the **global nuclear arena**, fostering cooperation with bodies like the **International Atomic Energy Agency (IAEA)**.
4. **Scientific Advancements**:
   o Drives innovation in nuclear applications for **healthcare**, **agriculture**, and **industrial processes**.
5. **Economic Impact**:
   o Boosts industries related to **nuclear technology** and strengthens India's **scientific infrastructure**.

Challenges

1. **Safety Concerns**:
   o Ensuring safety in **nuclear facilities** remains a priority to avoid potential disasters.
2. **Public Perception**:
   o Misconceptions about nuclear energy hinder its adoption as a clean energy source.
3. **Global Compliance**:
   o Maintaining compliance with **international non-proliferation norms** while advancing strategic programs.
4. **Technology Gaps**:
   o Dependence on foreign technology for certain aspects of **nuclear infrastructure**.

Purulia Observatory: Advancing India's Astronomical Research

Relevant for: GS-III (Science and Technology - Space and Astronomy)

Context

- The **S N Bose Centre for Basic Sciences (SNBCBS)**, under the **Department of Science and Technology (DST)**, inaugurated an advanced **astronomical observatory** atop **Panchet Hill** in **Purulia district, West Bengal**.

About Purulia Observatory

1. **Established By**:
   o **S N Bose Centre for Basic Sciences (SNBCBS)**, an autonomous institute under **DST, India**.
2. **What It Is**:
   o An advanced **astronomical observatory** featuring a **14-inch telescope** for:
     ▪ **Scientific observations**.
     ▪ **Astronomy training** for researchers and students.
3. **Location**:
   o **Panchet Hill**, **Garpanchakot area**, Purulia district, West Bengal.
   o **Elevation**: 600 meters above sea level.
4. **Other Observatories in India**:
   o **Aryabhatta Research Institute of Observational Sciences (ARIES)**: Nainital.
   o **Vainu Bappu Observatory**: Tamil Nadu.
   o **IUCAA Observatory**: Pune.

Significance of Purulia Observatory

1. **Longitudinal Advantage**:
   - Fills a critical **longitudinal gap** at **86° E** in global astronomical networks, enabling better coverage of **astronomical events**.
2. **Observation of Transient Events**:
   - Facilitates the study of **transient phenomena** like **supernovae**, **gamma-ray bursts**, and **meteor showers**.
3. **International Collaboration**:
   - Strengthens partnerships with **global astronomical observation networks** for synchronized data collection.
4. **Astrophysics Research**:
   - Provides a platform for advanced research in **astrophysics** and **space sciences**.
5. **Educational and Regional Impact**:
   - Encourages **student engagement** and scientific temperament.
   - Boosts the **local ecosystem** in a **backward region**, promoting development and opportunities.

Challenges

1. **Maintenance in Remote Area**:
   - Requires sustained **infrastructure** and skilled personnel for operations and maintenance.
2. **Climate Dependence**:
   - Susceptible to **weather constraints**, impacting observation schedules.
3. **Funding for Advanced Equipment**:
   - Need for consistent financial support to upgrade technology and instruments.

Way Forward

1. **Capacity Building**:
   - Train local and national talent in **astronomy** and **instrumentation**.
2. **Public Outreach**:
   - Conduct workshops and events to increase **public awareness** about astronomy.
3. **Integration with Global Networks**:
   - Collaborate with international observatories for **data-sharing** and **joint projects**.
4. **Upgrading Infrastructure**:
   - Introduce higher-resolution telescopes and advanced **data analysis tools**.
5. **Research Funding**:
   - Secure funding for **long-term research** and maintenance.

Small Language Models (SLMs)

Relevant for: GS-III (Science and Technology - Developments in AI and IT)

Context

- The shift toward **Small Language Models (SLMs)** marks a **paradigm change** in AI development, moving away from the **massive-scale Large Language Models (LLMs)** that dominated the field.

About Small Language Models (SLMs)

1. **What It Is**:
   - **SLMs** are compact AI systems designed for **specific, domain-focused tasks**, requiring fewer parameters and computational resources compared to LLMs.
2. **How It Works**:
   - Trained on **smaller, targeted datasets**, making them efficient for:
     - **Language translation**.
     - **Basic text summarization**.
     - **Domain-specific problem-solving**.
   - Can be **deployed efficiently** on **edge devices** like smartphones and IoT systems.
3. **Features**:
   - **Compact Size**: Reduced parameters compared to LLMs.
   - **Cost-Effective**: Minimal computational power and training data required.
   - **On-Device Deployment**: Local execution without cloud dependency.
   - **Quick Training**: Faster to train and fine-tune.
   - **Energy Efficient**: Lower resource consumption, ideal for low-infrastructure settings.

Significance of SLMs

1. **Accessibility**:
   o Extends **AI solutions** to regions with limited resources, such as **rural India**.
2. **Edge Applications**:
   o Powers real-time tasks like:
      ▪ **Language translation**.
      ▪ **Speech recognition** directly on devices.
3. **Industry-Specific Solutions**:
   o Tailored for sectors like **healthcare**, **agriculture**, and **education**.
4. **Cultural Preservation**:
   o Enables AI to support **local languages** and **dialects**, fostering inclusivity.

Differences Between Large Language Models (LLMs) and Small Language Models (SLMs)

Feature	Large Language Models (LLMs)	Small Language Models (SLMs)
Size	Trained on **billions/trillions** of parameters.	Trained on **millions to a few billion** parameters.
Purpose	Generalized tasks (e.g., **AGI**).	Specific, **niche applications**.
Cost	High computational and resource cost.	Low cost and resource-efficient.
Training Data	Requires **massive, diverse datasets**.	Uses **smaller, targeted datasets**.
Deployment	Cloud-based; requires **heavy infrastructure**.	Suitable for **on-device/edge computing**.
Use Cases	Complex tasks (e.g., **coding, advanced reasoning**).	Simple tasks (e.g., **translations, FAQs**).
Scalability	Demands significant infrastructure.	Easily scalable for **localized** use.

Challenges in Adopting SLMs

1. **Limited Generalization**:
   o Focused scope restricts their ability to handle **generalized tasks**.
2. **Data Availability**:
   o May face challenges in obtaining **domain-specific datasets** for training.
3. **Customization Complexity**:
   o Fine-tuning SLMs for **specific sectors** requires expert knowledge.
4. **Lack of Awareness**:
   o Industries might prefer **LLMs** due to their popularity, despite higher costs.

Way Forward

1. **Promote Research**:
   o Invest in **R&D** to optimize SLM architectures for broader domains.
2. **Public-Private Partnerships**:
   o Collaborate with **industries** and **academia** to develop SLMs for targeted use cases like **healthcare AI** or **agricultural insights**.
3. **Open Datasets**:
   o Encourage the creation of **domain-specific open datasets** to simplify training processes.
4. **Raise Awareness**:
   o Educate industries on the **cost-effectiveness** and scalability of SLMs compared to LLMs.
5. **Integration with Local Needs**:
   o Focus on **local languages**, regional applications, and low-resource settings to maximize impact.

India Develops World's Most Powerful Hydrogen Train Engine

Relevant for: GS-III (Science and Technology, Energy Resources, Environment)

Context

- Indian Railways has developed the **world's most powerful hydrogen-powered train engine** with a capacity of **1,200 horsepower**, surpassing existing hydrogen trains globally.
- It will undergo its **first trial run** on the **Jind-Sonipat route** in Haryana.

Significance of India's Hydrogen Train Engine

1. **Indigenous Innovation**:
   o The engine is built using **indigenous technology**, showcasing India's growing expertise in **green energy** and transportation technology.
2. **Global Benchmark**:
   o Other hydrogen-powered trains, developed by countries like **Germany, France, Sweden, and China**, produce **500-600 horsepower**.
   o India's engine exceeds this capability, demonstrating leadership in **hydrogen-based mobility**.
3. **Clean Mobility Solution**:
   o Hydrogen-powered trains emit only **water vapor**, making them a **zero-emission alternative** to diesel-powered locomotives.

Hydrogen as a Clean Fuel

1. **What It Is**:
   o Hydrogen is a **clean and versatile energy source** with potential to **decarbonize transportation, industry, and power generation**.
2. **Types of Hydrogen**:

Type	Description	Byproducts
Blue Hydrogen	Produced from **natural gas** via **steam methane reforming** (SMR) with **carbon capture technology**.	Water, some CO_2 captured.
Grey Hydrogen	Produced from **natural gas** via SMR but without carbon capture.	Significant CO_2 emissions.
Green Hydrogen	Produced through **water electrolysis** powered by **renewable energy** (e.g., wind, solar).	No harmful byproducts.
Pink Hydrogen	Produced via **electrolysis** powered by **nuclear energy**.	No harmful byproducts.

Advantages of Hydrogen as a Fuel

1. **Abundance**:
   o Hydrogen constitutes **75% of the mass of the universe**, making it readily available.
2. **Clean Energy**:
   o Hydrogen fuel cells produce only **water** as a byproduct, reducing pollution.
3. **High Efficiency**:
   o Hydrogen is more efficient compared to **conventional fuels** like coal and petroleum.

Challenges in Hydrogen Adoption

1. **High Costs**:
   o Hydrogen production and fuel cell technology remain **expensive** due to limited economies of scale.
2. **Storage and Transportation**:
   o Hydrogen is highly **flammable** and requires specialized equipment for safe handling and transportation.
3. **Infrastructure Gaps**:
   o Lack of a robust **hydrogen distribution network** and refueling infrastructure.
4. **Safety Concerns**:
   o Hydrogen's **flammable nature** poses risks during production, storage, and usage.

India's Initiatives in Hydrogen Adoption

1. **Green Hydrogen Policy (2022)**:
   o Aims to make India a **leading producer and supplier** of green hydrogen globally.
2. **National Green Hydrogen Mission (2023)**:
   o Objective: To establish India as a global hub for **green hydrogen production and export**.
   o **Investment**: ₹19,744 crore to scale production and deployment.
3. **Strategic Interventions for Green Hydrogen Transition (SIGHT) Program**:
   o Incentivizes:
     ▪ **Manufacturing of electrolysers**.
     ▪ **Production of green hydrogen** to reduce costs and improve scalability.

Way Forward

1. **Infrastructure Development**:
   o Build a **national hydrogen grid** for efficient production, storage, and transportation.
2. **Research and Development**:
   o Invest in **R&D** to develop cost-effective and safe hydrogen production technologies.
3. **International Collaboration**:
   o Partner with countries like **Germany** and **Japan** to share expertise and resources.
4. **Policy Alignment**:
   o Strengthen policies under the **National Green Hydrogen Mission** to accelerate adoption across industries.
5. **Public Awareness and Industry Incentives**:
   o Create awareness of hydrogen's benefits and incentivize private sector investment.