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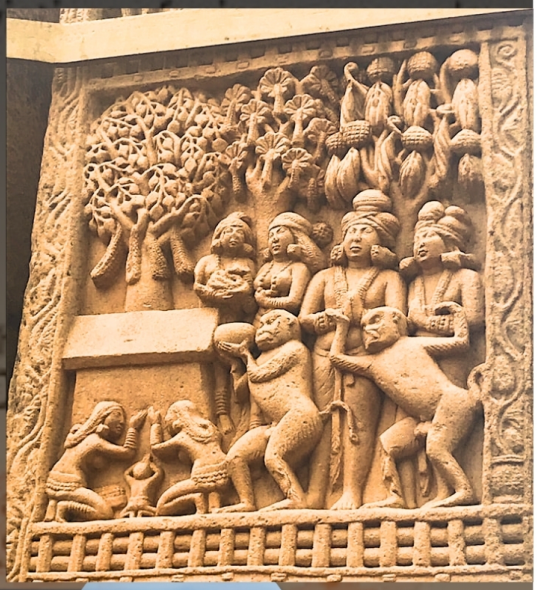

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PRELIMS

POLITY & GOVERNANCE

Online Gaming Rules, 2026: Regulatory Framework under the PROG Act, 2025

Why in News?

The Government notified the **Online Gaming Rules, 2026** under the **Prevention and Regulation of Online Gaming (PROG) Act, 2025** to establish a comprehensive regulatory framework for India's rapidly expanding online gaming sector. The rules aim to promote responsible gaming, protect users, curb illegal betting, and strengthen digital governance.

About the PROG Act, 2025

- Provides a statutory framework for regulating online gaming platforms.
- Distinguishes between **permissible online games** and prohibited gambling or betting activities.
- Focuses on consumer protection, transparency, and accountability.

Major Provisions of the Online Gaming Rules, 2026

- Mandatory registration and compliance requirements for online gaming operators.
- Establishment of **Self-Regulatory Bodies (SRBs)** for game verification and oversight.
- Stringent **Know Your Customer (KYC)** norms and age-verification mechanisms.
- Requirement for grievance redressal systems and responsible gaming measures.
- Restrictions on misleading advertisements and promotion of unlawful gaming activities.
- Enhanced safeguards against fraud, money laundering, and financial risks.
- Data protection and cybersecurity compliance obligations for gaming platforms.

Sikkim Becomes India's First Paperless Judiciary State

Why in News?

- **Sikkim** has been declared the **first paperless judiciary state** in India
- The state's Chief Minister, **Prem Singh Tamang (Golay)**, termed it a historic step towards a faster, transparent, and technology-driven justice system.

Key Features of the Initiative

- **e-Filing** of court cases
- **Digital case management** systems
- Elimination of physical paper movement within the judiciary
- Integration of technology into all levels of judicial processes

Significance and Expected Benefits

The key benefits as outlined are:

- **Faster justice delivery** by removing procedural delays caused by physical file movement.
- **Transparency** through digital records and tracking of case status.
- **Accessibility** for litigants and lawyers, allowing remote access to case files.
- **Efficiency** in court administration and case management.

Alignment with National Vision

- The move aligns with the national vision of **Viksit Bharat 2047** (Developed India by 2047).
- Chief Minister Golay emphasized that a strong, technology-driven judiciary would play a vital role in ensuring **fairness**, fostering **trust**, and supporting **sustainable development**.

Supreme Court Strength Increased to 37 Judges

Why in News?

The Union Cabinet has approved the **Supreme Court (Number of Judges) Amendment Bill, 2026**, increasing the sanctioned strength of Supreme Court judges from **33 to 37 (excluding the Chief Justice of India)** to improve judicial capacity and reduce pendency of cases.

Constitutional Provision

- **Article 124(1)** of the Constitution provides for:
  - A **Chief Justice of India (CJI)** and
  - Such number of judges as Parliament may prescribe by law.

Hence, Parliament can increase or decrease SC strength through legislation.

Current Change

- Existing sanctioned strength: **33 judges (excluding CJI)**
- Revised strength: **37 judges (excluding CJI)**
- Total strength including CJI: **38 judges**

Legal Basis

- Amends the **Supreme Court (Number of Judges) Act, 1956**
- Passed through **ordinary legislation (simple majority in Parliament)**

Objective of Increase

- Address **rising pendency of cases (~90,000+ cases)**
- Improve **speed of hearings and disposal**
- Allow formation of more benches:
  - Division Benches (2–3 judges)
  - Constitution Benches (5+ judges)

Appointment Mechanism

- Judges appointed by the **President of India**
- Based on recommendation of the **Collegium system**
  - CJI + 4 senior-most judges

Vande Mataram Insult: Proposed Criminal Liability under National Honour Law

Why in News?

The Union Cabinet has approved an amendment to the **Prevention of Insults to National Honour Act, 1971**, proposing to make any **insult, disruption, or obstruction during the singing of "Vande Mataram"** a **punishable offence**, placing it on par with the national anthem.

About the Proposed Amendment

- Extends legal protection currently given to:
  - **National Flag**
  - **Constitution of India**
  - **National Anthem (Jana Gana Mana)**
- Now includes **National Song: Vande Mataram**
- Any:
  - insult
  - disruption
  - obstruction during its singing will become a **cognizable offence (as reported)**

Legal Framework

Prevention of Insults to National Honour Act, 1971

- Provides punishment for disrespect to national symbols.
- Existing penalties:

- Up to **3 years imprisonment**
- Fine or both

- Section 3 already covers national anthem protection.

What is Vande Mataram?

- Written by **Bankim Chandra Chatterjee**
- Published in **Anandamath (1882)**
- Adopted as **National Song in 1950**
- Evokes nationalism and anti-colonial sentiment

Significance of Amendment

1. Legal Parity

- Brings **national song closer to national anthem in legal status**

2. Symbolic National Integration

- Reinforces constitutional and cultural symbolism of national identity

3. Governance Aspect

- Expands scope of **national honour protection laws**

Governor's Role in India: Constitutional Head vs Discretionary Boundaries

Why in News?

A recent controversy in Tamil Nadu regarding the **Governor delaying the swearing-in of a Chief Minister and questioning majority support** has reignited debate on the **scope of gubernatorial discretion, constitutional morality, and limits on the Governor as a constitutional head**.

Constitutional Position of Governor

- Governor is the **nominal head of the State executive**.
- Acts as **"agent of the Centre" and "constitutional head of State" simultaneously**.
- Appointed by the **President under Article 155**.
- Must act on **aid and advice of Council of Ministers (Article 163)** except in limited discretion.

Key Constitutional Provisions

1. Article 163

- Council of Ministers aids and advises Governor.
- Discretion only where Constitution expressly allows.

2. Article 164

- Governor appoints Chief Minister and other ministers.
- CM must prove majority in the **Legislative Assembly**.

3. Government Formation Convention

- Governor invites:
  - **Single largest party OR coalition with majority**
- Majority tested through **floor test in Assembly** (not Governor's subjective assessment).

Discretionary Powers of Governor

Governors can act independently in limited cases:

- Appointment of CM in **hung assembly**
- Reserving Bills for President (Article 200)
- Recommendation of President's Rule (Article 356)
- Reporting failure of constitutional machinery

Judicial Position (Key Principles)

- Governor is a **constitutional head, not political authority**.

- Cannot exercise **absolute or arbitrary discretion**.
- **Floor test is the only constitutionally valid method** to test majority.
- Delay or inaction is subject to **judicial review and mandamus** (SC rulings in multiple cases).

Current Issue (Conceptual Core)

- Delay in swearing-in raises questions:
  - Can Governor demand proof before invitation?
  - Can discretion override **clear electoral arithmetic?**
- SC jurisprudence suggests:
  - Governor cannot act as **"super-legislature" or "political gatekeeper"**

NCRB "Crime in India 2024" Report

Why in News?

The **NCRB "Crime in India 2024" Report** shows a **6% decline in cognisable crimes nationwide**, but highlights a significant **17% rise in cybercrime cases**, reflecting a structural shift from traditional crimes to digital and technology-enabled offences.

About NCRB

- Established: **1986**
- Under: **Ministry of Home Affairs**
- Functions:
  - Collects and analyses **crime data (IPC + Special & Local Laws)**
  - Maintains **Crime and Criminal Tracking Network & Systems (CCTNS)**

Overall Crime Trend (2024)

- Total cognisable crimes: **~58.85 lakh cases**
- Decline: **~6% compared to 2023**
- Decline partly influenced by **legal classification changes under Bharatiya Nyaya Sanhita (BNS)**

Cybercrime Surge (Key Highlight)

- Total cybercrime cases: **~1,01,000+ cases**
- Increase: **~17% over 2023**
- Major categories:
  - Financial frauds (~70%+ share)
  - Online extortion & impersonation
  - Sexual exploitation cases (minor share but rising concern)

Other Key Trends

- Crimes against women: slight **decline (~1–2%)**
- Crimes against SC/ST: mixed trend (region-specific variations)
- Economic offences: **steady rise**
- Drug overdose deaths & suicides: notable increase (as per NCRB ADSI 2024 linkage reports)

Reasons for Cybercrime Rise

- Rapid **digital payments expansion (UPI ecosystem)**
- Low **cyber awareness and digital literacy gaps**
- AI-enabled frauds and "digital arrest" scams
- Cross-border organised cyber syndicates

Institutional Mechanisms

- **Indian Cyber Crime Coordination Centre (I4C)**
- **National Cyber Crime Reporting Portal (cybercrime.gov.in)**

- Emergency helpline: **1930**
- CCTNS integration for crime tracking

GRAI Index: Measuring Efficiency of CPGRAMS-Based Grievance Redressal System

Why in News?

The **Department of Administrative Reforms and Public Grievances (DARPG)** has released the latest rankings of the **Grievance Redressal Assessment and Index (GRAI)**, which evaluates the performance of Central Ministries/Departments in resolving public grievances through the **CPGRAMS platform**, with top-performing departments in Group A and B categories.

What is GRAI?

- **Full Form:** Grievance Redressal Assessment and Index
- Launched by: **DARPG (Ministry of Personnel, Public Grievances & Pensions)**
- Objective: To **measure, compare, and improve grievance redressal efficiency** across government departments.

What is CPGRAMS?

- **Centralised Public Grievance Redress and Monitoring System**
- A **24×7 online platform** for citizens to register grievances related to:
  - Central Ministries
  - State Governments
- Enables **tracking, monitoring, and resolution of complaints**

Structure of GRAI Ranking

Departments are assessed and ranked based on CPGRAMS data under:

- **Efficiency of grievance disposal**
- **Timeliness of resolution**
- **Quality of redressal**
- **Citizen feedback mechanisms**

Departments are broadly grouped as:

- **Group A:** High grievance volume (≥ 500 grievances/month)
- **Group B:** Lower grievance volume (< 500 grievances/month)

Recent Performance Trends (2026)

- Top performers in Group A include:
  - **Department of Financial Services (Insurance Division)**
  - **Department of Telecommunications**
  - **CBIC / Department of Posts (varies monthly trends)**
- Reflects **continuous improvement in grievance disposal efficiency**

National Sports Board & Tribunal: New Governance Architecture for Indian Sports

Why in News?

The Union Government has notified the **National Sports Governance (National Sports Board) Rules, 2026** and **National Sports Governance (National Sports Tribunal) Rules, 2026** under the **National Sports Governance Act, 2025**, creating a new institutional framework to regulate sports federations and resolve sports disputes in India.

Legal Framework

- Enacted under: **National Sports Governance Act, 2025**
- Aim: Reform **sports administration, transparency, and dispute resolution**

1. National Sports Board (NSB)

Nature

- Apex **regulatory and recognition authority** for sports bodies

Composition

- Chairperson + **2 Members**
- Appointed by Central Government
- From panel recommended by **Search-cum-Selection Committee**

Key Functions

- Grant **recognition to National Sports Bodies (NSBs)**
- Ensure compliance with:
  - Governance standards
  - Financial discipline
  - Ethical norms
- Maintain records of **sports federations and election panels**
- Can **suspend or cancel recognition**

2. National Sports Tribunal (NST)

Nature

- Dedicated **quasi-judicial body** for sports disputes

Purpose

- Speedy, independent, cost-effective dispute resolution
- Reduces dependency on civil courts

Jurisdiction

- Disputes involving:
  - Sports federations
  - Athletes
  - Selection issues
  - Governance conflicts

Key Features

- Digital filing and hearing mechanisms
- Fixed tenure members (as per rules framework)
- Appeals lie to **Supreme Court (constitutional oversight)**

INTERNATIONAL RELATIONS

Lipulekh Pass: India–Nepal Border Dispute and Kailash Mansarovar Route Issue

Why in News?

Nepal has objected to the **Kailash Mansarovar Yatra route via Lipulekh Pass**, claiming it lies in its territory, while India has **firmly rejected the claim**, stating that the route is longstanding and based on historical usage and administrative control.

About Lipulekh Pass

- A **high-altitude Himalayan pass** located at the tri-junction of:
  - India (Uttarakhand)
  - Nepal (Sudurpashchim Province)
  - China (Tibet Autonomous Region)
- Situated in the **Kali/Mahakali River basin region**
- Used for:
  - **Kailash Mansarovar pilgrimage**
  - Traditional Indo-Tibet trade routes

Strategic Importance

- One of the **key passes in the western Himalayas**
- Connects India to **Tibet (China)** via Uttarakhand
- Important for:
  - Pilgrimage connectivity
  - Border trade
  - Military and strategic logistics

Core of India–Nepal Dispute

Nepal's Claim

- Based on **Sugauli Treaty (1816)** between British East India Company and Nepal
- Argues that the **Kali River originates from Lipulekh/Limpiyadhura region**, placing the area in Nepal

India's Position

- Claims **Kali River originates at Kalapani springs**
- States Lipulekh has been under **continuous Indian administrative control**
- Uses pass historically for pilgrimage and border trade routes

Recent Development

- India reaffirmed that:
  - Kailash Mansarovar Yatra via Lipulekh is **not a new route**
  - Claims by Nepal are **not historically justified**
- Nepal reiterated territorial objections through diplomatic channels

Dual-Use Satellites: Blurring Civilian–Military Boundaries in Space

Why in News?

The growing reliance on **dual-use satellites**—systems serving both civilian and military purposes—is reshaping modern space operations. Commercial satellite networks are increasingly used for **communication, navigation, surveillance, and military targeting**, raising concerns about the blurring line between peaceful and defence uses of outer space.

What are Dual-Use Satellites?

- Satellites or space systems designed for **civilian applications** but also usable for **military operations**.
- Provide services such as:
  - Communication (broadband, emergency networks)
  - Navigation (GPS-like services)
  - Earth observation and remote sensing
- Can be used by armed forces for:
  - Intelligence, Surveillance, Reconnaissance (ISR)
  - Target acquisition and battlefield coordination

Key Features

1. Overlapping Functionality

- Same satellite infrastructure supports **civilian users and defence forces simultaneously**.

2. Commercialisation of Space

- Private companies now operate major satellite constellations used by governments and militaries.

3. Operational Dependency

- Militaries increasingly depend on **commercial satellites for real-time battlefield data**.

4. Target Ambiguity

- Civilian satellites with military utility may become **legitimate targets in conflict scenarios**.

Strategic and Security Implications

- **Blurring of war boundaries:** Difficulty distinguishing civilian vs military assets in space.
- **Escalation risks:** Attacks on satellites may trigger broader conflicts.
- **Legal ambiguity:** Existing frameworks like the **Outer Space Treaty (1967)** do not clearly address commercial dual-use systems.
- **Space militarisation:** Growth of space-based ISR and anti-satellite capabilities.

Indian Context

- India is expanding both:
  - **ISRO civilian satellites**
  - **Defence Space Agency (DSA)** capabilities
- Increasing use of **commercial space startups (IN-SPACe ecosystem)** for Earth observation and communication.

Ecocide: Push to Make Environmental Destruction a Fifth International Crime

Why in News?

Environmental groups and several countries are intensifying efforts to recognise **"ecocide" as the fifth international crime under the Rome Statute of the International Criminal Court (ICC)**, alongside genocide, crimes against humanity, war crimes, and the crime of aggression. The proposal aims to criminalise **large-scale, severe environmental destruction in peacetime**.

What is Ecocide?

- Refers to **widespread, long-term, and severe destruction of ecosystems** caused by human activity.
- Proposed legal definition (Expert Panel, 2021):
  - *"Unlawful or wanton acts committed with knowledge that there is a substantial likelihood of severe and either widespread or long-term environmental damage."*

Current Status in International Law

- **No standalone international crime of ecocide exists yet.**
- Under **Rome Statute (1998)**:

  - Environmental harm is only criminalised in **war context (Article 8)**.
  - Requires high threshold: damage must be **widespread, long-term AND severe**.
- Hence, **peacetime environmental destruction is largely unpunished at ICC level**.

Push for "Fifth Crime"

- Advocated by NGOs like **Stop Ecocide International**.
- Requires:
  - Amendment to **Rome Statute**
  - Approval by **2/3rd of ICC member states**
- Supported by several states and regions:
  - Pacific Island countries (Vanuatu, Fiji, Samoa)
  - Some EU states (Belgium, France domestically)
  - Environmental leaders and legal scholars

Significance of Proposal

1. Expansion of International Criminal Law

- Would make **corporate and state leaders personally liable**.

2. Climate Justice Mechanism

- Targets **industrial-scale pollution, deforestation, fossil fuel damage**.

3. Closing Legal Gap

- Moves from **war-time environmental protection → peacetime accountability**.

4. Deterrence Effect

- Could influence corporate behaviour and global ESG governance.

Dorjilung Hydroelectric Project: India–Bhutan Clean Energy Corridor

Why in News?

The **Bhutan Government and World Bank** have signed a **$515 million financing agreement** for the **1,125 MW Dorjilung Hydroelectric Power Project**, a major **India–Bhutan clean energy initiative**, with around **80% of generated electricity expected to be supplied to India**, strengthening regional energy cooperation.

What is the Dorjilung Project?

- A **run-of-the-river hydropower project** (low reservoir impact design).
- Installed capacity: **1,125 MW**.
- Location: **Kurichhu River basin, Eastern Bhutan**.
- Developed as a **Public–Private Partnership (PPP)**.

Institutional Structure

- Special Purpose Vehicle (SPV): **Dorjilung Hydro Power Limited (DHPL)**
- Ownership:
  - **Druk Green Power Corporation (DGPC), Bhutan – 60%**
  - **Tata Power (India) – 40%**
- Financing support:
  - **World Bank Group: $515 million package**

Power Distribution

- Around **80% electricity exported to India**.
- Remaining used for **domestic consumption in Bhutan**.
- Expected annual generation: **~4,500 GWh clean electricity**.

Strategic & Economic Significance

1. India–Bhutan Energy Partnership

- Strengthens **long-standing hydropower cooperation**.
- Enhances **regional grid interdependence**.

2. Energy Security

- Supports India's **renewable energy transition**.
- Bhutan strengthens **export-led energy economy**.

3. Climate & Sustainability

- Hydropower contributes to **carbon-neutral/negative Bhutan policy**.
- Promotes **clean energy corridor in Eastern Himalayas**.

4. Investment Model Innovation

- Mix of:
  - Multilateral funding (World Bank)
  - Private sector participation (Tata Power)
  - Sovereign partnership (Bhutan–India)

Geopolitical Context

- Bhutan remains a key partner in India's **Himalayan neighbourhood strategy**.
- Hydropower acts as a **strategic interdependence tool**.
- Competes indirectly with regional infrastructure influence from other powers in the Himalayas.

India–Suriname Economic Ties: Diaspora-Driven South–South Partnership

Why in News?

During External Affairs Minister **S. Jaishankar's visit to Suriname**, India highlighted strengthening **economic cooperation, development partnerships, and diaspora-driven ties** with Suriname, emphasizing India's role as a **reliable partner in the Global South** and expanding engagement in trade, energy, digital, and capacity-building sectors.

India–Suriname Diplomatic Context

- Diplomatic relations established in **1976**
- Indian Embassy in Paramaribo: **1977**
- Surinamese Embassy in New Delhi: **2000**
- 2026 marks **50 years of diplomatic relations (Golden Jubilee)**

Economic & Trade Relations

- Bilateral trade (recent estimates): **over USD 200–500 million range (fluctuating annually)**
- India exports:
  - Pharmaceuticals
  - Machinery, vehicles
  - Textiles, iron & steel
- India imports:
  - Wood
  - Aluminum
  - Agricultural products

Key Drivers of Bilateral Cooperation

1. Diaspora Linkages (Most Important Feature)

- Indo-Surinamese constitute ~**27% of population**
- Largest ethnic group in Suriname
- Historical origin: **Indentured labour migration (1873 onwards)** during Dutch colonial period
- Strong cultural links (Hindi, Bhojpuri traditions, festivals)

2. Development Cooperation

- India provides:
  - **ITEC training programmes**
  - Lines of Credit for infrastructure, water, energy projects
  - Grants in health, agriculture, and capacity building
- Focus on **human-centric development model**

3. Institutional Mechanisms

- **India–Suriname Joint Commission (est. 1992)**
- Regular ministerial consultations
- Cooperation in:
  - Trade & investment
  - Health & education
  - Digital technologies & AI
  - Defence & energy

4. Emerging Areas

- Digital public infrastructure (DPI)
- Renewable energy cooperation
- Agriculture processing (India-assisted agro projects)
- Tourism and cultural diplomacy

Strategic Significance

- Strengthens India's outreach to **CARICOM and Latin America**
- Enhances India's **Global South leadership narrative**
- Supports **energy and resource diversification partnerships**
- Diaspora acts as a **"living bridge" of diplomacy**

QUAD Foreign Ministers' Meet 2026: Indo-Pacific Cooperation Deepens in New Delhi

Why in News?

Foreign Ministers of the **QUAD grouping (India, USA, Japan, Australia)** met in **New Delhi (May 2026)** to strengthen cooperation in the **Indo-Pacific region**, focusing on **maritime security, critical minerals, energy security, and infrastructure development**, including new joint initiatives.

What is QUAD?

- Informal strategic forum of:
  - IN India
  - US United States
  - JP Japan
  - AU Australia
- Aim: Promote a **"Free, Open and Inclusive Indo-Pacific"**
- Origin: Emerged from **2004 Tsunami Core Group → formalised in 2007**

Major Outcomes of 2026 Meet

1. Maritime Security Cooperation

- Launch of **integrated maritime surveillance initiative**
- Real-time data sharing across navies
- Enhanced monitoring of **Indo-Pacific sea lanes**

2. Critical Minerals Framework

- Cooperation on:

  - Mining
  - Processing
  - Recycling
- Aims to reduce **supply chain dependence on China**

3. Infrastructure Development

- Joint plan with Fiji for **port development in the Pacific Islands**
- First tangible QUAD regional infrastructure project

4. Energy Security Initiative

- Focus on stable and diversified **energy supply chains**

Strategic Significance

- Strengthens **rules-based maritime order**
- Enhances **supply chain resilience in strategic sectors**
- Expands QUAD beyond security to **economic and developmental cooperation**
- Reinforces India's role in **Indo-Pacific power balance**

ECONOMY

UPI @ 10: India's Digital Payments Revolution and Global Leadership

Why in News?

The **Unified Payments Interface (UPI)** completed **10 years** of operation in April 2026, marking a decade of transforming India's payment ecosystem into the world's largest real-time digital payments network.

About UPI

- Launched on **11 April 2016** by the **National Payments Corporation of India (NPCI)** under the regulatory oversight of the **Reserve Bank of India (RBI)**.
- Enables instant, interoperable, bank-to-bank fund transfers through mobile devices.
- Functions as a key component of India's **Digital Public Infrastructure (DPI)**.

Major Milestones

- Annual transactions increased from **2 crore (FY 2016-17)** to over **24,162 crore (FY 2025-26)**.
- Transaction value rose from **₹0.07 lakh crore** to approximately **₹314 lakh crore** during the same period.
- More than **700 banks** are now integrated with UPI.
- UPI accounts for nearly **49% of global real-time payment transactions**, making it the world's largest real-time payment system by volume.

Global Expansion

UPI is operational or accepted in **Singapore, UAE, France, Bhutan, Nepal, Sri Lanka, Mauritius, and Qatar**, facilitating cross-border digital payments.

India on the U.S. Priority Watch List

Why in News?

The **United States Trade Representative (USTR)** has retained **India on its Priority Watch List (PWL)** in the **2026 Special 301 Report**, citing concerns related to intellectual property protection and enforcement. The move has renewed discussions on balancing innovation, public welfare, and trade obligations.

What is the Special 301 Report?

- An annual review conducted by the **U.S. Trade Representative (USTR)**.
- Evaluates the adequacy and effectiveness of IP protection in U.S. trading partners.
- Countries are categorized into:
    - **Priority Watch List (PWL)** – serious IP concerns requiring close monitoring.
    - **Watch List** – countries with notable IP-related concerns.

Why is India on the Priority Watch List?

The USTR highlighted concerns regarding:

- Patent protection and enforcement.
- Lengthy judicial and administrative processes.
- Copyright piracy and trademark infringement.
- Protection of trade secrets and market access issues.

India's Position

- India maintains that its IPR framework is fully compliant with the **WTO-TRIPS Agreement**.
- Emphasizes a balance between innovation incentives and public interest, especially in sectors such as pharmaceuticals and healthcare.
- Continues to strengthen IP administration through digitization and faster processing mechanisms.

Revenue-Deficit States: Emerging Fiscal Stress in India

Why in News?

The Centre has cautioned that **states with persistent revenue deficits and high debt burdens may face rising fiscal stress**, reduced policy flexibility, and potential difficulty in maintaining fiscal discipline under FRBM norms, especially in the current phase of fiscal consolidation.

What is Revenue Deficit?

- Occurs when a government's **revenue expenditure exceeds revenue receipts**.
- Indicates that the state is borrowing even for **day-to-day consumption expenditure** (salaries, pensions, subsidies).
- Contrasts with fiscal deficit, which includes both revenue and capital components.

Current State of Fiscal Stress

- Nearly **9 out of 18 major states** are in revenue deficit.
- Examples of stressed states include:
  - Punjab, Kerala, Himachal Pradesh, Rajasthan, Andhra Pradesh
- Some states are spending a large share of revenue receipts on **interest payments**, limiting fiscal space.

Key Concerns Highlighted

1. Rising Debt Burden

- State liabilities in several cases are around **35–45% of GSDP**.
- High debt servicing reduces funds for development expenditure.

2. Violation of Fiscal Prudence ("Golden Rule")

- Borrowing is increasingly being used for **revenue expenditure instead of capital creation**.
- This weakens long-term growth potential.

3. Dependence on Central Transfers

- States with weak own-tax revenues rely heavily on:
  - GST compensation mechanisms (where applicable)
  - Finance Commission transfers
- Raises concerns for **fiscal federal imbalance**.

4. Limited Fiscal Flexibility

- High committed expenditure (salaries, pensions, interest) reduces ability to respond to shocks.

India's First Barrier-Less Toll Plaza: MLFF System at Choryasi

Why in News?

India operationalised its **first barrier-less toll plaza using Multi-Lane Free Flow (MLFF) system** at **Choryasi toll plaza on NH-48 in Gujarat**, marking a shift from physical toll booths to fully automated, non-stop toll collection infrastructure.

What is MLFF (Multi-Lane Free Flow) System?

- An advanced **electronic tolling system** that allows vehicles to pass without stopping.
- Eliminates **physical barriers (boom barriers)** at toll plazas.
- Uses:
  - **FASTag (RFID-based system)**
  - **ANPR cameras (Automatic Number Plate Recognition)**
  - High-speed gantries and sensors
  - Vehicle database integration (VAHAN system)

How It Works

- Overhead gantries scan:
  - FASTag RFID signal
  - Vehicle Registration Number (VRN) via ANPR cameras
- Toll is automatically deducted from linked bank accounts.
- If payment is missed:
  - e-notices issued
  - Penalties applied under National Highway fee rules
  - Integration with enforcement systems like VAHAN

Key Features

- No stopping or slowing down at toll plazas
- Fully automated toll deduction
- Reduced congestion and fuel consumption
- Lower emissions and travel time
- Minimal human intervention in toll operations

Institutional Framework

- Implemented by:
  - **NHAI (National Highways Authority of India)**
  - **IHMCL (Indian Highways Management Company Ltd.)**
  - Supported by MoRTH guidelines
- Private participation (e.g., bank-led OpEx model such as ICICI Bank involvement)

Balance of Payments & Remittances: India's External Sector Resilience

Why in News?

According to recent RBI commentary, India's **Balance of Payments (BoP) remains comfortable**, supported by **strong remittance inflows (over $135 billion)** and resilient services exports and FDI, which help offset volatile foreign portfolio flows amid global uncertainties.

What is Balance of Payments (BoP)?

- BoP is a **systematic record of all economic transactions** between residents of a country and the rest of the world over a period.
- It always **balances mathematically** (credit = debit).

Main Components

1. Current Account

- Includes:
  - **Trade in goods (exports-imports)**
  - **Services (IT, tourism, etc.)**
  - **Primary income (investment income)**
  - **Secondary income (remittances)**

2. Capital & Financial Account

- Records:
  - **FDI (Foreign Direct Investment)**
  - **FPI (Foreign Portfolio Investment)**
  - External borrowings and loans
  - Foreign exchange reserves movement

Role of Remittances in India

- India is one of the **largest global recipients of remittances**.

- Recent inflows exceed **$130–135 billion annually**, providing:
  - Stability to current account
  - Cushion against trade deficits
  - Foreign exchange liquidity
- Major sources: Gulf countries, US, UK, and other OECD economies.

Recent BoP Dynamics

- Strong **services exports (IT, business services)**.
- Stable **remittances even during global shocks**.
- Volatile **FPI flows due to global risk sentiment**.
- RBI interventions (FX swaps) sometimes influence BoP outcomes.

ECLGS 5.0: Emergency Credit Lifeline for MSMEs & Airlines

Why in News?

The Union Cabinet has approved **ECLGS 5.0 (Emergency Credit Line Guarantee Scheme 5.0)** to provide **guaranteed additional credit support to MSMEs, non-MSMEs, and airlines** impacted by the **West Asia geopolitical crisis**, ensuring liquidity stability and business continuity.

What is ECLGS 5.0?

A **credit guarantee scheme** under which the Government provides guarantee cover to banks for extending **additional working capital loans** to eligible businesses.

Institutional Framework

- Implemented by: **NCGTC (National Credit Guarantee Trustee Company Ltd.)**
- Administered under: **Department of Financial Services (DFS)**
- Lending institutions: Banks and NBFCs (Member Lending Institutions - MLIs)

Key Features

1. Guarantee Coverage

- **100% guarantee**: MSMEs
- **90% guarantee**: Non-MSMEs and airlines

2. Loan Quantum

- MSMEs/Non-MSMEs: Up to **20% of peak working capital (Q4 FY26)**
- Airlines: Higher targeted support (sector-specific package)

3. Total Credit Flow

- Around **₹2.55 lakh crore liquidity support**

4. Loan Conditions

- **Collateral-free additional credit**
- Standard accounts (not NPAs)
- Fixed repayment structure with moratorium provisions

5. Tenure

- MSMEs: **5 years (1-year moratorium)**
- Airlines: **7 years (2-year moratorium)**

6. Guarantee Fee

- **Nil**

Conceptual Understanding

What is Credit Guarantee Scheme?

- Government **absorbs default risk** of borrower.
- Banks are more willing to lend because:

- Risk is transferred to government-backed guarantee agency.

Logistics Port Performance Index (LPPI): India's First National Port Benchmarking Framework

Why in News?

India has launched the **Logistics Port Performance Index (LPPI)** for FY 2024–25 as its **first national benchmarking framework for ports**, aimed at improving **efficiency, transparency, and global competitiveness** of Indian maritime logistics under initiatives like **Sagarmala and Maritime Vision 2047**.

What is LPPI?

- A **national-level index** to evaluate and rank **port performance in India**.
- Developed by: **Ministry of Ports, Shipping and Waterways**
- Part of: **Sagar Aankalan framework**
- Objective: Create **data-driven benchmarking of port efficiency**

Key Objectives

- Measure **operational efficiency of ports**
- Improve **logistics performance and cargo handling**
- Enhance **ease of doing business in maritime trade**
- Support India's goal of becoming a **global maritime hub**

What Does LPPI Measure?

It evaluates ports based on logistics and operational indicators such as:

- **Vessel turnaround time**
- **Berth occupancy and idle time**
- **Cargo handling efficiency**
- **Dwell time of containers**
- **Port productivity and logistics flow**

Institutional Linkages

- Ministry: **Ports, Shipping and Waterways**
- Aligned with:
  - **PM Gati Shakti National Master Plan**
  - **Sagarmala Programme**
  - **Maritime India Vision 2030**
  - **Maritime Amrit Kaal Vision 2047**

Why LPPI is Important?

1. First-of-its-kind National Framework

- Unlike global indices (e.g., World Bank LPI, CPPI), LPPI is **India-specific**

2. Port Modernisation Tool

- Helps identify **bottlenecks in port logistics chain**

3. Trade Competitiveness

- Efficient ports reduce **export-import costs and delays**

4. Digital Governance in Maritime Sector

- Encourages **data-driven port administration**

GEOGRAPHY

Cell Broadcast System (CBS): India's Indigenous Real-Time Disaster Alert Network

Why in News?

The Government of India has launched the **Cell Broadcast System (CBS)**—an indigenous, nationwide mobile-based disaster alert platform developed by **C-DoT**, in collaboration with **NDMA** and the **Department of Telecommunications (DoT)**. The system enables **instant, geo-targeted emergency alerts during disasters** such as floods, earthquakes, and industrial accidents.

What is Cell Broadcast System (CBS)?

- A **cell-tower-based mass messaging system** that sends alerts to all mobile phones in a specific geographic area simultaneously.
- Unlike SMS, it does not send messages individually but broadcasts via **mobile network cells**.

Core Features

1. Ultra-Fast Delivery

- Alerts reach users **within seconds** without network delay.

2. Geo-Targeting

- Messages can be sent to:
  - Individual cell towers
  - District/state-level clusters
  - Large affected zones

3. Universal Reach

- Works across **2G, 3G, 4G, and 5G networks**
- Covers **roaming users and all mobile devices**

4. Non-Disable Alerts

- Emergency messages **cannot be turned off by users**
- Delivered as **loud pop-up alerts with vibration/siren**

5. High Reliability

- Works even during **network congestion or disasters**

Integration with Existing System

- Works alongside **SACHET system** (SMS-based alerts using CAP protocol).
- Strengthens India's **multi-layered early warning architecture** under NDMA.

Applications

- Floods and cyclones
- Earthquakes and tsunamis
- Gas leaks and industrial accidents
- Evacuation and public safety warnings

Institutional Framework

- **NDMA (National Disaster Management Authority)** – nodal body for disaster management
- **DoT (Department of Telecommunications)** – telecom integration
- **C-DoT (Centre for Development of Telematics)** – indigenous developer
- Based on **ITU-recommended Common Alerting Protocol (CAP)**

Lake Chad: Shrinking Endorheic Lake and Sahel Instability Nexus

Why in News?

Recent violent attacks in the **Lake Chad region by Boko Haram militants** highlight the continuing instability in the Sahel. The crisis is closely linked to the **shrinking and highly fluctuating Lake Chad**, which has become a hotspot of **climate stress, resource conflict, and insurgency**.

What is Lake Chad?

- A **large endorheic (inland drainage) lake** in **West-Central Africa**.
- Located at the intersection of:
  - **Chad**
  - **Niger**
  - **Nigeria**
  - **Cameroon**
- Fed mainly by:
  - **Chari–Logone river system (dominant inflow source)**

Endorheic Nature

- **Endorheic lakes**: Water does not flow out to oceans; lost mainly through **evaporation and seepage**.
- Highly sensitive to:
  - Rainfall variability
  - Temperature rise
  - River diversion and irrigation

Shrinkage of Lake Chad

- Since the 1960s, lake area has **shrunk dramatically (up to ~90% at its lowest estimates)**.
- Causes:
  - Reduced rainfall in the **Sahel belt**
  - High evaporation due to rising temperatures
  - Unsustainable irrigation and damming in tributary rivers
  - Overgrazing and land degradation

Sahel Region Context

- Semi-arid transition zone between **Sahara Desert and Sudanian savanna**.
- Characterised by:
  - Water scarcity
  - Desertification
  - High climate variability
  - Fragile livelihoods (fishing, pastoralism, subsistence farming)

Conflict Link: Boko Haram

- Lake Chad basin is a **major Boko Haram insurgency zone**.
- Impacts:
  - Over **millions displaced across Nigeria, Chad, Niger, Cameroon**
  - Attacks on military and civilian settlements
- Environmental stress → livelihood loss → recruitment into insurgency (conflict trap)

Mahi River: West-Flowing Peninsular River of India

Why in News?

A recent **boat capsize incident in the Mahi River in Rajasthan** brought attention to this important **west-flowing peninsular river system**, highlighting its geography, interstate nature, and human use in western India.

What is the Mahi River?

- A **major west-flowing peninsular river** in India.
- Originates in the **Vindhyan region (Dhar district, Madhya Pradesh)**.
- Flows through:
  - **Madhya Pradesh → Rajasthan → Gujarat**
- Empties into the **Arabian Sea via Gulf of Khambhat**.

Physical Characteristics

- Length: **~580 km**
- Drainage type: **Interstate river basin**
- Flow direction: **North → Northwest → Southwest**
- Mouth: **Estuary (not delta formation)** in Gulf of Khambhat
- Basin area: spread across **MP, Rajasthan, Gujarat**

Why it is a West-Flowing River?

- Western margin of peninsular India slopes toward the **Arabian Sea** in certain regions.
- Rivers like **Narmada, Tapi, Mahi, Sabarmati, Luni** flow west due to:
  - Rift/structural valleys (especially Narmada–Tapi system)
  - Regional slope towards western coast
- Unlike east-flowing rivers, west-flowing rivers:
  - Are generally **shorter**
  - Form **estuaries instead of deltas** due to steep gradients and strong tidal action

Key Features (Prelims Focus)

- Crosses **Tropic of Cancer twice** (unique geographical feature)
- Important tributary system supports irrigation in parts of Gujarat and Rajasthan
- Dam projects:
  - **Mahi Bajaj Sagar Dam**
  - **Kadana Dam**
  - **Wanakbori Weir**

Significance

- Supports agriculture in semi-arid western India
- Hydropower and irrigation potential
- Important for **interstate water resource management**
- Ecologically sensitive due to **salinity intrusion in lower reaches**

Baiga Tribe: PVTG of Central India Facing Trafficking Vulnerability

Why in News?

Recently, **13 children belonging to the Baiga tribe (a Particularly Vulnerable Tribal Group)** were rescued from a **human trafficking and forced labour network in Chhattisgarh**, highlighting persistent socio-economic vulnerability and exploitation risks in remote tribal regions.

Who are the Baiga Tribe?

- A **Particularly Vulnerable Tribal Group (PVTG)** in India
- Mainly found in:
  - **Madhya Pradesh (Mandla, Balaghat, Dindori)**
  - **Chhattisgarh (Kabirdham, Bilaspur)**
  - Smaller populations in **Uttar Pradesh and Jharkhand**

PVTG Status

- Category created for **most socio-economically vulnerable Scheduled Tribes**

- Identified based on:
  - Pre-agricultural level of technology
  - Low literacy rate
  - Stagnant or declining population
  - Economic and infrastructural backwardness

Cultural & Livelihood Features

- Traditional practice: **Shifting cultivation (bewar / dahiya)**
- Strong dependence on:
  - Forest produce
  - Minor millets (kodo, kutki)
- Deep ecological belief system:
  - Avoid ploughing land, considered disrespect to Mother Earth
- Language: **Baigani (Indo-Aryan influenced by Chhattisgarhi/Gondi)**
- Social structure includes **reverse dowry system (bride price)**

Key Issues & Vulnerabilities

- High dependence on forests → **livelihood insecurity**
- Low literacy and limited access to education
- Geographic isolation in forested regions
- Increased exposure to:
  - **Child trafficking**
  - Bonded labour
  - Migration-based exploitation
- Weak access to healthcare and governance institutions

Government Measures

- Inclusion under **Development of PVTG Scheme**
- Habitat rights recognition in some states
- Forest Rights Act (2006) support for community forest resources
- Tribal Sub-Plan (TSP) for targeted development

Significance of the News Case

- Highlights **intersection of poverty, isolation, and trafficking networks**
- Shows failure of **last-mile governance in tribal belts**
- Raises concerns about **child protection mechanisms in PVTG regions**
- Reflects broader issue of **tribal vulnerability in central India's forest corridors**

Musi River Rejuvenation

Why in News?

The Telangana government has intensified efforts for the **Musi River Rejuvenation Project**, with a cabinet sub-committee overseeing implementation aimed at **pollution abatement, riverfront development, and urban renewal of Hyderabad's historic river corridor**, despite debates over displacement and ecological restoration.

About Musi River

- A tributary of the **Krishna River system**
- Origin: Near **Ananthagiri Hills, Vikarabad district, Telangana**
- Flows through **Hyderabad city**
- Joins Krishna via **Tungabhadra–Krishna basin linkage system**

- Known as the **"lifeline of Hyderabad"**

Historical Significance

- Hyderabad developed historically along Musi banks
- Major floods in **1908 (Great Musi Flood)** led to urban planning reforms under **Nizam rule**
- Led to creation of **Osman Sagar and Himayat Sagar reservoirs**

Musi Rejuvenation Project (Core Features)

- Implemented by **Musi Riverfront Development Corporation Ltd (MRDCL)**
- Objective:
  - **Pollution abatement**
  - **Sewage interception & treatment**
  - **Riverfront development (55 km stretch)**
- Components:
  - Construction/upgrade of **STPs (Sewage Treatment Plants)**
  - Removal of encroachments in floodplains
  - Riverfront parks and public infrastructure
  - Heritage integration along river corridor

Environmental Concerns

- Severe **sewage discharge from Hyderabad into river**
- Loss of natural flow in urban stretches
- Encroachment on floodplains → increased flood risk
- Debate: **"river restoration vs real estate-led riverfront development"**

Governance & Institutional Mechanism

- Special Cabinet Sub-Committee (Telangana Govt)
- MRDCL as **Special Purpose Vehicle (SPV)**
- Public consultations conducted for project design

Mekedatu Project

Why in News?

The Supreme Court has **dismissed Tamil Nadu's review plea** against the proposed **Mekedatu Balancing Reservoir Project** on the Cauvery River, reiterating that the challenge is **"premature" as the Detailed Project Report (DPR) is still under consideration by statutory bodies** like CWMA and CWC.

What is Mekedatu Project?

- Proposed **balancing reservoir project** by Karnataka
- Location: **Mekedatu, Kanakapura Taluk, Karnataka**
- River: **Cauvery (Kaveri)**
- Objective:
  - Supply drinking water to **Bengaluru region**
  - Improve **water regulation during monsoon and lean seasons**
  - Generate **hydropower (proposed)**

Supreme Court's Stand

- Tamil Nadu's challenge termed **premature**
- DPR is **not yet approved by technical bodies**
- Must be examined first by:
  - **Cauvery Water Management Authority (CWMA)**
  - **Central Water Commission (CWC)**

- Karnataka remains bound by **Cauvery water-sharing directions (2018 judgment framework)**

Inter-State Water Dispute Context

Cauvery River System

- Rises in **Talakaveri, Karnataka (Western Ghats)**
- Flows through: Karnataka → Tamil Nadu → Puducherry → Bay of Bengal
- Major tributaries: **Hemavati, Kabini, Arkavathi, Bhavani**

Legal-Administrative Framework

- **Cauvery Water Disputes Tribunal (CWDT) Award (2007)**
- **Supreme Court Final Judgment (2018)**
- Institutions:
  - **CWMA (Cauvery Water Management Authority)**
  - **CWRC (Cauvery Water Regulation Committee)**

Key Issues in Mekedatu Dispute

- Tamil Nadu concern:
  - Reduced downstream water flow
  - Impact on **delta irrigation**
- Karnataka argument:
  - Drinking water security for **Bengaluru**
  - Flood moderation and storage benefits
- Core conflict:
  - **Upper riparian development vs lower riparian rights**

Constitutional & Legal Angle

- **Article 262**: Parliament can adjudicate inter-state river disputes
- **Inter-State River Water Disputes Act, 1956**
- Supreme Court acts as **final interpreter but defers technical evaluation to expert bodies**

Machkund Hydroelectric Project

Why in News?

- A **major fire** broke out at the **Machkund Hydroelectric Project** located on the **Odisha-Andhra Pradesh border** on **May 23, 2026**.
- Preliminary investigation points to a **technical malfunction** (electrical short circuit or turbine panel board issue) as the primary reason.

About Machkund Hydroelectric Project

Basic Details

- **Installed Capacity:** 120 MW
- **Location:** Koraput district, Odisha (on the border with Andhra Pradesh)
- **River:** Machkund River (a tributary of the Godavari River system)
- **Dam:** Jalaput Dam (along with its reservoir) supports the project
- **Nearby Falls:** Duduma Falls (well-known waterfall on the Machkund River)
- **Terrain:** Located on the western slopes of the Eastern Ghats

Historical Significance

- Originally proposed by **Maharaja Vikram Dev Varma of Jeypore** in the 1920s to provide electricity to his villages.
- Construction commenced in **1948**.
- Commercial operation began in **1955**.

- Formally inaugurated by **Dr. Rajendra Prasad**, the first President of India.

Inter-State Project

- Joint project of the **Government of Andhra Pradesh** and the **Government of Odisha**.
- Operated jointly by **APGENCO** (Andhra Pradesh Power Generation Corporation) and Odisha government.

Power Sharing Arrangement

- Initially: **70:30** ratio (Andhra Pradesh : Odisha)
- After negotiations and increasing demand, revised to **50:50** equal share.

Strategic Importance

- Crucial power source for:
    - **Andhra Pradesh:** Visakhapatnam, Vijayawada, and other regions.
    - **Odisha:** Koraput, Jeypore, and surrounding areas.

ENVIRONMENT AND ECOLOGY

Canine Distemper Threat in Kanha

Why in News?

A **tigress and her four cubs** died in **Kanha Tiger Reserve (Madhya Pradesh)** due to **Canine Distemper Virus (CDV)** infection. The incident has raised concerns about the growing threat of infectious diseases to India's wild carnivore populations and the need for disease surveillance in protected areas.

What is Canine Distemper Virus (CDV)?

- A highly contagious **viral disease** affecting carnivorous mammals.
- Belongs to the **Morbillivirus** genus of the **Paramyxoviridae** family.
- Commonly infects domestic dogs but can spread to:
  - Tigers
  - Leopards
  - Lions
  - Wolves
  - Foxes and other wild carnivores
- Transmission occurs through direct contact, respiratory droplets, or contaminated materials.
- Symptoms include respiratory distress, neurological disorders, fever, and eventual death.

About Kanha Tiger Reserve

- Located in **Madhya Pradesh**, within the **Maikal Range** of the Satpura Hills.
- Forms the core of the **Kanha-Pench landscape**.
- One of India's earliest reserves under **Project Tiger (1973)**.
- Known for conservation of the **Hard Ground Barasingha (Rucervus duvaucelii branderi)**.

Sacred Groves Restoration in Kerala

Why in News?

The Kerala government has initiated a programme to **restore and conserve sacred groves (Kavus)** across the State. The initiative aims to revive degraded groves, preserve biodiversity, strengthen ecological services, and protect cultural heritage associated with these traditionally conserved forest patches.

What are Sacred Groves?

- Patches of natural vegetation protected by local communities due to **religious, cultural, or spiritual beliefs**.
- Known by different names across India:
  - **Kavus** (Kerala)
  - **Devarakadu** (Karnataka)
  - **Orans** (Rajasthan)
  - **Sarna** (Jharkhand and Central India)
- Function as **community-conserved ecosystems** and represent an important form of **in-situ biodiversity conservation**.

Ecological Importance

- Serve as refuges for rare, endemic, and threatened species.
- Act as **gene banks** preserving native flora and fauna.
- Support groundwater recharge, soil conservation, and microclimate regulation.
- Provide habitat corridors for pollinators, birds, reptiles, and small mammals.

Threats

- Urbanization and land-use change.
- Encroachment and habitat fragmentation.
- Loss of traditional community management practices.
- Invasive species and ecological degradation.

India's First Green Methanol Plant

Why in News?

India is establishing its **first green methanol plant in Kutch (Gujarat)** that will convert the invasive plant **Prosopis juliflora** into **clean marine fuel (green methanol)**. The initiative aims to combine **invasive species management with green energy transition** and decarbonisation of shipping.

About the Project

- Location: **Kutch region, Gujarat (Deendayal Port area)**
- Feedstock: **Prosopis juliflora (Vilayati Babool / Kutch weed)** + other biomass residues
- Output: **Green methanol (marine fuel)**
- Technology: **Gasification → Syngas → Methanol synthesis**

What is Green Methanol?

- A **low-carbon, renewable liquid fuel**
- Produced from:
  - Biomass-based feedstock OR
  - Green hydrogen + captured CO_2 (e-methanol variant)
- Can reduce **greenhouse gas emissions by ~60–95%**
- Considered a **key alternative marine fuel** under global decarbonisation targets

About Prosopis juliflora

- Invasive shrub introduced for **afforestation/desertification control**
- Now widely spread in **Banni grasslands (Kutch)**
- Causes:
  - Loss of native grasslands
  - Reduced biodiversity
  - Ecological degradation
- Classified among major **global invasive species**

Strategic Importance

- Supports **IMO net-zero shipping target (2050)**
- Promotes **green ports and green bunkering hubs**
- Reduces dependence on fossil fuels
- Converts **environmental liability → economic asset**

International Sun Day 2026: India's Solar Milestone and 'Run for Sun' Initiative

Why in News?

On **International Sun Day 2026 (3 May)**, India celebrated major achievements in solar energy through the **'Run for Sun' marathon**, organised by the **Ministry of New and Renewable Energy (MNRE)**, highlighting India's rapid progress in renewable energy transition and solar capacity expansion.

About International Sun Day

- Observed on **3 May every year**.
- Aims to promote awareness about **solar energy and its role in sustainable development**.
- Emphasises clean energy transition and climate action.

'Run for Sun' Marathon

- Organised by **MNRE** across India.
- Symbolic mass participation event promoting solar energy awareness.
- Linked to India's achievement of **over 1,50,000 MW (150 GW) of installed solar capacity**.

India's Solar Energy Progress

- India is among the **top global leaders in solar capacity expansion**.
- Rapid growth driven by:
  - Utility-scale solar parks
  - Rooftop solar schemes
  - Policy support under renewable energy missions
- Key scheme linkage:
  - **PM Surya Ghar: Muft Bijli Yojana**
  - Promotes rooftop solar adoption and household energy self-reliance

Institutional Framework

- **MNRE (Ministry of New and Renewable Energy)**: Nodal ministry for renewable energy policies.
- Supports:
  - Solar Mission initiatives
  - Wind energy development
  - Green hydrogen transition ecosystem

International Big Cat Alliance (IBCA) Summit: Delhi Declaration

Why in News?

India is set to host the **first International Big Cat Alliance (IBCA) Summit in New Delhi**, where member countries are expected to adopt the **'Delhi Declaration'**, a global framework for strengthening cooperation in the conservation of **seven big cat species and their habitats**.

What is IBCA?

- A **treaty-based global alliance** launched by India in **2023 (Project Tiger 50-year event)**.
- Formal objective: **Conservation of seven big cat species**:
  - Tiger
  - Lion
  - Leopard
  - Snow leopard
  - Cheetah
  - Jaguar
  - Puma
- Membership: **Range countries + conservation partners** (Asia, Africa, Americas).

IBCA Summit 2026

- First official **global summit of IBCA** hosted by India in **New Delhi**.
- Participation: **Heads of states, conservation experts, scientists, policymakers**.
- Focus areas:
  - Habitat protection
  - Anti-poaching cooperation
  - Transboundary conservation
  - Funding and biodiversity corridors

Delhi Declaration

- Expected key outcome document of the summit.
- Will provide:
  - Shared conservation priorities
  - Framework for **transboundary ecosystem protection**
  - Commitment to **landscape-based conservation approach**
  - Strengthening of global coordination for big cats

Significance

1. Global Biodiversity Governance

- Positions India as a **lead coordinator in global wildlife conservation**.

2. Species Protection Focus

- All **seven big cat species unified under one framework** (rare in global treaties).

3. Transboundary Ecology

- Emphasises movement corridors across **Africa–Asia–Americas ecosystems**.

4. Climate–Biodiversity Link

- Big cats used as **umbrella species** → indicates ecosystem health.

Rusty-Spotted Cat: India's Smallest Wild Feline Facing Habitat Pressure

Why in News?

Recent sightings of the **rusty-spotted cat (world's smallest wild cat)** in human-dominated landscapes have raised concerns about **habitat fragmentation and increasing human–wildlife interface pressure**, especially in forest-edge and agricultural zones across India.

What is Rusty-Spotted Cat?

- Scientific name: **Prionailurus rubiginosus**
- Known as **world's smallest wild cat**
- Weight: **~1–1.6 kg**
- Length: **~35–48 cm (excluding tail)**

Distribution

- Native to:
  - **India**
  - **Sri Lanka**
  - Small pockets in **Nepal border region**
- Widely distributed across India:
  - Western Ghats
  - Aravalli and Vindhyan ranges
  - Central India (MP, Maharashtra)
  - Eastern India (Odisha, Chhattisgarh)
  - Recorded in protected areas like **Kanha, Gir, Pilibhit, Tadoba**

Habitat Preference

- Dry deciduous forests
- Scrublands and thorn forests
- Grasslands and rocky areas
- Increasingly found near:
  - Agricultural fields
  - Human settlements (due to prey availability like rodents)

Key Features

- Grey-rufous coat with **rusty spots**
- Short rounded ears
- Long tail (~half body length), **unspotted**
- **Nocturnal and highly elusive**
- Semi-arboreal (climbs trees occasionally)

Conservation Status

- **IUCN Red List:** Near Threatened
- **Wildlife Protection Act, 1972:** Schedule I (highest protection)

Ecological Role

- Controls **rodent population**
- Indicator of **healthy scrub and dry forest ecosystems**
- Important part of **small carnivore guild**

Threats

- Habitat loss and fragmentation
- Expansion of agriculture and urban areas
- Road mortality
- Hybridisation risk with domestic cats
- Lack of targeted conservation attention (overshadowed by big cats)

Banni Grasslands

Why in News?

A proposed **NTPC solar energy project in Gujarat's Banni Grasslands** has triggered concerns over **ecological damage, habitat fragmentation, and displacement of the Maldhari pastoral community**, highlighting tensions between **renewable energy expansion and fragile grassland ecosystems**.

What is Banni Grassland?

- Located in **Kutch district, Gujarat**, along the southern edge of the **Great Rann of Kutch**.
- Area: **~3,847 sq km** (one of Asia's largest tropical grasslands).
- Legally classified as **Protected Forest (since 1955)**.
- Ecosystem type: **Arid, salt-influenced grassland with seasonal wetlands**.

Ecological Features

- Dominated by:
  - Native grasses (Dichanthium, Sporobolus, Aristida)
  - Salt-tolerant species
  - Invasive species: **Prosopis juliflora (Vilayati babul)**
- Important fauna:
  - Chinkara, nilgai, Indian wolf, desert fox, caracal
- Identified as a **potential cheetah reintroduction habitat (WII study)**.

Maldhari Community

- Traditional **pastoralist community (herders)** of Kutch.
- Livelihood:
  - Buffalo rearing (notably **Banni buffalo breed**)
  - Milk, ghee, livestock trade
- Semi-nomadic grazing system dependent on **open grasslands**.

NTPC Solar Project Issue

- Large-scale **solar park development planned over grassland patches**.

- Government classification of land as **"wasteland" disputed by locals**.
- Concerns:
  - Loss of grazing grounds
  - Fragmentation of habitat
  - Disturbance to migratory birds and grassland ecology
  - Threat to pastoral livelihoods

Core Environmental Concerns

1. Grassland Ecosystem Sensitivity

- Grasslands often misclassified as "wastelands"
- High ecological value for **herbivores and migratory species**

2. Livelihood–Ecology Conflict

- Maldharis depend on **commons for grazing**
- Solar fencing and infrastructure restrict mobility

3. Biodiversity Risks

- Disturbance to **avian migration routes**
- Habitat loss for **small carnivores and ungulates**

Governance & Policy Dimension

- Conflict between:
  - **Renewable energy expansion targets**
  - **Forest/grassland conservation norms**
- Need for:
  - **Ecological impact assessment of grasslands (not just forests)**
  - Community participation in land-use planning
- Overlap with:
  - Wildlife (Protection) Act, 1972
  - Environmental Impact Assessment (EIA) framework

White-Bellied Heron: Critically Endangered Sentinel of Himalayan River Ecosystems

Why in News?

The **Kalai-II Hydroelectric Project in Arunachal Pradesh on the Lohit River** has received forest clearance, raising concerns over the habitat of the **White-bellied Heron**, one of the world's rarest birds, due to potential **riverine ecosystem disruption, forest diversion, and fragmentation of breeding habitats**.

What is White-Bellied Heron?

- Scientific name: **Ardea insignis**
- Family: **Ardeidae (herons)**
- Status: **Critically Endangered (IUCN Red List)**
- Legal protection in India: **Schedule I, Wildlife (Protection) Act, 1972**
- One of the **largest and rarest herons globally**

Distribution

- Restricted to **Eastern Himalayan river systems**
- Found in:
  - **India (Arunachal Pradesh, Assam)**
  - **Bhutan (stronghold population)**
  - Very small pockets in Myanmar
- Prefers **undisturbed, fast-flowing rivers with sandbars and forested banks**

Habitat Characteristics

- Riverine ecosystems in **foothill tropical forests**
- Requires:
  - Deep, clear river channels
  - Minimal human disturbance
  - Mature riverside trees for nesting
- Strong dependency on **fish-rich rapids (Schizothorax species)**

Ecological Importance

- Acts as a **bio-indicator species** of:
  - River health
  - Forest integrity
  - Hydrological stability
- Sensitive to:
  - Dam construction
  - Sand mining
  - River flow alteration

Threats

- Hydropower projects (major threat in India–Bhutan belt)
- Habitat fragmentation from **dams & reservoirs**
- Decline in fish populations due to river modification
- Nesting disturbance and deforestation
- Very small population (<250 mature individuals globally)

Conservation Linkages

- Protected under **Wildlife (Protection) Act, 1972 – Schedule I**
- Conservation efforts concentrated in:
  - Namdapha region (Arunachal Pradesh)
  - Assam riverine stretches
  - Bhutan river basins
- Requires **river basin-level conservation planning**

Hog Deer: Grassland Sentinel of Floodplain Ecosystems

Why in News?

A recent sighting of a rare **albino hog deer in Kaziranga National Park, Assam** has drawn attention to this **grassland-dependent species**, highlighting both its ecological importance in floodplain ecosystems and the conservation value of protected habitats like Kaziranga.

What is Hog Deer?

- Scientific name: **Axis porcinus**
- A small **cervid (deer species)** native to South and Southeast Asia
- Named for its **"hog-like" running posture**, with head lowered while moving through grasslands

Distribution in India

- Found mainly in:
  - **Assam (Kaziranga, Manas, Orang)**
  - **Terai grasslands (Uttarakhand, UP)**
  - Parts of **Bihar and West Bengal floodplains**
- Strong association with **riverine grasslands and alluvial plains**

Habitat & Ecology

- Prefers:
  - **Tall elephant grass ecosystems**
  - Floodplain marshes and river edges
- Often seen in:
  - **Kaziranga's Brahmaputra floodplains** (key herbivore population)
- Sensitive to:
  - Habitat fragmentation
  - Invasive species spread
  - Agricultural expansion

Ecological Role

- Acts as a **primary grazer (herbivore)**
- Maintains **grassland structure and regeneration**
- Serves as **important prey base** for:
  - Tigers
  - Leopards
  - Dholes
- Indicator of **healthy floodplain ecosystems**

Conservation Status

- **IUCN Red List:** Endangered
- Declining in several regions due to habitat loss
- Requires **grassland-specific conservation planning (often neglected vs forests)**

Kaziranga Significance

- One of the major strongholds globally
- Part of the **"Big Herbivore Complex" of Kaziranga**:
  - Rhino
  - Wild buffalo
  - Swamp deer
  - Hog deer
- Supports **high predator-prey balance in floodplain ecology**

Key Threats

- Conversion of grasslands into agriculture/settlements
- Floodplain alteration and embankments
- Invasive plants (e.g., **water hyacinth, Prosopis impact indirectly**)
- Poaching and human disturbance
- Declining connectivity between habitats

Duttaphrynus dhara

Why in News?

Scientists have discovered a **new toad species in Meghalaya's East Khasi Hills**, named **Duttaphrynus dhara**, after the traditional **Khasi women's attire "Dhara"**, highlighting the region's **rich and underexplored amphibian diversity in the Eastern Himalaya biodiversity hotspot**.

Taxonomy & Naming

- Scientific name: **Duttaphrynus dhara**
- Genus: **Duttaphrynus (true toads)**

- Family: **Bufonidae**
- Named after: **"Dhara" – traditional Khasi female attire**, reflecting cultural linkage with biodiversity discovery.

Discovery Location

- Region: **Mawphlang, East Khasi Hills, Meghalaya**
- Altitude: **~1,800+ metres above sea level**
- Habitat: **Forest-edge and semi-natural habitats** in montane landscapes.

Morphological Features

- Small-sized forest-associated toad (~40 mm males)
- Compact body with **warty, rough skin texture**
- Brown coloration with **dark patches and markings**
- Adapted to **humid, montane forest microhabitats**

Ecological & Scientific Significance

- Indicates **high endemism in Meghalaya's Khasi Hills**
- Reinforces Eastern Himalayas as a **global amphibian biodiversity hotspot**
- Suggests presence of **undocumented cryptic amphibian species**
- Highlights importance of **microhabitats in forest-edge ecosystems**

Conservation Relevance

- Species likely has **restricted distribution range**
- Requires **habitat protection in Meghalaya's montane forests**
- Sensitive to:
  - Forest fragmentation
  - Habitat degradation
  - Climate variability in high rainfall zones

Dragonfly Rediscovery: 110-Year-Lost Odonata Species Resurfaces in Arunachal

Why in News?

A rare dragonfly species, **Gynacantha khasiaca (Long-tailed Duskhawker)**, has been **rediscovered in Arunachal Pradesh's Namdapha National Park and Tiger Reserve** after being last recorded in **1914 (over 110 years ago)**, highlighting the ecological richness of the Eastern Himalayas and importance of habitat conservation.

Species Identity

- Scientific name: **Gynacantha khasiaca**
- Common name: **Long-tailed Duskhawker**
- Order: **Odonata (dragonflies and damselflies)**
- Family: **Aeshnidae**
- First recorded: **1914 (erstwhile Abor Hills region)**

Rediscovery Details

- Location: **Namdapha National Park & Tiger Reserve**
- District: **Changlang, Arunachal Pradesh**
- Region: **Eastern Himalayas, Indo-Myanmar biodiversity hotspot**
- Gap: **~110 years since last confirmed record**
- Recorded through **field surveys and photographic documentation**

Biological Features (Odonata Group)

- Possesses **large compound eyes with near-360° vision**

- Strong aerial predator of **mosquitoes and other insects**
- Life cycle depends on **freshwater ecosystems (larval stage aquatic)**
- Often shows **crepuscular activity (active during dawn/dusk)**

Ecological Significance

- Acts as a **bioindicator species of freshwater ecosystem health**
- Indicates:
  - Clean water systems
  - Healthy riparian vegetation
  - Low pollution levels
- Important part of **aquatic food web (predator + prey role)**

Habitat Context

- Namdapha National Park:
  - Located in **India–Myanmar border region**
  - Contains ecosystems from **tropical to alpine zones**
  - Known for extreme biodiversity and endemic species
- River system: **Noa-Dihing (Brahmaputra tributary)**

Conservation Significance

- Rediscovery highlights:
  - **Undocumented biodiversity in NE India**
  - Importance of **long-term ecological monitoring**
  - Need for **freshwater habitat protection**
- Threats:
  - Habitat degradation
  - Climate change
  - River pollution
  - Deforestation in catchment areas

Babesia Infection: Tick-Borne Threat to Gir Lion Conservation

Why in News?

Around **eight Asiatic lion cubs in Gir (Gujarat)** have died due to **suspected Babesia infection**, a **tick-borne parasitic disease**, prompting emergency veterinary response and large-scale **de-ticking and monitoring measures**, while authorities have stated that there is **no confirmed widespread outbreak** yet.

What is Babesia Infection?

- Caused by **Babesia spp. (protozoan parasites)**
- Transmitted primarily through **hard ticks (vector-borne disease)**
- Leads to **Babesiosis**, a malaria-like condition in animals

Effect on Wildlife (Especially Lions)

- Infects **red blood cells**, causing:
  - Severe anemia
  - Weakness and lethargy
  - Respiratory distress
- In severe cases → **organ failure and death**
- Particularly dangerous for:
  - **Lion cubs (low immunity)**
  - Stressed or malnourished individuals

Gir Context

- Location: **Gir National Park & surrounding revenue areas (Gujarat)**
- Habitat of **world's only wild Asiatic lion population**
- Recent cases involve:
  - Multiple cub deaths
  - Isolation of lions within **10 km radius of affected zones**

Transmission Ecology

- Disease spreads via:
  - Tick infestation in dense forest grasslands
  - Close contact within prides
- Peak risk conditions:
  - **Hot and humid weather**
  - High tick population density
  - Weak or young animals

Government Response

- **Isolation of potentially infected lions**
- **Veterinary intervention and sample testing**
- Large-scale:
  - **De-ticking drives**
  - Decontamination of habitat zones
- Monitoring of lion population under **Gir conservation network**

Conservation Significance

- Highlights vulnerability of **single-location endangered species**
- Shows importance of:
  - **Wildlife disease surveillance systems**
  - Habitat hygiene management
- Raises concern about **epizootic risks (animal epidemics)** in protected areas

SCIENCE & TECHNOLOGY

Mission Drishti: India's First OptoSAR Satellite Revolution

Why in News?

India's private space company **GalaxEye** successfully launched **Mission Drishti**, the world's first **OptoSAR satellite** and India's largest privately built Earth observation satellite, aboard a **SpaceX Falcon 9 rocket**.

About Mission Drishti

- Developed by: **GalaxEye (Bengaluru-based startup)**
- Type: **Earth Observation (EO) satellite**
- Weight: ~**190 kg**, making it India's largest private satellite
- Launched on: **SpaceX Falcon 9 (USA launch site)**
- Mission: Provide **all-weather, day-night imaging data**

What is OptoSAR Technology?

- A **hybrid imaging system** combining:
  - **Optical (EO) sensors** → high-resolution images in clear daylight conditions
  - **Synthetic Aperture Radar (SAR)** → imaging through clouds, rain, darkness
- Enables **continuous Earth observation regardless of weather or lighting conditions**

Significance of OptoSAR

- Overcomes limitations of:
  - Optical satellites (cloud cover dependency)
  - SAR satellites (complex image interpretation)
- Enhances:
  - Defence surveillance
  - Disaster management
  - Agriculture monitoring
  - Maritime security
  - Urban planning

India's Private Space Sector Linkage

- Reflects growth after **IN-SPACe reforms (2020)** and liberalisation of space sector.
- Strengthens India's role in **commercial remote sensing and geospatial intelligence**.
- Part of broader push toward **Atmanirbhar Bharat in space technology**.

Radiation-Induced "Glitch" in Quantum Computing

Why in News?

Researchers (including a **Google-led team**) have identified that **cosmic radiation and environmental particles can introduce errors ("glitches") in quantum processors**, disrupting qubit stability and posing a fundamental challenge to the **scalability of quantum computers**.

What is Quantum Computing?

- Uses **qubits (quantum bits)** instead of classical bits (0 or 1).
- Qubits exploit:
  - **Superposition** (multiple states simultaneously)
  - **Entanglement** (linked quantum states across distance)
- Enables potential speed-up for specific problems (cryptography, materials science, optimization).

What is the Radiation-Induced "Glitch"?

- Caused by **high-energy particles (cosmic rays, background radiation)** striking quantum hardware.
- Leads to:
  - **Qubit decoherence** (loss of quantum state)
  - Sudden computational errors ("bit flips" in quantum systems)
- Acts as a **non-trivial source of noise beyond engineering imperfections**.

Why is it a Scalability Problem?

- Quantum computers require **large-scale qubit arrays (millions of qubits)** for fault tolerance.
- Radiation events can:
  - Simultaneously disturb multiple qubits
  - Overload error correction systems
- Even advanced **quantum error correction codes** may struggle under such correlated disturbances.

Existing Mitigation Approaches

- **Quantum Error Correction (QEC)** using logical qubits.
- Shielding and isolation of hardware.
- Underground or low-radiation environments.
- Redundant qubit architectures.

Broader Scientific Implications

- Suggests limits are not only engineering-based but also **fundamental physical constraints**.
- Impacts roadmap toward:
  - Fault-tolerant quantum computing
  - Quantum supremacy in real-world applications
- Reinforces that current systems are still in the **NISQ (Noisy Intermediate-Scale Quantum) era**.

Hantavirus Outbreak

Why in News?

A **hantavirus outbreak aboard an international cruise ship** has caused multiple infections and deaths, including reported cases involving **Indian nationals**, prompting global health monitoring by WHO due to risks of confined-space transmission during international travel.

What is Hantavirus?

- A group of **zoonotic viruses** primarily carried by **rodents (rats, mice, voles)**.
- Causes two major diseases:
  - **Hantavirus Pulmonary Syndrome (HPS)** (Americas)
  - **Hemorrhagic Fever with Renal Syndrome (HFRS)** (Eurasia)

Transmission

- Humans infected through:
  - Inhalation of **aerosolised rodent urine, droppings, or saliva**
  - Rare rodent bites
- **Important:** Not usually highly contagious between humans, except rare strains like **Andes virus** (reported in this outbreak context).

Disease Characteristics

- Incubation period: **1–6 weeks**
- Early symptoms:
  - Fever, fatigue, muscle pain (flu-like)
- Severe phase:
  - Rapid respiratory failure (HPS)

- High fatality rate in severe cases (**up to 30–35% in some strains**)
- No specific cure; only **supportive treatment (oxygen therapy, ICU care)**

Current Outbreak Context

- Occurred in a **confined cruise ship environment (~150 passengers)**.
- Reported:
  - Multiple confirmed and suspected cases
  - **At least 3 deaths**
- Likely linked to:
  - **Rodent contamination in ship environment**
  - Close-contact conditions accelerating spread in confined space

Why Cruise Ships are High-Risk Settings

- Enclosed population + limited ventilation
- Delayed diagnosis due to **non-specific early symptoms**
- International movement → risk of **cross-border spread**
- Shared food/storage spaces increase rodent exposure risk

SkyCast System: India's First Aviation Weather Intelligence Platform

Why in News?

India has inaugurated the **SkyCast System at Indira Gandhi International (IGI) Airport, Delhi**, marking the country's first **integrated aviation weather monitoring and nowcasting system** developed under **Mission Mausam** to improve flight safety and reduce weather-related disruptions.

What is SkyCast?

- An **advanced integrated atmospheric remote sensing system** for aviation.
- Developed under: **Mission Mausam (Ministry of Earth Sciences)**.
- Objective: Enable **"weather-smart aviation"** with real-time decision support.

Core Functions

- Provides **real-time weather intelligence (nowcasting)** to pilots and air traffic controllers.
- Helps reduce:
  - Fog-related delays
  - Flight diversions
  - Turbulence-related risks
- Offers **short-term alerts (~3-hour window)** for safer landing/take-off decisions.

Technological Components

SkyCast integrates multiple atmospheric sensors:

- **Radar Wind Profiler (RWP)** – wind speed, direction, turbulence
- **SODAR** – low-altitude wind profiling
- **Microwave Radiometer** – humidity and temperature profiling
- **Ground-based Fog Aerosol Spectrometer (GFAS)** – fog particle analysis
- **Lidar Ceilometer** – cloud base and vertical visibility monitoring

Coverage & Capability

- Monitors atmospheric conditions up to **~3 km altitude (boundary layer)**
- Provides **high-resolution vertical profiles** of:
  - Wind
  - Temperature
  - Humidity

- Enhances **IMD forecasting models and AI-based decision systems**

Institutional Linkages

- Ministry: **Earth Sciences (MoES)**
- Agencies:
  - **IMD (India Meteorological Department)**
  - **IITM Pune**
  - Airport operator (GMR at IGI)

PM-WANI Upgrade: QR-Based Seamless Public Wi-Fi Access

Why in News?

The government has upgraded the **PM-WANI (Prime Minister Wi-Fi Access Network Interface) scheme** by introducing **QR-based authentication and short-duration affordable internet plans**, aiming to make public Wi-Fi more **user-friendly, accessible, and scalable** under the Digital India framework.

What is PM-WANI?

- Launched by: **Department of Telecommunications (DoT), 2020**
- Objective: Enable **public Wi-Fi hotspots across India without heavy licensing**
- Ecosystem includes:
  - **PDO (Public Data Office)** – provides Wi-Fi hotspots
  - **PDOA (Aggregator)** – manages authentication & accounting
  - **App Provider** – provides user interface for access
  - **Central Registry** – records all PM-WANI Wi-Fi providers

New Upgrades Introduced

1. QR Code-Based Access

- Users can **scan QR codes at hotspots**
- Enables **instant login without complex authentication steps**

2. Short-Duration Plans

- Introduced **flexible internet packs (e.g., 15, 30, 60 minutes)**
- Aimed at:
  - Travelers
  - Daily commuters
  - Rural users needing intermittent access

3. Simplified User Experience

- Reduced dependency on passwords or app-heavy onboarding
- Faster onboarding to **public Wi-Fi networks**

Objectives of the Upgrade

- Improve **ease of access to public internet**
- Expand **last-mile digital connectivity**
- Promote **affordable broadband alternatives**
- Support **Digital India and BharatNet complementarity**
- Encourage **private participation in Wi-Fi ecosystem**

Significance

1. Digital Inclusion

- Bridges connectivity gaps in **semi-urban and rural areas**

2. Affordable Internet Access

- Low-cost, time-based plans reduce user burden

3. Boost to Public Infrastructure

- Turns shops, institutions, and kiosks into **Wi-Fi access points**

4. Smart Governance Model

- Integrates **QR technology + telecom infrastructure + decentralized access**

Limitations / Concerns

- Cybersecurity risks in open public Wi-Fi
- Uneven distribution of hotspots in rural areas
- Need for awareness and digital literacy
- Dependence on stable backend telecom infrastructure

CLEAR Technology

Why in News?

Indian scientists at the **Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru** have developed **CLEAR technology (Cleavable Light-Erased Antibody Reporter)**, a novel **protein imaging platform** that enables high-resolution mapping of multiple proteins in tissues, with major applications in **cancer and neurological disease research**.

What is CLEAR Technology?

- A **highly multiplexed spatial protein imaging platform**
- Allows visualization of **multiple proteins in a single tissue sample using a single fluorescent channel**
- Developed by: **JNCASR (autonomous institute under Ministry of Science & Technology)**

Core Innovation

CLEAR overcomes the limitation of traditional microscopy where:

- Each protein requires a **different fluorescent colour**
- Only a limited number of proteins can be imaged simultaneously

Instead, CLEAR uses a:

- **Cyclic "erase and rewrite" imaging method**
- Enables repeated imaging of the same tissue sample

How it Works (Mechanism)

1. **Targeted labeling:** Antibodies tagged with light-sensitive fluorescent probes bind to specific proteins
2. **Imaging:** First set of proteins is visualized under fluorescence microscopy
3. **Light-based erasing:** Exposure to controlled **light pulse removes fluorescent signal without damaging tissue**
4. **Re-labeling cycle:** New protein sets are tagged and imaged repeatedly
5. **Final output:** A **multi-layered 3D protein map of tissues**

Key Features

- **High multiplexing capacity:** Maps many proteins in same sample
- **Single spectral channel usage:** Reduces complexity of imaging systems
- **High spatial resolution:** Preserves protein location in tissue microenvironment
- **Compatible with delicate samples:** Avoids harsh chemical stripping methods
- **Cost and time efficient:** Reuses same imaging setup repeatedly

Applications

- **Cancer research:** Understanding tumor microenvironment
- **Neurological disorders:** Mapping brain protein networks

- **Drug discovery:** Identifying protein targets
- **Immunology:** Studying immune cell interactions

Significance

- Advances **precision medicine and spatial biology**
- Helps decode **cell-to-cell protein interactions**
- Strengthens India's position in **biomedical imaging innovation**
- Bridges gap between **molecular biology and clinical diagnostics**

Rumen Fluke (Amphistome): 70 Cattle Deaths in Odisha – Disease Outbreak

Why in News?

- Around **70 cattle** have died in **Odisha's Kendrapada district** recently.
- The Chief District Veterinary Officer attributed most of the deaths to **amphistomes**, or **rumen flukes** disease, locally known as **'Kurmi'**.

What is Rumen Fluke?

Definition

- Parasites of **ruminants** (cattle, sheep, goats, buffalo) occurring worldwide.
- Disease caused is called **paramphistomosis**.

Scientific Name

- Belongs to the family **Paramphistomidae** (various genera).

Intermediate Host

- **Snails** act as the intermediate host.

Location in Host

- **Adult parasites** live in the **rumen** (first stomach chamber of ruminants).
- **Immature larval forms** live in the **small intestine**.

Cause of Disease

- Disease is due to **intestinal damage** caused by **massive numbers of larvae** in the intestine (not the adults).

Transmission

How Animals Get Infected

- Through **ingestion of contaminated water or vegetation** carrying larval stages (metacercariae) shed by infected snails.

Life Cycle (Simplified)

- Adult flukes in rumen produce eggs → eggs pass in faeces → eggs hatch in water → larvae infect snails → develop in snails → larvae released from snails onto vegetation → cattle eat vegetation → infection established.

Symptoms (Key Signs)

- **Severe diarrhoea** (watery, foul-smelling)
- **Rapid weight loss** (despite the animal's willingness to eat)
- **Swelling under the jaw** – known as **"bottle jaw"** (submandibular oedema)
- **Reduced milk yield** (and milk curdling)
- **Significant loss in body mass**
- Anaemia, weakness, dehydration (secondary symptoms)

Treatment and Management

Treatment

- **Anthelmintic medicines** – targeted drugs to eradicate parasitic worms (helminthes).

- Common anthelmintics used: Closantel, Oxyclozanide, Niclosamide, etc. (veterinary use).

HISTORY AND ART & CULTURE

Komagata Maru Incident (1914)

Why in News?

The **Komagata Maru incident (1914)** was recently referenced in public discourse after its mention on a global media platform, reviving attention on this historic case of **racial discrimination against Indian migrants in Canada under British colonial rule**.

What was Komagata Maru?

- A **Japanese steamship** chartered by Indian businessman **Gurdit Singh** in 1914.
- Carried **376 passengers** from British India:
  - 340 Sikhs, 24 Muslims, 12 Hindus
- Aim: To migrate to **Canada in search of livelihood opportunities**.

What Happened in Canada?

- Ship reached **Vancouver (23 May 1914)**.
- Canadian authorities refused entry citing **"Continuous Journey Regulation"** and other racist immigration laws.
- Only **24 passengers were allowed to disembark**.
- Remaining passengers were forced to stay on the ship for nearly **2 months without adequate food, water, or medical care**.
- Ship was eventually forced to return to India (July 1914).

Return to India & Violence

- Upon arrival at **Budge Budge (near Kolkata)** in September 1914:
  - British police attempted to arrest passengers.
  - Violence broke out; **around 20 passengers were killed**.
  - Many were arrested or detained.

Significance in Freedom Struggle

- Exposed **racial discrimination in British Empire policies**.
- Strengthened **anti-colonial sentiment** among Indians abroad.
- Inspired revolutionary groups like the **Ghadar Movement**.
- Became a symbol of **diaspora resistance and colonial injustice**.

Somnath Temple: 75 Years of Post-Independence Reopening and Cultural Resurgence

Why in News?

India is commemorating **75 years of the reopening and consecration of the reconstructed Somnath Temple (1951–2026)**, marking the anniversary of its post-independence revival and its inauguration by the **first President of India, Dr. Rajendra Prasad**, symbolising cultural restoration after independence.

About Somnath Temple

- Located at **Prabhas Patan, Gir Somnath (Gujarat)**
- One of the **12 Jyotirlingas of Lord Shiva**
- Known as the **"First Jyotirlinga"**
- Architectural style: **Maru-Gurjara (Solanki style)**

Historical Background

- Temple has been **reconstructed multiple times** due to invasions:
  - Mahmud of Ghazni (1026 CE)

- Subsequent medieval rulers (multiple destructions recorded)
- Symbolically represents **continuity of faith and cultural resilience**

Modern Reconstruction (Post-Independence)

- Initiated after **Indian Independence (1947)**
- Key leaders:
  - **Sardar Vallabhbhai Patel** (administrative push)
  - **K. M. Munshi** (Somnath Trust leadership)
- Constructed under **Somnath Trust (public fundraising model)**
- Inaugurated in **May 1951 by Dr. Rajendra Prasad**

75 Years Significance (2026)

- Marks **completion of post-independence revival cycle**
- Associated commemorations:
  - "Somnath Amrut Mahotsav"
  - Cultural events highlighting **civilisational continuity**
- Reinforces temple as a **symbol of national identity and heritage revival**

Architectural Features

- Built in **Nagara tradition (Maru-Gurjara style)**
- Features:
  - Tall **shikhara (spire)**
  - Ornate stone carvings
  - Mandapa with sculptural panels
- Located on the **Arabian Sea coast**

Sanchi Stupa Relics: Sariputra–Maudgalyayana Sent to Mongolia

Why in News?

Sacred relics of **Arhats Sariputra and Maudgalyayana**, preserved at the **Sanchi Stupa complex in Madhya Pradesh**, are being sent to **Mongolia for public exposition**, strengthening **India–Mongolia Buddhist and cultural ties** under a high-level diplomatic initiative.

About Sanchi Stupa

- Location: **Raisen district, Madhya Pradesh** (near Betwa River)
- Built by: **Emperor Ashoka (3rd century BCE)**
- UNESCO World Heritage Site: **"Buddhist Monuments at Sanchi"**
- One of the **oldest surviving Buddhist complexes in India**

Who are Sariputra and Maudgalyayana?

- Chief disciples of **Lord Buddha**
- Known as:
  - **Sariputra** → Wisdom and doctrine
  - **Maudgalyayana** → Supernatural powers
- Their relics were enshrined in stupas like Sanchi during **Mauryan–Shunga period religious spread**

Nature of Relics

- Comprise **bone fragments (asthi avashesh)** placed in reliquaries
- Discovered during 19th-century excavations at Sanchi stupas
- Considered among India's **most sacred Buddhist archaeological remains**

Current Event

- Relics being transported to **Ulaanbaatar (Mongolia)**

- Part of **cultural diplomacy initiative under Government of India**
- Display includes:
  - Public exposition in Mongolia
  - High ceremonial honours (state-level protocol)
- Strengthens India–Mongolia ties rooted in **Mahayana Buddhist tradition**

Cultural & Diplomatic Significance

1. Cultural Diplomacy Tool

- Buddhism as a **soft power instrument**
- Strengthens India's role as **"custodian of Buddhist heritage"**

2. Civilisational Linkages

- Reinforces historical **India–Central Asia–Mongolia Buddhist connect**

3. Tourism & Heritage Promotion

- Boosts global awareness of **Sanchi as a Buddhist pilgrimage site**

Algoza: Thar Desert's Double-Flute Folk Instrument

Why in News?

Rajasthan folk musician **Taga Ram Bheel**, a master of the **Algoza (double-flute instrument)**, has been awarded the **Padma Shri**, bringing attention to this traditional desert instrument and its role in preserving **Thar Desert's folk musical heritage**.

What is Algoza?

- A **traditional folk wind instrument (double flute)**
- Also called: **Alghoza / Do-nali flute**
- Widely used in:
  - Rajasthan
  - Punjab
  - Sindh (Pakistan)
  - Kutch region (Gujarat)

Structure of the Instrument

- Consists of **two wooden flutes played simultaneously**:
  - One flute: **melody**
  - Second flute: **drone (continuous background tone)**
- Requires **simultaneous blowing technique**

Playing Technique

- Uses **circular breathing**, allowing continuous sound without pause
- Produces a **hypnotic, rhythmic, and continuous musical flow**
- Often associated with **desert folk storytelling and pastoral life**

Cultural Significance

- Integral to **Rajasthani folk traditions (especially Jaisalmer region)**
- Used in:
  - Folk dances
  - Shepherd and pastoral music
  - Sufi-inspired rural performances
- Symbol of **oral musical heritage of the Thar Desert**

Taga Ram Bheel Contribution

- Renowned **algoza maestro from Jaisalmer, Rajasthan**

- Learned music in childhood while **grazing livestock in desert regions**
- Played a key role in **preserving and popularising folk desert music globally**
- Represents India's recognition of **"unsung folk traditions" through Padma awards**

DEFENCE & SECURITY

NASM-SR Missile: India's Indigenous Naval Anti-Ship Capability

Why in News?

The **Defence Research and Development Organisation (DRDO)** and the **Indian Navy** successfully conducted a **maiden salvo test of the NASM-SR (Naval Anti-Ship Missile–Short Range)** from a helicopter platform off the coast of Odisha, demonstrating rapid multi-missile firing capability and strengthening indigenous naval strike systems.

What is NASM-SR?

- **NASM-SR (Naval Anti-Ship Missile – Short Range)** is an **indigenously developed air-launched anti-ship missile**.
- Developed by **DRDO** for the **Indian Navy**.
- Designed primarily for **helicopter-based launch platforms**.

Salient Features

1. Platform & Launch System

- Launched from **naval helicopters (e.g., Sea King Mk 42B)**.
- Supports **salvo firing capability** (multiple missiles in quick succession).

2. Flight Characteristics

- **Sea-skimming trajectory** (~5 metres above sea level) to evade radar detection.
- High precision **terminal guidance using Imaging Infrared (IIR) seeker**.

3. Target Capability

- Designed to strike:
  - Small to medium enemy warships
  - Coastal naval assets
- Effective in **littoral and coastal warfare scenarios**.

Recent Development (Salvo Test)

- First successful **salvo launch (two missiles fired rapidly)** conducted in April 2026.
- Validated:
  - Simultaneous launch capability
  - Waterline hit accuracy
  - Operational readiness of helicopter-based strike system

Strategic Significance

- Enhances **Indian Navy's air-launched maritime strike capability**.
- Strengthens **coastal defence and anti-ship warfare readiness**.
- Reduces dependence on foreign systems.
- Part of broader push towards **Atmanirbhar Bharat in defence manufacturing**.

BRO Project Deepak: Strategic Himalayan Infrastructure Backbone

Why in News?

The **Border Roads Organisation (BRO)** celebrated the **66th Raising Day of Project Deepak** in Shimla, highlighting its role in building and maintaining **strategic road infrastructure in the Western Himalayas**, crucial for both national security and regional connectivity.

About Project Deepak

- One of the **oldest BRO projects**, established in **1961**.
- Headquarters: **Shimla, Himachal Pradesh**.
- Operates under the **Border Roads Organisation (BRO)**, Ministry of Defence.

Area of Responsibility (AOR)

- Covers key Himalayan districts of Himachal Pradesh:
  - Shimla, Kinnaur, Kullu, Lahaul-Spiti

Major Infrastructure Contributions

1. Strategic Road Network

- Responsible for **~1,100 km of road network** in high-altitude terrain.
- Includes critical stretches of:
  - **Hindustan–Tibet Road**
  - **Manali–Leh axis connectivity links**

2. Defence Significance

- Ensures **year-round mobility for armed forces** near sensitive border areas.
- Strengthens logistics along India's **northern frontier (China border region)**.

3. Disaster Response Role

- Active in **HADR (Humanitarian Assistance and Disaster Relief)** operations.
- Conducted multiple rescues:
  - Baralacha La (2023): ~300 stranded people rescued
  - Chandratal (2023): ~250 evacuees airlifted/evacuated

Institutional Context: BRO

- Established: **1960**
- Under: **Ministry of Defence**
- Role: Construction and maintenance of **strategic roads, bridges, tunnels, and airfields**
- Works in:
  - Border states (Himalayan & Northeastern regions)
  - Friendly neighbouring countries
- Known for engineering feats like **Atal Tunnel and high-altitude roads (e.g., Umling La)**

Project 17A (Nilgiri-Class)

Why in News?

India's **Project 17A (Nilgiri-class frigates)**—a ₹45,000 crore indigenous warship programme—has been in focus with the **progressive induction of stealth frigates like INS Dunagiri**, strengthening the Indian Navy's surface combat capability and highlighting advances in domestic shipbuilding.

What is Project 17A?

- A programme to build **advanced stealth guided-missile frigates** for the Indian Navy.
- Total ships: **7 Nilgiri-class frigates**
- Built under: **Ministry of Defence**
- Designed by: **Warship Design Bureau (Indian Navy)**
- Constructed by:
  - **Mazagon Dock Shipbuilders Ltd (MDL), Mumbai**

- **Garden Reach Shipbuilders & Engineers (GRSE), Kolkata**

Key Features of Nilgiri-Class Frigates

1. Stealth Design

- Reduced **Radar Cross Section (RCS)**
- Low **infrared and acoustic signatures**

2. Advanced Weapon Systems

- **BrahMos supersonic cruise missiles**
- Surface-to-Air Missiles (SAMs)
- Anti-submarine torpedoes
- Close-in Weapon Systems (CIWS)

3. Propulsion & Systems

- **CODOG propulsion system** (Combined Diesel or Gas)
- Integrated Platform Management System (IPMS)

4. Multi-role Capability

- Anti-surface warfare (ASuW)
- Anti-air warfare (AAW)
- Anti-submarine warfare (ASW)

Strategic Significance

- Strengthens India's **blue-water navy capability**
- Enhances **maritime security in Indian Ocean Region (IOR)**
- Key component of future **Carrier Battle Groups (CBG)**
- Promotes **Atmanirbhar Bharat in defence manufacturing**
- High indigenous content (significant domestic industrial participation)

Production & Timeline

- Approved: **2015**
- First ship launched: **INS Nilgiri (lead ship)**
- Delivery window: **2024–2027**
- Faster production due to **integrated modular construction techniques**

TARA Glide Weapon System: India's First Indigenous Glide Kit for Precision Strike Capability

Why in News?

The **DRDO and Indian Air Force (IAF)** successfully conducted the maiden flight trial of the **Tactical Advanced Range Augmentation (TARA)** system, India's first **indigenous glide weapon kit**, designed to convert conventional unguided bombs into **precision-guided, long-range strike weapons**.

What is TARA?

- **Tactical Advanced Range Augmentation (TARA)** is a **glide weapon system kit**
- Developed by: **DRDO (Research Centre Imarat, Hyderabad and other labs)**
- Function: Converts **"dumb bombs" (unguided bombs)** into **precision-guided munitions (PGMs)**

Core Concept

- A **bolt-on modular kit** attached to existing bombs
- Adds:
  - **Wings / glide surfaces**
  - **Guidance and navigation system**
  - **Control fins + mission computer**

Key Features

- **Indigenous system (first of its kind in India)**
- Enables **stand-off attack capability** (aircraft can release weapon from safer distance)
- Converts legacy stockpiles into **smart weapons (cost-effective upgrade)**
- Uses **satellite-based navigation (GNSS: likely NavIC + GPS)** with inertial backup
- Enhances **accuracy and reduces collateral damage**
- Compatible with multiple aircraft platforms (e.g., Jaguar class reported in trials)

Operational Significance

- Extends strike range significantly (glide-based delivery instead of free-fall)
- Improves **survivability of fighter aircraft** against air defence systems
- Enables **low-cost precision warfare** using existing bomb inventory
- Enhances India's **indigenous defence ecosystem under Atmanirbhar Bharat**

Strategic Importance

- Places India among select nations with **indigenous glide bomb technology**
- Comparable systems globally:
  - US: JDAM-ER / SDB
  - Russia: UMPK kits
  - Israel: SPICE family
  - China: LS-series glide kits

ULPGM-V3: DRDO's Drone-Launched Precision Guided Missile Completes Trials

Why in News?

The **DRDO successfully completed final development trials of ULPGM-V3**, a **drone-launched precision-guided missile**, capable of engaging both **ground and aerial targets**, marking a major step in India's **indigenous unmanned warfare capability**.

What is ULPGM-V3?

- Full Form: **Unmanned Aerial Vehicle Launched Precision Guided Missile – Version 3**
- Developed by: **DRDO (Defence Research & Development Organisation)**
- Type: **Fire-and-forget precision-guided missile**
- Launched from: **UAVs / drones (including hexacopter platforms)**

Operational Capabilities

- Can engage:
  - **Ground targets** (e.g., tanks, armoured vehicles)
  - **Airborne targets** (e.g., drones, helicopters)
- Modes tested:
  - **Air-to-Ground**
  - **Air-to-Air**
- Provides **multi-role battlefield flexibility**

Technological Features

- **Advanced seeker system** (high-precision target acquisition)
- **Dual-role capability** (anti-armour + anti-air)
- **Modular warhead options** for different mission profiles
- **Post-launch target update capability** (data-link enabled)
- Designed for **network-centric warfare environment**

Development Context

- Part of India's push for:

  - **Aatmanirbhar Bharat in defence**
  - Indigenous UAV–weapon integration
- Tested at **DRDO ranges near Kurnool, Andhra Pradesh**
- Enhanced version of earlier **ULPGM-V2 system**

Significance

1. Modern Warfare Capability

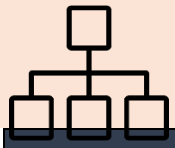
- Strengthens India's **drone-centric combat systems**
- Enables **stand-off precision strikes**

2. Indigenous Defence Ecosystem

- Built through **DRDO–startups–MSME collaboration**
- Reduces import dependence in precision weapons

3. Tactical Advantage

- Lightweight, drone-deployable system increases **flexible battlefield deployment**
- Useful in **asymmetric warfare and border conflicts**



GOVT. INITIATIVES, SCHEMES AND POLICIES, ORGANISATION

JANANI Platform: Digital Backbone for Maternal & Child Health Transformation

Why in News?

The Ministry of Health and Family Welfare has launched the **JANANI (Journey of Antenatal, Natal and Neonatal Integrated Care) platform**, a **digital health system to track and manage maternal and child health services across India** through real-time monitoring, digital records, and integrated service delivery.

What is JANANI Platform?

- A **service-oriented digital platform** for comprehensive tracking of **maternal, newborn, and child health (MNCH)** services.
- Developed as an **upgraded version of the Reproductive and Child Health (RCH) portal**.

Full Form

- **JANANI = Journey of Antenatal, Natal and Neonatal Integrated Care**

Core Objective

- Ensure **end-to-end continuum of care**:
  - Antenatal care (pregnancy monitoring)
  - Delivery preparedness and institutional delivery
  - Postnatal care
  - Newborn and child healthcare
  - Family planning services

Key Features

1. Digital Health Records

- Longitudinal digital record of women in reproductive age group
- Integration with **ABHA (Ayushman Bharat Health Account)**

2. QR-enabled MCH Cards

- Portable **Mother & Child Health (MCH) cards**
- Easy access to medical history across facilities

3. Real-Time Monitoring

- Dashboards for supervisors
- Automated tracking of service delivery

4. Smart Alerts System

- Alerts for **high-risk pregnancies**
- Due-list generation for frontline health workers

5. Interoperability

- Integration with:
  - **U-WIN (immunisation platform)**
  - **POSHAN Abhiyaan**
  - Other national health databases

6. Universal Access

- Self-registration via web/mobile
- Aadhaar/mobile/biometric-based authentication
- Supports migratory populations

Significance

1. Strengthening Public Health Delivery

- Reduces gaps in maternal and child healthcare tracking

2. Data-Driven Governance

- Enables real-time policy monitoring and targeted interventions

3. Reducing Maternal & Infant Mortality

- Early risk detection improves outcomes

4. Digital Health Ecosystem Integration

- Aligns with **Ayushman Bharat Digital Mission (ABDM)**

Mission Queen Pineapple: Tripura's GI-Tagged Fruit Value Chain Revolution

Why in News?

The Government has launched **"Mission Queen Pineapple"**, a ₹236 crore convergence-based initiative to transform Tripura's **GI-tagged Queen Pineapple** into a **global premium brand** through improvements in **cultivation, processing, logistics, and export infrastructure**.

About Mission Queen Pineapple

- Launched by: **Ministry of Development of North Eastern Region (MDoNER)**
- State: **Tripura**
- Financial outlay: **₹236 crore**
- Duration: **3-year mission (FY 2026–FY 2028)**
- Approach: **"Farm-to-global-market value chain" model**

About Queen Pineapple

- Scientific name: *Ananas comosus*
- Status: **GI-tagged product (2014)**
- State fruit of: **Tripura (since 2018)**
- Features:
  - Golden-yellow, highly aromatic
  - Low fibre, sweet taste
  - Mostly grown in **hill terrains under near-organic conditions**
- Major cultivation areas: **Gomati, West Tripura, Sepahijala districts**

Key Components of the Mission

1. Infrastructure Development

- Hub near **Agartala airport**
- 8 spoke collection centres
- Cold storage and **reefer logistics system**
- IoT-based farm monitoring systems

2. Value Addition & Processing

- Revival of **Nalkata Pineapple Processing Unit**
- Products: canned pineapple, jams, beverages

3. Bio-economy Utilisation

- Conversion of waste into:
  - **Bromelain extraction (enzyme industry)**
  - **Pineapple Leaf Fibre (PALF) textiles**
- Promotes **circular economy model**

4. Export & Branding

- GI monetisation frameworks

- QR-based traceability
- Buyer-seller meets and export certification support

Institutional Linkages

- **MDoNER** – overall mission coordination
- **APEDA** – export facilitation
- **ICAR, CSIR** – agri-research support
- **TRIFED & NERAMAC** – tribal and regional marketing support
- Convergence with multiple ministries (Agriculture, MSME, Commerce)

Significance

- Enhances **farmer income through value addition (not just production)**
- Strengthens **North-East agricultural branding in global markets**
- Promotes **GI-based rural entrepreneurship**
- Reduces post-harvest losses via cold-chain integration
- Supports India's **"One District One Product (ODOP)-like" strategy**

SARTHAK PDS Scheme: AI–Blockchain Driven Transformation of India's Public Distribution System

Why in News?

The Union Cabinet has approved the **SARTHAK-PDS Scheme**, an umbrella programme to modernise India's **Public Distribution System (PDS)** under the **National Food Security Act (NFSA), 2013**, with a focus on **technology-driven reforms using AI, ML, blockchain, and integrated logistics systems** for improved transparency and efficiency.

What is SARTHAK-PDS?

- Full Form: **Scheme for Assistance in Ration Transport and Handling – Income with Automation in PDS**
- Type: **Umbrella scheme**
- Objective: Strengthen and modernise **foodgrain distribution system in India**

Structure of the Scheme

SARTHAK-PDS integrates two existing schemes:

1. **Assistance to State Agencies for intra-State movement of foodgrains & FPS dealer margin under NFSA**
2. **SMART PDS (technology-driven reforms in PDS)**

Core Objectives

- Ensure **efficient last-mile delivery of foodgrains**
- Reduce **leakages, diversion, and inefficiencies**
- Improve **transparency and accountability**
- Strengthen **Fair Price Shop (FPS) ecosystem**
- Provide **financial support for logistics and transport**

Technology Integration

The scheme introduces advanced digital tools:

- **Artificial Intelligence (AI):** demand forecasting, anomaly detection
- **Machine Learning (ML):** pattern recognition in distribution systems
- **Blockchain:** tamper-proof supply chain tracking
- **Data analytics:** real-time monitoring of PDS network
- **Digital databases:** unified beneficiary and supply chain records

Institutional & Policy Linkages

- Ministry: **Ministry of Consumer Affairs, Food and Public Distribution**
- Framework: **NFSA, 2013**
- Supports:
  - One Nation One Ration Card (ONORC)
  - Digital India Mission
  - PM Gati Shakti (logistics integration)

Significance

1. Food Security Strengthening

- Ensures **efficient delivery to ~80 crore NFSA beneficiaries**

2. Governance Reform

- Moves PDS from **manual → digital + data-driven system**

3. Leakages Reduction

- Blockchain + AI reduces **ghost beneficiaries and diversion**

4. Logistics Efficiency

- Improves **transport, storage, and FPS-level operations**

Justice Naolekar Committee: Demographic Change & Illegal Immigration Panel

Why in News?

A **High-Level Committee headed by Justice (Retd.) Prakash Prabhakar Naolekar** has been constituted to examine **demographic changes in India attributed to illegal immigration and other "unnatural causes"**, including their **nature, causes, and policy implications**, with field visits planned in **metros, industrial hubs, and border areas**.

About the Committee

- **Chairperson:** Justice (Retd.) Prakash Prabhakar Naolekar
- **Type:** High-Level Committee (HLC), not a statutory body
- **Mandate:** Study **demographic shifts linked to illegal immigration** and recommend **policy, administrative, and legal measures**
- **Coverage areas:**
  - Metropolitan cities
  - Industrial regions
  - Border districts

Core Objectives

1. Demographic Assessment

- Examine **population changes over time**
- Identify patterns of **migration (legal & illegal)**
- Assess **regional demographic imbalance**

2. Illegal Immigration Analysis

- Study inflow routes and settlement patterns
- Evaluate **impact on resources, services, and governance**

3. Policy Recommendations

- Suggest **legal and administrative frameworks**
- Strengthen border and internal monitoring mechanisms
- Assess need for **new laws or institutional reforms**

Contextual Background

- Linked to broader government concern on **"unnatural demographic change"**

- Framed within **internal security and national integrity discourse**
- Similar past exercises include:
  - **Sachar Committee (2005)** – socio-economic study (different mandate)
  - **Border management and infiltration studies under security agencies**

Institutional Significance

- High-level committee acts as an **advisory mechanism to the executive**
- Can influence:
  - Immigration policy
  - Border security strategies
  - Census and demographic data interpretation
- Not binding but often shapes **future legislation or schemes**

Key Issues Involved

- Difficulty in **distinguishing migration vs illegal immigration**
- Potential **political sensitivity in demographic studies**
- Link between **population dynamics and internal security**
- Implications for **federal relations (border states vs Centre)**

MISCELLANEOUS

World Press Freedom Index 2026

Why in News?

The **World Press Freedom Index (WPFI) 2026**, released by the organization Reporters Without Borders (RSF) on **30 April 2026**, ranked India **157th out of 180 countries**, a decline of six places from its 151st rank in 2025.

About the World Press Freedom Index

- It is an **annual index** published by **RSF (Reporters Sans Frontières)**.
- It assesses the level of **press freedom** in **180 countries and territories**.
- The ranking is based on five broad indicators:
  1. Political Context
  2. Legal Framework
  3. Economic Context
  4. Sociocultural Context
  5. Safety of Journalists

Key Findings of WPFI 2026

- Global press freedom has reached its **lowest level in the 25-year history** of the index.
- For the first time, **more than half of the countries** assessed fall into the **"difficult" or "very serious"** categories for press freedom.
- The decline is attributed to increasing legal restrictions, political pressure, economic vulnerabilities of media organizations, and threats to journalists.

India's Performance

- **Rank (2026): 157/180**
- **Rank (2025): 151/180**
- **Change:** Dropped by 6 places.
- India remains in the **"Very Serious"** category of press freedom.

Reasons Highlighted by RSF

- Violence and intimidation against journalists.
- Concentration of media ownership.
- Growing political influence over media outlets.
- Use of legal provisions and anti-terror laws against journalists.
- Online harassment and threats targeting media professionals.

Global Rankings (Top & Bottom)

Top 5 Countries

- Norway, Netherlands, Estonia, Denmark, Sweden

Bottom 5 Countries

- Saudi Arabia, Iran, China, North Korea, Eritrea (last)

India and Neighbouring Countries

- In WPFI 2026, Nepal ranked 87th, Sri Lanka 134th, Bhutan 150th, Pakistan 153rd, Bangladesh 152nd, India 157th, and China 178th.

International Labour Day 2026

Why in News?

International Labour Day (May Day) was observed globally on **1 May 2026**, highlighting the contributions of workers and renewed discussions on labour rights, social security, workplace safety, and decent employment conditions.

Key Facts

- Celebrated annually on **1 May** in over **80 countries**.
- Commemorates the historic **Haymarket Affair (1886)** in **Chicago, USA**, where workers demanded an **eight-hour workday**.
- In **1889**, the **Second International** declared **1 May** as International Workers' Day.
- In India, the first Labour Day celebration was organized in **1923** at **Madras (Chennai)** by **Singaravelu Chettiar**.
- Also known as **May Day** or **International Workers' Day**.

Significance

Workers' Rights and Welfare

- Promotes fair wages, safe working conditions, social security, and collective bargaining.
- Recognizes the contribution of workers across organized and unorganized sectors.

Contemporary Relevance

- Highlights challenges related to the gig economy, informal employment, automation, and labour migration.
- Reinforces the principles of decent work advocated by the **International Labour Organization (ILO)**.

Padma Awards 2026: 131 Honours Conferred – Ceremony Held at Rashtrapati Bhavan

Why in News?

- President **Droupadi Murmu** conferred the **Padma Awards 2026** at the first Civil Investiture Ceremony held in the **Ganatantra Mandap of Rashtrapati Bhavan** on **May 25, 2026**
- For the year 2026, the President approved a total of **131 Padma awards** (5 Padma Vibhushan, 13 Padma Bhushan, 113 Padma Shri). However, in the first phase, only **66 awards** were presented (2 Padma Vibhushan, 6 Padma Bhushan, 58 Padma Shri)

About the Padma Awards

Establishment

- Instituted on **2nd January 1954** (by Government of India).
- These are among the highest civilian awards of India (Bharat Ratna is the highest).

Categories

- **Padma Vibhushan** (Highest among Padma awards) – for exceptional and distinguished service.
- **Padma Bhushan** – for distinguished service of a high order.
- **Padma Shri** – for distinguished service in any field.

Award Composition

- The award does not include a cash prize. It consists of a **Sanad** (certificate) signed by the President and a **medallion**

Fields of Recognition

- Art, social work, public affairs, science & engineering, trade & industry, medicine, literature & education, sports, civil service, etc.

Selection Process (Key Points for Prelims)

Nominations

- Open to all Indian citizens via the **Rashtriya Puraskar Portal**.
- Recommendations are invited from State/UT Governments, Central Ministries, and previous award recipients

Selection Committee

- The **Padma Awards Committee** is constituted annually by the **Prime Minister**.
- It is chaired by the **Cabinet Secretary** and includes the Home Secretary, Secretary to the President, and 4-6 eminent citizens

Vetting and Approval

- Shortlisted candidates undergo **background vetting** by intelligence agencies.
- The final list is approved by the **Prime Minister** and then by the **President**

Announcement

- Officially announced on the eve of **Republic Day (25th January)** every year

MAINS

PAPER 1

Buddha's Greatest Victory: Lessons for a Troubled World

Introduction

On Buddha Purnima, we honour Gautama Buddha—the "awakened one" who renounced royal life in search of truth and attained enlightenment at Bodh Gaya. His first sermon at Sarnath laid the foundation of Buddhism. Emphasising non-violence, truth, and self-discipline, his message remains deeply relevant in a world marked by conflict and unrest.

Main Body

The Core of Buddha's Teachings: Four Noble Truths and Eightfold Path

The Four Noble Truths:

- There is suffering (Dukkha) – pain, illness, loss, separation
- Desire (Tanha) is the root cause of suffering – attachment to pleasure, aversion to pain
- By eliminating desire, suffering can be overcome (Nirodha)
- By following the Eightfold Path, one can live free from suffering (Magga)

The Eightfold Path:

- Right View, Right Intention, Right Speech, Right Action
- Right Livelihood, Right Effort, Right Mindfulness, Right Concentration

The Five Moral Precepts (For Lay Followers):

- Non-violence (Ahimsa) – do not kill or harm living beings
- Non-stealing – do not take what is not given
- Refraining from adultery – sexual misconduct
- Truthfulness – speak the truth; avoid false speech
- Abstaining from intoxicants – avoid substances that cloud the mind

Key Advice from the Buddha:

- Do not dwell on the past—live in the present
- Truthfulness is powerful
- The mind is the source of all actions—cultivate positive thinking
- Do not retreat in fear during difficult times
- Words can wound—speak gently
- Love and non-violence are essential
- Always keep learning

Buddhism in Indian Literature and Culture

Tamil Buddhist Epics:

- **Manimekalai:** Explains essence of Buddhism—birth and death as sleep and waking; righteous deeds lead to noble world; evil deeds lead to suffering
- **Kundalakesi:** Another Tamil Buddhist text (lost, but contributions remain invaluable)

Ashoka's Transformation:

- Emperor Ashoka transformed from a conqueror to a proponent of peace after embracing Buddhism
- Propagated Buddhist principles through inscriptions and stupas across the land
- Sanchi and Sarnath stupas continue to attract pilgrims
- The lion capital at Sarnath is Bharat's national emblem

Spread of Buddhism:

- Ashoka's son Mahinda carried teachings to Sri Lanka

- Buddhist monks propagated faith in Tamil Nadu (traces remain)
- Monks provided free medical care and education without discrimination
- Charity, especially feeding the poor, was a fundamental duty

Buddhist Universities: India's Intellectual Legacy

Nalanda University (5th century CE):

- Around 10,000 students and 1,500 teachers
- Scholars from across Asia came to study
- Libraries of immense scale

Other Major Centres:

- Vikramashila University (Bihar)
- Odantapuri University (Bihar)
- Kanchipuram University (Tamil Nadu) – renowned centre of learning

Chinese Pilgrims:

- **Faxian:** 15-year pilgrimage specifically for Buddhism
- **Xuanzang:** 16 years in Bharat studying at Nalanda and collecting texts; visited Kanchipuram to study and copy manuscripts

Significance:

- Buddhism emphasised lifelong learning
- Established educational institutions and libraries on very large scale
- Showcased India's intellectual heights to the world

Contemporary Relevance of Buddha's Teachings

PM Modi's Message (Mann Ki Baat):

- Gautama Buddha’s message remains timeless: peace begins within, and self-mastery is the greatest victory. In today’s conflict-ridden world, his teachings are more relevant than ever.

Relevance for Ethics (GS Paper IV):

- Non-violence: Rejection of violence in thought, word, and deed
- Truthfulness: Foundation of integrity in public life
- Mindful speech: Words can wound—speak gently
- Conquering oneself: Greatest victory is self-mastery, not domination over others

Relevance for International Relations:

- India's soft power: Buddhism as a gift to the world
- Diplomatic tool: Shared Buddhist heritage with Japan, South Korea, China, Sri Lanka, Myanmar, Thailand, Vietnam, Cambodia, Laos, Nepal, Bhutan
- Alternative to conflict: Peace begins within; extends to family, community, nation, world

Relevance for Mental Health:

- "Do not dwell on the past—live in the present" (mindfulness)
- "The mind is the source of all actions—cultivate positive thinking" (cognitive behavioural principles)
- "Do not retreat in fear during difficult times" (resilience)

Buddha's Teachings on Love and Compassion

The Story of Sujata:

- Moved by compassion for the weakened Buddha after his severe austerities
- Offered him milk porridge, saving his life
- Gave him strength to meditate under the Bodhi tree
- On Buddha Purnima, we remember her love and kindness by preparing payasam

Buddha's Words on Love:

- "Love is the source of joy, love is the light of the world, love is the greatest power"

The Five Precepts in Practice:

- Non-violence: Protection of all living beings
- Non-stealing: Respect for others' property
- Refraining from adultery: Respect for relationships
- Truthfulness: Foundation of trust in society
- Abstaining from intoxicants: Mental clarity for ethical decision-making

Conclusion

On Buddha Purnima, we honour Gautama Buddha—the "Light of Asia" who taught that mastering oneself is the greatest victory. From renunciation to enlightenment at Bodh Gaya and his first sermon at Sarnath, his message offered a practical path of ethics and inner discipline. His legacy shaped figures like Ashoka and great centres of learning such as Nalanda. In a world of conflict, his teachings remind us: love and peace remain humanity's greatest strength.

Learning Outcomes and Child Health: The Early Childhood Imperative

Introduction

POSHAN Pakhwada highlights the critical role of early childhood development. Evidence shows that investing early—in nutrition, health, and caregiving—yields high lifelong returns in learning and earnings. Yet India still faces high stunting, wasting, anaemia, and learning gaps, underscoring the need for stronger, integrated early-childhood interventions.

Main Body

The Foundational Framework: Where India Stands

Policy Commitments (Already in Place):

- National Food Security Act (NFSA)
- POSHAN Abhiyaan (now Mission Poshan 2.0)
- Integrated Child Development Services (ICDS)
- Maternity benefits (PMMVY)
- School meals (PM-POSHAN)

National Education Policy (NEP) 2020:

- Recognises Early Childhood Care and Education (ECCE) as a crucial "foundational stage"
- Goal: universal, quality pre-primary education by 2030
- 5+3+3+4 framework begins with 3 years of preschool/Anganwadi

The Gaps (Persistent Despite Policy):

- High levels of stunting, wasting, and anaemia
- Learning gaps at school entry persist
- Nutrition outcomes lag even as coverage expands

The Science: Why Early Childhood is a Once-in-a-Lifetime Window

Neuroscience Advances:

- 85% of brain development occurs by age 6
- Most rapid growth during first 1,000 days (conception to age 2)
- Nutrition, health, stimulation, and responsive caregiving together shape brain architecture

Economic Returns:

- Early childhood investments generate higher returns than later-stage investments
- Channels: higher future earnings, better learning outcomes, reduced social costs (health, crime, welfare dependence)

The Critical Link:

- Learning outcomes and child health are not separate domains

- Malnourished child cannot learn well; poorly stimulated child does not develop optimally
- Nutrition and early stimulation are complementary, not sequential

The Convergence Problem: Different Systems, Different Priorities

What Anganwadis Focus On:

- Food supplementation (primary)
- Nutrition monitoring
- Early learning (secondary, especially for under-threes)

What Health Systems Focus On:

- Survival and disease control
- Immunisation
- Maternal health

What Gets Less Attention:

- Childcare and early learning for children under three
- Responsive caregiving counselling
- Maternal mental health and well-being

How This Affects Working Families:

- Most visible in agriculture, construction, domestic work, and informal occupations
- Childcare hard to access → families forced into difficult choices
- Trade-off affects both children's development and women's ability to work

Promising Initiatives: Models to Scale

Karnataka's Koosina Mane:

- Community-based childcare
- Supported through converged funding
- Panchayat leadership
- Benefits both children and working mothers

Mobile Creches:

- Provides childcare near worksites
- Operates in urban informal settings
- Demonstrates feasibility for migrant and construction workers

Centre's Palna Initiative:

- Strengthens anganwadi-cum-crèches
- Targeted at children of working parents
- Integrates childcare within existing service platforms

Common Thread:

- Convergence across health, nutrition, childcare, and early learning is feasible
- Local leadership (panchayats) and flexible funding are key

Three Administrative Priorities for India

First: Make Care a Defined Function of Existing Frontline Platforms

- Anganwadi centres and primary health services already reach families during pregnancy and early childhood
- Integrate counselling on responsive caregiving and maternal well-being alongside nutrition services
- Incorporate structured caregiving messages into routine antenatal visits, immunisation days, and home-based care schedules
- Adjust anganwadi activities to better serve younger children and working caregivers

Second: Link Childcare Provision with Livelihoods and Social Protection

- Clearer guidance allowing local governments to use converged funds for community-based childcare
- Target high-migration and informal-work settings
- Locate childcare centres near worksites, markets, or villages with high female labour participation
- Enable role for private sector (workplace creches, employer-supported childcare)

Third: Strengthen Programme Reviews by Tracking Child Development Outcomes

- Current reviews focus on inputs (rations distributed, beneficiaries reached)
- Add child development indicators (early language, motor skills, social-emotional development)
- Add service-quality measures (caregiver-child interaction, stimulation activities)
- Add equity markers (caste, tribe, gender, disability, geography)
- Use existing data systems across sectors to support local planning and accountability

The Timing: Why Now

POSHAN Pakhwada 2026 Focus:

- "Maximizing Brain Development in the First Six Years of Life"
- Shift from "nutrition for health" to "nutrition and early childhood stimulation for optimal brain development"

Viksit Bharat 2047:

- Human capital central to inclusive growth
- Children must not only survive but thrive
- Early childhood is the foundation of the skilled, productive workforce of 2047

The Opportunity:

- Policy framework exists (NEP 2020, Mission Poshan 2.0, Palna)
- Models exist (Koosina Mane, Mobile Creches)
- What is needed is administrative priority and converged funding

Conclusion

Early childhood investments yield the highest returns, with the first 1,000 days critical for brain development. India has strong schemes (POSHAN, ICDS, NEP 2020), but outcomes—stunting, anaemia, learning gaps—remain poor due to weak convergence. Nutrition and survival dominate, while care and early learning lag, especially for informal workers. Priorities: institutionalise childcare in frontline systems, link it with livelihoods/social protection, and track developmental outcomes. For Viksit Bharat 2047, children must not just survive—they must thrive.

The Living Light of Ancient Tales: India's Puppetry Traditions

Introduction

In the age of AI and immersive media, India’s traditional puppetry forms are witnessing renewed interest as carriers of storytelling, ethics, and cultural heritage. Traditions such as Togalu Gombeyaata and Tholu Bommalata preserve epic narratives and folk traditions, while institutions like the Karnataka Chitrakala Parishath help revive these declining art forms amid the impact of television and cinema.

Main Body

Puppetry Traditions in India: An Overview

Two Major Categories Discussed:

String Puppets (Marionettes) – Kathputli:

- Predominantly from North India (Rajasthan).
- Traditionally practised by the Putli Bhats, a community of itinerant performers.
- Travelled with portable theatres; gained popularity in royal courts.
- Eventually settled in different kingdoms, creating puppets modelled on rulers, queens, court dancers, acrobats, and other courtly figures.

Leather Shadow Puppets:

- Practised across Karnataka, Andhra Pradesh, Tamil Nadu, Kerala, Maharashtra, Odisha, and Goa.

- While performance techniques remain broadly similar, regional variations in language, style, and narrative lend each tradition unique character.
- Puppets are crafted from leather (deer, goat, or buffalo hide) and mounted on bamboo sticks.

Regional Forms of Leather Shadow Puppetry

Togalu Gombeyaata (Karnataka):

- The name literally means "leather puppet play."
- Draws on epics, folktales, humour, and drama, often performed through the night.
- Regional variations within Karnataka:
  - Bijapur and Gulbarga: known as katabarata (smaller puppets).
  - Bellary and Dharwad: called kille katarata (larger figures).
  - Bengaluru and Kolar: larger puppets in Togalu Gombeyaata.
- Visual language reflects both temple and Islamic artistic influences.
- Narratives drawn from Ramayana, Mahabharata, Puranas, and local folklore (Janapada Kathegalu).

Tholu Bommalata (Andhra Pradesh and Telangana):

- One of the most elaborate shadow puppetry traditions.
- Puppets can reach heights of up to eight feet.
- Craft dates back to at least the 12th century.
- Significant development under the Vijayanagara rulers in the 16th century.
- Artisans, many of whom migrated from Maharashtra during the Maratha period, created intricately painted and perforated figures.
- Performances staged using a white cloth screen, illuminated from behind by oil lamps or bulbs, with puppets mounted on bamboo sticks for movement.
- Episodes from Ramayana and Mahabharata remain central, often accompanied by song.

Other Regional Forms (Mentioned):

- Kerala, Tamil Nadu, Maharashtra, Odisha, and Goa have their own distinct shadow puppetry traditions.
- Each has unique regional variations in language, style, and narrative.

Construction and Craftsmanship

Kathputli (String Puppets) – Construction:

- Head, neck, and face carved from a single piece of wood.
- Torso and hands made from stuffed cloth.
- Female puppets typically have no legs and are dressed in long, flowing skirts of leheriya or bandhej adorned with gota work.
- Male puppets include legs or footwear.
- Wood carefully selected based on the character, coated with chalk, and then painted with stylised features, especially elongated eyes.

Leather Puppets (Shadow Puppets) – Construction:

- Made from deer, goat, or buffalo hide.
- Can reach heights of up to eight feet (Tholu Bommalata).
- Intricately painted and perforated to create detailed patterns.
- Mounted on bamboo sticks for manipulation during performances.

Performance and Storytelling

Performance Setup:

- White cloth screen (comparable to a cinema screen).
- Illuminated from behind by oil lamps or bulbs (traditional lighting).
- Puppets placed close to the screen to cast sharp shadows.

- Accompanied by song, music, and narration.

Narrative Content:

- Epics: Ramayana and Mahabharata.
- Puranas: Bhagavata Purana (stories of Krishna and Yashoda).
- Local folklore (Janapada Kathegalu).
- Humour and drama, not just serious mythology.

Performance Duration:

- Often performed through the night (Togalu Gombeyaata).

Decline and Adaptation

Causes of Decline:

- Advent of television and cinema.
- Immersive digital experiences replacing traditional storytelling.
- Changing audience preferences.
- Economic viability of itinerant performers diminished.

Adaptation Strategies:

- Many puppeteers have adapted by creating smaller decorative items: miniature puppets, lampshades.
- Transition from performance art to craft production for tourists and urban consumers.

Preservation Efforts:

- Karnataka Chitrakala Parishad's leather puppetry gallery (established 2007) houses over 3,000 traditional puppets.
- Indian Music Experience, Bengaluru: puppets dressed in regional attire narrating stories from the Bhagavata Purana.
- Renewed interest in traditional forms amidst AI and digital experiences.

Cultural Significance and Contemporary Relevance

Connection to India's Storytelling Traditions:

- Puppetry is deeply connected to India's vast oral and performance heritage.
- Represents the "magic of storytelling, the beauty of the handmade, and the dexterity of the human hand."

Bringing Alive Morality and Ethical Living:

- Not just stories, but enduring ideas of morality and ethical living.
- Epics and Puranas convey dharma (righteousness) through accessible, entertaining performances.
- Puppetry makes complex philosophical concepts accessible to all ages and literacy levels.

Reflection of Material Culture:

- Regional variations in puppetry reflect India's diversity: language, artistic influences (temple and Islamic), and local folklore.
- Puppets modelled on rulers, queens, court dancers, acrobats, and courtly life provide glimpses into historical social structures.

Way Forward: Preservation and Promotion

For Government and Cultural Institutions:

- Document regional puppetry traditions before they are lost.
- Support puppeteers through grants, performance venues, and inclusion in festivals.
- Establish more museums and galleries (like the Chitrakala Parishad collection).
- Integrate puppetry into school curricula as part of arts education.

For Artisans and Performers:

- Adapt to contemporary themes while retaining traditional craftsmanship.

- Explore collaborations with digital media (e.g., animated films using puppet designs).
- Train younger generations in both performance and craft.

For Society:

- Attend performances; support local puppeteers.
- Recognise puppetry as living heritage, not just a museum artefact.

Conclusion

India's puppetry traditions such as Togalu Gombeyaata, Tholu Bommalata, and Kathputli preserve ancient storytelling, morality, and folk culture through leather shadow puppets and string marionettes. Though television and cinema led to their decline, institutions like the Karnataka Chitrakala Parishath and renewed interest in traditional arts are helping revive these living performance traditions beyond mere museum preservation.

Volcanic Eruptions: Cooling, Warming, and Ozone Impacts

Introduction

Volcanoes alter Earth's atmosphere by releasing gases and particles during eruptions. Sulphur dioxide forms aerosols that reflect sunlight and can cool the planet temporarily, while ash blocks sunlight locally. Volcanoes also emit CO_2, acid-forming gases, and ozone-damaging compounds. The 2022 2022 Hunga Tonga–Hunga Ha'apai eruption also revealed significant methane release, offering new insights into climate processes.

Main Body

Cooling Effects: Sulphur Dioxide and Aerosols

Mechanism:

- Volcanoes blast sulphur dioxide (SO_2) high into the stratosphere.
- SO_2 reacts with water vapour to form sulfate aerosols (tiny particles).
- Aerosols scatter incoming sunlight back into space.
- Reduces the amount of solar radiation reaching earth's surface.

Duration:

- Aerosols remain in the stratosphere for years (not weeks like ash).
- A powerful eruption can cool the earth's surface for multiple years.

Historical Examples:

- **Mount Pinatubo (1991, Philippines):** Largest eruption in living memory. Released about 20 million tonnes of SO_2. Global temperatures dropped by about 0.5°C for over a year.
- **Tambora (1815, Indonesia):** Caused the "Year Without a Summer" (1816) with widespread crop failures and frost in summer months across Europe and North America.

Ash vs. Aerosols:

- Ash clouds block sunlight locally around the eruption site.
- Most ash falls back to earth within a few weeks (too heavy to stay aloft).
- Aerosols are lighter and remain in the stratosphere for years.

Warming Effects: Carbon Dioxide Release

Volcanic CO_2 Emissions:

- Volcanoes also release carbon dioxide (CO_2), a greenhouse gas that traps heat.
- CO_2 remains in the atmosphere for centuries to millennia.

Comparison with Human Activity:

- Modern human activity (fossil fuel burning, deforestation) produces much more CO_2 than volcanoes.
- Annual human CO_2 emissions are approximately 100 times larger than volcanic emissions.

Long-Term Climate Influence:

- Eruptions throughout geological history have helped drive long-term warming trends.
- Large igneous provinces (e.g., Deccan Traps, Siberian Traps) have caused mass extinctions through CO_2-driven warming.

The Balancing Act:

- Short-term cooling (SO_2 aerosols) vs. long-term warming (CO_2 accumulation).
- For most eruptions, cooling dominates for 1–5 years, after which warming resumes.

Methane Release: The Hunga Tonga Discovery

2022 Hunga Tonga-Hunga Ha'apai Eruption (South Pacific):

- Researchers used satellites to study this eruption.
- Volcano released massive quantities of methane (CH_4) into the stratosphere.
- Volcanic ash triggered chemical reactions that turned methane into formaldehyde.

Significance for Climate:

- Methane is a potent greenhouse gas (about 28 times more powerful than CO_2 over 100 years, and 80 times over 20 years).
- The discovery that volcanic ash can convert methane into formaldehyde (a less potent greenhouse gas) points to potential new ways to slow global warming.

Potential Application:

- If scientists can replicate this chemical reaction artificially, it could be used to remove methane from the atmosphere.
- Atmospheric methane removal is an emerging climate intervention strategy (complementary to CO_2 removal).

Other Atmospheric Effects

Ozone Layer Damage:

- Volcanic eruptions emit chlorine and bromine compounds.
- These compounds catalyse ozone destruction in the stratosphere.
- Large eruptions can temporarily thin the ozone layer, increasing UV radiation reaching earth's surface.

Acid Rain Formation:

- SO_2 and nitrogen oxides from volcanoes react with water and oxygen in the atmosphere.
- Form sulphuric acid and nitric acid.
- Fall as acid rain, damaging forests, soils, and aquatic ecosystems.

Conclusion

Volcanoes influence Earth's climate by releasing gases and particles into the atmosphere. Sulphur dioxide forms aerosols that reflect sunlight and cool the planet temporarily, as seen after the 1991 Mount Pinatubo eruption. Volcanoes also emit CO_2, acid-forming gases, and ozone-damaging compounds. The 2022 2022 Hunga Tonga–Hunga Ha'apai eruption revealed large methane-related reactions, offering new insights into climate processes and global warming mitigation.

Bhojshala Complex: High Court Verdict and ASI Access Order

Introduction

The Archaeological Survey of India has granted Hindus unrestricted access to the Bhojshala complex in Madhya Pradesh after a High Court ruling declared it a Saraswati temple and quashed the 2003 order permitting Friday namaz. The verdict, concerning the monument also known as Kamal Maula Mosque, has revived debate over the Places of Worship (Special Provisions) Act, 1991 and judicial intervention in religious disputes.

Main Body

The High Court Verdict

Key Rulings:

- The Madhya Pradesh High Court (Indore bench) declared that the Bhojshala complex is a temple dedicated to Goddess Saraswati.
- The Centre and ASI can decide on its administration and management.
- Quashed the ASI's April 7, 2003 order that allowed Muslims to offer namaz inside the Bhojshala complex every Friday.

- The Muslim community may approach the state government for allotment of separate land in the district for the construction of a mosque.

ASI's Decision on Access

Unrestricted Access Granted to Hindus:

- ASI granted Hindus unrestricted access to the monument for worship and other purposes.
- The ASI order stated that Bhojshala was a centre of learning and research on Sanskrit language, grammar, and literature, besides being a temple.
- The Hindu community shall have unrestricted access in connection with the ancient practice of learning and worship of Goddess Saraswati.

Historical Background of Bhojshala Complex

11th-Century Monument:

- The Bhojshala complex is an ASI-protected monument in Dhar, Madhya Pradesh.
- Built by Raja Bhoja (Paramara dynasty), a renowned scholar-king.
- Historically a centre for Sanskrit learning and a temple dedicated to Goddess Saraswati (Vagdevi).

Disputed Character:

- Muslims refer to the complex as Kamal Maula Mosque.
- For decades, both communities had managed access through informal arrangements.
- The 2003 ASI order formalized Muslim access for Friday namaz.

Legal and Constitutional Dimensions

Places of Worship (Special Provisions) Act, 1991:

- Section 3: Prohibits conversion of any place of worship from its religious character as it existed on August 15, 1947.
- Section 4: Declares that all suits regarding conversion of religious character pending before any court shall abate.

The Question Before the Court:

- What was the religious character of Bhojshala complex on August 15, 1947?
- If it was a temple, the 1991 Act protects that character.
- If it was a mosque, the 1991 Act protects that character.

High Court's Interpretation:

- The Court declared it was a temple based on historical and archaeological evidence.
- Quashed the 2003 ASI order (which had allowed Muslim access) as being contrary to the historical character.

The Dissenting View:

- Critics argue that the 1991 Act was intended to freeze all disputes as of 1947 and prevent further litigation.
- By adjudicating the religious character, the Court may have reopened disputes that Parliament sought to settle.

Implications for Communal Harmony

Potential for Tension:

- Both communities have coexisted with shared access arrangements for decades.
- Unrestricted Hindu access and removal of Muslim namaz rights may create resentment.
- The Court's direction to allot separate land for a mosque may be a pragmatic solution, but implementation is key.

The 2003 Arrangement (Now Quashed):

- Allowed Muslims to offer namaz every Friday.

- A workable compromise that had prevented conflict.
- Its quashing removes a long-standing local arrangement.

Way Forward for the Muslim Community:

- Approach state government for separate land for mosque construction.
- Requires government cooperation and community acceptance.

Role of the Archaeological Survey of India (ASI)

ASI's Statutory Role:

- Protects and maintains monuments of national importance under the Ancient Monuments and Archaeological Sites and Remains Act, 1958.
- Does not adjudicate religious rights; implements court orders and government policies.

ASI's 2003 Order:

- Allowed Muslim namaz inside the complex.
- Based on an arrangement to maintain communal harmony.

ASI's 2026 Order:

- Granted Hindus unrestricted access following High Court verdict.
- Stated that Bhojshala was a centre of learning besides being a temple.

ASI's Dilemma:

- Caught between religious claims and statutory duties.
- Court orders supersede administrative arrangements.

Concerns:

- May reopen settled disputes under the Places of Worship Act, 1991.
- Quashes a 2003 arrangement that had worked for over two decades without major conflict.
- Risks communal tension in a region where both communities have coexisted with shared access.
- The 1991 Act's purpose was to prevent courts from adjudicating such disputes; this verdict may set a precedent.

The Core Tension:

- Historical evidence vs. statutory freeze (1991 Act).
- Archaeological truth vs. legislative intent.
- Judicial clarity vs. communal harmony.

Conclusion

The Madhya Pradesh High Court declared the Bhojshala complex a Saraswati temple and struck down the 2003 Archaeological Survey of India order allowing Friday namaz, leading to unrestricted Hindu access. The ruling, involving the site also known as Kamal Maula Mosque, has reignited debate over the Places of Worship (Special Provisions) Act, 1991 and the balance between judicial decisions and communal harmony.

PAPER 2

Tackling Takedowns: Online Censorship and the Threat to Free Speech

Introduction

The Union government's use of Information Technology Act 2000—especially Sections 69A and 79(3)(b)—along with amended IT Rules, pressures platforms like Meta Platforms and X (formerly Twitter) into rapid takedowns, risking misuse of censorship powers. This opaque system distorts public discourse and raises serious concerns for democracy.

Main Body

Legal Framework: The IT Act and IT Rules, 2021

Key Provisions Being Weaponised:

- **Section 69A, IT Act, 2000:** Empowers government to block public access to any information online in the interest of sovereignty, security, public order, or decency. Requires procedural safeguards (review by a committee). In practice, safeguards are bypassed.
- **Section 79(3)(b) of IT Act:** Exempts intermediaries (social media platforms) from liability for third-party content if they comply with government takedown orders. Grants "safe harbour" protection to platforms that act on "actual knowledge" of illegally.
- **IT Rules, 2021 (Amendments):** Mandate three-hour takedown timelines for content flagged by government. Failure to comply leads to loss of safe harbour protection and potential criminal liability for employees. Create an environment of hyper-compliance.

Sahyog Portal:

- Opened to police officials around the country.
- Supercharges requests under Section 79(3)(b) as a censorial rubber stamp.
- Allows police to bypass judicial scrutiny.
- X (formerly Twitter) has resisted; faces pressure from Karnataka and Delhi High Courts.

Constitutional Violation: Article 19(1)(a) and the Shreya Singhal Precedent

Fundamental Right:

- Article 19(1)(a) guarantees freedom of speech and expression.
- Restrictions permitted only under Article 19(2): sovereignty, security, public order, decency, contempt of court, defamation, incitement to offence.

Shreya Singhal v. Union of India (2015) – Landmark Supreme Court Judgment:

- Struck down Section 66A of IT Act (which criminalized online speech).
- Laid down strict standard for takedowns under Section 79(3)(b): government must provide a court order or notification from competent authority (not merely police request).
- "Actual knowledge" of illegality must be based on a court order or statutory notification.

Violation of Precedent:

- Karnataka High Court has brushed aside binding Shreya Singhal precedent.
- Sahyog portal allows police requests without court order.
- Government has not dared to formalise these powers by passing a law in Parliament (using executive rules instead).

Three-Hour Takedown Timeline: Shifting the Burden

What the Rule Does:

- Requires platforms to remove flagged content within three hours.
- Failure leads to loss of safe harbour protection.
- Platform employees face personal criminal liability.

Why This Is Problematic:

- Three hours is insufficient for meaningful review.
- Platforms have no time to determine whether content is actually illegal.
- Platforms err on side of takedown (hyper-compliance) to avoid liability.
- Users lose speech without due process.

The Result:

- Platforms automatically process takedown notices without scrutiny.
- X resists but faces High Court pressure.

- Independent media outlets and critical commentators face wholesale deletions.

The Cost:

- Entire Opposition accounts deleted.
- Some deletions reversed, but at cost of revealing identity of those who flagged.
- Secrecy: government publishes no meaningful data on takedowns.

Misuse of AI-Generated Content as Cover

Government's Justification:

- Fighting AI-generated content (deepfakes, misinformation).

The Reality:

- Used as cover for censoring all speech.
- Visceral, hard-hitting expressions of independent voices are being silenced.
- The promise of the Internet as an alternative voice for everyday concerns is being destroyed.

The Slippery Slope:

- What starts as fighting deepfakes becomes routine censorship.
- No transparency on how AI flagging works.
- No accountability for erroneous takedowns.

The Bipartisan Problem: Opposition States Follow Suit

Not Just a Central Government Issue:

- Opposition-ruled States have quickly leapt to leverage Sahyog portal's powers.
- A future government run by today's Opposition will likely play by the same rules.

The Structural Problem:

- Infrastructure of censorship has been built brick by brick.
- No moral compunction on the path down which it leads.
- Once in place, censorship powers available to any future government.

The Precedent Danger:

- What the ruling party does today, the Opposition will do tomorrow.
- Constitutional rights should not depend on which party holds power.

Way Forward: Restoring Free Speech Online

For the Judiciary:

- Karnataka High Court must be corrected by Supreme Court (reinforce Shreya Singhal).
- Takedown orders must require court order or statutory notification—police request is insufficient.
- Three-hour takedown timeline must be struck down as unconstitutional.

For Parliament:

- Any censorship power must be enacted by statute, not executive rules.
- Formalise substantive safeguards: judicial oversight, notice to content creator, opportunity to be heard.
- Publish annual data on takedowns (number, grounds, authority, reversal rate).

For Platforms:

- Resist automatic compliance without judicial process.
- Challenge illegal takedown orders in court.
- Publish transparency reports on government requests (country-specific).

For Citizens and Civil Society:

- Challenge illegal takedowns in court.
- Demand transparency from government and platforms.
- Recognise that today's censorship powers will be used by tomorrow's government.

Conclusion

The misuse of Information Technology Act 2000 powers and amended IT Rules threatens free speech under Article 19(1)(a) of the Indian Constitution. Measures like rapid takedowns and platforms such as Sahyog bypass the safeguards set in Shreya Singhal v. Union of India, enabling opaque censorship. The Court must restore judicial oversight, and Parliament should enact a rights-based framework to protect digital freedoms.

Abortion Law: Supreme Court Places the Woman at the Centre

Introduction

The Supreme Court has urged Parliament to revisit the Medical Termination of Pregnancy Act, advocating removal of gestational limits for minor rape survivors. It places dignity and rights under Article 21 of the Indian Constitution at the core, pushing for a more compassionate, rights-based framework.

Main Body

The Legal Framework: Medical Termination of Pregnancy (MTP) Act, 1971 (Amended in 2021)

Key Provisions for Survivors of Sexual Violence:

- The MTP Act allows termination up to 24 weeks for specific categories, including survivors of rape.
- For a minor survivor, the 24-week limit applies uniformly.
- In cases of delayed reporting due to trauma, lack of awareness, or legal delays, the pregnancy may exceed this term.

Medical Opinion Requirements:

- For terminations beyond 20 weeks, the opinion of two registered medical practitioners is required.
- For terminations beyond 24 weeks (under special categories), a Medical Board must be constituted.

The Core Judicial Question:

- Is it constitutionally tenable to impose a strict gestational limit on a minor rape survivor?
- The primary consequence—continuation of a pregnancy caused by sexual violence—inflicts profound and lifelong harm on bodily integrity, mental health, and dignity.

The Supreme Court's Reasoning: Dignity, Autonomy, and the Constitution

Right to Bodily Integrity (Article 21):

- Forcing a minor rape survivor to continue a pregnancy violates her right to live with dignity.
- It constitutes a state-compelled violation of her physical and mental integrity.

Right to Equality (Article 14):

- There is no rational basis to treat a 23-week pregnancy differently from a 25-week pregnancy for a minor rape survivor.
- The trauma, not the gestational age, is the determining factor.

Right to Privacy (Article 21):

- Reproductive choices, including the decision to terminate a pregnancy, are an intrinsic facet of the right to privacy (*Justice K.S. Puttaswamy v. Union of India*).

Prioritising Dignity over Gestational Age:

- The current law's mechanical reliance on gestational limits fails the proportionality test.
- The harm from forced continuation of pregnancy far outweighs the state's interest in potential life, especially when pregnancy results from a crime against a child.

Removing Barriers to Access:

- The Court has previously emphasised that access to safe abortion is a component of healthcare (*X v. Principal Secretary, Health and Family Welfare Dept., 2022*).
- The 2022 judgment held that all women, including unmarried women, are entitled to abortion up to 24 weeks.
- The current push extends this logic further for minor survivors.

Key Issues and Challenges in Implementation

Distinction Between Therapeutic and Rights-Based Abortion:

- The MTP Act is framed around medical necessity (risk to physical or mental health).

- The Court is shifting the ground to a rights-based framework (dignity and autonomy).
- This creates a jurisprudential shift that Parliament must accommodate.

Judicial vs. Medical Authority:

- Current law relies on Medical Boards for terminations beyond 24 weeks, leading to delays and state-imposed gatekeeping.
- The Court implicitly questions whether a medical board's opinion should override a minor survivor's choice when her dignity is at stake.

Parliament's Reluctance:

- Abortion remains a politically sensitive issue.
- Parliament has consistently avoided fundamental revisions, using the 24-week limit as a political compromise.
- Judicial nudging may be necessary but faces legislative inertia.

Parental Consent for Minors:

- For a minor (under 18), the MTP Act requires the consent of a guardian.
- In cases of rape within the family or when the survivor is in conflict with her family, this requirement becomes a near-impossible barrier.
- The Court's direction must address this practical hurdle separately.

Way Forward: Recommendations for Legislative and Policy Reform

For Parliament (Recommended by the Court):

- **Remove gestational limits for minor rape survivors:** Explicitly provide that no gestational limit applies to abortions sought by minor survivors of sexual assault. The decision should be based on the survivor's will and medical safety, not a calendar.
- **Streamline the Medical Board requirement:** For such survivors, mandate a single, expedited medical opinion (within 7 days) rather than a multi-member board that causes delays.
- **Address parental consent:** Create a judicial or medical authority that can provide consent for a minor survivor's abortion in exceptional cases where involving the guardian is not in the child's best interest.

For the Judiciary:

- **Issue clear guidelines:** The Supreme Court should issue binding guidelines until Parliament amends the law, directing states to constitute fast-track Medical Boards.
- **Clarify mental health provisions:** The "risk of grave injury to mental health" under the MTP Act includes the trauma of forced continuation of pregnancy for a minor survivor, irrespective of gestational age.

For Healthcare Providers:

- **Training on rights-based approach:** Medical practitioners must be trained that the law is being interpreted to prioritise the survivor's dignity.
- **Recognise constitutional obligations:** Refusal without valid medical grounds can amount to denial of healthcare and violation of constitutional rights.

Conclusion

The Supreme Court's call to revisit the Medical Termination of Pregnancy Act underscores that dignity and bodily autonomy under Article 21 of the Indian Constitution cannot be constrained by rigid gestational limits. It highlights the tension between fundamental rights, social morality, and legislative delay, and calls for a more compassionate, survivor-centric legal framework.

AI in Education: A Human-Centred Approach to Transforming Learning

Introduction

As AI transforms economies and societies, integrating it into education has become essential. Reflecting this, India plans to introduce AI and Computational Thinking education from Class 3 onwards from 2026-27 under the National Education Policy 2020. Globally, UNESCO has led efforts through the Beijing Consensus on AI and

Education (2019), Guidance for Generative AI (2023), and AI Competency Frameworks (2024), promoting ethical, inclusive, and human-centred AI learning.

Main Body

UNESCO's Vision for AI in Education

Core Principles:

Rooted in a humanistic vision, UNESCO's frameworks emphasize that AI should enhance human capabilities and support social justice, rather than replace human interaction or widen digital divides.

The Beijing Consensus (2019):

- The first-ever global consensus document on AI and education.
- Recommends that governments plan AI education policies using a whole-government approach.
- Emphasizes that AI should empower teachers, not replace them.
- Promotes equitable access and ensures ethical use of educational data.

Guidance for Generative AI (2023):

- Released to help countries navigate the rapid emergence of tools like ChatGPT.
- Stresses the need for immediate actions: protecting data privacy, setting age limits for independent AI use, and validating the ethical and pedagogical appropriateness of AI tools before classroom use.

UNESCO's AI Competency Frameworks

Launched in 2024, these two landmark frameworks guide curriculum development and teacher training.

A. AI Competency Framework for Students (Four Core Competencies):

- **Human-centred mindset:** Understanding human agency, accountability, and social responsibility in the face of AI.
- **Ethics of AI:** Teaching responsible use, ethics-by-design, and safe practices regarding data and algorithms.
- **AI techniques and applications:** Foundational AI knowledge, including how machines learn and how to apply AI tools.
- **AI system design:** Fostering problem-solving, creativity, and design thinking to build or customize AI solutions.

B. AI Competency Framework for Teachers (Five Key Competency Areas):

- Human-centred mindset
- Ethics of AI
- AI foundations and applications
- AI pedagogy (leveraging AI for innovative teaching methods)
- AI for professional development

India's Policy Push: Integrating AI into the National Curriculum

India has taken significant steps to embed AI into its educational ecosystem, recognizing its potential to drive future economic growth.

Key Government Initiatives:

- **AI and CT Curriculum for Schools (2026-27):** The Ministry of Education will introduce a curriculum on AI and Computational Thinking from Class 3 onwards, aligned with NEP 2020 and the National Curriculum Framework for School Education (NCF-SE) 2023. The goal is to reinforce concepts of learning and expand towards the idea of "AI for Public Good".
- **Centre of Excellence (CoE) in AI for Education (Budget 2025-26):** With a dedicated outlay of ₹500 crore, the CoE aims to serve as a national hub for integrating AI into higher education. It will establish AI Learning Labs, collaborate with IITs and IIITs, and introduce AI Fellowships for students to drive research and peer learning.

Role of AI in Pedagogy:

- **Computational Thinking (CT):** The curriculum emphasizes CT techniques—decomposition, pattern recognition, abstraction, and algorithms—to develop problem-solving skills from a young age.
- **Personalized and Accessible Learning:** AI enables learning pathways tailored to individual strengths. For instance, UNICEF's Accessible Digital Textbooks initiative uses AI to create inclusive resources for students with disabilities.
- **Teacher Empowerment:** Platforms like NISHTHA will be used for large-scale teacher training to upskill educators on the new AI curriculum.

Key Challenges in Implementation

Despite the policy push, the adoption of AI in education faces significant structural and pedagogical hurdles.

- **The Risk of "Dis-education":** A primary concern is that instant AI-generated answers could disincentivize the learning process itself, potentially eroding critical thinking and inter-generational knowledge transfer if not managed properly.
- **Infrastructure Deficit:** A large proportion of schools lack basic amenities such as reliable electricity, computers, and internet connectivity. Approximately 9% of schools in India have only one teacher, making the introduction of tech-heavy curricula difficult.
- **Teacher Upskilling:** Over one crore educators need reskilling, many of whom have varying degrees of comfort with technology. Training must address both technical know-how and pedagogical integration.
- **Localization and Data Privacy:** Most advanced AI models are not available in local languages. Furthermore, unregulated use of AI tools raises concerns about student data privacy and emotional dependency.

Ethical Considerations and Way Forward

For India to successfully leverage AI, a balanced approach is needed—one that embraces innovation while safeguarding fundamental rights.

- **Human Agency vs. Automation:** While AI can streamline research and answer evaluation, it is a poor substitute for the independent thinking and originality required for high-stakes exams. AI should act as a study companion, not a shortcut.
- **Ethical Guardrails:** Following UNESCO's recommendations, India must mandate the protection of data privacy, set age limits for independent AI interactions, and establish auditing mechanisms to prevent algorithmic bias.
- **Adopting an "Unplugged" Approach:** In regions with limited infrastructure, CT logic can be taught using physical objects (algorithms without computers). AI can also be woven into mathematics and science curricula (interdisciplinary integration), as seen in successful models like Uruguay's Ceibal program.
- **Focus on Entrepreneurship:** For higher classes (9-12), the focus should shift from basic AI literacy to workforce readiness and entrepreneurship, encouraging students to build AI-driven solutions for local problems.

Conclusion

AI integration in education marks a major shift in pedagogy and skill development. India’s plan to introduce AI and Computational Thinking from Class 3 onwards under the National Education Policy 2020 reflects its vision for Viksit Bharat 2047. However, successful implementation will require bridging infrastructure gaps, training teachers, and ensuring ethical safeguards, in line with UNESCO’s human-centred AI framework, to promote inclusive and equitable learning.

How BRICS Can Provide Mortar for a New World Order

Introduction

India’s foreign policy stands at a strategic crossroads: it is both a key Quad partner aligned with the West and the 2026 BRICS president representing the Global South. Rising tensions—seen in trade disputes, missed joint statements, and differences over global financial reforms—highlight the limits of simple “multi-alignment.” The

real challenge for India is whether it can balance these competing roles while emerging as a credible leader of a divided Global South.

Main Body

The Genesis of BRICS: From Acronym to Institution

The Conceptual Birth (2001):

- Jim O'Neill of Goldman Sachs published 'Building Better Global Economic BRICs'.
- Argued that G7 structure failed to account for tectonic shifts in global productivity.
- In purchasing power parity terms, Brazil, Russia, India, and China accounted for almost a quarter of global GDP.

O'Neill's Prediction on India:

- He predicted India might be the "least eager" to join a formal club.
- New Delhi might view collective obligations as an unwelcome constraint on its domestic policy or independent advice.

The Political Birth (2006):

- September 2006 on the sidelines of UN General Assembly.
- India represented by Defence Minister Pranab Mukherjee (standing in for PM Manmohan Singh).
- The joint statement asserted that "economic weight must equal political power".

India's Nuanced Approach: Complementary, Not Confrontational

The Middle Path:

- While Brazil and China wanted a counter-hegemonic force, India stressed BRICS was "complementary" to existing structures.
- Not envisaged as a replacement for Western-led institutions.

The Shift After 2008 Financial Crisis:

- The 'Great Recession' exposed the fragility of Western financial dominance.
- At the first formal summit in Yekaterinburg (June 2009), PM Manmohan Singh advocated a multipolar vision.
- He remarked that the crisis had shown existing governance structures needed reform to ensure the developing world's voice was heard.

BRICS Today: Expansion and Institutional Heft

Membership Expansion:

- Four nations (Brazil, Russia, India, China) became five (South Africa added in 2010).
- 2024: Massive expansion added Egypt, UAE, Ethiopia, Iran, and Saudi Arabia.
- 2025: Indonesia added as full member; partner country status for 10 others (Malaysia, Nigeria, Thailand, Vietnam, etc.).
- BRICS now controls a staggering share of world's energy resources and maritime trade routes.

Key Institutions:

- **New Development Bank (NDB):** Approved infrastructure projects worth about $43 billion; provides alternative to IMF's often-stringent conditions.
- **Contingent Reserve Arrangement (CRA):** $100 billion safety net for balance-of-payments crises.
- **BRICS Pay (2026):** Facilitates trade in local currencies, bypassing US dollar and SWIFT network.
- Other initiatives: Remote-sensing satellite data sharing, vaccine R&D centre, BRICS Startup Forum.

The Kazan Declaration (2024):

- Bloc committed itself to "a just and democratic world order".
- No longer positioned as an add-on to G7.

US Resistance: Trump's Economic Warfare

Escalating Threats:

- July 2025: Trump dismissed BRICS as "fading out".
- October 2025: Shifted to explicit economic warfare, declaring BRICS an "attack on the dollar".
- Threatened 100% tariffs on any nation moving away from the dollar.

Limitations of US Approach:

- US Supreme Court intervened to limit executive overreach on tariffs.
- Attempt to isolate Iran backfired (Iran demonstrated economic and military resilience).
- American public showed little appetite for another conflict.

India's BRICS Presidency (2026): Challenges and Fissures

Low-Key Presidency:

- Unlike the over ₹4,000 crore spent on the G20 carnival (2023), the BRICS presidency has been low-key.
- Follows a strong Brazilian presidency.

Rio de Janeiro Declaration (July 2025):

- Unanimously condemned US and Israeli attack on Iran.
- Warned that unilateral actions dismantle the foundations of international law.

Current Challenges:

- Deputy foreign ministers' meeting on West Asia and North Africa (April 23-24) ended without a joint statement.
- Iran and UAE reportedly at loggerheads.
- India tried to soften language (removing references to East Jerusalem as Palestinian capital, using "occupying power" for Israel).
- Iran wanted a stronger stance.

The Risk:

- If differences are not bridged at the foreign ministers' meeting, the September summit may prove difficult.
- India may have to choose a direction: remain with the South (as tradition) or align more closely with the West.
- Otherwise, things can fall between two stools.

The Way Forward: India's Strategic Choices

The Dual Identity Test:

- India cannot indefinitely straddle both camps without facing consequences.
- As BRICS president, India must champion Global South causes (reform of global financial architecture, de-dollarisation, sovereign decision-making).
- As Quad partner, India must maintain strategic ties with the US, Japan, and Australia.

Possible Paths:

- **Continued multi-alignment:** Manage frictions issue by issue; risk being trusted by neither side.
- **Lean towards the South:** Prioritise BRICS and Global South leadership; accept US tariff and diplomatic consequences.
- **Lean towards the West:** Prioritise Quad and Western alliance; risk losing credibility as Global South champion.

The Stakes:

- BRICS now represents a significant share of global GDP, population, energy resources, and trade routes.
- The bloc's 2024 Kazan Declaration committed to "a just and democratic world order".
- India's presidency will determine whether BRICS becomes a cohesive counterweight to G7 or remains a fractured coalition.

Conclusion

BRICS has transformed into a major voice of the Global South, expanding its membership and strengthening institutions like the New Development Bank and BRICS Pay. Yet India's 2026 presidency faces challenges, including internal divisions over West Asia and balancing BRICS commitments with its Quad partnership. India now confronts a strategic choice: deepen leadership of the Global South or move closer to the West, as its handling of upcoming BRICS meetings will shape both its global role and BRICS' future relevance.

PAPER 3

Great Nicobar Project: Strategic Imperative or Environmental Crime?

Introduction

The ₹92,000-crore Great Nicobar project—featuring a transshipment port, airport, township, and power units—has triggered sharp debate. Supporters see it as vital for economic growth and strategic leverage near the Malacca Strait, while critics call it environmentally and socially damaging. Despite NGT clearance in Feb 2026, concerns persist.

Main Body

Project Components and Scale

The Four Key Components:

- **International Container Transshipment Terminal (ICTT)** at Galathea Bay – to capture transshipment cargo currently handled by Colombo, Singapore, and Port Klang.
- **Greenfield International Airport** – for civilian and military use, enhancing connectivity and rapid deployment.
- **Township** – to support the port and airport operations, including residential and commercial infrastructure.
- **Power Plant** – gas or solar-based to meet the energy demands of the new infrastructure.

Investment and Scale:

- Total project cost: Rs 92,000 crore.
- Location: Great Nicobar Island, the southernmost island of the Andaman and Nicobar archipelago.
- The project is being implemented by the Andaman and Nicobar Islands Integrated Development Corporation (ANIIDCO).

Strategic Importance: Monitoring the Malacca Strait

The Malacca Strait Chokepoint:

- The Strait of Malacca is one of the world's busiest shipping lanes.
- Approximately 80% of China's oil imports and a significant portion of its cargo pass through this narrow waterway.
- China's increasing naval presence in the Indian Ocean Region (IOR) makes monitoring this chokepoint critical.

Proximity to the Strait:

- Great Nicobar Island is located just 150 km from the Strait of Malacca.
- The project will provide India with the capability to position itself near this strategic waterway.

Surveillance and Domain Awareness:

- Former IAF chief Air Chief Marshal R.K.S. Bhadauria (retd.) stated: "Our overall domain awareness, both in the air and maritime spheres, will receive a significant boost."
- The project will enhance India's ability to monitor maritime trade and military movements in the region.

Countering China's String of Pearls:

- China's 'String of Pearls' strategy involves developing ports across the Indian Ocean: Gwadar (Pakistan), Hambantota (Sri Lanka), Kyaukpyu (Myanmar), and others.
- A strong strategic and economic hub at Campbell Bay and Galathea Bay would counter this encirclement.
- Defence veterans warn that opposition to the project benefits China, which is "wary of such a project at Great Nicobar Island."

Environmental and Tribal Concerns

Environmental Impact:

- The project requires diversion of forest land on an ecologically sensitive island.
- Great Nicobar is home to unique biodiversity, including the Nicobar megapode, saltwater crocodile, and giant robber crab.
- Opposition argues that a transshipment terminal and airport will cause irreversible damage to fragile island ecosystems.

Tribal Communities:

- The island is home to the Shompen tribe (particularly vulnerable) and the Great Nicobarese.
- The government claims "no proposed displacement of indigenous communities" as part of the project.
- Critics, including Rahul Gandhi, allege that the project threatens the natural and tribal heritage of the country.

National Green Tribunal (NGT) Clearance (February 16, 2026):

- The NGT cleared the project, noting "considering the strategic importance of it and other relevant considerations, we do not find any good ground to interfere."
- The Tribunal directed authorities "to ensure full and strict compliance of EC (environment clearance) conditions."
- Applications challenging the environment clearance were disposed of.

Government's Position on Environment:

- The project involves "limited forest diversion" and "compensatory afforestation."
- Air Vice Marshal P.K. Srivastava (retd.) stated: "Whenever the govt of India undertakes a project, it consults a wide range of expert advisors... Such projects are not designed sitting in Delhi alone—teams visit the site and assess all aspects."

Parallels with the Strait of Hormuz Crisis

Learning from West Asia:

- The ongoing conflict in West Asia and the disruption at the Strait of Hormuz have demonstrated how tactical choke points can be exploited.
- Major General G.S. Rawat (retd.) noted: "Recent global developments have shown how tactical choke points can be exploited, as seen around the Strait of Hormuz."

The Malacca Dilemma:

- China's ability to block the Strait of Malacca would cripple its own energy imports.
- However, India's inability to monitor or respond to developments in the strait is a strategic vulnerability.
- The Great Nicobar project addresses this vulnerability by providing a surveillance and response platform.

Economic Rationale: Transshipment Hub

Capturing Transshipment Cargo:

- Currently, a significant portion of India's transshipment cargo is handled at Colombo (Sri Lanka), Singapore, and Port Klang (Malaysia).

- The ICTT at Galathea Bay aims to capture this traffic, saving foreign exchange and generating revenue.

Integration with Act East Policy:

- The project is part of India's broader Act East Policy and its efforts to develop the Andaman and Nicobar Islands as a strategic and economic hub.
- It complements the development of other island infrastructure, including the naval base at Campbell Bay.

Way Forward: Balancing Security and Ecology

For the Government:

- Ensure full compliance with NGT conditions and environment clearance terms.
- Implement compensatory afforestation rigorously and monitor outcomes.
- Engage with tribal communities through the Tribal Council and ensure no forced displacement.
- Maintain transparency on project costs and environmental mitigation measures.

For the Opposition:

- Distinguish between legitimate environmental concerns and blanket opposition that may benefit strategic rivals.
- Propose alternatives or mitigation measures rather than calling for project cancellation.

For Strategic Communication:

- India must articulate the strategic imperative of the project more clearly to domestic and international audiences.
- The comparison with the Strait of Hormuz crisis (ongoing West Asia war) is a powerful tool to explain the importance of monitoring choke points.

Long-Term Vision:

- The Andaman and Nicobar Islands have been underdeveloped for decades due to environmental and tribal sensitivities.
- A balance must be struck: strategic infrastructure with the highest environmental and social safeguards.

Conclusion

The ₹92,000-crore Great Nicobar project is strategically vital near the Malacca Strait, seen as a counter to China's presence in the Indian Ocean. While cleared by the NGT, it faces criticism over environmental and tribal impacts. India must balance security needs with ecological and indigenous safeguards.

Steady Fall of the Rupee: Challenges on Current and Capital Accounts

Introduction

The rupee, around ₹95.36/$, has fallen ~5.6% this year, continuing last year's slide, driven by twin pressures—high crude prices (Brent ~$113/bbl) widening the current account deficit and FPI outflows (~$21.2 bn) weakening capital flows—requiring careful macroeconomic management.

Main Body

The Scale of the Rupee's Fall

Recent Depreciation:

- The rupee hovered around 95.36 per dollar during early trading on the day of the article.
- Since the beginning of the year, the currency has fallen by approximately 5.64%.
- Last year (2025), the rupee fell by roughly 5% against the dollar.

Drivers of the Fall:

- The West Asia conflict (ongoing Iran war) has rattled investor sentiment and disrupted energy markets.
- Fresh attacks in the region continue to weigh on the currency.
- However, the pressure predates the war—the rupee was already weakening in 2025.

Implications:

- A weaker rupee makes imports more expensive (especially crude oil, fertilisers, electronics, and capital goods).
- It benefits exporters (IT services, textiles, pharmaceuticals, and remittances) by making their goods cheaper in dollar terms.
- The net effect depends on the balance between import dependence and export competitiveness.

Current Account Pressure: Elevated Crude Oil Prices

Crude Oil Price Trends:

- Brent crude is currently around $113 per barrel.
- The price of the Indian crude oil basket averaged $114.48 per barrel in April 2026 (data from the Petroleum Planning and Analysis Cell).

Impact on Current Account Deficit (CAD):

- India imports nearly 85-90% of its crude oil requirements.
- Higher oil prices directly widen the trade deficit (imports increase in value).
- The CAD is projected to widen to around 2% of GDP in 2026-27.

Historical Comparison (Taper Tantrum Period):

- During the 2012-13 taper tantrum, India's CAD had widened to 4.8% of GDP.
- The current projected CAD of 2% is considerably lower than that peak.
- However, financing even a 2% CAD is challenging in the current environment (capital outflows, global uncertainty).

Other Current Account Pressures:

- Remittances from the Gulf may decline due to the West Asia war (Indians employed there face income uncertainty).
- Exports to the region (16.4% of India's merchandise exports in 2024-25) are also affected.

Capital Account Pressure: FPI Outflows

FPI Outflow Data:

- So far in the 2026 calendar year, foreign portfolio investors have taken out approximately $21.2 billion from Indian stock markets.
- This follows outflows of $18.9 billion in 2025 (the previous year).

Why FPIs Are Exiting:

- Global uncertainty due to the West Asia war and rising geopolitical risks.
- Higher interest rates in developed countries (US bonds offer attractive risk-free returns).
- Currency risk (depreciating rupee reduces returns for foreign investors when converted back to dollars).

Implications of Outflows:

- The stock market experiences downward pressure (lower demand for equities).
- The rupee depreciates further (higher demand for dollars to repatriate investments).
- The central bank's ability to defend the rupee is constrained (it must use its foreign exchange reserves).

RBI's Response and Constraints

Central Bank Actions (So Far):

- The RBI has been taking steps to ease the stress on the rupee (interventions in the foreign exchange market).
- Its short dollar book has swelled (meaning it has sold dollars from reserves to support the rupee).

Historical Precedent (Taper Tantrum, 2013):

- During the taper tantrum, the RBI facilitated capital inflows through various instruments.

- For example, funds were mobilised through Foreign Currency Non-Repatriable (FCNR-B) deposits, which brought in dollars from NRIs.

Current Constraints:

- Using reserves to defend the rupee is finite (India's foreign exchange reserves are substantial but not unlimited).
- Raising interest rates to attract FPI inflows would hurt domestic growth (already under pressure).
- Imposing capital controls would signal weakness and deter future investment.

Domestic Spillovers: Inflation and Growth

Retail Fuel Prices Unadjusted (So Far):

- The government and oil marketing companies have not fully passed on higher global crude prices to retail fuel prices (petrol, diesel, domestic LPG).
- However, there are limits to the burden that can be borne by oil companies (under-recoveries) and the government (excise duty cuts).

Commercial LPG Price Hiked:

- A few days ago, the price of commercial LPG cylinders was raised by Rs 993.
- This will translate to higher input costs for restaurants, hotels, commercial kitchens, etc., feeding price pressures across the economy.

Retail Inflation (March 2026):

- Retail inflation edged up to 3.4% in March (from 3.2% in February).
- Higher fuel prices will push up inflation further.

Growth-Inflation Dynamics:

- A prolonged conflict will impact economic momentum (lower exports, higher input costs, reduced investment).
- The RBI faces a stagflation-like trade-off: raising rates to combat inflation will hurt growth; keeping rates low will allow inflation to rise.

Way Forward: Deft and Delicate Management

Short-Term Measures (Crisis Management):

- **Selective intervention:** Use reserves to curb excessive volatility, not to defend a specific exchange rate level.
- **Facilitate remittances and NRI deposits:** Launch special deposit schemes (like FCNR-B) to attract dollar inflows.
- **Swap arrangements:** Utilize currency swap lines with other central banks (Japan, UAE, etc.) to access dollars.

Medium-Term Measures (Reducing Vulnerability):

- **Diversify crude oil imports:** Reduce dependence on West Asia (increase sourcing from Russia, South America, US).
- **Build strategic petroleum reserves:** Expand cavern-based storage (currently only 1.5 days of demand) to buffer supply shocks.
- **Rare earth extraction and renewable energy:** Reduce import dependence for energy and critical minerals over the long term.

Fiscal Space:

- The government has limited room to cut excise duties on fuel (already reduced during election periods).
- Higher subsidy bills for fertilisers and LPG will strain the fiscal deficit.

RBI's Balancing Act:

- The central bank must support the rupee without sacrificing growth or depleting reserves entirely.
- Communication is key: transparent messaging to prevent panic and anchor expectations.

Conclusion

The rupee has weakened ~5.6% this year (near ₹95/$), continuing 2025's slide. Pressure comes from both sides: a widening current account deficit due to high crude (Brent ~$113/bbl) and heavy capital outflows (~$21.2 bn this year after $18.9 bn in 2025).

Rising fuel costs are adding to inflation, while the RBI's interventions strain reserves.

India faces a tightrope—contain inflation, support growth, and stabilise the rupee with limited policy space.

Operation Sindoor, One Year Later: Underground Infra to Air Defence

Introduction

One year after Operation Sindoor (7th May), India has intensified efforts to build underground military infrastructure and strengthen air defence systems. Lessons from recent conflicts have also pushed reforms in troop deployment, drone warfare, and counter-drone capabilities.

Main Body

Underground Infrastructure: Command Centres and Bunkers

Major Focus Area:

- Large-scale construction of underground infrastructure is a major focus of the military.
- This includes passive measures such as dispersal of assets and formations, increased concealment and camouflage, and force preservation efforts.

Underground Command and Control Centres:

- Work is underway starting with the Army's Command and Corps Headquarters level, later extending to divisional and lower levels.
- These centres will be equipped with **C4I2SR (Command, Control, Communications, Computers, Intelligence, Information, Surveillance and Reconnaissance)** .
- C4I2SR is an integrated system that enables military commanders to achieve situational awareness and coordination across all domains (air, land, sea, space, cyber).
- It allows secure sharing of information among all services on a secure network.

Other Underground Infrastructure:

- Limited medical facilities (hardened against attacks).
- Living bunkers designed for long-term habitation during wars and natural disasters.
- Ammunition and FOL (Fuel, Oil, Lubricants) storage facilities in forward locations along borders and in depth areas.
- Rations storage facilities.

3D-Printed Bunkers:

- Construction of 3D-printed bunkers will also form part of the country's underground infrastructure.
- Advantages: quick to make, resilient, easily relocatable.

Focus on Western Borders:

- Additional underground infrastructure is being created along the western borders (Pakistan front).
- Aim: to make daily routine operations resilient to wars or disasters.
- A key element is the hardened bunker.

Dual-Use Infrastructure: Airfields and Highways

Key Priority:

- Creation of dual-use infrastructure such as airfields, highways, and roads connecting strategic areas closer to borders.

Emergency Landing Field Drill (April 2026):

- The Indian Air Force conducted an emergency landing field activation drill on the Purvanchal Expressway in Sultanpur, Uttar Pradesh.
- Fighters including Su-30MKI, Jaguar, Mirage 2000, and C295 transport aircraft participated.
- Demonstrates the use of highways as emergency runways during conflicts.

Civil Use of Airfields:

- Several airfields across the country, including those closer to borders, have been opened for civil use.
- Enhances regional connectivity while maintaining military readiness.

Strategic Rationale:

- Dual-use infrastructure ensures that military assets can be rapidly deployed to forward areas.
- Highways and expressways can serve as备用 runways when main airfields are damaged or saturated.

Air Defence: Lessons from Operation Sindoor and Global Conflicts

Key Lessons:

- Pakistan sent swarms of low-cost drones into Indian territory during Operation Sindoor, camouflaging armed and surveillance drones.
- The Iran war (ongoing West Asia conflict) saw Iran launch drones and missiles towards Israel and US bases.
- Legacy air defence systems (such as L/70 guns) were used to shoot down drones, but there is a need for dedicated counter-UAS systems.

Sudarshan Chakra Mission:

- A comprehensive air defence shield across the country.
- A panel under DRDO recently submitted a pre-feasibility report on the project.

Akashteer (Army's Air Defence System):

- An indigenous, automated Air Defence Control and Reporting System.
- Vehicle-mounted and highly mobile, ideal for deployment in dangerous and active war zones.
- Can be easily integrated with IACCS (Indian Air Force) and TRIGUN (Indian Navy), creating a clear real-time picture of the battlefield.

IACCS (Integrated Air Command and Control System - IAF):

- An automated command and control system that integrates data from all air defence assets.
- Detects, identifies, intercepts, and destroys hostile intruders.

Offensive Air Defence:

- Former Vice Chief of Air Staff Air Marshal Narmdeshwar Tiwari (retd) explained: the idea is not only to deny the enemy from hitting Indian targets, but also to deny them from using their own airspace to launch attacks.
- S-400 systems, Project Kusha (indigenous long-range surface-to-air missile system), and MRSAMs can act as offensive air defence systems based on deployment.

Counter-UAS Systems and Sensor Upgrades

Procurement Priority:

- Large-scale procurement of counter-UAS systems (many will be integrated with legacy weapon systems).
- These systems are cheaper to operate, accurate, and help optimise ammunition use.

Integration with Legacy Systems:

- Legacy air defence systems (L/70 guns) used during Operation Sindoor will be further integrated with new anti-drone systems.

Detection is Key:

- Air Marshal Tiwari: "Getting more advanced and specialised sensors and radars that pick up information about incoming threats, covering everything from ballistic missiles to small drones, will be the way forward."

Prioritisation of Assets:

- It may not be feasible to defend every piece of land against all weapon systems.
- Deployment of air defence assets should focus on protecting the most important targets (command centres, nuclear assets, major cities, economic hubs).

Future Acquisitions and Indigenous Development

S-400 Systems:

- India has been planning to procure more S-400 surface-to-air missile systems from Russia (additional batteries beyond the five already delivered).

Project Kusha (DRDO):

- Indigenous long-range surface-to-air missile system.
- Designed to protect strategic military and civilian assets and infrastructure from a range of aerial threats (ballistic missiles, aircraft, drones).

MRSAMs (Medium-Range Surface-to-Air Missiles):

- Already in service with all three services.
- Can be deployed offensively based on positioning.

Counter-UAS Systems:

- Continued procurement and integration with legacy systems.
- Focus on cost-effectiveness (cheap drones require cheap countermeasures).

Conclusion

One year after Operation Sindoor, India has focused on underground military infrastructure and integrated air defence systems. Rising drone threats also highlight the need for stronger counter-UAS capabilities, more S-400 systems, and faster progress on Project Kusha. The key lesson is that passive and active defence must develop together.

Understanding Inequality in India's Growth Story: What 'Low' Inequality Conceals

Introduction

Recent policy changes, including the new Labour Codes and the replacement of MGNREGA with the Viksit Bharat Rozgar Mission, have raised concerns over protections for informal and rural workers.

Although official data suggests inequality has declined since the early 2010s, doubts over data comparability and reliability remain. The apparent 'low' inequality may hide widening gaps in wealth, consumption, and access to essential services.

Main Body

The Official Narrative: Declining Inequality?

What Official Data Suggests:

- Inequality measures (such as the Gini coefficient) have reportedly improved since the early 2010s.
- Rapid economic growth, financial inclusion (Jan Dhan accounts), and direct benefit transfers (DBT) are cited as drivers of reduced disparities.

The Counter-Narrative:

- Data comparability across different survey rounds is a serious issue (changes in methodology, sample design, and recall periods).
- Consumption surveys may undercount top-tier spending, leading to an underestimation of true inequality.
- Wealth inequality (ownership of assets, land, financial instruments) is often not captured in standard consumption-based inequality measures.

What 'Low' Inequality Conceals: Methodological and Structural Gaps

A. Data Comparability Problems:

- The National Sample Survey Office (NSSO) has changed its consumption survey methodology multiple times, making inter-temporal comparison difficult.
- The shift from 'recall period' (30-day vs. 365-day) affects reported consumption patterns, especially for non-food items.

B. The Shift in Policy Framework: Labour Codes (November 2025):

- The four Labour Codes raised the threshold for prior government permission for layoffs from 100 workers to 300, exempting most factories from scrutiny.
- The statutory definition of a 'factory' was increased from 10 workers (with power) to 20 workers, excluding small manufacturing units from safety and social security coverage.
- These changes may have increased formal sector flexibility but at the potential cost of reduced worker bargaining power and social protection.

C. Replacement of MGNREGA:

- The MGNREGA (2005) provided a legal entitlement to 100 days of wage employment per rural household, acting as an automatic stabilizer during economic distress.
- Its replacement with the Viksit Bharat-Guarantee for Rozgar and Ajeevika Mission (Gramin) Bill, 2025, raises concerns about whether the new scheme will retain the same legal enforceability and demand-driven nature.

D. The Informal and Rural Workforce:

- A vast majority of India's workforce remains in the informal sector, not covered by formal social security.
- Rural wages have stagnated or grown slowly in real terms, while input costs (fertilisers, fuel) have risen due to global supply shocks.
- The withdrawal of the state from direct employment guarantee programs may increase distress migration and depress rural consumption.

E. Wealth vs. Consumption Inequality:

- Consumption inequality may appear lower because the rich consume a smaller proportion of their income (higher savings).
- Wealth inequality (stock of assets) is often much higher and more concentrated than consumption inequality (flow of spending).
- India's top 1% own a disproportionate share of national wealth—a fact that 'low' consumption inequality does not capture.

Why Inequality Matters: Economic and Social Consequences

Economic Consequences:

- High inequality reduces aggregate demand (the rich save more, the poor spend more).
- Inequality limits human capital formation (poor households cannot invest in education and health).
- Inequality can lead to financial instability (excessive credit to maintain consumption at the bottom).

Social and Political Consequences:

- Inequality fuels social unrest, political polarization, and loss of faith in democratic institutions.
- Caste-based and regional inequalities intersect with economic disparities, creating compounding disadvantages.
- Perceptions of inequality (even if official data shows improvement) can undermine social cohesion.

Way Forward: Measuring and Addressing Inequality

Improving Measurement:

- Restore comparability of NSSO consumption surveys over time (standardize recall periods and methodologies).
- Publish regular wealth inequality estimates using tax data, household surveys, and national accounts.
- Use multi-dimensional poverty indices (MPI) that capture health, education, and living standards alongside income/consumption.

Policy Responses:

- Strengthen the social security coverage of informal workers under the Labour Codes (not just formal sector).
- Ensure the new rural employment guarantee scheme (Viksit Bharat mission) retains the demand-driven, legal entitlement character of MGNREGA.
- Progressively tax high incomes and wealth to finance investments in public goods (education, health, infrastructure).
- Publish credible data on inequality at regular intervals to enable evidence-based policy debates.

Conclusion

Official data suggests inequality in India has declined since the early 2010s, but this may mask deeper disparities. Changes in survey methods limit comparison over time, while new Labour Codes and the replacement of MGNREGA raise concerns over worker protections and rural employment security.
Since consumption surveys fail to capture wealth concentration, actual inequality is likely far higher. Policymakers must ensure comparable data, publish regular wealth estimates, and address unequal access to opportunities and services—not just consumption levels.

Building Hazards: Preventing and Fighting Fires in Indian Cities

Introduction

Repeated fire tragedies in Indian cities reveal systemic failures in fire safety and emergency response. The Shahdara and Palam fires exposed poor evacuation planning, inaccessible buildings, and inadequate access for rescue services.
While authorities focus on advanced technologies, basic preventive and safety measures remain neglected. India must strengthen both fire prevention and firefighting preparedness.

Main Body

Recent Fire Accidents: Patterns and Causes

- Recent fires in Shahdara and Palam killed nine people each, exposing poor fire safety and delayed emergency response.
- Blocked exits, inaccessible terraces, faulty lifts, and metallic grills severely hampered evacuation and rescue operations.
- Narrow access and structural obstructions, as seen in Dwarka, prevented fire engines from reaching affected buildings quickly.

Electrical Problems: The Overlooked Root Cause

Why Fires Start:

- Overloading of air-conditioners and other high-load appliances during summer.
- Wires not designed for such loads burn due to heat.

Circuit Breaker Failure:

- Breakers that should trip as protection often do not function.
- The hierarchy of loads and circuit breakers is not observed.
- Residences are packed with equipment beyond what the system can safely carry.
- Many households bypass breakers or use poor-quality components to save cost.

Safety vs. Convenience:

- The intent is to keep equipment running under all conditions.

- Tripping of overloaded equipment is a necessary safety feature, but often disabled.

Building Design and Access Problems

Electronic Locks (Shahdara Case):

- Locks could not be opened during the fire.
- Security features must be fail-safe (open when power fails).

Metallic Grills:

- Grills on balconies prevented rescue access; had to be cut.
- Balconies that could be escape routes became death traps.

Terrace Access:

- Terrace was not easily accessible from inside.
- Rooftops should be designated safe assembly points.

Access for Fire Vehicles:

- Palam: hydraulic lifts malfunctioned.
- Dwarka: name board blocked fire engine entry.
- Narrow gates, unauthorised parking, and non-standard entry points are common.

Regulatory Framework and Implementation Gaps

National Building Code (NBC):

- NBC provides fire safety guidelines (escape routes, suppression systems, access).
- But NBC is recommendatory, not mandatory for all states.
- Many states have not fully adopted NBC provisions.

Fire No Objection Certificate (NOC):

- Buildings must obtain fire NOC at construction and renew periodically.
- Many buildings operate without valid NOC.
- Renewal is often ignored after occupancy.

Electrical Safety:

- CEA regulations govern wiring and circuit protection.
- Enforcement at household level is non-existent.
- Poor-quality wires, switches, and breakers are widespread.

Penalties:

- Current penalties are low and not enforced.
- Criminal liability for fire deaths requires proving negligence beyond doubt—rarely achieved.

Technological Solutions: Drones, Robots, and Basics

What Authorities Talk About:

- Drones for surveillance, robots for hazardous zones.

The Ground Reality:

- Drones cannot rescue trapped people; they only survey.
- Robots are expensive and not available in most fire departments.
- Without basic hydrants, access roads, and functioning equipment, technology is a distraction.

Where Technology Can Help (If Basics Are in Place):

- AI-based fire detection (smoke and heat sensors with automatic alarms).
- Smart meters with overload alerts.
- GIS mapping of hydrants and access routes for quicker response.

Way Forward: From Response to Prevention

Immediate Measures:

- Audit all high-rise and mixed-use buildings for fire safety.
- Enforce periodic renewal of fire NOC (annually for commercial, 3-5 years for residential).

- Ensure electronic locks are fail-safe (open on power failure).
- Ensure terrace access is unobstructed and clearly marked.

Electrical Safety:

- Mandate periodic electrical audits (every 5 years for residential, annually for commercial).
- Ban poor-quality wires, switches, and breakers (BIS certification mandatory).
- Ensure hierarchy of loads and circuit breakers is observed.
- Public awareness campaigns on overloading ACs.

Building Design:

- Metallic grills must have quick-release mechanisms for rescue access.
- Mixed-use buildings must comply with commercial fire safety norms.

Fire Service Modernisation:

- Upgrade equipment (hydraulic lifts, aerial ladder platforms).
- Improve response times with clear building address systems.
- Establish fire stations based on risk assessment.

Legal Reforms:

- Make NBC mandatory for all states.
- Introduce strict criminal liability for owners, architects, and developers for fire deaths due to safety violations.
- Link fire NOCs to property registration and trade license renewal.

Public Awareness:

- Campaigns on electrical safety (overloading, circuit breakers, quality of wires).
- Evacuation drills in residential societies.
- Simple instructions: never block terrace access, keep grills releasable, know where the main electrical switch is.

Conclusion

The Shahdara, Palam, and Dwarka fires highlight recurring failures in urban fire safety—blocked exits, inaccessible rescue routes, faulty infrastructure, and delayed emergency response. Electrical overloading and poor safety compliance remain major causes. India needs strict enforcement of fire norms, mandatory NBC adoption, regular electrical audits, and greater public awareness, as prevention is far more effective than post-disaster response.

National Mission for Sustainable Agriculture: Building Climate-Resilient Farming in India

Introduction

Rainfed agriculture covers nearly 60% of India's net sown area and contributes about 40% of food production, making sustainable resource management and climate-resilient farming essential. To address this, the Government launched the National Mission for Sustainable Agriculture (NMSA) in 2014-15 under the National Action Plan on Climate Change.

Since 2018-19, it has functioned under Green Revolution-Krishonnati Yojana and from 2022-23 under Pradhan Mantri Rashtriya Krishi Vikas Yojana, promoting climate-resilient agriculture through Rainfed Area Development (RAD), Per Drop More Crop (PDMC), and Soil Health Management (SHM).

Main Body

Rainfed Area Development (RAD): Integrated Farming Systems

Objective and Approach:

- Promotes sustainable agricultural production through agro-climatic zone-specific Integrated Farming System (IFS) models developed by ICAR.
- Integrates multi-cropping, rotational, inter- and mixed-cropping systems with allied activities (horticulture, livestock, fisheries) to enhance farmers' income and resilience.

Achievements:

- From 2014-15 to date, ₹2,119.84 crore released under RAD.
- 8.50 lakh hectares covered; 14.35 lakh farmers benefited.
- In FY 2025-26, allocation of ₹343.86 crore made to States/UTs; 96,013 farmers trained.

National Rainfed Area Authority (NRAA):

- Serves as expert body providing knowledge inputs for systematic upgradation and management of dry-land and rainfed agriculture.
- Enables knowledge-based interventions and efficient coordination with various agencies.

Per Drop More Crop (PDMC): Water-Use Efficiency

Objective:

- Enhance water-use efficiency through micro-irrigation (drip and sprinkler) and other water-saving technologies.
- Drip irrigation: targeted application of water to root zone through emitters, minimizing losses.
- Sprinkler irrigation: distributes water under pressure through pipes and nozzles, simulating rainfall.

Achievements and Targets:

- Implemented since 2015-16; about 109 lakh hectares covered.
- ₹26,325 crore released as central assistance.
- Target: bring 100 lakh hectares under micro-irrigation over 2025-26 to 2029-30.
- Requires annual coverage of at least 20 lakh hectares through PDMC.

Soil Health Management (SHM) and Soil Health Card (SHC) Scheme

Soil Health Management (SHM):

- Promotes location and crop-specific sustainable soil management practices (residue management, organic farming).
- Supports systematic soil fertility mapping, balanced application of macro and micronutrients, and measures to mitigate soil erosion and land degradation.

Soil Health Card (SHC) Scheme (Launched 2015):

- Principal farmer advisory instrument under NMSA.
- Provides crop-specific nutrient recommendations, enabling farmers to rationalize fertilizer use and enhance soil health.

Achievements (2025-26):

- 97.53 lakh soil samples collected; 92.87 lakh tested.
- Cumulatively, 25.79 crore Soil Health Cards generated up to February 2026.

NITI Aayog Evaluation (2025):

- Scheme has contributed to correcting nutrient imbalances, particularly reducing excessive urea use.
- 68.5% of surveyed farmers reported significant improvement in soil health; 25.7% observed marginal improvements.

Soil Fertility Maps:

- Soil and Land Use Survey of India (SLUSI) preparing village-level soil fertility maps at cadastral level.
- Undertaken in 6,954 identified model villages; completed in 2,023 villages.
- Maps publicly displayed to enhance awareness and facilitate informed decision-making.

ICAR-Led Research: National Innovations on Climate Resilient Agriculture (NICRA)

Overview (Launched 2011):

- Develops and disseminates climate-resilient agricultural technologies.
- Supports short- and long-term research to enhance adaptive capacity of farming systems to withstand droughts, floods, and heat waves.

Vulnerability Assessment:

- Conducted across 651 agricultural districts per IPCC protocols.
- 310 districts identified as highly or very highly vulnerable.
- District Agriculture Contingency Plans developed with location-specific climate-resilient crops and management practices.

Climate Resilient Villages:

- Established in 448 villages across 151 vulnerable districts spanning 28 States/UTs.

Climate-Resilient Crop Varieties:

- Between 2014 and 2025, 2,996 climate-resilient varieties released under National Agricultural Research System (ICAR-led).
- Complementary agronomic practices developed: direct-seeded rice, zero-till wheat, stress-tolerant crop adoption, crop residue management.

NMSA and Sustainable Development Goals (SDGs)

SDG 2 (Zero Hunger):

- RAD promotes IFS improving productivity and stabilizing farmers' incomes.
- SHM encourages balanced nutrient use, maintaining long-term soil fertility and strengthening food security.

SDG 6 (Clean Water and Sanitation):

- PDMC improves water-use efficiency through micro-irrigation, precision water application, and soil moisture conservation.

SDG 13 (Climate Action):

- NMSA promotes climate-resilient cropping systems, natural resource conservation, and risk mitigation strategies for droughts, floods, and other climate-related stresses.

Conclusion

The National Mission for Sustainable Agriculture promotes climate-resilient farming through RAD, PDMC, and Soil Health Management. PDMC has expanded micro-irrigation to 109 lakh hectares, while the Soil Health Card scheme generated 25.79 crore cards. Under NICRA, the Indian Council of Agricultural Research identified 310 vulnerable districts and released 2,996 climate-resilient crop varieties. Though NMSA supports SDG 2, 6, and 13, its coverage remains limited relative to India's vast rainfed area.

Quantum and AI Sovereignty: Defining India's Next-Generation Growth

Introduction

Union Minister Jitendra Singh highlighted that quantum and AI sovereignty will shape India's future growth. The RDI Fund and National Quantum Mission aim to boost private-sector R&D, deep-tech innovation, and quantum-secure communication, supporting India's transition towards an innovation-driven economy.

Main Body

Research, Development and Innovation (RDI) Fund Scheme

Purpose and Progress:

- Aims to accelerate private sector participation in R&D through institutional and financial support mechanisms.
- Technology Development Board (TDB) became the first Second Level Fund Manager to launch calls, sign agreements, and release funds.
- Received 124 project proposals worth over ₹25,000 crore within a short period.
- 22 companies selected for funding; 15 selected through Bharat Innovates 2026 (global showcase in Nice, France, June 2026).
- First electronic fund disbursement: ₹50 crore to M/s Eyestem Research Private Limited.

Five High-Impact RDI Projects Approved

- **Advanced Lithium-ion Battery Cells (Maharashtra):** Patented 3-Dimensional Electrode Architecture (3DEA) technology for cost-efficient battery production.
- **Project Garud (Telangana):** Indigenous 500 kg-class modular satellite platform for mass production and constellation-scale deployment.
- **Cell Therapies for Incurable Diseases (Karnataka):** First-in-class therapies for Geographic Atrophy and Idiopathic Pulmonary Fibrosis.
- **Intelligent Mobile Life Support System (Uttar Pradesh):** Portable ICU-grade emergency care platform with AI-assisted guidance for Indian conditions.
- **Project Sabal-200 (Uttar Pradesh):** Indigenous unmanned helicopter with payload exceeding 200 kg for high-altitude logistics, disaster response, and surveillance.

National Quantum Mission: Progress and Preparedness

Achievements:

- India is among select countries investing in quantum communication, computing, sensing, and materials.
- Original target: 2,000 km quantum-secure communication in eight years.
- Achieved nearly half (approx. 1,000 km) in less than four years.

Quantum-Safe Infrastructure:

- Emerging quantum computing may challenge existing cryptographic systems in banking, governance, telecom, and strategic infrastructure.
- Post-quantum cryptography, quantum key distribution, and quantum-safe infrastructure are critical for long-term national security.
- India must prepare for the "Q-Day" scenario when current encryption becomes vulnerable.
- Report on "Quantum-Safe Ecosystem in India" released, recommending national preparedness across finance, healthcare, governance, and defence.

Compendium and Policy Reforms

- Compendium on RDI Scheme status report released, detailing proposals, sector-wise distribution, approved projects, and funding trends.
- Space sector reforms have demonstrated how strategic policy interventions unlock innovation and public participation.
- Bharat Innovates 2026 will showcase India's technology innovation globally.

Challenges:

- RDI Fund is in early stages; long-term commercialization impact remains to be seen.
- Quantum-safe infrastructure requires coordination across multiple ministries.
- Private sector R&D investment in India remains low (less than 1% of GDP).

Conclusion

India’s RDI Fund Scheme has approved major deep-tech projects in batteries, space, healthcare, and unmanned systems, with proposals worth over ₹25,000 crore. Meanwhile, the National Quantum Mission is advancing quantum-secure communication and quantum-safe infrastructure, strengthening India’s push towards AI and quantum sovereignty under Atmanirbhar Bharat and Viksit Bharat 2047.

Sahkar Se Samriddhi: Madhur Dairy and India's White Revolution 2.0

Introduction

Amit Shah inaugurated Madhur Dairy Unit-2 in Gandhinagar, a ₹128-crore automated milk processing plant that doubles capacity to 5 lakh litres/day. From collecting 6,000 litres in 1971 to achieving a ₹628-crore

turnover today, Madhur Dairy reflects the vision of "Sahkar Se Samriddhi" and "White Revolution 2.0" aimed at boosting India's dairy sector.

Main Body

Madhur Dairy: A Cooperative Success Story

Historical Journey:

- Established in 1971 with 6,000 litres milk collection and ₹7,000 turnover.
- Carries forward the cooperative legacy of Sardar Vallabhbhai Patel, Tribhuvandas Patel, and Dr. Verghese Kurien.
- Today: annual turnover of ₹628 crore with a large-scale network for milk collection, processing, and distribution.

White Revolution 2.0

Objective:

- Launched under Prime Minister Modi's leadership.
- Aims to triple India's milk production over the next decade.

Leading Dairies Adopting World-Class Technologies:

- Amul, Banas Dairy, Mehsana Dairy (all from Gujarat).
- Technologies used: protein shakes, probiotic curd, high-protein beverages, and other value-added nutritional products.
- Benefits reach milk producers directly through the cooperative framework.

Women Empowerment Through Dairy Cooperatives

Scale of Women's Participation in Gujarat:

- 36 lakh women associated with milk production.
- Produce 3 crore litres of milk daily.
- Generate business worth approximately ₹200 crore every day.
- Money is transferred directly into their bank accounts through the cooperative dairy network.

Social Transformation:

- Earlier women were confined largely to household responsibilities.
- Today they have emerged as key contributors to their families' economic strength through dairy activities.
- This is a large-scale movement of women empowerment and self-reliance in rural India.

Technology and Innovation: AI Digital Assistant "Sarlaben"

Launch:

- Amul's AI Digital Assistant inaugurated by Prime Minister Modi during the AI Summit.
- Named "Sarlaben."

Purpose:

- Provide technological support to rural women and livestock farmers.
- Make technology simple and accessible for villages and ordinary livestock rearers.
- Emerging as a powerful tool of technological empowerment.

Circular Economy in Dairy Sector

Expected Impact:

- Adoption of circular economy principles in the dairy sector expected to increase dairy incomes by at least 20 percent.

Government Commitment:

- Taking cooperative dairy sector to new heights through modern technology, innovation, and value addition.

Challenges:

- Replicating Gujarat's cooperative dairy success in other states (Bihar, UP, Rajasthan, Maharashtra) has been uneven.
- White Revolution 2.0's tripling target requires massive investment in cold chains, processing infrastructure, and veterinary services.
- AI digital assistant "Sarlaben" requires digital literacy and smartphone access (not universal in rural areas).
- Circular economy adoption requires farmer awareness and initial capital investment.

Conclusion

Madhur Dairy, founded in 1971 with just 6,000 litres of milk collection, has grown into a ₹628-crore cooperative institution. Its new ₹128-crore Dashela plant will raise processing capacity to 5 lakh litres/day, strengthening the vision of “Sahkar Se Samriddhi” and “White Revolution 2.0.” Gujarat’s 36 lakh women dairy producers generate 3 crore litres of milk daily, while innovations like Amul’s AI assistant “Sarlaben” and circular economy practices are boosting rural incomes and women’s empowerment.

PAPER 4

CASE STUDY

Q.) You are the Police Commissioner of a metropolitan city facing increasing incidents of cybercrime, organize crime, and communal misinformation. The State Government proposes an integrated surveillance platform combining facial recognition, predictive policing tools, social media monitoring, and real-time CCTV analytics. Supporters argue that the system will improve crime prevention and public safety. Several recent incidents have strengthened public demand for stronger law enforcement measures. The technology provider claims high accuracy and promises significant reductions in crime rates.

However, digital rights groups argue that the technology lacks adequate legal safeguards, independent oversight, and transparency. Studies from other jurisdictions indicate risks of algorithmic bias, wrongful identification, and disproportionate targeting of marginalized communities.

Political leaders are eager to launch the project before upcoming elections. The media has amplified both security concerns and privacy fears. Meanwhile, law enforcement personnel welcome technological support but worry about accountability if errors occur.

You receive reports indicating that procurement procedures were expedited, and some technical evaluations may have been compromised. At the same time, delaying deployment could expose the administration to criticism if a major security incident occurs.

The issue has become a national debate involving privacy rights, public security, technological governance, and democratic accountability.

a) Identify the ethical issues, stakeholders, and competing values.

b) Evaluate the available options available to you.

c) Recommend a course of action using constitutional morality, public accountability, rights-based ethics, and principles of responsible technology governance. (20 Marks)

Q.) You are the Secretary, Health Department, of a state facing an outbreak of a highly infectious disease. Vaccine supplies are limited and only enough doses are available to cover 25% of the population during the first phase.

Competing demands emerge immediately. Political representatives demand priority allocation to their constituencies. Industrial associations seek vaccination of workers to prevent economic disruption. Medical experts recommend prioritizing frontline workers, elderly persons, and vulnerable populations. Rural leaders argue that urban areas have historically received preferential treatment.

Social media is flooded with misinformation and conspiracy theories. Several influential individuals attempt to secure preferential access through political channels. The media is closely monitoring allocation decisions and publishing allegations of favoritism.

You are informed that some senior officials expect "flexibility" in allocation decisions. Simultaneously, health experts warn that any deviation from scientific prioritization could increase mortality and reduce public trust.

As the crisis intensifies, public anxiety rises. Whatever decision is taken will affect lives, livelihoods, and confidence in public institutions.

a) Examine the ethical dilemmas and governance challenges involved.
b) Evaluate the options available to you.
c) Recommend a justified course of action using distributive justice, utilitarian ethics, constitutional values, and principles of public health governance. (20 Marks)

Q.) You are the District Collector of a mineral-rich tribal district where a major deposit of rare earth minerals crucial for renewable energy technologies has been discovered. The Central and State Governments view the project as strategically important for energy security and economic growth.

The proposed mining area overlaps with forests traditionally used by tribal communities. While compensation and rehabilitation packages have been announced, community leaders fear displacement, cultural erosion, an environmental degradation. Some villages have withheld consent, alleging inadequate consultation.

National security experts emphasize the importance of reducing dependence on foreign mineral supply chains Environmental groups warn about biodiversity loss and water contamination. Political leaders are under pressure to accelerate project approvals.

You also receive intelligence inputs suggesting that extremist groups are attempting to exploit local grievance Corporate representatives insist that delays will affect investments and international partnerships.

Legally, multiple clearances are pending. Ethically, the issue involves balancing national development, tribal autonomy, environmental sustainability, and social justice.

a) Identify the ethical issues, stakeholders, and competing values.

b) Evaluate the available options.

c) Recommend the most appropriate course of action with justification using constitutional values, environmental ethics, tribal justice, and good governance principles. (20 Marks)

Q.) You are the Chief Electoral Officer of a state during a highly polarized election. A senior political leader publicly alleges large-scale voter fraud in certain districts and demands immediate administrative action. Independent verification has not substantiated the claims.

Several ministers privately pressure you to transfer district officials perceived as "uncooperative." Social medi campaigns target election officials, questioning their integrity. National media outlets have amplified allegations, creating public confusion.

Your refusal to act without evidence may attract accusations of bias. Conversely, arbitrary action could undermine institutional credibility and electoral fairness. Some officers fear retaliation if they resist political pressure.

Election integrity, public confidence, bureaucratic neutrality, and democratic legitimacy are all at stake. Every decision will be scrutinized intensely.

a) Identify the ethical issues, stakeholders, and competing values.

b) Discuss the ethical dilemmas and constitutional concerns.

c) Evaluate the options before you.

d) Recommend a course of action using constitutional morality, civil service values, rule of law, and democratic ethics. (20 Marks)