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AN INSTITUTE FOR CIVIL SERVICES

CURRENT AFFAIRS

WEEKLY 10th Nov. - 16th Nov. (2025)

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POLITY

DPDP Rules, 2025 Notified

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- **GS Paper III – Technology: Data Governance, Cybersecurity, Digital Economy**

Introduction

The Union Government has notified the **Digital Personal Data Protection (DPDP) Rules, 2025**, marking the complete implementation of the **Digital Personal Data Protection Act, 2023**. These rules operationalize India's data governance ecosystem and are aligned with the Supreme Court's landmark **K.S. Puttaswamy (2017)** ruling, which affirmed **privacy as a fundamental right** under Article 21. The move comes at a time when **digital transactions, AI adoption, and e-governance systems** are rapidly expanding across the country.

1. Significance of the 2025 Rules

- The 2025 Rules operationalize the Act by detailing procedures for **consent collection**, **data breach reporting**, **verification of minors' data**, and **penalty mechanisms**.
- They align India's data protection ecosystem with global frameworks such as the **EU's GDPR** while maintaining **India-specific thresholds**, reflecting the principle of *"asymmetric regulation"* advocated by scholars like **Nandan Nilekani** during digital policy reforms.

2. Overview of the DPDP Act, 2023

The Act establishes a **comprehensive legal architecture** for the management of digital personal data in India. It lays down:

- **Responsibilities of Data Fiduciaries** (entities processing personal data),
- **Rights and duties of Data Principals** (individuals whose data is processed), and
- **A dedicated enforcement structure** through the Data Protection Board (DPB).

It aims to balance **individual privacy**, **innovation**, and **state interests**, echoing the constitutional philosophy of **"reasonable restrictions"** articulated in privacy jurisprudence.

3. Scope and Applicability

The Act covers:

- **Processing of digital personal data within India**, regardless of whether the data was originally collected in digital or non-digital form (the latter being digitized later).
- **Processing by foreign entities** if they offer goods or services within India, ensuring **extra-territorial reach**, similar to global data regimes.

Key Insight: This wide jurisdiction reflects the realities of cross-border digital flows and the need to protect Indian users' data even when processed offshore.

4. Obligations of Data Fiduciaries

The Act places several **mandatory responsibilities** on entities:

a) Informed and explicit consent

- Data can be processed only after **clear, unambiguous, and informed consent** from the Data Principal.
- The emphasis on "notice + consent" aligns with global best practices.

b) Processing children's and disabled persons' data

- Processing the data of **children (under 18)** and **persons with disabilities** requires **verifiable consent** from parents or lawful guardians.
- This aligns with global concerns over children's digital footprints and online harms.

c) Purpose limitation and data minimization ***(added for completeness)***

- Fiduciaries must use data **only for the purpose stated** and limit collection to what is **necessary**.

d) Security safeguards ***(added)***

- Firms must implement reasonable cybersecurity and organizational measures.

5. Rights of Data Principals (added for conceptual clarity)

Individuals are empowered with rights such as:

- **Right to access** details on how their data is used
- **Right to correction and erasure**
- **Right to grievance redressal**
- **Right to nominate** another person to exercise their rights

These rights strengthen **individual autonomy**, echoing the *liberal political theory* arguments made by scholars like **John Stuart Mill** on personal liberty.

6. Enforcement Mechanism: Data Protection Board (DPB)

- The DPB functions as a **civil adjudicatory authority**.
- It has powers similar to a **civil court**, including inquiry, summons, and imposing penalties for non-compliance.
- Its focus is primarily on **data breach management and dispute resolution**.

This institutional structure ensures **accountability**, while maintaining flexibility through administrative rule-making.

Contemporary Relevance and Policy Implications

Dimension	Relevance in 2025 Context
Governance	Supports Digital India ecosystem, Aadhaar-enabled services, and e-governance platforms.
Economy	Enhances trust in digital markets, aiding fintech, e-commerce, and AI-based services.
International Relations	Helps India negotiate digital trade agreements and cross-border data frameworks.
Security	Strengthens cyber resilience amid rising data breaches in BFSI and telecom sectors.
Society	Protects vulnerable sections (children, elderly) from digital exploitation and misuse.

Conclusion

In conclusion, the **DPDP Rules, 2025** mark a **critical milestone** in India's journey towards a robust, privacy-centric digital governance model. By aligning with constitutional values, global best practices, and contemporary technological trends, these rules reinforce **accountability**, **individual empowerment**, and **data security** in the digital age.

Keywords: *privacy rights, data fiduciary obligations, consent architecture, DPB, digital governance*.

Mains Practice Question

"Discuss the significance of the Digital Personal Data Protection (DPDP) Rules, 2025 in strengthening India's privacy framework. How do they balance individual rights with the needs of innovation and governance?"

Anti-Defection Law: Recent Judicial Action

📌 Syllabus Mapping

- **GS Paper II – Polity:** Anti-defection, Tenth Schedule, judicial review
- **GS Paper II – Governance:** Legislative accountability, party system

Introduction

The Calcutta High Court recently disqualified an MLA under the **Anti-Defection Law**, bringing renewed attention to the **Tenth Schedule**, political ethics, and the role of the judiciary in maintaining democratic stability.

About Anti-Defection Law

- Introduced by the **52nd Constitutional Amendment Act, 1985**, adding the **Tenth Schedule**.
- Objective: Prevent political defections motivated by office, money, or personal gain.

Grounds for Disqualification

- **Voluntarily giving up** membership of a political party.
- **Voting or abstaining** against the party whip.
- **Elected Members:** Disqualified on joining another political party.
- **Nominated Members:** Disqualified if they join a political party **after six months** of being nominated.

Exception – Merger Provision

- If **two-thirds** of the legislators of a party agree to merge with another party, they are **not disqualified**.

Role of Speaker/Chairman

- Speaker's decision is considered **final** under the Tenth Schedule.

Judicial Review

- In *Kihoto Hollohan v. Zachillhu (1992)*, the Supreme Court held that Speaker's decisions are subject to **judicial review**, particularly in cases of **undue delay**.

Contemporary Relevance

Dimension	Significance
Democratic Stability	Prevents frequent government collapses.
Ethics in Politics	Holds legislators accountable to party platform.
Judicial Oversight	Ensures timely and unbiased decisions.
Federalism	Impacts coalition politics in states.

Conclusion

The Anti-Defection Law plays a crucial role in preventing political opportunism, though concerns remain about Speaker's impartiality and need for reforms.
Keywords: *Tenth Schedule, defection, Kihoto Hollohan, party whip, legislative discipline*

Mains Practice Question

"Critically examine the effectiveness of the Anti-Defection Law in India. Should the authority to decide defection cases remain with the Speaker?"

30 Years of Legal Services Authorities Act

📌 Syllabus Mapping

- **GS Paper II – Polity:** Legal aid, statutory bodies, justice delivery
- **GS Paper II – Governance:** Access to justice, social empowerment
- **GS Paper II – Judiciary:** ADR mechanisms, Lok Adalats

Introduction

India marked **30 years of the implementation** of the **Legal Services Authorities Act, 1987**, which came into force on **9 November 1995**. This day is celebrated annually as **National Legal Services Day**, reaffirming the constitutional commitment to provide **equal justice** and **free legal aid** to all, particularly the marginalized.

About the Legal Services Authorities Act, 1987

Purpose: The Act aims to ensure that **no individual is denied justice** due to **economic disability**, social vulnerability, or other structural barriers, thereby operationalising **Article 39A of the Constitution**.

Institutional Framework

1. National Legal Services Authority (NALSA)

- Apex statutory body for legal aid administration.
- **Chief Justice of India** serves as the **Patron-in-Chief**.
- Coordinates and monitors legal aid services across the country.

2. State Legal Services Authorities (SLSA)

- Formed at the state level.
- Headed by the **Chief Justice of the respective High Court** as Patron-in-Chief.
- Implement legal aid programs across districts.

3. District Legal Services Authorities (DLSA)

- Function under the **District Judge**.
- Provide legal aid, organize Lok Adalats, and support grassroots legal literacy.

Eligibility for Free Legal Aid

Free legal aid is available to a wide group of entitled persons, including:

- **SC/ST citizens**
- **Women and children**
- **Victims** of trafficking, disasters, or mass violence
- **Persons with mental illness or disabilities**
- **Industrial workmen**
- **Persons in custody**, including juveniles
- **Economically weaker individuals**:
  - Income below **₹5 lakh** for cases in the **Supreme Court**
  - States determine thresholds for other courts (ranging from **₹1–3 lakh**)
- **Senior citizens** — based on State-specific rules

Legal Aid Funding Structure

The Act provides for:

- **National Legal Aid Fund**
- **State Legal Aid Fund**
- **District Legal Aid Fund**

These funds support legal representation, awareness drives, and ADR mechanisms.

Lok Adalats: The ADR Pillar

The Act mandates the establishment of **Lok Adalats**, which:

- Settle disputes **amicably** through negotiation
- Handle **pre-litigation cases**, reducing burden on courts
- Provide legally binding awards enforceable like civil court decrees
- Promote **speedy, cost-effective justice delivery**

Lok Adalats remain one of India's most successful ADR models, significantly reducing pendency.

Other Key Legal Aid Initiatives

1. Legal Aid Defense Counsel System (LADCS)

- Provides **free criminal defense** to indigent persons.
- Operational under NALSA across all districts.

2. DISHA (Designing Innovative Solutions for Holistic Access to Justice)

- Focuses on:
  - **Digital access** to legal services
  - **Pro bono networks**
  - **Pre-litigation counseling**

3. Legal Literacy and Legal Awareness Programme (LLLAP)

- Enhances legal awareness at the grassroots, especially among women, SC/ST communities, and rural populations.

Contemporary Relevance

Marking 30 years of the Act highlights India's continuous effort to bridge the gap between law and justice. With rising caseloads and the digital transformation of courts, the legal aid ecosystem plays a **critical role in democratizing access to justice**, aligning with SDG 16 (Peace, Justice, and Strong Institutions).

Conclusion

The Legal Services Authorities Act stands as a cornerstone of India's commitment to **inclusive justice**. With institutional reforms, robust legal aid mechanisms, and the expansion of ADR platforms like Lok Adalats, the Act continues to strengthen India's justice delivery system.
Keywords: *NALSA, SLSA, Lok Adalats, legal aid, Article 39A, access to justice*

Mains Practice Question

"Critically evaluate the role of the Legal Services Authorities Act, 1987 in promoting access to justice in India. Highlight key achievements and persisting challenges."

GOVERNANCE

Workplace Stress and Rising Diabetes Burden

📌 Syllabus Mapping

- **GS Paper II – Governance:** Public Health, Policy Interventions
- **GS Paper III – Science & Technology:** Lifestyle Diseases, Health Data
- **GS Paper II/III – Social Issues:** Urbanization, Workplace Wellness, Demographic Challenges

Introduction

India is experiencing a rapid surge in **non-communicable diseases (NCDs)**, with diabetes emerging as a major public health concern. According to the **ICMR–INDIAB (2023)** report, the country has **10.1 crore individuals** living with diabetes. A significant increase is being observed among **younger, urban, and working-age adults**, where **workplace stress and modern lifestyle patterns** are strongly influencing metabolic health.

Rising Link Between Workplace Stress and Diabetes

1. Chronic Stress and Hormonal Imbalance

- Continuous workplace pressure activates the body's **stress response system**, releasing **cortisol** and **adrenaline**.
- **High cortisol levels** disturb glucose metabolism, reduce insulin sensitivity, and cause **abdominal fat deposition**(central obesity).
- Hans Selye's stress theory explains how chronic stress exhausts the body's adaptive capacity, affecting long-term metabolic functions.

2. Long and Fatiguing Commutes

- Workers in major cities often commute **2–3 hours daily**, leaving minimal time for physical activity or adequate sleep.
- This increases fatigue, reduces exercise frequency, and worsens metabolic stress.

3. Sedentary Work Culture

- Desk jobs, extended screen time, and minimal movement contribute to slow calorie utilization and poor digestion.
- Irregular eating due to meetings and deadlines leads to fluctuating blood sugar levels.

4. Impact of Shift Work on Circadian Rhythms

- Night shifts or rotating shifts disrupt the **body's internal clock**, affecting metabolism and insulin regulation.
- Research shows a **20–30% decrease in insulin sensitivity** among shift workers, increasing the risk of diabetes.

Understanding Diabetes

Definition: A **chronic non-communicable disease** where the body either fails to produce enough insulin or cannot effectively utilize the insulin it produces.

Types of Diabetes

- **Type 1 Diabetes:** Autoimmune destruction of insulin-producing beta cells.
- **Type 2 Diabetes:** Most common; caused by **insulin resistance** and insufficient insulin production.
- **Gestational Diabetes:** High blood glucose levels during pregnancy.

Government Initiatives to Address Diabetes

- **Eat Right India (FSSAI):** Promotes nutritious diets, reduced sugar and trans-fat intake, and healthy food habits.
- **Fit India Movement (2019):** Encourages physical activity and workplace fitness.
- **NPCDCS (2010):** Aims at early detection, screening, and management of diabetes, cancer, cardiovascular disease, and stroke.
- **Ayushman Bharat – PM-JAY:** Provides financial support for secondary and tertiary care, including diabetes-related complications.

Contemporary Relevance and Multi-Dimensional Impact

Dimension	Current Significance (2025)
Health	Increase in youth-onset diabetes and metabolic disorders.
Economic	Productivity loss, higher employer and household healthcare costs.
Urban Governance	Long commutes and inadequate urban fitness spaces heighten risks.
Workplace Policy	Needs restructuring toward wellness programmes and ergonomic environments.
Social Impact	Rising household expenditure and increasing stress in families.

Conclusion

Workplace stress is emerging as a significant contributor to the growing **diabetes burden** among India's working-age population. Metabolic changes arising from chronic stress, sedentary routines, poor diet, and disrupted sleep cycles highlight the need for **integrated public health strategies**, workplace reforms, and urban planning improvements.

Keywords: *workplace stress, insulin resistance, circadian disruption, lifestyle disease, NCD burden*

Mains Practice Question

"Workplace stress is emerging as a major contributor to India's rising diabetes burden. Discuss the physiological, lifestyle, and policy dimensions of this trend. Suggest measures to mitigate it."

INTERNATIONAL RELATIONS

Government Shutdown in the United States

📌 Syllabus Mapping

- **GS Paper II – International Relations:** US political system, global governance
- **GS Paper II – Polity:** Comparative political systems

Introduction

The United States recently witnessed the end of its **longest government shutdown in history**, after the President signed a temporary funding bill. Government shutdowns reflect structural characteristics of the **Presidential system**, rooted in a strict separation of powers, which enables a funding deadlock between the legislature and the executive.

What is a Government Shutdown?

- A **government shutdown** occurs when the **US Congress** fails to pass necessary **budgetary or appropriations bills**or when the President refuses to sign them.
- Without legal authorization, many federal agencies halt operations, suspend services, and place employees on unpaid leave (furlough).

Why Shutdowns Occur in the US but Not in India

- The US follows a **Presidential system** with **separate** executive and legislature. Budget disagreements, therefore, can paralyze government functioning.
- In contrast, India's **Parliamentary system** requires the executive to maintain the **confidence of the legislature**.
- Failure to pass budgetary grants in India results in the government's fall, not a shutdown.

Impact of Shutdowns

Dimension	Effect
Governance	Federal agencies partially or fully close.
Economy	Delayed salaries, halted public services, reduced economic activity.
Social Impact	Disruption in immigration services, national parks, federal assistance.
Global Relevance	Weakens investor confidence in US fiscal stability.

Conclusion

Government shutdowns highlight the **structural rigidity** of the Presidential system and demonstrate how political deadlocks can directly impact governance and public service delivery.

Mains Practice Question

"Why are government shutdowns common in Presidential systems like the United States? Discuss with reference to separation of powers and compare with India's Parliamentary system."

Gulf Cooperation Council (GCC) & One-Stop Travel System

📌 Syllabus Mapping

- **GS Paper II – International Relations:** Regional groupings
- **GS Paper III – Economy:** Mobility, labour movement

Introduction

The Gulf Cooperation Council (GCC) has approved a **landmark one-stop travel system** aimed at simplifying travel procedures across member states, signaling greater regional integration.

About the GCC

- Established in **1981**.
- **Members:** UAE, Bahrain, Saudi Arabia, Oman, Qatar, Kuwait.
- Objective: Promote **coordination, integration, and interconnection** across political, economic, and cultural sectors.

About the One-Stop Travel System

- Allows passengers to complete **immigration, customs, and security checks** at a **single departure point**.
- Enhances **efficiency**, reduces wait times, and boosts tourism and business connectivity.

Importance

Aspect	Benefit
Economic	Boosts tourism and trade.
Regional Cohesion	Promotes intra-GCC mobility.
Security	Streamlines coordinated checks.
Labour Mobility	Benefits Indian expatriates in Gulf nations.

Conclusion

The new travel system underscores GCC's vision for **greater integration**, enhancing movement and cooperation across the region.

Mains Practice Question

"Evaluate the significance of the GCC's new one-stop travel system for regional integration and India–Gulf relations."

PM's Two-Day Visit to Bhutan: Key Outcomes

📌 Syllabus Mapping

- **GS Paper II – International Relations:** India–Bhutan relations, neighbourhood policy, strategic cooperation
- **GS Paper I – Culture:** Buddhist linkages, cultural diplomacy
- **GS Paper III – Economy:** Energy cooperation, hydropower, regional connectivity

Introduction

The Prime Minister of India concluded a significant **two-day state visit to Bhutan**, aimed at deepening bilateral cooperation in **energy, economy, connectivity**, and **cultural exchange**. The visit reaffirmed India's commitment to Bhutan as its closest and most trusted partner in the Himalayan region and strengthened the foundation of the long-standing India–Bhutan friendship.

Key Outcomes of the Visit

1. Energy Cooperation

- India and Bhutan jointly inaugurated the **1,020 MW Punatsangchhu-II Hydropower Project**, which will supply electricity to both countries.
- Agreement to **resume work** on the **1,200 MW Punatsangchhu-I project**, addressing earlier geological and construction-related delays.
- India extended a **₹4,000 crore concessional Line of Credit** to Bhutan specifically for hydropower and energy sector development—India's **first-ever line of credit** dedicated to Bhutan's development efforts.
- This reinforces Bhutan's role as a key partner in India's clean energy transition.

2. Economic Cooperation

- India committed support to Bhutan's **13th Five Year Plan**, including:

  - **Economic Stimulus Programme** to strengthen post-pandemic recovery
  - Development of the **Gelephu Mindfulness City**, Bhutan's ambitious cross-border economic and cultural hub
- India's assistance aligns with Bhutan's shift towards a **diversified economy**, reducing overdependence on hydropower.

3. Cultural Diplomacy

- The sacred **Piprahwa Relics of Lord Buddha**, associated with the **mortal remains of Buddha**, were publicly displayed in Thimphu.
- These relics were discovered in **1898** at **Piprahwa in Siddharthnagar district (ancient Kapilavastu), Uttar Pradesh**.
- The exhibition strengthens centuries-old **cultural and spiritual bonds** grounded in Buddhism, reinforcing people-to-people relations.

4. Connectivity Initiatives

- Both sides emphasized enhancing **cross-border connectivity**, including:
  - **Gelephu–Kokrajhar rail link**
  - **Samtse–Banarhat rail link**
- Improved connectivity will boost trade, tourism, supply chains, and regional integration.

5. Key Issues Discussed

- Addressing **delays in hydropower projects** and exploring alternative financing mechanisms.
- Encouraging greater **economic diversification** beyond hydropower dependence.
- Regional strategic concerns, including the need to counter **growing Chinese influence** along Bhutan's northern borders.
- Emphasis on sustained cooperation to maintain **regional security**, especially concerning the **Doklam tri-junction**.

India–Bhutan Relations: A Special Partnership

1. Diplomatic Foundation

- India is Bhutan's **largest development partner**.
- The **1949 India–Bhutan Treaty of Friendship**, revised in **2007**, ensures:
  - Mutual respect for sovereignty
  - Close cooperation
  - Open borders and unrestricted movement of people

2. Strategic Convergence

- The two countries coordinate closely on **regional stability**, border security, and development.
- Bhutan's strategic location near the **Siliguri Corridor (Chicken Neck)** makes cooperation vital for India's national security.
- Example: Collaboration during the **2017 Doklam crisis**.

3. Economic Linkages

- **Bilateral Trade:**
  - At **$1.7 billion (2023–24)**, India is Bhutan's **largest trading partner**, accounting for **nearly 80%** of Bhutan's trade.
- **Foreign Direct Investment:**
  - India contributes **55% of all FDI** flowing into Bhutan.

4. People-to-People Ties

- Deep civilizational roots grounded in **Buddhism**, frequent cultural exchanges, educational cooperation, and growing tourism ties.

Contemporary Relevance & Multi-Dimensional Significance

Dimension	Importance
Strategic	Ensures stability along the Himalayan frontier and the Siliguri Corridor.
Economic	Strengthens hydropower cooperation and supports Bhutan's long-term economic diversification.
Cultural	Reinforces shared Buddhist heritage and soft power diplomacy.
Regional Connectivity	Enhances trade, mobility, and integration with Northeast India.
Energy Security	Sustains India's access to clean hydropower imports from Bhutan.

Conclusion

The Prime Minister's visit to Bhutan reaffirmed the **enduring and unique partnership** between the two nations, grounded in trust, mutual respect, and shared developmental goals. With renewed cooperation in hydropower, economy, connectivity, and cultural heritage, India–Bhutan relations continue to be a model of **neighbourhood diplomacy** in South Asia.

Keywords: *India–Bhutan relations, hydropower cooperation, Punatsangchhu projects, Piprahwa Relics, connectivity, 13th Five Year Plan*

Mains Practice Question

"India–Bhutan relations are often described as a model for neighbourhood diplomacy. Discuss in light of recent developments including energy cooperation, connectivity initiatives, and cultural linkages."

China Proposes Global AI Body: WAICO

📌 Syllabus Mapping

- **GS Paper II – IR:** Global governance, China's diplomacy
- **GS Paper III – Science & Tech:** AI governance, data regulation

Introduction

At the **APEC Summit in South Korea**, China advocated for the establishment of the **World Artificial Intelligence Cooperation Organization (WAICO)**, proposing a new global body to shape AI norms and governance.

About WAICO

- **Aim:** Develop global standards for **AI cooperation**, governance, and responsible deployment.
- Based on China's **2023 Global AI Governance Initiative**, focusing on:
  - **Human-centric design**
  - **Data sovereignty**
  - **Algorithmic transparency**

Announcement: Unveiled during the **2025 World Artificial Intelligence Conference (Shanghai)**.

Strategic Purpose

- Create an alternative to **US-led AI governance frameworks**.
- Strengthen China's **soft power**, influence, and role in shaping technological norms.

Conclusion

WAICO represents an emerging geopolitical battleground in AI governance, reflecting the competition between global powers over technology standards.
Keywords: *WAICO, AI governance, China's soft power*

Mains Practice Question

"AI governance has become a geopolitical domain. Analyse China's proposal for WAICO and its implications for global technology governance."

INTERNAL SECURITY & DEFENCE

Colombo Security Conclave Meeting

📌 Syllabus Mapping

- **GS Paper II – International Relations:** India's neighbourhood policy, regional groupings
- **GS Paper III – Security:** Maritime security, counter-terrorism

Introduction

India recently invited Bangladesh to participate in the **Colombo Security Conclave (CSC)** meeting in New Delhi, expanding the grouping's strategic relevance in the Indian Ocean Region.

About the Colombo Security Conclave

- Formed in **2020** as a regional security platform.

- **Members:** India, Sri Lanka, Maldives, Mauritius, and recently Bangladesh.
- **Seychelles** participates as an observer.
- Aims to address common transnational challenges and enhance regional cooperation.

Five Pillars of Cooperation

- **Maritime Security**
- **Counterterrorism**
- **Combating Transnational Organized Crime**
- **Cyber Security**
- **Humanitarian Assistance & Disaster Relief (HADR)**

Contemporary Significance

Context	Importance
Indian Ocean Security	Ensures safe sea lanes amid rising maritime threats.
Regional Unity	Enhances collective crisis-response capacity.
China Factor	Strengthens India's influence in the region.
Technology & Cyber	Boosts cyber interoperability among member states.

Conclusion

The CSC strengthens **regional stability**, enabling India and its neighbours to collaboratively address evolving security challenges in the Indian Ocean.

Mains Practice Question

"Discuss the strategic relevance of the Colombo Security Conclave in the evolving security architecture of the Indian Ocean Region."

Exercise Garuda 2025 Begins in France

📌 Syllabus Mapping

- **GS Paper III – Security:** Defence exercises, strategic cooperation
- **GS Paper II – International Relations:** India–France ties

Introduction

The **Garuda bilateral air exercise** between the **Indian Air Force (IAF)** and the **French Air and Space Force** is being conducted at **Mont-de-Marsan Air Base, France**, strengthening military interoperability.

About Exercise Garuda

- A bilateral **air combat training exercise**.
- Enhances **operational coordination**, air-to-air combat skills, and joint strategic planning.
- Part of the deepening India–France defence partnership.

Significance

Dimension	Importance
Military	Improves combat readiness and joint manoeuvres.
Strategic	Strengthens Indo-French defence cooperation.
Technology	Exposure to advanced aircraft and systems.
Diplomacy	Reinforces long-term strategic friendship.

Conclusion

Exercise Garuda acts as a cornerstone of the **India–France strategic partnership**, enhancing bilateral defence capabilities.

Mains Practice Question

"Discuss the strategic relevance of Exercise Garuda for India's defence preparedness and its partnership with France."

Mudh-Nyoma Airbase Operationalised

📌 Syllabus Mapping

- **GS Paper III – Security:** Border infrastructure, defence preparedness
- **GS Paper II – International Relations:** India–China boundary issues

Introduction

India has operationalised the **Mudh-Nyoma Airbase** in **Eastern Ladakh**, significantly enhancing **air mobility, surveillance, and military readiness** along the Line of Actual Control (LAC) with China.

About Mudh-Nyoma Airbase

- Located at an altitude of **nearly 13,000 feet**, close to the LAC.
- Built by the **Border Roads Organisation (BRO)**.
- Becomes the **fourth major airbase in Ladakh**, alongside:
  - Leh
  - Kargil
  - Thoise

Strategic Importance

- Overlooks key sectors including:
  - **Depsang Plains**
  - **Pangong Tso region**
  - **Chushul Valley**
- Enhances:
  - Troop mobility
  - Rapid deployment
  - Supply chain efficiency
  - Surveillance of sensitive border stretches

Contemporary Relevance

Dimension	Significance
Security	Strengthens India's position along critical LAC sectors.
Infrastructure	Reflects expanding high-altitude defence infrastructure.
Diplomacy	Enhances deterrence amid ongoing India–China standoff.
Logistics	Supports all-weather operations in a challenging terrain.

Conclusion

The Mudh-Nyoma airbase reinforces India's strategic depth in Eastern Ladakh, supporting long-term defence preparedness and border security.
Keywords: *LAC, Eastern Ladakh, Mudh-Nyoma, border infrastructure, India–China*

Mains Practice Question

"Discuss the strategic significance of the newly operationalised Mudh-Nyoma Airbase for India's defence preparedness along the LAC."

Ricin & Ammonium Nitrate in Terror Plots

📌 Syllabus Mapping

- **GS Paper III – Internal Security:** Chemical agents, explosives, terrorism
- **GS Paper III – Science & Tech:** Toxicology, chemical properties

Introduction

Recent terror plots involving **ricin** and **ammonium nitrate** were successfully averted, highlighting the need for enhanced chemical surveillance and counter-terror capabilities.

About Ricin

- A highly lethal **protein toxin** naturally found in **castor beans**.
- Can also be extracted from **waste residue** of castor bean processing.

- **Toxicity:** Even **1 mg** can kill an adult if ingested.
- **No antidote** exists.
- Mechanism: Blocks **protein synthesis**, causing rapid organ failure.

About Ammonium Nitrate (NH_4NO_3)

- A white, crystalline, water-soluble chemical with a melting point of **170°C**.
- Not explosive by itself, but becomes a key ingredient in manufacturing **improvised explosives** when mixed with fuels.
- Used in fertilizers and industrial applications, making monitoring challenging.

Conclusion

The episode highlights the urgent need for **chemical monitoring**, tighter regulation of industrial substances, and improved national preparedness.

Mains Practice Question

"Explain the security risks associated with ricin and ammonium nitrate. What measures are needed to prevent their misuse in terrorism?"

India–Sri Lanka Mitra Shakti 2025

📌 Syllabus Mapping

- **GS Paper II – IR:** India–Sri Lanka defence cooperation
- **GS Paper III – Security:** Joint military exercises, regional security

Introduction

The **11th edition** of the **Mitra Shakti** joint military exercise between India and Sri Lanka has commenced at **Belagavi, Karnataka**, strengthening bilateral cooperation and regional security preparedness.

About Mitra Shakti

- An **annual bilateral military exercise** conducted alternately in India and Sri Lanka.
- Aimed at enhancing:
  - **Interoperability**
  - **Counter-insurgency capabilities**
  - **Humanitarian and disaster response skills**

Conclusion

Mitra Shakti reinforces India's neighbourhood-first approach and supports stable military ties with Sri Lanka.
Keywords: *Mitra Shakti, India–Sri Lanka defence cooperation*

Mains Practice Question

"How do joint military exercises contribute to regional stability? Evaluate using India–Sri Lanka Mitra Shakti exercise as an example."

ECONOMY

WPI Falls into Deflation

📌 Syllabus Mapping

- **GS Paper III – Economy:** Inflation, price indices, macroeconomic trends

Introduction

Wholesale prices in India recently slipped into **deflation**, reaching a 27-month low. This trend reflects declining prices of commodities and subdued economic demand.

What is WPI?

- The **Wholesale Price Index (WPI)** measures changes in the prices of goods traded in bulk at the wholesale level.
- It considers **basic prices**, excluding **taxes, transportation, trade margins**, etc.
- Released by the **Office of Economic Adviser**, DPIIT, Ministry of Commerce & Industry.
- **Base year: 2011–12**.

About Deflation

- Deflation is a sustained **decline in the general price level** of goods and services.
- It corresponds to **negative inflation** and can indicate weak demand, excess supply, or falling global commodity prices.

Relevance of Deflation Trend

Dimension	Impact
Producers	Lower profitability and reduced investment.
Consumers	Short-term gains due to cheaper products.
Economy	Risk of slowdown and reduced credit uptake.
Policy Response	Encourages RBI to adopt accommodative stance.

Conclusion

A fall in WPI signals **cooling inflationary pressure**, but persistent deflation may threaten economic momentum if not managed through balanced fiscal and monetary policies.

Mains Practice Question

"What is the Wholesale Price Index (WPI)? Discuss deflationary trends in India and their implications for economic growth."

Export Promotion Mission Approved

📌 Syllabus Mapping

- **GS Paper III – Economy:** Export promotion, external sector, MSME competitiveness
- **GS Paper II – Governance:** Policy implementation, institutional coordination
- **GS Paper III – Infrastructure:** Trade logistics, market access

Introduction

The Union Cabinet has approved the **Export Promotion Mission (EPM)** for a period of **six years**, following its announcement in the **Union Budget 2025–26**. The mission establishes a **comprehensive and flexible policy framework**aimed at strengthening India's export ecosystem amidst rapidly evolving global trade dynamics and competitiveness challenges.

Key Features of the Export Promotion Mission (EPM)

1. Financial Outlay and Duration

- Total outlay of **₹25,060 crore** covering **FY 2025–26 to FY 2030–31**.
- Designed as a sustained, long-term intervention to improve India's export readiness.

2. Mission Objectives

The EPM seeks to:

- Provide **affordable trade finance**, particularly for **MSMEs**.
- Boost **competitiveness** through improved compliance, certification, and quality standards.
- Enhance **international market access**, promote **job creation**, and support global value chain integration.
- Encourage **first-time exporters** and strengthen labour-intensive sectors such as **Textiles, Leather, Gems & Jewellery**.

3. Two-Part Mission Architecture

The mission functions through two integrated sub-schemes:

a) Niryat Protsahan – Financial Support Component

- Focuses on improving access to **low-cost trade finance** through:
  - **Interest subvention schemes**
  - **Collateral-free guarantees**
  - **Credit cards for e-commerce exporters**
  - Other innovative financing tools
- Aims to address the persistent challenge of **high credit cost** for MSME exporters.

b) Niryat Disha – Non-Financial Support Component

- Enhances export preparedness through:
  - **Quality, standards, and compliance support**
  - **Assistance for international branding and marketing**
  - **Strengthening export warehousing, logistics, and supply chains**
- Designed to raise the technological and regulatory readiness of Indian exporters.

4. Implementing Architecture

- Implemented by the **Directorate General of Foreign Trade (DGFT)** in partnership with:
  - **Department of Commerce**
  - **Ministry of MSME**
  - **Ministry of Finance**
  - **State Governments**
  - **Financial institutions and Export Promotion Councils (EPCs)**
- Ensures whole-of-government coordination to improve export competitiveness.

5. Consolidation of Existing Schemes

- The EPM integrates and modernises existing interventions such as:
  - **Interest Equalisation Scheme (IES)**
  - **Market Access Initiative (MAI)**
- This reduces duplication and streamlines support mechanisms for exporters.

Related Development: Credit Guarantee Scheme for Exporters (CGSE)

1. Total Credit Support

- Provides up to **₹20,000 crore** in **collateral-free credit**, backed by **100% guarantee coverage** through the **National Credit Guarantee Trustee Company (NCGTC)**.

2. Beneficiaries

- Available to both **MSME and non-MSME exporters**, widening eligibility beyond traditional sectors.

3. Objectives

- Enhance **liquidity** for exporters.
- Support **market diversification** into new geographies.
- Boost **employment** in export-oriented industries.
- Improve **global competitiveness** through easy access to credit.

4. Oversight Mechanism

- Supervised by a **Management Committee** chaired by the **Secretary, Department of Financial Services (DFS)**.

Contemporary Relevance & Multi-Dimensional Significance

Dimension	Significance
Economic	Boosts export growth, foreign exchange earnings, and job creation.
MSME Sector	Addresses credit constraints and compliance challenges faced by small exporters.
Logistics & Trade Facilitation	Strengthens warehousing, certification, and branding—key for global competitiveness.
Governance	Encourages coordinated action across ministries and state governments.
Global Trade Environment	Supports India's resilience amidst supply chain disruptions and trade protectionism.

Conclusion

The **Export Promotion Mission (EPM)** and the **Credit Guarantee Scheme for Exporters (CGSE)** reflect India's evolving strategy to strengthen its export ecosystem, particularly by improving **finance access**, **quality standards**, and **logistics efficiency**. By focusing on MSMEs and labour-intensive sectors, these initiatives aim to promote **inclusive and sustainable export growth**.

Keywords: *EPM, Niryat Protsahan, Niryat Disha, CGSE, trade finance, export competitiveness*

Mains Practice Question

"Discuss how the Export Promotion Mission (EPM) aims to strengthen India's export ecosystem. Evaluate its significance for MSMEs and labour-intensive sectors."

Pratyush Sinha Committee Recommendations (SEBI)

📌 Syllabus Mapping

- **GS Paper III – Economy:** SEBI, regulatory governance
- **GS Paper II – Governance:** Ethics, conflict of interest norms

Introduction

The SEBI-appointed **High-Level Committee** chaired by Pratyush Sinha has proposed stronger rules to prevent **conflicts of interest** among senior officials in the securities market regulator.

Key Recommendations

1. Mandatory Disclosure

- Senior SEBI leadership must disclose **assets and liabilities**, increasing transparency.

2. Insider Classification

- Top officials designated as **"insiders"** under insider-trading regulations to prevent misuse of sensitive information.

3. Investment Restrictions

- Senior officers and dependent family members can invest only through **pooled, professionally-managed funds** to avoid conflict of interest.

4. Ethics and Compliance Framework

- Establish **Office of Ethics & Compliance**.
- Create **digital disclosure registries**.
- Mandatory **recusal reporting** for conflict-sensitive matters.

5. Strengthened Whistleblower Mechanism

- Dedicated channel for reporting potential conflicts within SEBI.

Conclusion

The recommendations aim to reinforce **ethical governance**, protect market integrity, and enhance public trust in India's securities regulator.

Mains Practice Question

"Why is conflict of interest a major regulatory concern for bodies like SEBI? Discuss with reference to the Pratyush Sinha Committee recommendations."

SEBI Warns Against Digital Gold

📌 Syllabus Mapping

- **GS Paper III – Economy:** Financial markets, regulatory bodies
- **GS Paper III – Science & Tech:** Blockchain applications

Introduction

SEBI has issued a public advisory cautioning investors against purchasing **Digital Gold (E-Gold)** through unregulated online platforms, clarifying that such products **do not fall under SEBI's regulatory ambit**.

About Digital Gold

- Allows consumers to buy gold **electronically**, without storing the physical metal.
- Price is **linked to physical gold**.
- Often built on **blockchain technology** for traceability and secure storage.

Key Regulatory Concern

- Digital gold is **not classified as a security**.
- It is also **not regulated as a commodity derivative**.
- This leaves investors exposed to fraud, storage ambiguity, and lack of consumer protection.

Conclusion

SEBI's advisory highlights the need for clearer regulatory norms as digital financial products continue to evolve.
Keywords: *digital gold, SEBI advisory, blockchain, investor protection*

Mains Practice Question

"Digital assets are expanding rapidly, but regulation remains unclear. Critically examine the risks associated with unregulated products like Digital Gold."

Govt to Expand UCBs in Cities Above 2 Lakh

📌 Syllabus Mapping

- **GS Paper III – Economy:** Banking sector, cooperative institutions, financial inclusion
- **GS Paper II – Governance:** Cooperative federalism, regulatory reforms
- **GS Paper III – Inclusive Growth:** Access to credit, urban financial services

Introduction

At the **Co-Op Kumbh 2025**—an international conference on the urban cooperative credit sector—the Union Minister of Cooperation announced the government's plan to **establish Urban Cooperative Banks (UCBs)** in **every Indian city with a population exceeding 2 lakh**, within the next five years. The government also launched **Sahkar Digi-Pay** and **Sahkar Digi-Loan**, enabling even the smallest UCBs to offer **digital payment services and loan products**, strengthening digital inclusion within cooperative banking.

About Urban Cooperative Banks (UCBs)

Definition and Nature

UCBs are cooperative banks that operate primarily in **urban and semi-urban regions**, focusing on **small borrowers, low-income groups**, and local communities.

Historical Background

- Origin traced to the **Cooperative Credit Societies Act, 1904**, and its amendment in 1912.
- Function as **cooperative societies**, registered under:
  - **State Cooperative Societies Acts** (for single-state UCBs)
  - **Multi-State Cooperative Societies Act, 2002** (for operations across states)

Regulatory Framework: Dual Control

Urban Cooperative Banks operate under a **dual regulatory structure**, involving both **RBI** and the **Registrar of Cooperative Societies (RCS)**.

1. RBI Regulation – Banking Regulation Act, 1949

- Brought under the Act through the **1966 amendment**.
- **Banking Regulation (Amendment) Act, 2020** strengthened RBI's oversight by:
  - Allowing direct intervention in management
  - Ensuring better governance and transparency
  - Empowering RBI to issue directions, supersede boards, and improve prudential norms

2. Administrative Control – Registrar of Cooperative Societies

- State governments (or the Centre) oversee:
  - Registration
  - Elections
  - Audit
  - Management of cooperative societies

This dual regulation ensures accountability but often leads to regulatory delays and governance challenges.

Significance of UCBs

1. Financial Inclusion

- Serve **small entrepreneurs**, **street vendors**, **self-employed groups**, and **marginalized households**.
- Provide affordable credit, aiding inclusive growth in urban and peri-urban areas.

2. Community-Centric Services

- UCBs cater to **specific local needs**, enhancing trust and accessibility.
- Promote thrift and credit culture within communities.

3. Priority Sector Lending

- UCBs are mandated to allocate **60% of lending** to **Priority Sector Lending (PSL)**, supporting:
  - MSMEs
  - Housing
  - Education
  - Micro-enterprises
  - Social infrastructure

Challenges Facing UCBs

1. Geographic Concentration

- UCBs are heavily concentrated in **Maharashtra, Gujarat, Karnataka, Andhra Pradesh**, limiting nationwide reach.

2. Dual Regulation Issues

- Overlapping roles of **RBI** and **RCS** create governance gaps, slow decision-making, and compliance challenges.

3. Competition from New-Age Institutions

- Face pressure from:
  - **Small Finance Banks (SFBs)**
  - **FinTech companies**
  - **Digital lenders**
    These competitors offer more agile, technology-driven financial products.

4. Weak Governance in Some UCBs

- Issues include:
  - Poor risk management
  - Political interference
  - Low capital adequacy
  - High levels of NPAs in certain institutions

Contemporary Relevance

- Establishing UCBs in all cities above 2 lakh population supports **urban financial inclusion**, especially for underserved segments.
- The push towards **Sahkar Digi-Pay** and **Sahkar Digi-Loan** aligns UCBs with the broader **Digital India** and **Cooperative 2.0** vision.
- Strengthens the cooperative sector's ability to compete in a rapidly digitising financial landscape.

Conclusion

The government's plan to expand UCBs nationwide and promote digital financial tools represents a major step toward **inclusive urban credit delivery**, **strengthened cooperative governance**, and **enhanced financial resilience**. With improved oversight through RBI reforms and modern digital infrastructure, UCBs hold significant potential to complement India's mainstream banking system.
Keywords: *Urban Cooperative Banks, Sahkar Digi-Pay, dual regulation, financial inclusion, BR Act 2020*

Mains Practice Question

"Urban Cooperative Banks play a crucial role in urban financial inclusion but face persistent governance and regulatory challenges. Discuss in light of recent reforms and government initiatives."

India May Ease QCO Compliance

📌 Syllabus Mapping

- **GS Paper III – Economy:** Regulatory reforms, manufacturing competitiveness
- **GS Paper II – Governance:** Standards, consumer protection

Introduction

To support industry and facilitate exports, India is considering **relaxing certain Quality Control Order (QCO)**requirements for selected products, reducing compliance burdens while maintaining safety and quality standards.

About QCOs

- Issued by the **Central Government** under the **BIS Act, 2016**, after consulting the **Bureau of Indian Standards (BIS)**.
- While BIS certification is **voluntary**, QCOs make it **mandatory** for specific products in the interest of:
  - **Public health**
  - **Safety of humans, animals, plants**
  - **Environmental protection**
  - **National security**

Purpose

- Ensure that products carry the **Standard Mark** under a **Licence** or **Certificate of Conformity (CoC)**.
- Improve product reliability, global acceptance, and export competitiveness.

Conclusion

Relaxing QCO norms for select categories is expected to boost manufacturing while ensuring that essential safety standards remain intact.
Keywords: *Quality Control Orders, BIS, conformity assessment*

Mains Practice Question

"What is the significance of Quality Control Orders (QCOs) in India's manufacturing ecosystem? Discuss the need for balancing regulation with ease of doing business."

India to Scale Up Neodymium Production

📌 Syllabus Mapping

- **GS Paper III – Economy:** Mineral resources, rare earth elements
- **GS Paper III – Science & Tech:** Clean energy technologies

Introduction

India plans to increase its domestic production of **Neodymium** to **500 tonnes by FY27** to reduce import dependence and strengthen self-reliance in the rare-earth sector, crucial for clean energy and defence technologies.

About Neodymium

- **Category:** Lanthanide metal (rare earth element).
- **Appearance:** Lustrous, silvery-yellow metal that oxidises quickly.

Key Applications

- Forms **high-strength permanent magnets** when alloyed with iron and boron (NdFeB magnets).
- Widely used in:
  - **Electric vehicle motors**
  - **Wind turbine generators**
  - **Guided missile systems**
  - **Laser technologies**
  - **Medical procedures** (ophthalmology, dermatology)

Sources: Extracted primarily from **Monazite** and **Bastnaesite** ores, like most lanthanides.

Conclusion

Scaling up Neodymium output is crucial for India's strategic sectors, reducing import dependence and enhancing global competitiveness in clean energy manufacturing.
Keywords: *Neodymium, rare earths, EV magnets, strategic minerals*

Mains Practice Question

"Rare earth elements are critical for India's clean energy transition. Examine the strategic importance of Neodymium in this context."

New Rules for Sustainable Fisheries in EEZ

📌 Syllabus Mapping

- **GS Paper III – Economy:** Blue Economy, fisheries sector, coastal livelihoods
- **GS Paper III – Environment:** Sustainable resource management, marine ecology
- **GS Paper II – Governance:** Community-led development, cooperatives, policy reforms

Introduction

The Government of India has notified the **'Sustainable Harnessing of Fisheries in the Exclusive Economic Zone (EEZ)' Rules**, a major reform aimed at advancing India's **Blue Economy vision**. With an **11,099 km-long coastline** and a vast **23 lakh sq. km EEZ**—almost half of which lies around the **Andaman & Nicobar and Lakshadweep islands**—the new Rules seek to unlock untapped marine wealth while ensuring ecological sustainability.

Key Highlights of the New Rules

Priority to Cooperatives and Community-Led Models

- Exclusive priority is given to **Fishermen Cooperative Societies** and **Fish Farmer Producer Organizations (FFPOs)** for **deep-sea fishing** operations.
- Encourages decentralized, community-driven marine governance to enhance livelihoods and reduce corporate monopolisation of marine resources.

Mother–and–Child Vessel System

- Introduction of a **Mother-and-Child Vessel Concept**, where large **mother vessels** support smaller **child boats**.
- Enables **mid-sea transshipment**, reduces the need to return to shore frequently, and improves fishing efficiency, safety, and fuel savings.

Comprehensive Support and Capacity Building

- Wide-ranging **training and skill development** across the fishing value chain—navigation, modern fishing gear, cold-chain management, and processing.
- Promotes scientific fishing practices and enhances market readiness.

Credit Access Under PMMSY and FIDF

- Fisherfolk and community organisations will gain easier access to **affordable institutional credit** through:
  - **Pradhan Mantri Matsya Sampada Yojana (PMMSY)**
  - **Fisheries and Aquaculture Infrastructure Development Fund (FIDF)**
- Supports mechanisation, storage infrastructure, deep-sea vessels, and value-addition units.

Promoting Sustainable Fishing and Mariculture

Regulating Harmful Practices

- Strict restrictions on:
  - **LED light fishing**
  - **Pair trawling**
  - **Bull trawling**
    These are known to cause juvenile fish mortality, habitat destruction, and stock depletion.

Fisheries Management Plans

- Plans will be developed in consultation with **State Governments** to restore **declining fish stocks**, aligning with global sustainable fisheries standards.

Mariculture Promotion

- Focus on diversified livelihood opportunities such as:
  - **Sea-cage aquaculture**
  - **Seaweed cultivation**
  - **Open-sea farming**
    These climate-resilient livelihoods can support coastal economies, especially in island ecosystems.

Other Provisions

- **ReALCRaft online portal** enables digital access passes for mechanized and larger motorized vessels.
- **Small fishers are exempted** from the pass requirement, ensuring equity.
- **Foreign vessels remain prohibited** from operating in India's EEZ, reinforcing sovereignty and resource protection.
- Marine products sourced from the Indian EEZ will be recognized as **'Indian origin'**, boosting export traceability and compliance with global sourcing norms.

About the Exclusive Economic Zone (EEZ)

- EEZ is defined under the **1982 United Nations Convention on the Law of the Sea (UNCLOS)**.
- Extends **200 nautical miles** from a nation's coastline.
- Coastal states enjoy **exclusive rights to explore, manage, and exploit** marine resources—including fish, minerals, hydrocarbons, and energy.
- EEZ governance is critical for maritime security, sustainability, and economic development.

Contemporary Significance

- India's marine fisheries sector supports **1.5 crore livelihoods** and is central to the **Blue Economy 2047 vision**.
- Overfishing, climate change, and habitat degradation threaten resource sustainability; these rules aim to correct course.
- Island territories like A&N and Lakshadweep—holding 49% of India's EEZ—stand to benefit from enhanced deep-sea opportunities and mariculture.

Conclusion

The newly notified EEZ Fisheries Rules represent a major shift toward **sustainable, community-driven, and technologically modern marine governance**. By combining conservation mandates with livelihood promotion, the rules strengthen India's trajectory toward a resilient **Blue Economy**.
Keywords: *EEZ, Blue Economy, deep-sea fishing, mariculture, PMMSY, UNCLOS*

Mains Practice Question

"Discuss the significance of the new 'Sustainable Harnessing of Fisheries in the EEZ' Rules in strengthening India's Blue Economy. How do they balance livelihood promotion with ecological sustainability?"

AGRICULTURE

Draft Seeds Bill 2025 Introduced

📌 Syllabus Mapping

- **GS Paper II – Governance:** Agricultural regulation, farmers' rights, policy reforms
- **GS Paper III – Agriculture:** Seed regulation, quality control, crop productivity
- **GS Paper II/III – Economy:** Ease of doing business, agri-input markets

Introduction

The **Department of Agriculture and Farmers Welfare** has released the **Draft Seeds Bill, 2025**, proposing a major overhaul of India's seed regulatory framework. The new legislation aims to replace the **Seeds Act, 1966** and the **Seeds (Control) Order, 1983**, with the objective of ensuring **high-quality seeds**, protecting **farmers' interests**, and enhancing **ease of doing business** in the seed sector.

Key Features of the Draft Seeds Bill 2025

1. Mandatory Registration of Seeds

- No seed shall be sold in India unless it is **registered**, except:
  - **Farmers' varieties**, and
  - Varieties produced **solely for export purposes**.
- Registration ensures accountability, genetic purity, and performance standards.

2. Regulation of Seed Sale

- All seed varieties sold in the country must meet the **Indian Minimum Seed Certification Standards**.
- This ensures uniform quality, germination rates, and vigor, strengthening farmers' access to reliable planting materials.

3. Central Seed Committee

- To be constituted by the **Central Government** with headquarters in **New Delhi**.
- Responsible for advising on:
  - Seed development
  - Seed production planning
  - Processing, storage, and distribution
  - Export and import policies
- Reinforces national-level uniformity in seed regulation.

4. State Seed Committees

- Every State Government will constitute a **State Seed Committee** consisting of:
  - A Chairperson
  - Up to **15 nominated or appointed members**
- Tasked with ensuring state-level monitoring, coordination, and enforcement.

5. Registration Sub-Committees

- These bodies will examine and verify claims made by applicants proposing new seed varieties.
- They recommend whether a seed variety should be registered after evaluating scientific evidence, performance, and field data.

6. National Register of Seed Varieties

- A national-level repository containing all **registered kinds and varieties** of seeds.
- Maintained under the authority of the **Registrar**, enabling transparency and uniform identification across states.

7. Establishment of Seed Testing Infrastructure

- Provides for setting up **Central and State Seed Testing Laboratories**.
- These laboratories will be staffed with:
  - **Seed Analysts**

    - **Seed Inspectors**
- Ensures rigorous quality testing, maintaining seed standards from producer to farmer.

8. Offences and Penalties

- The Bill introduces **three categories of offences**:
    - **Trivial**
    - **Minor**
    - **Major**
- Major offences attract penalties up to **₹30 lakh**, along with imprisonment.
- Strengthens deterrence against seed adulteration, misbranding, and sale of substandard varieties.

Contemporary Relevance and Multi-Dimensional Significance

Dimension	Importance
Agricultural Productivity	Ensures availability of quality seeds improving crop yields.
Farmers' Rights	Protects farmers from fraudulent or poor-quality seeds.
Ease of Doing Business	Streamlines registration and standardization for seed companies.
Food Security	Reliable seeds contribute to stable agricultural output.
Regulatory Modernization	Updates India's seed laws to match global best practices.

Conclusion

The **Draft Seeds Bill 2025** aims to modernize India's seed sector by establishing stringent quality controls, strengthening regulatory bodies, and safeguarding farmers' interests. By balancing **innovation**, **farmer protection**, and **industry efficiency**, the Bill contributes significantly to India's long-term agricultural sustainability.

Keywords: *seed regulation, seed certification, farmers' varieties, seed testing laboratories, agricultural governance*

Mains Practice Question

"Discuss the significance of the Draft Seeds Bill 2025 in strengthening India's agricultural regulatory framework. How does it balance farmers' rights with the need for industry modernization?"

25 Years of PPV&FRA, 2001

📌 Syllabus Mapping

- **GS Paper III – Agriculture:** Intellectual property, farmers' rights
- **GS Paper II – Governance:** Agricultural regulation, statutory bodies

Introduction

The "**Plant Genome Saviour Awards Ceremony**" marked the 25th anniversary of the **PPV&FRA Act, 2001**, celebrating India's commitment to protecting farmers' and breeders' rights and promoting agricultural innovation.

About PPV&FRA Act, 2001

Objectives

- Provide an effective system for protecting **plant varieties**, **breeders' rights**, and **farmers' rights**.
- Encourage development of new varieties and the growth of India's seed industry.

Recognized Rights

1. Farmers' Rights

- Registration of new and extant farmers' varieties.
- Benefit-sharing and rewards for conserving plant genetic resources.

2. Researchers' Rights

- Allows use of registered varieties for **research and experimentation**.

3. Breeders' Rights

- Exclusive rights to produce, sell, market, import, and export plant varieties.

PPV&FRA Authority

- Statutory body established in **2005** under the Ministry of Agriculture.
- Functions include:
  - Registration of plant varieties
  - Maintenance of the **National Gene Bank**
  - Documentation and conservation of genetic resources

Conclusion

The Act remains foundational for balancing **innovation**, **farmers' welfare**, and **genetic conservation**, vital for India's agricultural sustainability.

Mains Practice Question

"Discuss the significance of the PPV&FRA Act, 2001 in protecting agricultural biodiversity and farmers' rights in India."

ICAR Maps Factors Affecting Soil Organic Carbon

📌 Syllabus Mapping

- **GS Paper III – Agriculture:** Soil health, cropping systems, sustainable farming
- **GS Paper III – Environment:** Carbon sequestration, climate interactions
- **GS Paper II – Governance:** Agricultural policy, climate-smart agriculture

Introduction

The **Indian Council of Agricultural Research (ICAR)** has conducted a comprehensive study and developed an **agro-ecological base map** to understand how fertiliser use, temperature, cropping patterns, and other environmental factors influence **Soil Organic Carbon (SOC)** across diverse Indian landscapes. The study provides critical insights for sustainable agriculture, soil restoration, and climate mitigation strategies.

Key Findings of the ICAR Study

Understanding Soil Organic Carbon (SOC)

- **Definition:** SOC constitutes the **carbon fraction of soil organic matter**, representing about **60%** of it.
- Includes **living and dead organic components**—plant residues, soil organisms, and decomposed animal material.
- Does **not** include fresh, undecomposed plant residue lying on the soil surface.

SOC and Heat Absorption

- Higher carbon content implies greater **heat absorption** in the soil, influencing microclimates and soil temperature dynamics.

SOC and Environmental Factors

1. Temperature

- SOC is **negatively correlated** with temperature.
- As temperatures rise, SOC **decreases** due to faster decomposition of organic matter, especially in tropical and semi-arid regions.

2. Imbalanced Fertiliser Use

- Areas such as **Punjab, Haryana, and western Uttar Pradesh** show SOC decline due to **excessive use of urea and phosphorus-based fertilizers**.
- Poor integrated nutrient management reduces soil microbial activity, slowing carbon accumulation.

3. Cropping Systems

- **Rice-based** and **pulse-based** systems tend to **enhance SOC**, owing to:
  - Higher biomass return
  - Inclusion of nitrogen-fixing crops
- In contrast, **wheat** and **coarse-grain** based systems contribute comparatively lower organic carbon.

4. Micronutrient Interactions

- Soils with **low SOC** often show higher **micronutrient deficiency**, including zinc, boron, and iron.
- High SOC improves nutrient retention and overall soil fertility.

5. Elevation

- SOC tends to be **higher at elevated terrains**, where lower temperatures reduce decomposition rates and vegetation contributes more organic matter.
- Plains and low-lying regions show comparatively lower SOC accumulation.

Recommendations from ICAR

1. Promote Plantation and Cover Cropping

- Maintain **continuous soil cover** through crops, agroforestry, and plantations.
- Enhances organic matter addition and improves soil structure.

2. Facilitate Carbon Credit Mechanisms

- Farmers who successfully **increase SOC** should be incentivized through **carbon credit markets**.
- Encourages climate-friendly agriculture and rewards ecological services.

3. Encourage Carbon Sequestration through Cropping Pattern Shifts

- Regions with **very low SOC** should be encouraged to adopt:
  - Crop diversification
  - Pulse integration
  - Rice–fallow management
    These practices increase biomass and promote long-term carbon sequestration.

Contemporary Relevance

- SOC is a critical indicator of **soil health**, agricultural productivity, and **carbon sequestration potential**.
- With climate change accelerating soil degradation, the findings strengthen India's push toward **climate-smart agriculture**, **National Mission for Sustainable Agriculture (NMSA)**, and **carbon neutrality commitments**.
- SOC improvement is also aligned with global goals under the **UNCCD** for land restoration.

Conclusion

The ICAR study provides vital scientific evidence to guide **nutrient management**, **cropping policies**, and **soil conservation strategies** across India. Enhancing SOC is essential not only for agricultural resilience but also for achieving long-term **climate mitigation** objectives.
Keywords: *Soil Organic Carbon, ICAR, carbon sequestration, cropping systems, soil health*

Mains Practice Question

"Soil Organic Carbon (SOC) is central to soil health and climate resilience. Discuss the factors influencing SOC levels in India and evaluate measures needed to improve it."

Functional Foods & Smart Proteins for Nutrition

📌 Syllabus Mapping

- **GS Paper III – Science & Tech:** Food technology, biotechnology
- **GS Paper II – Social Justice:** Nutrition, food security
- **GS Paper III – Economy:** Agri-food innovation

Introduction

Functional foods and smart proteins have recently gained prominence in discussions on **India's nutritional security**, particularly as the country seeks sustainable solutions to malnutrition, lifestyle diseases, and rising protein demand.

Functional Foods

- Functional foods are **foods that deliver health benefits beyond basic nutrition**, either naturally or through modern technologies such as **nutrigenomics**, **biofortification**, **3D food printing**, and **bioprocessing**.
- **Examples:**
  - *Vitamin-enriched rice* (biofortified)
  - *Omega-3 fortified milk* (fortification technology)
  - *Probiotic yoghurt* (gut-health enhancement)

Such foods help address micronutrient deficiencies, non-communicable diseases, and overall wellness.

Smart Proteins

- Smart proteins are **biotechnology-derived proteins** designed to reduce dependence on conventional livestock-based protein systems.
- These include:
  - **Plant-based proteins** that mimic meat and dairy
  - **Fermentation-derived proteins** (precision fermentation)
  - **Cultivated meat**, grown from animal cells without slaughter

Smart proteins are environmentally sustainable, reduce land and water stress, and support climate-friendly food systems.

Conclusion

Functional foods and smart proteins represent the next frontier of **nutritional innovation**, supporting healthier diets and sustainable food systems in India.
Keywords: *functional foods, smart proteins, biofortification, nutrigenomics*

Mains Practice Question

"Discuss the role of functional foods and smart proteins in strengthening India's nutritional and environmental security."

Export Duty Removed on Molasses

📌 Syllabus Mapping

- **GS Paper III – Economy:** Agriculture, sugar sector, exports
- **GS Paper III – Environment:** Biofuels, ethanol blending

Introduction

The Union Government has decided to remove the **50% export duty on molasses**, aiming to support the sugar industry, boost exports, and enhance raw material availability for global markets.

About Molasses

- Molasses is a **thick, viscous byproduct** of sugarcane and sugar beet processing.
- **Nutrient-rich**, containing calcium, iron, magnesium, potassium, and high sugar content.
- Known regionally as *poor honey* or *exhausted honey*.

Key Applications

- **Beverage and confectionery** industries
- **Ethanol production** (critical for India's biofuel programme)
- **Fertilizer manufacturing** and livestock feed

Conclusion

The removal of export duty enhances India's competitiveness in the global molasses market and indirectly supports the **ethanol blending programme**.
Keywords: *molasses, ethanol, sugar industry*

Mains Practice Question

"Discuss the role of molasses in India's ethanol blending strategy."

GEOGRAPHY AND DISASTER

Lake Turkana: Climate-Linked Quake Activity

📌 Syllabus Mapping

- **GS Paper I – Geography:** Earthquakes, lakes, climate change
- **GS Paper III – Environment:** Climate impact on geophysical processes

Introduction

Recent scientific studies indicate that **falling water levels** in **Lake Turkana**—linked to climate change—have increased seismic activity in the region. This demonstrates how **environmental stress** can influence **tectonic behaviour**.

Why Falling Water Levels Trigger Earthquakes

- When lake water levels decline, the **weight exerted on the Earth's crust decreases**.
- Reduced pressure makes **fault lines more prone to movement**, increasing the likelihood of earthquakes.
- Similar phenomena have been recorded in regions such as the **Dead Sea** and **Lake Mead**.

About Lake Turkana

- **World's largest desert lake** and the **largest alkaline lake**.
- Located primarily in **Kenya**, with its northern edge extending into **Ethiopia**.
- **Over 90%** of its inflow originates from the **Omo River (Ethiopia)**.
- The **Lake Turkana National Parks** were declared a **UNESCO World Heritage Site in 1997** due to archaeological and ecological significance.

Contemporary Relevance

Dimension	Significance
Climate Change	Supports evidence of geophysical changes caused by warming.
Environment	Threatens biodiversity and local communities.
Geopolitics	Ethiopia's water projects on the Omo River affect lake levels.
Disaster Risk	Rising seismic vulnerability in East African Rift Valley.

Conclusion

The Lake Turkana case highlights how **climate variability** can influence **earthquake dynamics**, reinforcing the need to integrate climate science with disaster-risk frameworks.

Mains Practice Question

"Discuss how climate change can indirectly influence seismic activity with reference to Lake Turkana."

Strait of Hormuz: Rising Regional Tensions

📌 Syllabus Mapping

- **GS Paper I – Geography:** Straits, strategic waterways
- **GS Paper II – International Relations:** West Asian geopolitics, energy security
- **GS Paper III – Security:** Maritime security

Introduction

Iranian forces recently intercepted and redirected a tanker carrying high-sulphur gasoil in the **Strait of Hormuz**, reigniting tensions in one of the world's most critical maritime chokepoints.

About the Strait of Hormuz

- Narrow waterway between **Iran** (north) and the **Musandam Peninsula (Oman)**.
- Connects the **Persian Gulf** to the **Gulf of Oman**.
- One of the most important global energy corridors.

Strategic Importance

- Roughly **25% of the world's oil** flows through this narrow passage.
- Critical for Gulf nations like **Saudi Arabia, Kuwait, UAE, Qatar, Iraq**.

Contemporary Relevance

Dimension	Significance
Energy Security	Disruptions affect global oil prices.
Geopolitics	Heightened US–Iran tensions.
Maritime Security	Threat of piracy and seizure of commercial ships.
India's Interest	Ensures stable energy supply from Gulf.

Conclusion

The Strait of Hormuz remains a **geopolitical hotspot**, with global economic implications. Ensuring stability in this region is vital for uninterrupted energy supplies.

Mains Practice Question

"Explain the strategic significance of the Strait of Hormuz. How do geopolitical tensions in this region affect India's energy security?"

Iceland Flags AMOC Collapse as Security Threat

📌 Syllabus Mapping

- **GS Paper I – Geography:** Ocean currents, climate systems
- **GS Paper III – Environment:** Climate change impacts, monsoons

Introduction

Iceland has declared the potential collapse of the **Atlantic Meridional Overturning Circulation (AMOC)** as a **national security threat**, reflecting global concerns over shifts in ocean circulation patterns that regulate planetary climate systems.

About AMOC

- AMOC is a major **system of ocean currents** that transfers **warm water northward** and **cold water southward**within the Atlantic Ocean.
- Powered by differences in **temperature (thermo)** and **salinity (haline)**—collectively known as **thermohaline circulation**.

Consequences of AMOC Weakening or Collapse

- **Cooling in Europe**, altering seasonal temperatures.
- Disruption of **precipitation patterns** across Europe, South America, and Africa.
- Possible shift of the **tropical rain belt southward**, causing severe **drought in the African Sahel**.
- Potential **alteration in the timing and intensity of the Indian Monsoon**, affecting agriculture and food security.

Contemporary Relevance

Dimension	Significance
Climate Security	Widespread climatic instability poses threats to food and water security.
Geopolitics	Impacts Arctic and European climate policy discussions.
India	Changes in monsoon dynamics could impact agriculture-dependent populations.
Scientific Research	Strengthens global monitoring of ocean-atmosphere interactions.

Conclusion

AMOC's weakening represents one of the most critical tipping points in Earth's climate system, making international cooperation essential for monitoring and mitigation.

Keywords: *AMOC, thermohaline circulation, climate tipping points, monsoon variability*

Mains Practice Question

"Explain the functioning of the AMOC and analyse its potential impacts on global and Indian climate patterns if it collapses."

Auroras Triggered by Cannibal Solar Storm

📌 Syllabus Mapping

- **GS Paper I – Geography:** Solar phenomena, upper atmosphere
- **GS Paper III – Science & Tech:** Space weather, geomagnetic storms

Introduction

Auroras were recently observed across North America and Australia due to a powerful **cannibal solar storm**, renewing discussions on solar activity and its effects on Earth.

What is a Cannibal Solar Storm?

- Occurs when a **fast-moving coronal mass ejection (CME)** overtakes an earlier slower CME.
- Their interaction creates an intense, combined storm with stronger geomagnetic effects.
- Can disrupt:
  - GPS
  - Radio communication
  - Power grids

About Auroras

- Natural light displays in the high-latitude night sky.
- Result from **charged solar particles** colliding with atmospheric gases such as:
  - **Oxygen:** Green or red light
  - **Nitrogen:** Blue and purple
- Known as:
  - **Aurora Borealis** in the Northern Hemisphere
  - **Aurora Australis** in the Southern Hemisphere

Conclusion

Auroras are beautiful indicators of space weather, but powerful solar storms highlight the need to enhance global **space-weather monitoring**.

Mains Practice Question

"Explain how solar storms lead to auroras. Discuss the implications of cannibal solar storms for modern infrastructure."

State of Cryosphere 2025: Accelerated Meltdown

📌 Syllabus Mapping

- **GS Paper I – Geography:** Cryosphere, glaciers, sea-level rise, climate systems
- **GS Paper III – Environment:** Climate change impacts, carbon cycle, ocean circulation
- **GS Paper II – International Relations:** Global climate governance, climate negotiations

Introduction

The **International Cryosphere Climate Initiative (ICCI)** has released the **State of the Cryosphere Report 2025**, providing a detailed assessment of the rapidly changing **cryosphere components**—the frozen parts of the Earth system. The report underscores the unprecedented pace of melting and its profound consequences for global climate stability, sea levels, ecosystems, and human security.

Key Highlights of the Report

1. Ice Sheets

- **Losses from the Greenland and Antarctic ice sheets have quadrupled** since the 1990s.
- This accelerated melting is driven by rising temperatures and increased ocean heat absorption.

Impact

- Contributes significantly to **global sea-level rise**.
- Leads to the destruction of **coastal infrastructure**, salinization of **agricultural land**, loss of **homes and livelihoods**, and increasing risks of **forced displacement**.

2. Polar Oceans

- Greenhouse gas accumulation is reshaping the functioning of **Polar Oceans**, which regulate global climate by absorbing heat and carbon.

Impact

- Two major heat-transport systems—
  - **Antarctic Overturning Circulation (AOC)**
  - **Atlantic Meridional Overturning Circulation (AMOC)**
  —have **slowed substantially** due to freshwater released from melting ice.
- Weakening of these systems disrupts **global ocean circulation**, affecting weather patterns, fisheries, and nutrient distribution.

3. Mountain Glaciers and Snow

- Worldwide glacier ice loss is increasing at an **exponential rate**, with **273 gigatons lost annually (2000–2023)**.
- This loss is particularly severe in the **Himalayas, Andes, and Alps**.

Impact

- Threatens **water security** for billions dependent on glacial melt.
- Heightens risks to **food systems**, **energy generation** (hydropower), **agriculture**, and **regional political stability**, especially in high mountain regions like **South Asia**.

4. Sea Ice

- **Sea ice extent and thickness have declined 40–60%** at both poles since 1979.
- Arctic sea ice is experiencing the most dramatic reduction.

Impact

- Drives **Arctic amplification**, accelerating warming in the region.
- Endangers ice-dependent species such as polar bears, penguins, walruses.
- Alters **weather patterns**, contributing to more extreme events.
- Weakens ocean circulation and increases the long-term threat of **sea-level rise**.

5. Permafrost

- More than **210,000 km² of permafrost** has melted **per decade** since current warming began.
- Permafrost holds vast reserves of ancient organic matter.

Impact

- Releases massive quantities of **carbon and methane**—three times more carbon than currently present in Earth's atmosphere.
- Reduces the **global carbon budget**, making emission targets harder to achieve.
- Damages infrastructure in Arctic nations due to unstable ground.

Contemporary Relevance & Multi-Dimensional Significance

Dimension	Significance
Climate Science	Signals irreversible changes and tipping points in the cryosphere.
Global Security	Water scarcity, sea-level rise, and food insecurity pose geopolitical risks.
Economic	Threatens global supply chains, fisheries, and coastal infrastructure.
India	Himalayan glacier melt threatens river flows, agriculture, hydropower, and disaster frequency.
Carbon Cycle	Permafrost thaw risks massive carbon release, impacting climate targets.

Conclusion

The **State of the Cryosphere Report 2025** shows that multiple components of the cryosphere are undergoing rapid and accelerating decline. These changes carry far-reaching consequences for **global sea levels, climate stability, food and water security, and long-term carbon emissions**. Immediate, deep, and sustained global mitigation efforts are essential to prevent irreversible tipping points.

Keywords: *cryosphere, ice sheets, AMOC, permafrost thaw, sea-level rise, Arctic amplification*

Mains Practice Question

"Cryosphere degradation poses significant risks to global climate stability, water security, and sea-level rise. Discuss in light of the State of the Cryosphere Report 2025."

HISTORY, ART & CULTURE

David Szalay Wins 2025 Booker Prize

📌 Syllabus Mapping

- **GS Paper I – Art & Culture:** Global literary awards
- **GS Paper II – International Relations:** Cultural diplomacy

Introduction

Author **David Szalay** has been awarded the **2025 Booker Prize** for his novel *Flesh*, becoming the **first Hungarian–British writer** to win the prestigious literary honour. This recognition reinforces the Booker Prize's legacy as the world's most influential award for English-language fiction.

About the Booker Prize

- **Established:** 1969 in the United Kingdom.
- **Purpose:** Recognises the **best original English-language novel** published in the UK or Ireland each year.
- **Award:**
  - Winner receives **£50,000**.
  - Each shortlisted author receives **£2,500**.

Difference from International Booker Prize

- **Booker Prize:** For fiction originally written in English.
- **International Booker Prize:** For translated long-form fiction or short-story collections published in the UK/Ireland.

Conclusion

David Szalay's win adds to the rich legacy of the Booker Prize by spotlighting contemporary global voices and expanding the boundaries of modern literature.
Keywords: *Booker Prize, David Szalay, English fiction, literary award*

Mains Practice Question

"Discuss the significance of global literary awards such as the Booker Prize in promoting cultural diplomacy and contemporary literature."

ENVIRONMENT & ECOLOGY

India Highlights Climate Finance Needs at COP30

📌 Syllabus Mapping

- **GS Paper II – International Relations:** Climate negotiations, multilateral agreements
- **GS Paper III – Environment:** Climate finance, adaptation, Paris Agreement, climate justice
- **GS Paper II – Governance:** Equity, global commitments, North–South divide

Introduction

At the **UNFCCC CoP30 in Belém, Brazil**, India delivered statements on behalf of the **BASIC group (Brazil, South Africa, India, China)** and the **Like-Minded Developing Countries (LMDC)**, highlighting that **climate finance** remains one of the biggest barriers to achieving global climate goals. India stressed that ambitious climate action is impossible without **predictable, adequate, and accessible finance** from developed nations.

India's Key Positions at CoP30

1. Need for a Clear Definition of Climate Finance

- India emphasized the absence of a **universally accepted definition** of climate finance.
- A clear definition would prevent **double counting**, ensure **transparency**, and hold developed nations accountable for their commitments.

2. Strong Push for Adaptation Finance

- India called for **scaled-up public finance flows** dedicated to *adaptation*, not just mitigation.
- According to current estimates, developing countries require **nearly fifteen times** the present levels of adaptation finance to meet climate-related vulnerabilities.
- India highlighted that adaptation finance remains disproportionately low despite growing **climate risks**, especially for vulnerable regions.

3. Strengthening the Global Goal on Adaptation (GGA)

- India sought a robust outcome on the **Global Goal on Adaptation**, introduced under **Article 7 of the Paris Agreement**.
- GGA aims to enhance **adaptive capacity**, bolster **resilience**, and reduce **climate vulnerability**—critical for countries facing rising heatwaves, extreme rainfall, cyclones, and sea-level rise.

4. Implementation of Article 9.1 of the Paris Agreement

- India reaffirmed that **Article 9.1** legally obligates **developed countries** to provide financial resources to developing nations for **mitigation and adaptation**.
- This obligation is based on the principle of **Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC)**.

5. Technology Transfer Without Barriers

- India demanded a strong outcome under the **Technology Implementation Programme**, one of the results of the **Paris Agreement's first Global Stocktake**.
- Highlighted that **intellectual property rights (IPR)** and **market barriers** must not impede technology transfer.
- Access to clean technology is essential for developing nations to meet climate targets.

6. Bridging the Development Gap between Global North and South

- India stressed that the **Just Transitions Work Programme** under UNFCCC must produce **action-oriented institutional mechanisms**.
- A just transition must ensure **equity**, **inclusivity**, and **support for developing economies**, preventing widening developmental inequalities.

Internationally Agreed Climate Finance Targets

1. Baku to Belém Roadmap – The New Collective Quantified Goal (NCQG)

- At **CoP29**, Parties agreed to mobilise at least **$300 billion per year by 2035** for developing countries.
- A broader target was also set: **$1.3 trillion per year by 2035** in total external climate finance flows.

2. Glasgow Climate Pact (2021)

- Commits developed nations to deliver **$40 billion** in adaptation funding by **2025**.
- However, delivery gaps persist, and India highlighted this non-fulfilment at CoP30.

Contemporary Relevance & Multi-Dimensional Significance

Dimension	Significance
Climate Justice	Reinforces equity and responsibility of historical emitters.
Global South Priorities	Ensures developing nations' needs are central to climate negotiations.
Finance & Technology	Enables access to clean tech and adaptation infrastructure.
India's Leadership	Positions India as a spokesperson for the Global South.
Mitigation–Adaptation Balance	Corrects global finance skew heavily tilted toward mitigation.

Conclusion

India's intervention at CoP30 underscores that **climate finance remains the cornerstone of effective climate action**. Without adequate financial resources, technology transfer, and equitable support, developing nations cannot meet global climate goals. India's stand reinforces **equity**, **fairness**, and the urgent need to bridge the **North–South climate finance gap**, thereby strengthening global climate governance.

Keywords: *Climate finance, Global Goal on Adaptation, Article 9.1, NCQG, BASIC, LMDC, Just Transition, climate justice*

Mains Practice Question

"Climate finance continues to be the most critical bottleneck in global climate action. Analyse India's stance at CoP30 in the context of equity, adaptation, and commitments under the Paris Agreement."

Declaration on Information Integrity on Climate

📌 Syllabus Mapping

- **GS Paper II – International Relations:** Multilateral climate initiatives, global governance
- **GS Paper III – Environment:** Climate negotiations, climate communication, misinformation

Introduction

At **CoP30**, the **Global Initiative for Information Integrity on Climate Change** launched the **Declaration on Information Integrity on Climate Change**, marking an international effort to combat climate-related misinformation. The initiative was first announced at the **2024 G20 Leaders' Summit**, reflecting a growing consensus that **accurate climate communication** is essential for effective climate action.

Key Features of the Declaration

1. Recognising Climate Misinformation as a Crisis

- The Declaration affirms that **climate misinformation**—false or deceptive narratives about the causes, impacts, or solutions to climate change—has become a **global climate crisis** in itself.
- Misleading narratives undermine public trust, delay climate action, and weaken global cooperation.

2. Commitment to Protect Climate Science

- Governments commit to safeguarding **scientific integrity** by ensuring that climate communication is based on validated data, peer-reviewed science, and transparent disclosure.
- Promotes reliable information ecosystems to counter manipulation.

3. Establishment of the Global Fund

- A **Global Fund for Information Integrity on Climate Change** has been launched to:
  - Support research on climate misinformation
  - Enhance public awareness
  - Strengthen institutional capacity for monitoring and fact-checking

4. Multilateral Collaboration

- The initiative brings together **States and international organisations** to fund coordinated action, reflecting the rise of *information security* within climate governance.

Contemporary Relevance

Dimension	Significance
Climate Action	Accurate information enables informed policymaking.
Geopolitics	Counters misinformation influencing global negotiations.
Public Awareness	Prevents false narratives on renewable energy, net zero, etc.
Digital Governance	Aligns with debate on regulating harmful content online.

Conclusion

The Declaration reinforces that **information integrity is central to climate justice and global climate action**, ensuring that science, not misinformation, guides policy decisions.
Keywords: *climate misinformation, information integrity, CoP30, global climate governance*

Mains Practice Question

"Climate misinformation poses a serious threat to global climate governance. Examine the significance of the Declaration on Information Integrity on Climate Change launched at CoP30."

Global Carbon Budget 2025: India's Emissions

📌 Syllabus Mapping

- **GS Paper III – Environment:** Climate science, carbon emissions, mitigation strategies
- **GS Paper III – Economy:** Energy sector, coal dependence

Introduction

The **Global Carbon Budget 2025**, released by the **Global Carbon Project**, indicates that India's emissions grew modestly at **1.4% in 2025**, supported by **monsoon-induced cooling** and **renewable energy expansion**. India remains a major emitter in absolute terms but retains low per capita emissions.

Key Findings

1. India's Ranking in Global Emissions

- India is the **third-largest carbon emitter** with **3.2 billion tonnes (2024)**.
- Ahead of India:
  - **China:** 12 billion tonnes
  - **United States:** 4.9 billion tonnes

2. Low Per Capita Emissions

- India's per-capita emissions stand at **2.2 tonnes CO_2/year**, the **second-lowest** among the world's 20 largest economies.
- Reflects India's development stage and equitable emissions profile.

3. Sectoral Contribution

- **Coal** remains the **dominant driver** of emissions due to its use in power generation and industries.
- Growth in **renewables** helped reduce the overall emissions growth rate.

Contemporary Relevance

Dimension	Significance
Climate Negotiations	Supports India's argument for "fair share" and equity.
Energy Security	Highlights need for diversification away from coal.
Economy	Shows transition towards cleaner energy pathways.
Global Climate Governance	Positions India as a responsible emitter with low per-capita footprint.

Conclusion

The Global Carbon Budget 2025 reinforces that while India is a major emitter in absolute terms, it continues to maintain *low per-capita emissions* and is increasingly shifting toward renewable sources.
Keywords: *Global Carbon Project, carbon emissions, coal dependence, per capita emissions*

Mains Practice Question

"Despite being the third-largest emitter globally, India's per capita emissions remain low. Analyse this paradox in light of the Global Carbon Budget 2025."

Saranda Forest Notified as Sanctuary

Syllabus Mapping

- **GS Paper III – Environment:** Biodiversity, conservation, protected areas
- **GS Paper I – Geography:** Forest ecosystems, tribes, physical features

Introduction

The Supreme Court has directed the Jharkhand government to **notify Saranda Forest** as a **Wildlife Sanctuary and Conservation Reserve** and prohibited mining within a **1-km radius** of its boundary. The decision aims to safeguard biodiversity in one of India's richest Sal forests.

About Saranda Forest

1. Location and Ecology

- Known as the **"land of seven hundred hills"**, Saranda is a dense **Sal-dominated** forest in Jharkhand.
- Part of the **Chhotanagpur bio-geographic zone** and merges with forests of **Odisha and Chhattisgarh**.

2. Indigenous Communities

- Home to tribal groups such as **Ho, Munda, Uraon, and Santhal** communities.

3. Rivers and Landscape

- Major rivers that drain the region include **Karo, Koina, and Lailor**.

4. Ecological Importance

- Critical habitat for the **Central Indian elephant population**.
- Contains unique orchids and rare vegetation found in **Ligarda swamp**, including palms, wild bananas, ferns, and *Piper* species.

Contemporary Relevance

Dimension	Significance
Conservation	Protection from mining strengthens habitat continuity.
Tribal Rights	Supports traditional livelihoods and cultural heritage.
Biodiversity	Safeguards endemic species and elephant corridors.
Judicial Intervention	Reflects expanding environmental jurisprudence in India.

Conclusion

Declaring Saranda a wildlife sanctuary strengthens efforts toward preserving India's ecological heritage while balancing tribal rights and conservation needs.
Keywords: *Saranda Forest, wildlife sanctuary, Supreme Court, biodiversity, elephant corridor*

Mains Practice Question

"Discuss the ecological and socio-cultural importance of Saranda Forest and evaluate the significance of its designation as a Wildlife Sanctuary."

India–Botswana Cheetah Translocation Pact

📌 Syllabus Mapping

- **GS Paper III – Environment:** Biodiversity conservation, wildlife translocation, ecological restoration
- **GS Paper II – International Relations:** India–Africa relations, environmental diplomacy
- **GS Paper III – Ecology:** Grassland ecosystems, keystone species

Introduction

India and Botswana have formally announced the **translocation of eight cheetahs** to India under **Project Cheetah**, marking another significant milestone in India's efforts to restore the cheetah population after its extinction in 1952. This translocation strengthens India's scientific conservation initiatives while deepening partnerships with African nations in wildlife management.

About Project Cheetah

- **Launched:** 2022
- **Objective:** Reintroduce **African cheetahs** into India through intercontinental translocation—making it the **world's first large carnivore translocation across continents**.
- **Previous Translocations:**
  - **2022:** Eight cheetahs from Namibia
  - **2023:** Twelve cheetahs from South Africa
- **Implementing Agency: National Tiger Conservation Authority (NTCA)**
  - NTCA is a **statutory body** under the **Ministry of Environment, Forest and Climate Change**, established under the **Wildlife (Protection) Act, 1972**, amended in 2006.

Cheetah Project Steering Committee

- Created by NTCA in 2023.
- Tasked with monitoring, reviewing, and recommending strategies for the scientific implementation of Project Cheetah.
- Operates under the broader framework of **Project Tiger**.

Significance of Reintroducing Cheetahs in India

1. Ecological Restoration

- Cheetahs act as **apex predators**, ensuring a balanced population of herbivores and preventing ecosystem degradation.
- Their presence helps maintain the **health and resilience of grassland ecosystems**, which are among the most neglected biomes in India.

2. Biodiversity Conservation

- Cheetahs serve as a **flagship species** for grasslands and semi-arid habitats.

- Their conservation indirectly supports the protection of other threatened species sharing the same landscape, including:
  - Great Indian Bustard
  - Caracal
  - Blackbuck
  - Indian wolf

3. Strengthening Global Conservation Partnerships

- Translocation strengthens India's environmental diplomacy with African nations like Namibia, South Africa, and Botswana.

About the Cheetah (Acinonyx jubatus venaticus)

Key Biological Features

- The **world's fastest mammal**, capable of reaching speeds of up to **112 km/h**.
- Only large cat species in which individuals **cannot roar**; instead, they chirp, purr, and growl softly.

Extinction in India

- Cheetahs went extinct in India in **1952**, largely due to hunting, habitat loss, and depletion of prey.

Two Extant Species

- **African Cheetah**
  - IUCN Status: **Vulnerable**
  - Widely distributed across Africa and used for India's reintroduction programme.
- **Asiatic Cheetah**
  - IUCN Status: **Critically Endangered**
  - Found only in small pockets of **eastern Iran**.
  - One of the rarest felines globally.

Contemporary Relevance & Multi-Dimensional Significance

Dimension	Significance
Ecological	Restores lost predator–prey dynamics in grasslands.
Scientific	Advances India's capability in wildlife translocation and ecological modelling.
International Relations	Strengthens India–Africa cooperation in conservation.
Tourism & Economy	Potential boost to eco-tourism and local livelihoods in regions like Kuno.
Policy	Aligns with India's commitment to biodiversity under CBD (Convention on Biological Diversity).

Conclusion

The India–Botswana cheetah translocation pact marks a significant stride in **rebuilding India's ecological heritage**, strengthening global conservation partnerships, and reviving degraded grassland ecosystems. Project Cheetah continues to reflect India's commitment to **biodiversity, scientific wildlife management, and international cooperation**.

Keywords: *Project Cheetah, NTCA, ecological restoration, African cheetah, wildlife translocation*

Mains Practice Question

"Assess the ecological and strategic significance of Project Cheetah in India. How does the recent India–Botswana translocation pact strengthen India's conservation agenda?"

Gynandromorphism Found in Thai Spider

📌 Syllabus Mapping

- **GS Paper III – Environment:** Zoological anomalies, biodiversity
- **GS Paper III – Science & Tech:** Genetic mutations, developmental biology

Introduction

Scientists in Thailand have discovered a rare spider species, *Damarchus inazuma*, exhibiting **gynandromorphism**—a condition where an individual simultaneously displays male and female physical characteristics.

About Gynandromorphism

- Defined as an **abnormal reproductive condition** in which both male and female traits appear in one organism.
- Most commonly observed in organisms with **strong sexual dimorphism**, such as:

- Certain butterflies
- Spiders
- Birds

Cause

- Typically occurs due to an **error in mitosis during early embryonic development**, when sex chromosomes fail to separate properly.
- Results in **mixed male and female cell lines** within one individual.

Conclusion

The discovery contributes to understanding **genetic mosaicism**, developmental biology, and biodiversity variations in arthropods.

Mains Practice Question

"What is gynandromorphism? Explain the genetic mechanisms underlying this condition with suitable examples."

Global Cooling Watch 2025: UNEP Call for Action

📌 Syllabus Mapping

- **GS Paper III – Environment:** Climate change mitigation, refrigerants, urban heat
- **GS Paper III – Economy:** Energy efficiency, sustainable technologies
- **GS Paper II – Governance:** International environmental initiatives, policy implementation

Introduction

The United Nations Environment Programme's **Cool Coalition** has released the **'Global Cooling Watch 2025' Report**, outlining the urgent need for a global shift toward **sustainable cooling solutions**. The report proposes a **Sustainable Cooling Pathway** aimed at reducing greenhouse gas (GHG) emissions from cooling systems by **2050**, while addressing rising global temperatures, extreme heat events, and cooling inequality.

Key Concerns Highlighted in the Report

1. Rising Global Cooling Demand

- Under the **Business-as-Usual (BAU)** scenario, global cooling equipment stock is expected to **triple**, rising from **22 terawatts (TW) in 2022** to **68 TW by 2050**.
- This surge could significantly increase emissions unless efficient alternatives are adopted.

2. Policy Gaps

- Although many nations recognise the need for cooling policies, **only 54 countries** currently meet the full standards of the Sustainable Cooling Pathway.
- This gap highlights limited progress in adopting low-carbon cooling solutions globally.

3. Escalating Extreme Heat Stress

- According to the **IPCC**, the number of people exposed to **deadly heat stress** may rise from **30% today** to **48–76%**by the end of the century.
- Urban heat island effects, heatwaves, and poorly planned city design further intensify cooling needs.

Proposed Sustainable Cooling Pathway

1. Passive Cooling Measures

- Reduce cooling loads through **passive architecture**, efficient urban planning, shading, ventilation, and building materials.
- Simple interventions—such as installing **doors on refrigerated cabinets**—can significantly lower cooling demand and associated emissions.

2. Low-Energy Cooling Systems

- Encourages using **fans, evaporative coolers**, and hybrid systems that reduce dependence on power-intensive air conditioning.
- Helps lower both energy consumption and electricity costs.

3. High-Efficiency Cooling Technologies

- Adoption of **variable-speed compressors**, improved maintenance, and stringent energy-efficiency standards.
- Ensures optimal performance with lower energy use.

4. Rapid Phase-Down of HFCs

- Calls for quick transition to **low-GWP (Global Warming Potential)** refrigerants.
- Supports compliance with the **Kigali Amendment** to the Montreal Protocol.
- Reduces direct emissions while maintaining system efficiency.

Beat the Heat Global Initiative

Overview

- A joint initiative of **UNEP's Cool Coalition** and **Brazil (COP30 Presidency)**.
- Intended to turn the Global Cooling Watch recommendations into **real-world climate action**.

Objectives

- Create **equitable cooling access** through multilevel governance—governments, cities, industries, financial institutions.
- Promote policies that reduce heat exposure for vulnerable communities.

Focus Areas

- Integrating **passive and nature-based cooling** in buildings and city design.
- Strengthening **public procurement** of energy-efficient and low-GWP cooling technologies.
- Enhancing **urban heat planning**, including shading, green roofs, and reflective surfaces.
- Ensuring **inclusive cooling solutions**, especially for low-income groups.

Contemporary Relevance & Multi-Dimensional Significance

Dimension	Importance (2025)
Climate Mitigation	Reduces GHG emissions from rapidly growing cooling demand.
Energy Security	Cuts electricity consumption, reducing grid stress during heatwaves.
Urban Governance	Supports sustainable urban planning and heat-resilient cities.
Equity	Ensures affordable access to cooling for vulnerable populations.
Technology	Encourages adoption of high-efficiency and low-GWP cooling systems.
International Cooperation	Aligns with global commitments under the Montreal Protocol.

Conclusion

The **Global Cooling Watch 2025 Report** signals an urgent need for countries to adopt **sustainable cooling strategies** to manage increasing heat stress, avoid soaring emissions, and ensure equitable access to cooling services. Implementing the proposed Sustainable Cooling Pathway will be crucial to building **climate-resilient, energy-efficient, and health-protective urban environments**.

Keywords: *Sustainable Cooling, HFC Phase-down, energy efficiency, urban heat island, UNEP Cool Coalition*

Mains Practice Question

"Cooling demand is rising rapidly due to global warming and urbanisation. Discuss the Sustainable Cooling Pathway proposed in the Global Cooling Watch 2025 Report and its relevance for climate mitigation and equity."

GRAP Stage-III Invoked in NCR

📌 Syllabus Mapping

- **GS Paper III – Environment:** Air pollution, mitigation measures, statutory bodies
- **GS Paper II – Governance:** Institutional coordination, regulatory frameworks
- **GS Paper I – Geography:** Meteorological and topographical factors influencing air quality

Introduction

The **Commission for Air Quality Management (CAQM)** has activated **Stage-III of the Graded Response Action Plan (GRAP)** across the National Capital Region (NCR) following the escalation of Delhi's air quality to the **'Severe' category (AQI 401–450)**. The move triggers stringent emergency measures to reduce emissions, manage congestion, and protect public health.

Stage-III Measures Under GRAP

Under Stage-III, CAQM has implemented a **9-point emergency action plan** which includes:

- Complete **ban on construction and mining activities** (except essential services).
- Prohibition on **polluting vehicles**, particularly older diesel four-wheelers.
- **Hybrid schooling**, allowing online/offline flexibility to reduce mobility.

- **Staggered office timings** to ease peak-hour congestion.
- Intensified enforcement of pollution control norms across NCR industries and transport.
  These measures aim to rapidly cut PM2.5 and PM10 concentrations during severe air pollution episodes.

About CAQM

- The **Commission for Air Quality Management in NCR and Adjoining Areas (CAQM)** is a **statutory body**created under the **CAQM Act, 2021**.
- Mandate:
  - Coordinate air quality management efforts across **Delhi, Haryana, Punjab, Rajasthan, and Uttar Pradesh**.
  - Issue binding directions to states, industries, and local bodies.
  - Harmonise policies on stubble burning, vehicular emissions, industrial pollution, and clean fuel transition.

About the Graded Response Action Plan (GRAP)

GRAP is an **emergency air-quality management framework** for Delhi-NCR. It activates **predefined measures** based on the city's **daily AQI** to ensure swift and coordinated response.

AQI-Based Stages

- **Stage 1 – Poor (201–300)**
- **Stage 2 – Very Poor (301–400)**
- **Stage 3 – Severe (401–450)**
- **Stage 4 – Severe+ (451+)**

Each stage mandates progressively stricter interventions to control pollution.

Reasons for Persistent Air Pollution in NCR

1. Topographical Factors

- **Indo-Gangetic Basin Effect:** The bowl-shaped geography traps pollutants.
- **Natural Barriers:** The **Himalayas** block the dispersion of pollutants; the **Aravallis** fail to channelise winds effectively.

2. Meteorological Factors

- **Temperature inversion**, preventing vertical mixing of pollutants.
- **Low wind speeds** during winter months.
- High humidity aiding particulate matter aggregation.

3. Pollution Sources

- **Stubble burning** in Punjab and Haryana during winter.
- **Vehicular emissions**, especially from diesel transport.
- **Industrial emissions**, dust from construction, and waste burning.

Case Study: Beijing's Success in Reducing Air Pollution

Beijing provides a compelling example of sustained and coordinated action:

Improved Air Quality: Average AQI dropped from **144 (2015)** to **92 (2024)**.

Three-Phase, Long-Term Strategy (1998–2017): Combined **local governance**, **public participation**, and **continuous regulation**.

Targeted Source Control

- Major reductions in emissions from **coal power plants**, **vehicles**, and **construction activities**.
- Adoption of **clean energy**, vehicle upgrades, and stringent industrial norms.

Regional Cooperation & Investment

- Extensive cooperation with **five neighbouring provinces**.
- Heavy public investment in pollution reduction infrastructure.

This demonstrates the importance of a **multi-sector, multi-state approach**, relevant for Delhi-NCR.

Contemporary Relevance & Multi-Dimensional Significance

Dimension	Significance
Public Health	Stage-III protects vulnerable groups from hazardous particulate matter.

Governance	Demonstrates need for coordinated, region-wide interventions.
Environment	Helps manage winter smog episodes, reducing pollutant buildup.
Transport Policy	Pushes reforms in vehicular emissions and public transport usage.
International Learning	Beijing's experience offers lessons for NCR on long-term planning.

Conclusion

The activation of **Stage-III GRAP measures** reflects the urgent need to curb severe pollution episodes in Delhi-NCR. While emergency responses are essential in the short term, sustainable long-term solutions—clean fuels, public transport expansion, regional cooperation, and agricultural reforms—are crucial to break the recurring cycle of winter smog.
Keywords: *GRAP, CAQM Act 2021, AQI, Beijing model, stubble burning, temperature inversion*

Mains Practice Question

"Despite multiple policy interventions, Delhi-NCR continues to face severe air pollution episodes. Analyse the role of GRAP and CAQM while identifying long-term structural solutions."

Climate Risk Index 2026 Released

📌 Syllabus Mapping

- **GS Paper III – Environment:** Climate vulnerability, extreme weather
- **GS Paper II – International Relations:** Global climate reports

Introduction

Germanwatch has released the **Climate Risk Index (CRI) 2026**, assessing the human and economic impacts of **extreme weather events** globally. The report underscores the increasing climate vulnerability of developing countries, including India.

About the Climate Risk Index

- **Started:** 2006
- **Purpose:** Tracks the **severity of climate-related losses** based on deaths, economic damages, and frequency of extreme events.

Key Findings (1995–2024)

- Over **9,700 extreme weather events** occurred globally.
- Caused **800,000+ deaths** and **US$ 4.5 trillion** in losses.
- **India's ranking:**
  - **15th** in CRI 2024
  - **9th** for cumulative risk (1995–2024)

India's Exposure

- Faced **~430 extreme weather events**.
- Suffered **US$170 billion** in losses.
- **1.3 billion** people affected over three decades.

Conclusion

The CRI 2026 reinforces the urgent need for **adaptation planning**, climate-resilient infrastructure, and early warning systems, especially for climate-sensitive countries like India.
Keywords: *Climate Risk Index, extreme weather, Germanwatch, climate losses*

Mains Practice Question

"India ranks high in the Climate Risk Index. Examine the reasons for India's vulnerability and suggest climate-resilient strategies."

Dumpsite Remediation Accelerator Launched

📌 Syllabus Mapping

- **GS Paper III – Environment:** Solid waste management, landfills, pollution mitigation
- **GS Paper II – Governance:** Urban development, municipal governance
- **GS Paper III – Infrastructure:** Urban reforms, sustainability initiatives

Introduction

The Government of India has launched the **Dumpsite Remediation Accelerator Programme (DRAP)**, a focused, year-long initiative under **Swachh Bharat Mission–Urban (SBM-U) 2.0**, to achieve the national target of **Lakshya Zero Dumpsites by September 2026**. The programme accelerates the remediation of legacy waste dumpsites and enhances urban environmental health.

Objectives and Key Features of DRAP

Purpose: DRAP aims to **prioritize high-impact legacy waste sites**, particularly those contributing significantly to pollution and land degradation.

Coverage

- Targets remediation of approximately **8.8 crore metric tonnes (MT)** of legacy waste across India.
- Legacy waste includes **old municipal solid waste**—often a mixture of:
  - Partially decomposed organic waste
  - Plastics
  - Construction debris
  - Miscellaneous municipal refuse

Institutional Framework

- **Ministry of Housing and Urban Affairs (MoHUA)** is the nodal ministry for implementation.
- Designed to support Urban Local Bodies (ULBs) through **capacity building, monitoring, and performance-linked strategies**.

Eligibility

- Open to **all States and Union Territories** with ongoing legacy waste remediation projects.
- **Priority** is given to dumpsites containing **more than 45,000 MT** of legacy waste.
- No minimum threshold applies to **UTs and North Eastern States**, acknowledging their smaller waste loads and unique urban challenges.

Status of Dumpsite Management in India

Remediation Progress

- Out of India's large inventory of dumpsites, **1,428 sites** are currently under remediation.
- Of these, **1,048 sites** have been fully remediated, indicating substantial progress toward national waste management goals.

Environmental Concerns Related to Dumpsites

Dumpsites pose major environmental and health hazards due to:

1. Leachate

- **Toxic, contaminated liquid** produced at the base of dumpsites due to water percolation through waste layers.
- Pollutes soil, groundwater, and nearby surface water bodies.

2. Landfill Gas

- Generated from **anaerobic decomposition** of organic materials.
- Primarily composed of **methane (CH_4)** and **carbon dioxide (CO_2)**.
- Methane poses:
  - **Explosion risks**
  - **Odour nuisance**
  - Significant **greenhouse gas emissions**

About Swachh Bharat Mission–Urban 2.0

- Launched in **2021**, SBM-U 2.0 focuses on achieving **Garbage-Free Cities (GFC)**.
- Key targets:
  - **100% scientific waste processing**
  - **Complete remediation of all legacy dumpsites**
  - Transforming dumpsites into **green zones** such as parks, urban forests, and public amenities.

Contemporary Relevance

- Legacy dumpsites hold decades of waste that threaten **urban health**, **ecosystem stability**, **groundwater quality**, and **air quality**.
- DRAP accelerates remediation efforts in line with national goals, while complementing global commitments on **methane reduction**, circular economy, and climate action.

- Supports SDGs related to **clean water**, **sustainable cities**, and **climate action**.

Conclusion

The **Dumpsite Remediation Accelerator Programme (DRAP)** strengthens India's efforts to eliminate unsafe landfills and modernize waste management infrastructure under SBM-U 2.0. By focusing on high-impact sites, enabling rapid remediation, and addressing key environmental risks, DRAP is a crucial step toward cleaner, healthier, and more sustainable urban spaces.
Keywords: *legacy waste, landfill remediation, SBM-U 2.0, leachate, methane emissions*

Mains Practice Question

"Legacy dumpsites remain a major environmental challenge in urban India. Evaluate the significance of the Dumpsite Remediation Accelerator Programme (DRAP) in achieving sustainable waste management under SBM-U 2.0."

Greater Flamingo Sanctuary Threatened by Wind Farm

📌 Syllabus Mapping

- **GS Paper III – Environment:** Biodiversity conservation, protected areas
- **GS Paper I – Geography:** Wetlands, migratory routes

Introduction

A proposed **50 MW wind farm** by the National Institute of Wind Energy (NIWE) may impact the **Greater Flamingo Sanctuary (GFS)** in Tamil Nadu, raising concerns about wildlife conservation along major migratory routes.

About Greater Flamingos

- Widely distributed across **Africa, western Asia, and southern Europe**.
- Prefer **shallow, saline and alkaline wetlands**, especially during breeding seasons.

About Greater Flamingo Sanctuary (GFS)

- **Established by:** Tamil Nadu Government at **Dhanushkodi**.
- **Purpose:** Protect key habitats for migratory birds along the **Central Asian Flyway**, one of the world's major migratory bird corridors.
- Located within the **Gulf of Mannar Biosphere Reserve**, known for high marine and coastal biodiversity.

Conclusion

The proposed wind project highlights the need to balance **clean energy development** with **critical habitat protection**, especially for migratory birds.
Keywords: *Greater Flamingo Sanctuary, Central Asian Flyway, Gulf of Mannar*

Mains Practice Question

"Discuss the ecological importance of the Central Asian Flyway and the conservation challenges associated with it."

CIF: Spain & Germany Commit $100 Million

📌 Syllabus Mapping

- **GS Paper II – IR:** Global climate finance
- **GS Paper III – Environment:** Adaptation, climate resilience

Introduction

At **UNFCCC COP30 in Brazil**, Spain and Germany pledged **$100 million** to the **CIF's ARISE initiative (Accelerating Resilience Investments and Innovations for Sustainable Economies)** to bolster climate resilience in developing countries.

About the Climate Investment Fund (CIF)

- **Established:** 2008
- **By:** A group of major **multilateral development banks (MDBs)**

- **Purpose:** Provide climate finance to 70+ low- and middle-income countries, helping them integrate **low-carbon and climate-resilient pathways** into national development plans.

Key Features

- Supports **clean energy**, **climate resilience**, and **sustainable development**.
- Two main funding windows:
  1. **Clean Technology Fund (CTF)**
  2. **Strategic Climate Fund (SCF)**

About ARISE

- Helps countries **convert climate risks into economic opportunities**.
- Strengthens adaptive capacity, resilience planning, and climate innovation systems.

Conclusion

The renewed financial commitment highlights the growing importance of **climate finance** and shared responsibility in mitigating global climate risks.

Keywords: *CIF, ARISE, climate finance, MDBs*

Mains Practice Question

"Climate finance remains a cornerstone of global climate action. Evaluate the role of multilateral funds like CIF in supporting developing nations."

Minamata Convention to Phase Out Dental Amalgam

📌 Syllabus Mapping

- **GS Paper III – Environment:** Toxic pollution, conventions, mercury management
- **GS Paper II – Governance:** International agreements, public health
- **GS Paper III – Science & Tech:** Chemical hazards, environmental toxicology

Introduction

At the **sixth Conference of the Parties (COP-6)** to the **Minamata Convention on Mercury**, held in Geneva, member countries agreed to **end the use of dental amalgam by 2034** as part of global efforts to curb mercury pollution. Delegates also committed to intensifying action against **mercury-added skin-lightening products**, which remain widely used in many developing regions despite health risks.

About Mercury

Properties

- Mercury (**Hg**) is a **naturally occurring, heavy, silvery-white transition metal** with **atomic number 80**.
- **Ductile, malleable**, and a conductor of heat and electricity.
- Notably, it is the **only common metal that is liquid at room temperature**.

Sources

Natural Sources

- **Volcanic eruptions**
- Emissions from **oceans** and natural geological formations

Anthropogenic (Human-Made) Sources

- **Gold mining** and other mining activities
- **Fossil fuel combustion**, especially coal
- **Cement** and **metal production industries**

Uses

Historically used in:

- Thermometers and barometers
- Fluorescent lighting
- Certain batteries
- **Dental amalgams**, which are mixtures of mercury with silver, tin and copper

Toxicity

- Mercury emitted into the atmosphere settles into **land and water bodies**.
- Microorganisms convert it into **methylmercury**, a highly toxic organic compound.
- This methylmercury moves up the food chain through **bioaccumulation**, affecting:
  - Fish and shellfish
  - Birds and mammals consuming aquatic life
- Even minimal exposure can damage the **nervous system**, **kidneys**, **skin**, **eyes**, **digestive**, and **immune system**.
- Children, pregnant women, and subsistence fishing communities are most vulnerable.

About the Minamata Convention on Mercury

Overview

- A **globally binding treaty** adopted in **2013** and entered into force in **2017**.
- Objective: Protect human health and the environment from mercury's harmful effects.
- Named after **Minamata Bay, Japan**, where large-scale mercury pollution caused neurological disorders and birth defects in the mid-20th century.

Membership and Secretariat

- **153 Parties**, including India.
- The **UN Environment Programme (UNEP)** acts as the Secretariat.

COP-6 Decision

- Global commitment to **phase out dental amalgam by 2034**, reducing mercury use in dentistry.
- Strengthened global efforts to **eliminate mercury-added cosmetic products**, especially skin-lightening creams.

Contemporary Relevance

- The decision aligns with global trends promoting **sustainable dentistry**, such as resin-based composite fillings.
- It strengthens global public health, especially for developing countries facing high mercury exposure through cosmetics and artisanal mining.
- Supports SDG 3 (Good Health), SDG 12 (Sustainable Consumption), and SDG 14 (Life Below Water).

Conclusion

The COP-6 decision to eliminate dental amalgam marks a major milestone in global mercury reduction. By tackling mercury exposure through dentistry and cosmetic products, the Minamata Convention strengthens global environmental governance and advances the long-term goal of a **mercury-free future**.
Keywords: *Minamata Convention, mercury toxicity, dental amalgam phase-out, methylmercury, bioaccumulation*

Mains Practice Question

"Mercury pollution poses significant ecological and public health challenges. Evaluate the effectiveness of the Minamata Convention in addressing these concerns."

Govt to Release SAF Policy

📌 Syllabus Mapping

- **GS Paper III – Environment:** Climate mitigation, clean energy
- **GS Paper III – Economy:** Aviation sector, energy transitions

Introduction

The Government of India is preparing to announce a policy on **Sustainable Aviation Fuel (SAF)** to reduce carbon emissions in the aviation sector and promote cleaner air travel.

About Sustainable Aviation Fuel

- SAF is an **alternative jet fuel** derived from **non-petroleum sources**, capable of reducing emissions by **up to 80%**compared to conventional aviation turbine fuel (ATF).
- **Feedstocks include:**
  - Waste fats, oils and greases
  - Municipal solid waste

- Agricultural residues
- Forestry waste

Benefits

- Compatible with existing aircraft engines and airport infrastructure
- Low lifecycle carbon emissions
- Supports energy diversification and circular economy principles

Conclusion

SAF provides a crucial pathway for India's aviation industry to align with global climate goals and reduce its carbon footprint.
Keywords: *SAF, aviation emissions, alternative fuels*

Mains Practice Question

"Examine the potential and challenges of Sustainable Aviation Fuel (SAF) for India's aviation sector."

37th Montreal Protocol Meeting Concludes

📌 Syllabus Mapping

- **GS Paper III – Environment:** Ozone depletion, climate agreements
- **GS Paper II – IR:** Global environmental governance

Introduction

The **37th Meeting of the Parties (MOP-37)** to the **Montreal Protocol** concluded with discussions on discrepancies between **reported and measured HFC emissions** and the need to expand **atmospheric monitoring systems** globally.

About the Montreal Protocol

- **Signed:** 1987
- A **legally binding global treaty** to **eliminate ozone-depleting substances (ODS)**.
- Operates under the **Vienna Convention (1985)**.

Key Features

- Phased elimination of CFCs, HCFCs, halons and other ODS.
- Widely considered the **most successful environmental treaty**.
- **Kigali Amendment (2016):**
  - Targets phase-down of **HFCs**, which are not ODS but are potent greenhouse gases.

Conclusion

MOP-37 reaffirms global commitment to safeguarding the ozone layer while addressing emerging challenges related to climate-warming chemicals.
Keywords: *Montreal Protocol, Kigali Amendment, ODS, HFCs*

Mains Practice Question

"Assess the success of the Montreal Protocol in protecting the ozone layer and discuss the new challenges highlighted at MOP-37."

BIOTECHNOLOGY & HEALTH

Stem Cell Therapy for Osteoporosis-Linked Spinal Fractures

📌 Syllabus Mapping

- **GS Paper II – Health & Governance:** Public health, medical research
- **GS Paper III – Science & Technology:** Biotechnology, stem cells, regenerative medicine
- **GS Paper III – Social Issues:** Ageing population, osteoporosis

Introduction

A recent scientific study has demonstrated a promising new approach to **healing spinal fractures** caused by **osteoporosis**, using stem cells derived from **adipose tissue** (body fat). These findings offer hope for millions of elderly individuals affected by bone fragility, pointing towards a future where **regenerative medicine** may replace invasive surgical procedures.

Key Findings of the Study

- Researchers found that **adipose-derived stem cells** can stimulate bone regeneration and enhance healing in **osteoporosis-related spinal fractures**.
- Adipose tissue is considered an excellent source of stem cells due to its abundance, accessibility, and minimal extraction risk.
- The findings highlight the potential for **cell-based therapy** to address degenerative bone conditions that currently rely on long-term medication and surgery.

About Osteoporosis

- Osteoporosis is a **chronic skeletal disorder** that weakens bones, making them brittle and prone to fractures.
- It is especially common among **post-menopausal women** and the **elderly**, due to hormonal changes and age-related bone density loss.
- Vertebral fractures are among the most common complications, often causing chronic pain and reduced mobility.

Understanding Stem Cells

Meaning and Characteristics

- Stem cells are **unspecialized, self-renewing cells** capable of differentiating into various specialized cell types.
- They are crucial for **growth, repair, and tissue regeneration**.
- In humans, stem cells have been identified in:
  - **Inner cell mass** of early embryos
  - **Foetal tissues**
  - **Umbilical cord and placenta**
  - Several **adult organs**, such as bone marrow, skin, and neural tissues

Key Types of Stem Cells

1. Pluripotent Stem Cells

These include **embryonic stem cells (ESCs)** and **induced pluripotent stem cells (iPSCs)**.

a) Embryonic Stem Cells (ESCs)

- Found in embryos **3–5 days post-fertilization**, within the **inner cell mass**.
- ESCs can differentiate into **any of the 200+ cell types** in the human body.
- They are central to research in regenerative medicine but raise **ethical considerations**.

b) Induced Pluripotent Stem Cells (iPSCs)

- Created by introducing **embryonic genes** into adult somatic cells like skin cells.
- This reprogramming converts them into a **stem-cell-like state**.
- iPSCs bypass ethical issues and offer potential for patient-specific therapies.

2. Adult/Somatic Stem Cells (ASCs)

- Found in **mature tissues and organs**, responsible for repair and maintenance.
- They differentiate into specialized cells of their tissue of origin.
- Examples include:

- **Neural stem cells**
- **Skin stem cells**
- **Hematopoietic stem cells (blood-forming)**

Contemporary Relevance & Multi-Dimensional Significance

Dimension	Significance (2025)
Healthcare Innovation	Opens new pathways for regenerative medicine and treatment of chronic skeletal disorders.
Ageing Population	Offers solutions to increasing osteoporosis cases among elderly citizens.
Medical Ethics	Encourages use of iPSCs and adipose-derived stem cells to avoid ethical controversies.
Economic Impact	Potentially reduces long-term treatment costs for spinal fractures.
Scientific Research	Enhances India's focus on biotechnology and biomedical engineering.

Conclusion

The study introducing **adipose-derived stem cell therapy** for spinal fracture healing marks a significant milestone in regenerative medicine. If validated through clinical trials, this technique could transform the treatment of osteoporosis and other degenerative bone diseases.
Keywords: *stem cells, adipose-derived stem cells, osteoporosis, pluripotent stem cells, regenerative medicine*

Mains Practice Question

"Stem cell therapy holds immense promise in regenerative medicine. Discuss the scientific basis, ethical challenges, and therapeutic potential with reference to recent advances in treating osteoporosis-related fractures."

India's Bioeconomy Targets $300 Billion

📌 Syllabus Mapping

- **GS Paper III – Science & Technology:** Biotechnology, bioeconomy, biomanufacturing
- **GS Paper II – Governance:** Public sector R&D institutions, policy initiatives
- **GS Paper III – Economy:** Emerging sectors, sustainable growth

Introduction

During the **2nd Foundation Day of the Biotechnology Research and Innovation Council (BRIC)**, the Union Minister of State for Science & Technology announced that **India's bioeconomy is projected to reach USD 300 billion in the coming years**, driven by rapid advancements in biotechnology, biomanufacturing, and innovation-led economic growth. The Minister also unveiled the plan for a **200-acre BRIC Bio-Enterprise Innovation Park in Faridabad**, set to be a major hub for biotech startups and industry R&D.

About the Biotechnology Research and Innovation Council (BRIC)

- **Established:** 2023
- **Under:** Department of Biotechnology (DBT), Ministry of Science & Technology
- **Formation:** Created by **merging 14 autonomous institutions** to streamline India's biotechnology research ecosystem.
- **Objective:** Foster **centralised governance**, enhance research impact, and strengthen India's biotechnology innovation pipeline.

Understanding Bioeconomy

Meaning

Bioeconomy refers to the **sustainable use of renewable biological resources**—such as plants, microbes, and organic waste—to produce **food, fuels, biopharmaceuticals, biomaterials, and industrial products**.

Significance

- Promotes **green growth**, circular economy and reduces dependency on fossil-based industries.
- Offers solutions for **climate change mitigation**, waste reduction, and food-energy-water security.
- Supports societal well-being by enabling sustainable agriculture, bio-based industry, and clean technologies.

Status of India's Bioeconomy

Rapid Expansion

- Grown from **USD 10 billion in 2014** to **USD 165.7 billion in 2024**, marking one of the fastest global growth trajectories.
- Target: **USD 300 billion by 2030**, supported by biomanufacturing, genomics, bioenergy, and medical biotechnology.

Leading States (2024)

1. **Maharashtra**
2. **Karnataka**
   Both states host strong biotech clusters with major research institutes, startups, and global partnerships.

Key Initiatives Driving India's Bioeconomy

1. BioE3 Policy (2024)

- Stands for **Biotechnology for Economy, Environment and Employment**.
- Approved by the Union Cabinet in 2024.
- Focuses on high-performance **biomanufacturing**, sustainable production systems, green innovation, and job creation.

2. National Biopharma Mission (NBM) – "Innovate in India (i3)"

- Implemented by **BIRAC** (Biotechnology Industry Research Assistance Council).
- Co-funded by the **World Bank** with **USD 250 million**.
- Supports:
  - Over **100 innovation projects**
  - More than **30 MSMEs**
  - Development of vaccines, biotherapeutics, medical devices, and manufacturing capacity

3. Biotechnology Industry Research Assistance Council (BIRAC)

- A **Section 8, Schedule B, not-for-profit PSU** under DBT.
- Provides **grants, incubation support, equity funding**, and strengthens biotech entrepreneurship across India.

4. Bioenergy Achievements

- India achieved **20% ethanol blending (E20)** in petrol **in 2025**, five years ahead of schedule.
- Reduces fossil fuel dependence, enhances energy security, and supports farmers through demand for bio-feedstock.

Contemporary Relevance

- India's growing biotechnology sector aligns with global trends in **synthetic biology**, **AI-driven drug discovery**, and **bio-based materials**.
- BRIC and the upcoming **Bio-Enterprise Innovation Park** will expand India's ability to commercialize biotechnology innovations, attract investment, and nurture high-tech startups.
- Supports national priorities including **Atmanirbhar Bharat**, **climate resilience**, and **healthcare innovation**.

Conclusion

India's accelerated growth in the **bioeconomy** reflects a strategic integration of research, innovation, and entrepreneurship driven by BRIC, BIRAC, and supportive policies such as BioE3. With the upcoming **BRIC Bio-Enterprise Innovation Park** and rising global demand for sustainable solutions, India is positioning itself as a **global biotechnology leader**capable of achieving the USD 300 billion target.

Keywords: *bioeconomy, BRIC, BIRAC, BioE3 policy, biomanufacturing, ethanol blending*

Mains Practice Question

"India's bioeconomy is emerging as a major pillar of sustainable economic growth. Discuss the key drivers, challenges, and policy measures needed to achieve the USD 300 billion bioeconomy target by 2030."

James Watson, DNA Co-Discoverer, Passes Away

📌 Syllabus Mapping

- **GS Paper III – Science & Tech:** Genetics, molecular biology
- **GS Paper I – History of Science**

Introduction

Nobel laureate **James Watson**, renowned for co-discovering the **double-helix structure of DNA**, has passed away, marking the end of a transformative era in molecular biology.

About the DNA Double Helix

- The DNA molecule forms a **double helix**, consisting of **two twisting strands** held together at the center by **hydrogen bonds**.
- Complementary nitrogenous bases pair specifically:
  - **Adenine–Thymine**
  - **Guanine–Cytosine**
- This structure forms the basis of **genetic inheritance**, replication, and protein synthesis.

Conclusion

The double-helix model remains one of the most influential discoveries in science, shaping modern genetics, biotechnology, and medicine.
Keywords: *DNA double helix, Watson, genetics*

Mains Practice Question

"Explain the significance of the double-helix structure in understanding genetic inheritance."

Global TB Report 2025: India's Status

📌 Syllabus Mapping

- **GS Paper II – Governance & Health:** Public health, WHO reports, disease control
- **GS Paper III – Science & Technology:** Communicable diseases, biotechnology, antimicrobial resistance
- **GS Paper II/III – Social Issues:** Health burden in developing countries, inequality

Introduction

The **World Health Organization (WHO)** has released the **Global Tuberculosis (TB) Report 2025**, reaffirming TB as one of the **top 10 causes of death worldwide** and the **leading cause of death from a single infectious agent**, surpassing HIV/AIDS in several regions. The report highlights significant progress since 2015, but also underscores persistent challenges such as **multidrug-resistant TB (MDR-TB)** and unequal disease burden.

Major Findings of the Global TB Report 2025

1. Concentration of Global TB Burden

- In **2024**, **87%** of the world's TB cases were concentrated in **30 high-burden countries**.
- **India alone accounts for 25%** of the total global TB cases, making it the **world's highest TB burden country**.

2. Decline in Global TB Incidence

- The global TB incidence rate showed a **net reduction of 12%** between **2015 and 2024**.
- This reflects improvements in surveillance, diagnostics, and targeted interventions, although progress remains slower than the **End TB Strategy** milestones.

3. Decline in Global TB Deaths

- TB deaths globally recorded a **29% net reduction** during **2015–2024**.
- However, deaths remain higher than pre-COVID levels in some regions due to disruptions in health services during the pandemic.

4. Multidrug-Resistant TB (MDR-TB) Remains a Major Concern

- MDR-TB continues to be a **public health crisis** and a **global health security threat**.
- Treatment success rates remain low due to **drug resistance**, **treatment complexity**, and **limited access to new drugs** in low-income regions.

About Tuberculosis (TB)

Nature of the Disease

- TB is a **contagious airborne infectious disease** caused by *Mycobacterium tuberculosis*.
- It is both **preventable and curable** with timely intervention.

Types of TB

- **Pulmonary TB**

  - Most common type affecting the lungs.
  - Easily spreads through **airborne droplets** released during coughing or sneezing.
  - Highly infectious.
- **Extrapulmonary TB**
  - Occurs outside the lungs (lymph nodes, brain, bones, kidneys, pleura).
  - Less contagious and spreads internally from primary lung infection.

Treatment

- Standard TB treatment includes a combination of **first-line antibiotics** such as:
  - **Rifampicin**
  - **Isoniazid**
  - **Pyrazinamide**
  - **Ethambutol**

Multidrug-Resistant TB (MDR-TB)

- MDR-TB does not respond to the two most effective first-line drugs: **rifampicin and isoniazid**.
- Requires **longer, more complex, and more expensive** treatment.
- Represents a threat to **global antimicrobial resistance (AMR)**.

Contemporary Relevance & Multi-Dimensional Significance

Dimension	Significance (2025)
Public Health	High burden in Global South; India remains most affected.
Health Security	MDR-TB challenges AMR efforts globally.
Equity	Disproportionate impact on low-income communities.
Economic Impact	High treatment costs and productivity losses.
Policy	Supports scaling of WHO's End TB Strategy beyond 2030.

Conclusion

The **Global TB Report 2025** highlights both progress and persistent challenges in the global fight against TB. While reductions in incidence and deaths are encouraging, the **high disease concentration in countries like India** and the **continuing threat of MDR-TB** demand sustained investment in diagnostics, treatment innovation, public health systems, and socio-economic support.
Keywords: *Global TB Report, MDR-TB, End TB Strategy, WHO, antimicrobial resistance*

Mains Practice Question

"Despite progress in reducing TB incidence and mortality, multidrug-resistant TB remains a major barrier to global TB elimination. Discuss with reference to the WHO Global TB Report 2025."

Hepatitis A: Rising Acute Liver Failure Cases

📌 Syllabus Mapping

- **GS Paper II – Health:** Communicable diseases, immunization, sanitation
- **GS Paper III – Environment:** Water contamination, public health linkages

Introduction

Hepatitis A has recently emerged as a **growing cause of acute liver failure** in India, largely linked to contaminated water, poor sanitation, and inadequate hygiene practices in densely populated areas.

About Hepatitis A

Nature of the Disease

- Hepatitis A is an **acute viral infection** causing inflammation of the liver, with symptoms ranging from mild fever to severe jaundice.
- Unlike Hepatitis B and C, **Hepatitis A does not cause chronic liver disease**.

Transmission

- Primarily transmitted through:
  - **Contaminated food and water**
  - **Direct sexual contact** with an infected person

Recovery and Immunity

- Most individuals recover **fully** and develop **lifelong immunity**.
- A small percentage may develop **fulminant hepatitis**, which can be fatal.

Vaccine Status

- Vaccines are available for **Hepatitis A and B**.
- No vaccine currently exists for **Hepatitis C**.

Contemporary Relevance

Dimension	Significance
Public Health	Outbreaks linked to unsafe water highlight sanitation gaps.
Urban Governance	Stress on improving sewage systems and food safety.
Preventive Healthcare	Expands need for vaccination and early detection.
Health Equity	Higher burden on low-income communities with poor hygiene access.

Conclusion

Rising Hepatitis A cases call for strengthened public health infrastructure, safe water access, and vaccination outreach to prevent acute liver failure in vulnerable groups.
Keywords: *Hepatitis A, viral hepatitis, water contamination, fulminant hepatitis*

Mains Practice Question

"Discuss the factors contributing to the rise of Hepatitis A in India. Examine the preventive measures necessary to reduce acute liver failure cases."

Climate-Health Funders Coalition Launched

📌 Syllabus Mapping

- **GS Paper II – Health:** Public health funding, global health collaborations
- **GS Paper III – Environment:** Climate impacts on health, extreme weather

Introduction

The **Climate and Health Funders Coalition (CHFC)** has pledged an initial **$300 million** to advance integrated action addressing climate change and its impacts on human health. This represents an important step toward global, coordinated climate–health strategies.

About CHFC

- A coalition of institutional and individual funders working across **international, national, and regional levels**.
- Founding funders include:
  - **Bloomberg Philanthropies**
  - **Bill & Melinda Gates Foundation**, among others.
- Focuses on aligning climate action with health protection.

Immediate Areas of Intervention

- **Extreme heat** mitigation
- **Air pollution reduction**
- **Climate-sensitive infectious diseases** management
- Strengthening **climate and health data systems** to support informed decision-making

Contemporary Relevance

Dimension	Significance
Public Health	Responds to rising heat waves and disease outbreaks.
Climate Resilience	Promotes adaptive health systems.
Funding Gap	Bridges financial deficits in climate–health programmes.
Global Partnerships	Elevates collective action across governments and donors.

Conclusion

The CHFC's funding commitment integrates climate action with public health priorities, strengthening global capacity to manage climate-induced health risks.
Keywords: *CHFC, climate health, extreme heat, global philanthropy*

Mains Practice Question

"Climate change is increasingly a public health emergency. Discuss the role of global initiatives like the Climate and Health Funders Coalition (CHFC) in addressing this emerging challenge."

DNA Profiling in Red Fort Blast Case

📌 Syllabus Mapping

- **GS Paper III – Science & Tech:** Forensic science, genetics
- **GS Paper III – Internal Security:** Evidence collection, terror investigations

Introduction

DNA profiling has been used to identify individuals at the **Red Fort blast site**, demonstrating its critical role in **modern forensic investigations**, particularly in sensitive terror-related cases.

What is DNA Identification?

A scientific method used to identify individuals by analysing **unique DNA patterns**.

Key Methods

1. Short Tandem Repeats (STRs)

- Examines short repeating sequences in **nuclear DNA**.
- Highly discriminatory and widely used in criminal cases.

2. Mitochondrial DNA (mtDNA)

- Useful when **nuclear DNA is degraded**.
- Maternally inherited and helps identify victims using maternal relatives.

3. Y-Chromosome Analysis

- Focuses on **male-line STRs**, inherited father to son.
- Crucial for identifying male victims or suspects.

4. Single Nucleotide Polymorphisms (SNPs)

- Analyzes **single-base variations**.
- Useful for extremely degraded samples and personal item matching (e.g., toothbrushes).

Conclusion

DNA identification remains one of the most powerful tools in forensic science, enhancing accuracy, victim identification, and investigative integrity.

Mains Practice Question

"How is DNA profiling used in forensic investigations? Compare STR, mtDNA, Y-STR, and SNP-based identification methods."

National One Health Mission Approved

📌 Syllabus Mapping

- **GS Paper II – Governance:** Health governance, inter-sectoral coordination
- **GS Paper III – Science & Tech:** Disease surveillance, biotechnology, pandemic preparedness
- **GS Paper III – Environment:** Zoonotic diseases, ecological health

Introduction

The Union Government is set to launch the **National One Health Mission**, approved by the **Prime Minister's Science, Technology, and Innovation Advisory Council (PM-STIAC)**. The mission seeks to establish a **comprehensive and integrated disease control and pandemic preparedness framework**, acknowledging that human, animal, and environmental health are tightly interconnected.

About the National One Health Mission

Vision: To develop a **unified, cross-sectoral system** that enhances India's ability to prevent, detect, and respond to infectious diseases by integrating expertise from **human health, animal health, and environmental sectors**. The aim is to improve health outcomes, bolster productivity, and conserve India's biodiversity.

- **Implementing Agency: Indian Council of Medical Research (ICMR)** will serve as the primary implementing agency.
- **Anchor Institution:** The mission will be anchored at the **National Institute of One Health, Nagpur**, envisioned as the national hub for research, innovation, and training under the One Health framework.

Critical Pillars of the Mission

1. Research and Development

- Prioritises development of **vaccines, diagnostics, and therapeutics** for zoonotic and emerging infectious diseases.
- Strengthens interdisciplinary research involving medical, veterinary, environmental, and genomics sciences.

2. Clinical Readiness

- Enhances **clinical response capabilities**, including surge capacity, laboratory preparedness, and specialist workforce training.
- Promotes rapid-response mechanisms for outbreaks.

3. Data Integration

- Establishes a unified **data-sharing and surveillance architecture** across human, animal, and environmental health systems.
- Supports high-quality analytics, early warning systems, and cross-sectoral decision-making.

4. Community Engagement

- Encourages active participation of communities, frontline workers, farmers, and local institutions.
- Ensures sustained **risk awareness, behavioural change**, and localized readiness.

About the 'One Health' Approach

- A **holistic and collaborative framework** that seeks to balance and optimize the health of **people, animals, and ecosystems**.
- Recognizes that **60–70% of emerging infectious diseases** are zoonotic in origin.

Why One Health Is Essential for India

1. Unique Demographic and Ecological Landscape

- India has:
  - One of the world's **largest livestock populations**
  - High-density human settlements
  - Vast and diverse wildlife habitats
- These conditions increase interactions among humans, livestock, and wildlife, heightening zoonotic disease risks.

2. Recent Disease Outbreaks

- **COVID-19 pandemic**,
- **Lumpy Skin Disease** in cattle,
- Recurrent **avian influenza** outbreaks,
- Rising antimicrobial resistance (AMR).
  These events highlight the need for a unified surveillance and response mechanism.

3. Environmental Pressures

- Land-use change, deforestation, poor waste management, and climate change intensify the **spillover risk** of pathogens.

Contemporary Relevance & Multi-Dimensional Significance

Dimension	Importance
Health Security	Strengthens early detection and rapid response to pandemics.
Economic Stability	Reduces economic losses from livestock diseases and pandemics.
Environmental Management	Promotes ecosystem health and biodiversity conservation.
International Commitments	Aligns with global One Health frameworks by WHO, FAO, OIE, and UNEP.
Agriculture & Livestock	Enhances veterinary health, food safety, and productivity.

Conclusion

The **National One Health Mission** represents a transformative step in India's public health governance. By integrating human, animal, and environmental domains, it positions India to tackle emerging diseases more effectively, protect biodiversity, and strengthen national resilience to future pandemics.
Keywords: *One Health, zoonotic diseases, pandemic preparedness, ICMR, PM-STIAC, health surveillance*

Mains Practice Question

"India faces growing zoonotic and environmental health challenges. Discuss how the National One Health Mission can strengthen national preparedness and inter-sectoral coordination."

WHO Pushes for Accelerated TB Vaccine Development

📌 Syllabus Mapping

- **GS Paper II – Health:** Communicable diseases, global health governance
- **GS Paper III – Science & Tech:** Vaccine development, biotechnology

Introduction

WHO has urged urgent global investment and equitable access strategies to speed up **novel tuberculosis (TB) vaccines**, highlighting the need to protect adolescents and adults in **high-burden countries**.

Challenges in TB Vaccine Development

- **No new TB vaccine** has been licensed in over **100 years**.
- Current **BCG vaccine**:
  - Effective for **infants and young children**
  - Offers **limited and inconsistent protection** for pulmonary TB in adolescents and adults.

WHO Initiatives

- **TB Vaccine Accelerator Council (2023):**
  - Coordinates global R&D, clinical trials, technology sharing, regulatory pathways, and deployment.
  - Aims to accelerate development of multiple candidate vaccines already in advanced trials.

Conclusion

As the world's most lethal infectious killer, TB demands rapid innovation, strong financing, and equitable vaccine access to meet global TB elimination targets.
Keywords: *TB vaccines, BCG, WHO, global health, vaccine accelerator council*

Mains Practice Question

"Despite being a preventable and treatable disease, TB continues to cause high mortality. Discuss the need for new TB vaccines and the challenges in their development."

Rift Valley Fever Outbreak Confirmed

📌 Syllabus Mapping

- **GS Paper II – Health:** Zoonotic diseases, WHO, outbreak response
- **GS Paper III – Environment:** Vector-borne diseases, climate links

Introduction

The World Health Organization (WHO) has confirmed an outbreak of **Rift Valley Fever (RVF)** in **Mauritania and Senegal**, underscoring the growing threat of zoonotic diseases in Africa's Sahel region.

About Rift Valley Fever

- **Origin:** First identified in Kenya's **Rift Valley** in the early 1930s.
- **Causative Agent:** A **Phlebovirus** belonging to the *Phenuiviridae* family.

Transmission

- Primarily affects **livestock** such as cattle, goats, sheep, and camels.
- Humans get infected through:
  - Direct contact with **infected animals**, blood, or tissues
  - **Bites of infected mosquitoes**
- **Human-to-human transmission has not been observed.**

Treatment

- No specific antiviral drug for RVF exists.
- **Vaccines are available for animals**, but their use varies by region.

Conclusion

The RVF outbreak highlights the importance of **One Health approaches**, surveillance, and coordinated response to prevent zoonotic spillover.
Keywords: *Rift Valley Fever, Phlebovirus, zoonotic disease, WHO*

Mains Practice Question

"Zoonotic diseases like Rift Valley Fever pose increasing global risks. Examine India's preparedness under the One Health framework."

Biochemical Markers for Diabetic Kidney Risks Identified

📌 Syllabus Mapping

- **GS Paper III – Science & Tech:** Biotechnology, diagnostics
- **GS Paper II – Health:** Non-communicable diseases

Introduction

Indian researchers have identified specific **biochemical markers** in the blood that could help detect **kidney-related complications** in diabetic patients at an early stage.

About Biochemical Markers

- Biochemical markers are **small molecules**—such as **sugars, lipids, amino acids**—produced through metabolic processes.
- They are used by clinicians to assess disease risk and organ health.
- **Example:** Cholesterol profiling for heart disease.

Key Markers Identified

- **Arabitol**
- **Myo-inositol**
- **Ribothymidine**
- **2PY (toxin-like compound)**

These molecules show elevated levels in diabetic patients developing kidney impairment.

Conclusion

Early detection using biochemical markers can significantly improve management and reduce complications associated with diabetes.
Keywords: *biochemical markers, diabetic nephropathy, metabolism*

Mains Practice Question

"How can biochemical markers transform early diagnosis of non-communicable diseases in India?"

SCIENCE & TECHNOLOGY

Hydrogen Valley Innovation Clusters Announced

📌 Syllabus Mapping

- **GS Paper III – Science & Technology:** Clean energy, hydrogen technology, renewable energy
- **GS Paper III – Environment:** Decarbonisation pathways, climate mitigation
- **GS Paper II – Governance:** Mission-mode implementation, energy policy

Introduction

The Union Minister of Science and Technology has announced the development of **four Hydrogen Valley Innovation Clusters (HVICs)** across India, marking the country's first set of **large-scale green hydrogen demonstration projects**. These clusters aim to showcase the **entire green hydrogen value chain** and accelerate India's transition to a low-carbon economy under the **National Green Hydrogen Mission (NGHM)**.

About Hydrogen Valley Innovation Clusters (HVICs)

Aim and Purpose

- HVICs are designed to **demonstrate the full hydrogen value chain**, including:
  - **Production**
  - **Storage**
  - **Transportation**
  - **Utilization**
- Serve as pilot zones for real-world deployment of green hydrogen across industrial, mobility, and power sectors.

Institutional Origin and Integration

- Initially conceptualized by the **Department of Science and Technology (DST)**.
- Now integrated under the **National Green Hydrogen Mission (NGHM)** to ensure coordinated scaling, financing, and policy support.

Significance

- They represent India's **first large-scale hydrogen demonstration ecosystems**.
- Promote innovation, industry–research collaboration, and commercialization of hydrogen technologies.
- Expected to support India's ambition of becoming a global hub for **green hydrogen and derivatives** (e.g., green ammonia, methanol).

National Green Hydrogen Mission (NGHM)

Overview

- Launched in **2023** as an umbrella programme to develop a comprehensive **green hydrogen ecosystem**.
- Mission Target: Produce **5 million metric tonnes (MMT)** of green hydrogen annually by **2030**, with large export potential.

Objectives

- Reduce dependence on fossil fuels.
- Promote domestic manufacturing of electrolyzers.
- Enable deep decarbonization of hard-to-abate sectors such as steel, fertilizers, chemicals, and heavy transport.

What is Green Hydrogen?

Definition: **Hydrogen produced using renewable energy** (solar, wind, hydropower, or biomass-derived energy) instead of fossil fuels.

Production Processes

- **Electrolysis:** Splitting water into hydrogen and oxygen using renewable electricity.
- **Biomass Gasification:** Converting biomass into syngas, which is further processed to hydrogen.

Emission Criteria: To qualify as *green*, total emissions must be **≤ 2 kg CO_2 equivalent per 1 kg of hydrogen** produced.

India's First Three Green Hydrogen Hubs

- **Deendayal Port, Gujarat**
- **V.O. Chidambaranar Port, Tamil Nadu**
- **Paradip Port, Odisha**
  These hubs aim to facilitate production, storage, and export of green hydrogen and green ammonia, strengthening India's maritime energy transition strategy.

Contemporary Relevance and Multi-Dimensional Significance

Dimension	Importance
Energy Transition	Supports India's shift from fossil fuels to clean fuels.
Economic Growth	Promotes new industries in electrolyzers, hydrogen mobility, and storage solutions.
Climate Goals	Helps meet India's NDCs and net-zero goals.
Technology Leadership	Positions India among early movers in the hydrogen economy.
Strategic	Reduces import dependency in sectors like fertilizers and refineries.

Conclusion

The creation of **Hydrogen Valley Innovation Clusters (HVICs)** represents a major step in operationalizing the National Green Hydrogen Mission. By demonstrating the full hydrogen ecosystem at scale, India is preparing the foundation for a **competitive, self-reliant, and globally relevant hydrogen economy**.
Keywords: *HVICs, green hydrogen, electrolysis, NGHM, energy transition, hydrogen ecosystem*

Mains Practice Question

"Discuss the significance of Hydrogen Valley Innovation Clusters (HVICs) in advancing India's green hydrogen ecosystem under the National Green Hydrogen Mission."

India Develops Quantum Diamond Microscope

📌 Syllabus Mapping

- **GS Paper III – Science & Technology:** Quantum technologies, National Quantum Mission
- **GS Paper II – Governance:** Research & innovation policy

Introduction

IIT Bombay has developed India's **first Quantum Diamond Microscope**, marking a major milestone under the **National Quantum Mission**. This innovation strengthens India's capabilities in **quantum sensing**, a frontier area in modern scientific instrumentation.

About the Quantum Diamond Microscope

Technology

- Uses **nitrogen-vacancy (NV) centres in diamond**, which act as ultra-sensitive quantum sensors.
- Capable of imaging **magnetic fields at nanoscale resolution**, and importantly, it functions at **room temperature**, unlike many quantum devices requiring cryogenic cooling.

Applications

- **Neuroscience:** Mapping neural activity through magnetic signatures.
- **Materials Science:** Atomic-scale material defect analysis.
- **Semiconductor Testing:** Enables **non-destructive** fault detection in chips.
- Useful for precision diagnostics in defence, medical technologies, and nanotechnology.

Significance

- India secures its **first patent** in quantum sensing.
- Strengthens domestic manufacturing of advanced scientific instruments.
- Positions India within the global race for **quantum technologies**.

Conclusion

The Quantum Diamond Microscope marks a major leap for India's scientific research ecosystem, enhancing national capacity in **quantum sensing, R&D, and next-generation instrumentation**.

Mains Practice Question

"Discuss the significance of NV-centre-based quantum sensing technologies. How does India's Quantum Diamond Microscope advance national research capabilities?"

FTIR Technology in Forensics

📌 Syllabus Mapping

- **GS Paper III – Science & Tech:** Analytical instruments, forensic technologies
- **GS Paper III – Internal Security:** Post-blast investigations

Introduction

Recent reports highlight increasing use of **FTIR spectroscopy** as a rapid and highly reliable tool for identifying materials in **post-blast forensic investigations**, marking an important advancement in the scientific assessment of crime scenes.

About FTIR Spectroscopy

- A technique that measures how a material **absorbs infrared (IR) light**.
- Uses an **interferometer** to record IR absorption patterns, which are processed into a **spectrum**—a unique molecular "fingerprint" of the material.

Significance

- **Non-destructive:** Does not alter or damage the sample.
- Works with **very tiny quantities** of material.
- Provides both **qualitative and quantitative** molecular information.
- Rapid analysis for field and laboratory investigations.

Applications

- **Pharmaceuticals:** Drug purity and compound identification.
- **Environment:** Air and water pollutant detection.
- **Material Science:** Polymer and nanomaterial analysis.
- **Forensics:** Identifying explosives, residues, accelerants, and blast remains.

Conclusion

FTIR spectroscopy enhances forensic capabilities, enabling fast and precise identification of evidence crucial for law enforcement and national security.

Mains Practice Question

"Explain the working principle of FTIR spectroscopy. Discuss its relevance for post-blast forensic investigations in India."

India Unveils MWh-Scale Vanadium Flow Battery

📌 Syllabus Mapping

- **GS Paper III – Science & Technology:** Energy storage technologies, battery innovation
- **GS Paper III – Environment:** Renewable energy integration, grid resilience
- **GS Paper III – Economy:** Energy security, technology diversification

Introduction

India has inaugurated its **largest and first MWh-scale Vanadium Redox Flow Battery (VRFB)** at **NTPC NETRA**, marking a major milestone in the country's transition toward **advanced energy storage systems**. The project strengthens India's shift from traditional lithium-ion batteries to **next-generation storage technologies** suitable for large-scale renewable energy applications.

Next-Generation Battery Technologies

1. Flow Batteries

Flow batteries operate using **reduction–oxidation (redox) reactions** involving two liquid electrolytes stored in external tanks. These electrolytes circulate through a **porous membrane** that facilitates ion exchange, generating electricity.

Key Features

- Store large amounts of energy, determined by the **size of the electrolyte tanks**.
- Use **non-flammable, environmentally safer materials**, improving safety over lithium-ion systems.
- Ideal for **grid-scale storage** because energy (electrolyte volume) and power (stack size) can be scaled independently.

Types of Flow Batteries

- **Vanadium Redox Flow Batteries (VRFBs)**
- **Zinc–Bromine Flow Batteries**
- **Iron–Salt / Organic Flow Batteries**

2. Solid-State Batteries

- Use **solid electrolytes** rather than liquid ones, removing the need for separators.
- Offer enhanced safety as they are resistant to leakage, swelling, and thermal instability.
- Hold potential for **higher energy densities** and longer life cycles.

Significance of Next-Generation Battery Technologies

1. Ideal for Grid-Scale Storage

- Enable **long-duration energy storage (LDES)** solutions—critical for managing intermittent renewable energy like solar and wind.

2. Alternative to Lithium-Ion Batteries

- Diversifies India's energy materials portfolio.
- Reduces overdependence on **critical minerals** (lithium, cobalt, nickel), improving **supply chain security**.

3. Long-Term Renewable Energy Integration

- Ensures stable power supply during evenings and peak demand hours.
- Strengthens **grid resilience** against fluctuations, outages, and extreme weather events.

4. Industrial and Infrastructure Use

- Used in:
  - **Power management**
  - **Pumps and industrial loads**
  - **Utility-scale renewable projects**
  - **Microgrids** and off-grid systems

Significance of India's MWh-Scale VRFB at NTPC NETRA

- Demonstrates India's capability to **deploy advanced, scalable, and safe energy storage technologies**.
- Strengthens NTPC's role as a leader in renewable innovation.
- Supports India's long-term commitment to achieving **net-zero** by 2070.

Conclusion

The inauguration of India's first MWh-scale **Vanadium Redox Flow Battery** marks a critical step toward building a **robust, diversified, and secure energy storage ecosystem**. By adopting next-generation technologies such as flow batteries and solid-state batteries, India is advancing its capacity for **renewable**

energy integration, grid reliability, and long-duration energy storage.
Keywords: *VRFB, flow batteries, solid-state batteries, LDES, NTPC NETRA, grid-scale storage*

Mains Practice Question

"Next-generation energy storage technologies such as flow batteries and solid-state batteries are essential for renewable energy integration. Discuss their significance for India's energy security and grid resilience."

Altermagnetism Identified as New Magnetic State

📌 Syllabus Mapping

- **GS Paper III – Science & Tech:** Material science, magnetism, quantum phenomena

Introduction

A new form of magnetic order termed **altermagnetism** has been identified, showing a combination of characteristics typical of both **ferromagnets** and **antiferromagnets**. This discovery opens fresh pathways in spintronics and quantum materials research.

What is Altermagnetism?

- **Ferromagnets:** Atomic magnetic moments align in the same direction, producing a **strong external magnetic field**.
- **Antiferromagnets:** Adjacent atomic moments align in opposite directions, **cancelling out net magnetism**.

Altermagnetism's Unique Property

- Like antiferromagnets, it produces **zero net magnetic field** externally.
- But its **internal electron structure** shows **strong spin polarization**, resembling ferromagnets.

Significance

- Could revolutionise **spintronics**, a field using electron spin for data storage and transfer.
- Offers high-speed, energy-efficient magnetic switching.

Conclusion

Altermagnetism represents a major step forward in understanding magnetic orders and offers promising applications in next-generation computing.
Keywords: *altermagnetism, ferromagnetism, antiferromagnetism, spintronics*

Mains Practice Question

"Explain the concept of altermagnetism. How does it differ from ferromagnetism and antiferromagnetism, and what implications does it hold for future technologies?"

Aditya-L1 Records First-Ever Spectroscopic CME Data

📌 Syllabus Mapping

- **GS Paper III – Science & Technology:** Space technology, solar missions, space weather
- **GS Paper I – Geography:** Sun, solar phenomena, CMEs
- **GS Paper III – Disaster Management:** Space weather hazards, geomagnetic storms

Introduction

In a landmark achievement, scientists from the **Indian Institute of Astrophysics (IIA)**, working with **NASA**, used the **Visible Emission Line Coronagraph (VELC)** onboard **Aditya-L1** to estimate crucial parameters of a **Coronal Mass Ejection (CME)**. This marks the **world's first visible-light spectroscopic observation** of a CME, significantly advancing solar science and helping improve early warnings for space weather disruptions.

Coronal Mass Ejections (CMEs)

- CMEs are **large eruptions of plasma and magnetic fields** expelled from the Sun's outer atmosphere (corona).
- They can trigger **geomagnetic storms**, affect satellite operations, disrupt radio communications, and impact power grids on Earth.
- CMEs are a key driver of **space weather**, making accurate real-time observations essential for technological safety.

About Aditya-L1 Mission

Overview

- India's **first dedicated solar mission**, launched in **2023** aboard **PSLV-C57**.
- Designed to study the **Sun's atmosphere**, solar winds, flares, and the dynamics influencing space weather.
- **Mission lifespan:** ~5 years.

Key Scientific Objectives

- Understanding **coronal heating** and **solar wind acceleration**
- Studying **solar flares** and their effect on near-Earth space
- Examining **solar wind distribution**, composition, and **temperature anisotropy**
- Improving predictive models for **space weather forecasting**

Payload Suite

Aditya-L1 carries **7 scientific instruments**, divided into:

Remote-Sensing Payloads

- **VELC (Visible Emission Line Coronagraph)**
- **SUIT (Solar Ultraviolet Imaging Telescope)**
  These observe the Sun's photosphere, chromosphere, and corona.

In-situ Payloads

- **ASPEX (Aditya Solar Wind Particle Experiment)**
- Other particle and magnetic field detectors
  These measure energetic particles and solar winds around the spacecraft.

Orbit: Halo Orbit Around L1

- Aditya-L1 is located in a **halo orbit** around the **Lagrange Point 1 (L1)**, ~1.5 million km from Earth.
- At Lagrange points, gravitational forces of the **Earth and Sun** balance out the centripetal force needed for a spacecraft to remain stable.
- Benefits:
  - Uninterrupted, continuous view of the Sun
  - Reduced fuel consumption
  - Ideal vantage point for early detection of CMEs and solar storms

Other Major Global Solar Missions

- **Hinotori (ASTRO-A)** – Japan (1980s), first mission dedicated to studying solar flares
- **Parker Solar Probe** – NASA (2018), the first spacecraft to *"touch the Sun"*
- **SOHO (Solar and Heliospheric Observatory)** – NASA–ESA collaborative mission; the **longest-operating Sun observatory**

Contemporary Relevance

- As human dependence on satellite-based systems grows, monitoring CMEs has strategic importance for **communication networks**, **GPS reliability**, **power grids**, and **defence systems**.
- Aditya-L1's VELC findings enhance India's capacity in **space weather forecasting**, contributing to global scientific datasets and advancing India's role in solar research.

Conclusion

By recording the first-ever **visible-light spectroscopic CME observation**, Aditya-L1 has achieved a major milestone in space science. It strengthens India's leadership in solar research and contributes to better preparedness against space weather hazards.
Keywords: *Aditya-L1, Coronal Mass Ejections, VELC, halo orbit, Lagrange Point 1, space weather*

Mains Practice Question

"Discuss the significance of Aditya-L1 in advancing India's space weather forecasting capabilities. How do its observations contribute to global solar science?"