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April-2025

Current Affairs

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Chapter- 1

HISTORY & CULTURE

Sarhul Festival

Context:

The tribal communities of Jharkhand and Chotanagpur region are celebrating Sarhul, a New Year and spring festival rooted in nature worship.

About Sarhul Festival:

What is Sarhul?

- Sarhul literally means 'worship of the Sal tree' and marks the onset of spring and the Adivasi New Year.
- It symbolizes the cosmic union of the Sun and Earth, essential for the cycle of life and agriculture.

Tribes Associated:

- Celebrated by Adivasi groups such as the: Oraon, Munda, Santal, Khadia, and Ho.
- The festival is observed across Jharkhand, Chhattisgarh, Odisha, Bihar, and also by tribal diaspora in Assam, Andaman, Nepal, Bangladesh, and Bhutan.

Features of the Festival:

- Three-day celebration held at Sarna Sthals (sacred groves).
- Sal flowers are offered to the village deity, Sarna Maa.
- Traditional dances like Jadur, Gena, and Por Jadur are performed.
- A community feast and consumption of Handia (rice beer) mark the final day.
- Ploughing and agricultural activities begin only after the rituals conclude.

Cultural Importance & Significance:

- Demonstrates the spiritual connection between humans and forests, especially the Sal tree.
- An occasion for community bonding, ritual purity, and cultural expression.

Tribhuvandas Patel

Context:

The Lok Sabha has passed a Bill to establish Tribhuvan Sahkari University in Anand, Gujarat, named after Tribhuvandas Patel, founder of the Kaira Milk Union (Amul).

About Tribhuvandas Patel:

Early Life & Background:

- Born: 22 October 1903 in Anand, Kheda district, Gujarat.
- Family: Son of Kishibhai Patel, a farmer; studied at DN High School, Anand.
- Education: Graduate from Gujarat Vidyapith, Ahmedabad.
- Participated in movements like Civil Disobedience, Salt Satyagraha, and anti-untouchability drives; jailed in Nasik (1930) and Visapur.



Contribution to the Cooperative Movement:

- Founded Kaira Milk Union (Amul) on 14 December 1946 to end dairy exploitation by private traders like Polson Dairy.
- Promoted inclusive village-level dairy cooperatives based on:

One man, one vote principle

- Equal participation across castes and communities
- Appointed Dr. Verghese Kurien and supported him in building the foundation of India's White Revolution.

Later helped establish:

- National Dairy Development Board (NDDB)
- Institute of Rural Management Anand (IRMA)
- Gujarat Cooperative Milk Marketing Federation (GCMMF)

Role in Freedom Struggle:

- Close follower of Mahatma Gandhi's principles.
- Dedicated life to rural upliftment, community health, and self-reliance.
- Founded Tribhuvandas Foundation from public donations to serve rural health needs.

Recognitions & Awards:

- Ramon Magsaysay Award (1963) for Community Leadership.
- Padma Bhushan (1964) for Social Service.

Vikramashila University

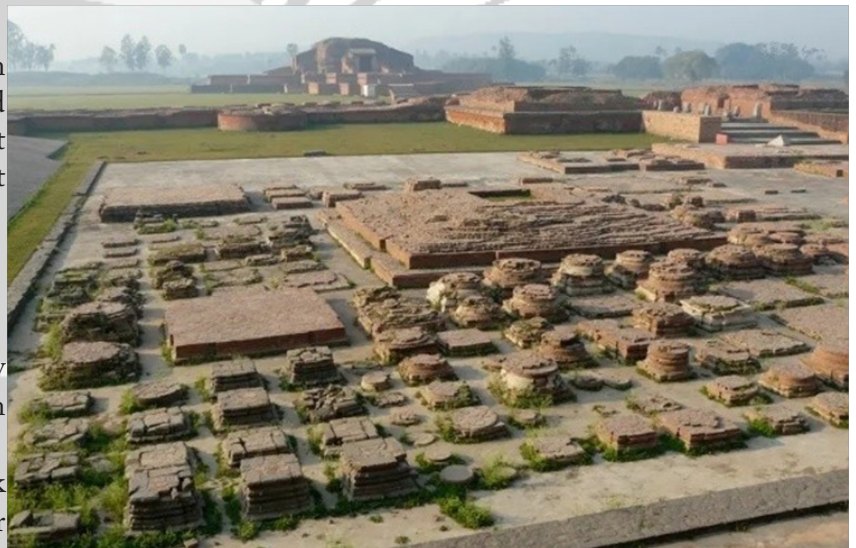
Context:

Vikramashila University has recently drawn attention due to renewed efforts aimed at reviving and transforming this ancient Buddhist learning centre into a prominent educational hub.

About Vikramashila University:

What is Vikramashila?

- It is an ancient Buddhist monastery and leading centre of learning in medieval India.
- Location: Situated at Antichak village near Kahalgaon, Bhagalpur district, Bihar.
- Established by: Founded by King Dharmapala of the Pala dynasty in the late 8th or early 9th century CE.



Historical Significance:

- Vikramashila ranks among India's most distinguished Buddhist mahaviharas, alongside Nalanda and Odantapuri (Bihar).
- Primarily known through Tibetan historical accounts, especially those authored by Tāranātha, a renowned Tibetan monk-historian (16th–17th century).
- Noted for scholars like Atisha Dipankara, founder of the Sarma traditions in Tibetan Buddhism.
- At its height during King Chanaka's reign (955–983 CE), Vikramashila gained prominence for its structured hierarchy, as highlighted by historian Sukumar Dutt.

Major Academic and Cultural Features:

- Renowned as a prominent centre of Vajrayana Buddhism, employing eminent Tantric teachers such as Buddhajñānapāda, Dīpa karabhadra, and Jayabhadra.
- Specialized in Buddhist Tantra, philosophy, grammar, metaphysics, logic, and occult studies.

Architectural Highlights:

- Features a central cruciform stupa surrounded by 208 cells (52 cells on each side) for monks.
- Hosted an advanced library with a cooling system designed for manuscript preservation.

Heritage Repatriation Fund

Context:

A Parliamentary panel recently proposed establishing a 'Heritage Repatriation Fund' to assist in recovering Indian antiquities stolen and smuggled overseas.

About Heritage Repatriation Fund:

What is Heritage Repatriation Fund?

- A proposed financial initiative to facilitate the recovery and return of stolen Indian cultural artifacts from abroad.
- Proposed by: Department-related Parliamentary Standing Committee on Transport, Tourism, and Culture.
- Ministry: Under the Ministry of Culture, Government of India.
- Aim: To support efforts in reclaiming India's stolen or illegally exported antiquities from other nations.



RETURN OF SMUGGLED ANTIQUITIES

Since 2014, the Centre has brought **642** antiquities from various countries such as Australia, France, and the United Kingdom

Majority of them have come from the United States of America (USA)	Only 13 objects could be fetched till 2014	The Government signed a Cultural Property Agreement (CPA) with the USA to prevent smuggling of Indian antiquities
Between 2020 and 2024, a total 610 cultural objects including precious idols and sculptures were returned	Formation of a dedicated 'Heritage Recovery Task Force', comprising diplomats and legal experts	Panel suggests that India should leverage its growing economic and diplomatic influence to negotiate cultural property agreements with more countries, similar to the recent pact with US
So far, about 588 antiquities have been brought back from the US and 297 of them were received in 2024		

Features and Functions:

- **Funding Sources:** Accept contributions from corporations, wealthy individuals, and Indian diaspora through Public-Private Partnerships (PPP).
- **Legal Support:** Finance legal actions, negotiations, and purchases of disputed cultural objects.
- **Technological Integration:** Use advanced imaging, DNA testing, and AI databases to authenticate and establish the provenance of artifacts.
- **Logistics & Conservation:** Fund safe transportation and proper conservation of repatriated items.
- **Heritage Recovery Task Force:** A dedicated multidisciplinary team comprising diplomats, legal experts, and art historians to identify and recover artifacts worldwide.
- **International Agreements:** Advocate more Cultural Property Agreements (CPAs) to prevent illicit trafficking, similar to recent agreements with the USA.

Maasai Tribe

Context:

Maasai tribe in Tanzania are resisting international carbon credit projects, fearing land dispossession and erosion of their traditional way of life.

About the Maasai Tribe:

Who They Are:

- The Maasai are semi-nomadic pastoralists and one of the most prominent indigenous communities of East Africa.
- They speak Maa, a language from the Eastern Sudanic branch of the Nilo-Saharan language family.
- Found In: Tanzania and Kenya, particularly along the Great Rift Valley and semi-arid savannas.



Key Features:

Physical Characteristics & Identity:

- Known for their distinct dress, beadwork, and warrior traditions.
- Morans (young men aged 14–30) undergo bush training to build courage, endurance, and tribal discipline.

Social Structure:

- Society is patrilineal with clans divided into two moieties.
- Operates through age-set systems, with stages from junior warriors to senior elders over ~15-year intervals.

Livelihood:

- Dependent on livestock—mainly cattle, sheep, and goats—for meat, milk, and blood.
- Traditional Maasai pastoralists do consume blood as part of their cultural diet.
- Practice transhumance, moving in search of pasture and water throughout the year.
- Reside in kraals, circular enclosures with mud-dung houses and thorn fences.

Kamba Ramayana**Context:**

The Ministry of Culture has launched a comprehensive initiative to preserve and promote Kamba Ramayana recitals in Tamil Nadu.

About Kamba Ramayana:**What it is:**

- Kamba Ramayana, also known as Ramavataram, is a Tamil epic based on the Sanskrit Valmiki Ramayana.
- It is celebrated for its poetic excellence and spiritual interpretations unique to Tamil culture.

Written by:

- Composed by Tamil poet Kambar in the 12th century CE.
- Patronized by ThiruvennaiNallur Sadayappa Vallal, whose name appears every 1,000 verses in gratitude.
- Year: Written during the 12th century CE.

**State associated:**

- Strongly associated with Tamil Nadu, especially the poet's birthplace, Kambar Medu in Therazhundur.

Key Features:

- Structure: Divided into 6 Kandams (chapters), 113 Padalams (sections), and around 10,569 verses.
- Language: Written in classical Tamil, highlighting regional devotion and cultural values.
- Cultural Integration: Combines Tamil folk elements with deep philosophical and spiritual symbolism.
- Performance Tradition: Traditionally recited by Kamba Ramayana Mandali in temples; now being revived through state initiatives.

About Kambar:**Who he is:**

- Kambar, also known as Kavichakravarthy Kambar, was a renowned Tamil poet.
- He is celebrated for composing the Ramavataram (Kamba Ramayanam), the Tamil adaptation of the Ramayana.
- Birth: Born in Therazhundur, located in the present-day Mayiladuthurai district, Tamil Nadu.

Kingdom associated:

- Kambar lived and flourished in the Chola Empire during the reign of Kulothunga III.
- He received royal recognition and was bestowed the title Kavi Chakravarthy (Emperor of Poets).

Period:

- His lifetime is generally dated between 1180 CE and 1250 CE.
- He lived after Vaishnavite philosopher Ramanuja, whom he references in his works.
- Significant contributions:
- Kamba Ramayanam: Tamil version of the Ramayana, merging classical poetry with Tamil cultural depth.

Other works:

- Thirukkai Valakkam – Ethical and moral verses.

- Erelupatu and Silai Elupatu – Spiritual compositions.
- Kangai Puranam – Temple-based mythological narrative.
- Sadagopar Antati and Saraswati Antati – Devotional compositions.

UNESCO Tentative List

Context:

UNESCO added six new sites from India to its Tentative List, increasing the total to 62 sites.

- This inclusion is a mandatory step before nomination for the World Heritage List in the future

About UNESCO Tentative List:

What is the Tentative List?

- An inventory of cultural and natural heritage sites that a country intends to nominate for UNESCO World Heritage status.

How Are Sites Added?

- Countries submit Tentative Lists to the World Heritage Centre.
- A site must demonstrate Outstanding Universal Value (OUV).
- The list must be submitted at least one year before official nomination.
- Periodic revisions are encouraged every 10 years.

About Six New Sites Added to India's UNESCO Tentative List:

Kanger Valley National Park (Chhattisgarh)

- A biodiversity hotspot with rare limestone caves and dense forests.
- Home to endemic species like the Bastar Hill Myna.

Mudumal Megalithic Menhirs (Telangana)

- Ancient burial site featuring prehistoric megalithic structures.
- Dates back to Iron Age (1000 BCE – 300 CE), providing insights into early human settlements.



Ashokan Edict Sites:

- Pillars and rock edicts commissioned by Emperor Ashoka.
- Spread across Bihar, Madhya Pradesh, Odisha, and Karnataka, reflecting Mauryan governance and Buddhist teachings.

Chausath Yogini Temples (Serial Nomination) (Multiple States)

- Circular temples housing 64 Yogini deities, known for their tantric significance.
- Found in Madhya Pradesh, Odisha, and Uttar Pradesh.

Gupta Temples (Serial Nomination) (Northern India)

- Represents classical Indian temple architecture from the Gupta period (4th–6th century CE).
- Temples feature intricate carvings, shikharas, and artistic excellence.



Palace-Fortresses of the Bundelas (Madhya Pradesh & Uttar Pradesh)

- Medieval fort-palaces built by the Bundela Rajputs.
- Notable structures include Orchha Fort and Datia Palace, showcasing Rajput and Mughal architectural fusion.

Aurangzeb

Context:

Recent violent clashes erupted in Nagpur over demands for the removal of Mughal Emperor Aurangzeb's tomb.

About Aurangzeb:

- Muhi-ud-Din Muhammad Aurangzeb (Alamgir I) — Known for his military expansion and strict adherence to Islamic principles.
- Born: November 3, 1618, in Dahod, Gujarat — Born to Shah Jahan and Mumtaz Mahal.
- Reign: 1658–1707 — His 50-year rule was the longest and marked by territorial expansion and religious conservatism.
- Death: March 3, 1707 — Died in Ahmednagar while managing the Deccan campaigns.



Aurangzeb's Administration & Governance:

- Centralized Administration: He directly supervised every policy and order, reducing ministerial autonomy.
- Revenue System: Introduced revenue farming, where middlemen collected taxes, causing corruption and inefficiency.
- Legal Reforms: Appointed Muhtasibs to enforce Sharia law and ensure public morality.
- Military Expansion: Expanded the empire to its largest geographical extent, covering nearly 4 million sq. km.

Aurangzeb's Contributions:

Art and Architecture:

- Badshahi Mosque (1673): Built in Lahore; known for its massive structure and grandeur.
- Bibi Ka Maqbara (1678): Monument in Aurangabad resembling the Taj Mahal, built in memory of his wife.
- Idgah in Mathura: Constructed on the ruins of a temple to assert Mughal authority over rebellious Jats.

Literature & Education:

- Fatawa-e-Alamgiri: A collection of Islamic laws that guided governance and personal conduct.
- Patronage to Scholars: Supported Persian and Arabic literature development to spread Islamic knowledge.
- Quran Copying: He personally copied the Quran, reflecting his piety and devotion.

Religious Policies:

- Imposed Jizya tax (1679): Reintroduced tax on non-Muslims, seen as both revenue generation and religious assertion.
- Temple Destruction: Ordered selective temple demolitions, though some scholars argue they were politically motivated.
- Execution of Guru Tegh Bahadur (1675): Ordered due to refusal to convert and growing Sikh influence.

Chapter- 2

POLITY

The Dramatic Performances Act, 1876

Context:

Prime Minister during the NXT Conclave highlighted the Dramatic Performances Act, 1876, which allowed the British government to ban public performances on vague grounds.

- Though declared unconstitutional in 1956 by the Allahabad High Court, the law was formally repealed in 2017 as part of the government's effort to remove obsolete laws.



About the Dramatic Performances Act, 1876:

What is the Dramatic Performances Act, 1876?

- Enacted by the British colonial government to curb nationalist expression through theatre and stage performances.
- Gave authorities the power to ban plays, pantomimes, and public performances that were deemed seditious, obscene, defamatory, or scandalous.

Reason Behind the Act:

- Introduced after the 1875-76 visit of the Prince of Wales, Albert Edward, to suppress growing nationalist sentiments in India.
- Aimed at controlling public opinion and restricting freedom of expression through the arts.

Who Were Covered Under the Act?

- Theatre groups, playwrights, actors, and performers involved in public performances.
- Any venue hosting plays, pantomimes, or any form of dramatic art.

Important Provisions of the Act:

- Banning Power:** Any public performance could be prohibited if deemed “scandalous, defamatory, seditious, or obscene.”
- Search & Seizure:** Authorities could raid venues and seize materials related to banned performances.
- Punishment:** Imposed up to 3 months in jail or fines for violating the Act.
- Magistrate's Authority:** Allowed a Magistrate to cancel permits or licenses of performing groups.
- Why Did the Law Continue After Independence?**
- Article 372 of the Constitution allowed pre-existing colonial laws to remain in force until repealed or challenged.
- The Allahabad High Court in 1956 (*State v. Baboo Lal & Ors.*) struck down the Act for violating Article 19(1)(a) – Freedom of Speech & Expression.
- Formally repealed by The Repealing and Amending (Second) Act, 2017 under the government's ease of doing business

From Borrowers to Builders: Women's Role in India's Financial Growth Story

Context:

NITI Aayog launched the report “From Borrowers to Builders: Women's Role in India's Financial Growth Story”

highlighting increased financial participation of women.

- The report, published by TransUnion CIBIL, Women Entrepreneurship Platform (WEP), and MicroSave Consulting (MSC), shows a 42% rise in women monitoring their credit as of December 2024.

About Findings on Women and Financial Growth:

Increased Credit Participation:

- Women borrowers tripled between 2019 and 2024.
- 60% of women borrowers are from semi-urban and rural areas.
- Women's share in business loans increased by 14%, and in gold loans by 6% since 2019.



Rise in Credit Monitoring & Awareness:

- 27 million women monitored their credit in 2024, a 42% increase from 2023.
- More women in non-metro regions (48%) are actively monitoring credit than in metro areas (30%).
- 62% of self-monitoring women fall into prime or above credit bands, improving credit health.

Regional Credit Participation:

- Southern states lead in financial inclusion, with Tamil Nadu, Karnataka, and Telangana having the highest women borrowers.
- Northern & central states (UP, Rajasthan, MP) saw the fastest growth in live women borrowers in the past five years.

Success of Financial Inclusion for Women:

- Women Entrepreneurship Platform (WEP): Provides mentorship, market access, and financial literacy.
- Financing Women Collaborative (FWC): Promotes gender-intelligent financial products and public-private partnerships.
- Pradhan Mantri Mudra Yojana (PMMY): 2.22 lakh crore in loans disbursed to 4.24 crore women entrepreneurs in FY 2023-24.
- PM SVANidhi Yojana: 5,939.7 crore disbursed to 30.6 lakh women street vendors by Dec 2024.
- Udyam Registration: 40% of MSMEs in India are now women-owned.

Challenges Faced by Women in Financial Access:

- Credit Aversion: Fear of loan repayment and financial instability.
- Collateral & Guarantor Issues: 79% of women-owned businesses are self-financed, with limited access to formal credit.
- Poor Banking Experience: Women face bureaucratic hurdles and lack advisory support in financial institutions.
- Limited Financial Products for Women: Rigid loan structures do not cater to women's unique financial needs.
- Lack of Credit Readiness: 30% of individual women entrepreneurs lack required documentation and financial records.

Way Ahead:

- Reimagining Credit Risk Assessment: Using AI, big data, and alternative scoring models to reduce gender bias.
- Gender-Intelligent Financial Products: Offering flexible repayment terms, non-collateral loans, and tailored services.

- Boosting Credit Readiness: Promoting digital transactions, bookkeeping, and financial literacy to increase loan accessibility.
- Strengthening Support Ecosystem: Expanding WEP and FWC networks to provide mentorship, networking, and access to capital.
- Increasing Gender Representation in Finance: Encouraging more women in financial decision-making roles to design inclusive products.

Conclusion:

Women are transitioning from borrowers to economic builders, leveraging financial tools for business growth and financial independence. While credit awareness and participation are rising, gender-based financial barriers persist. Addressing these challenges through inclusive policies, AI-driven credit assessments, and targeted financial products will unlock women's full economic potential, driving India's financial growth and gender equity.

EPIC Number

Context:

West Bengal Chief Minister has alleged voter fraud due to duplicate EPIC numbers, accusing the Election Commission of electoral manipulation.

- The Election Commission of India (ECI) clarified that identical EPIC numbers exist due to past decentralized systems but do not imply fake voters.

About EPIC Number:

What is an EPIC Number?

- A unique alphanumeric code assigned to each registered elector to prevent impersonation.
- It is distinct from the EPIC card, which is a physical identity document for voters.

Launched in:

- Introduced in 1993 under the Registration of Electors Rules, 1960 to enhance electoral transparency.

How is EPIC Different from EPIC Card?

- EPIC Number: A unique identifier linked to a voter's registration.
- EPIC Card: A physical voter ID card containing personal details, a photograph, and constituency details.
- EPIC does not confer voting rights; only electoral roll inclusion does.

How is EPIC Number Allocated?

- Assigned electronically via ERONET when a new voter registers.
- Linked to state and constituency data to ensure regional uniqueness.

Key Features of EPIC Number:

- Alphanumeric format: Three-letter alphabetical codes followed by a seven-digit number.
- Assigned through ERONET: Automated allocation via ECI's digital portal since 2017.
- Functional Unique Serial Number (FUSN): Ensures constituency-level uniqueness.
- Permanent Identification: Remains the same even after reissuing of voter ID.

Can Two Voters Have the Same EPIC Number?

- Yes, but only across different states due to past manual allocation before the ERONET system.
- ECI has now initiated EPIC rectification under ERONET 2.0 to ensure uniqueness.

Can an EPIC Number Be Changed?

- Yes, if duplication is detected, ECI will reassign a unique EPIC number.
- The voter's eligibility, polling station, and constituency details remain unchanged.

Significance of EPIC Number:

- Prevents voter impersonation by uniquely identifying electors.
- Enhances electoral integrity by maintaining a centralized database.
- Enables easy verification of voter details across states.

- Supports digital election processes under Election Commission modernization efforts.

PUNCH Mission

Context:

NASA is set to launch the PUNCH mission on March 6, 2025, to study the Sun's corona and heliosphere.

About PUNCH Mission

Launched by:

- NASA (National Aeronautics and Space Administration).

Key Objective:

- To study the Sun's outer atmosphere (corona) and how solar wind evolves as it moves through space.
- To improve understanding of solar storms and their impact on Earth's space environment.

Unique Features:

- First-of-its-kind mission focusing on the Sun's corona and its interaction with the heliosphere.
- Consists of four identical suitcase-sized satellites that will provide continuous imaging of the inner corona.
- Will enhance predictions of space weather events, helping protect satellites and communication networks.



Offshore Mining

Context:

The Kerala Assembly passed a resolution opposing the Centre's offshore mining policy, citing environmental, economic, and security concerns.

About Offshore Areas Mineral (Development and Regulation) Act, 2002:

- The Offshore Areas Mineral (Development and Regulation) Act, 2002 regulates mineral exploration and mining activities in India's offshore areas.

Key Features

- Legal Framework: Establishes guidelines for granting mineral concessions in offshore regions.
- Authority: Empowers the Union Ministry of Mines to regulate and oversee mining operations.
- Private Participation: The 2023 amendment allows private players to explore and extract deep-sea minerals through an auction system.
- Revenue Sharing: Introduces royalty and revenue-sharing mechanisms between the Centre and States.

Cause of Contention

- Environmental Concerns: Deep-sea mining threatens marine biodiversity, fisheries, and coastal ecosystems.
- Economic Impact: Adversely affects the livelihood of fisherfolk dependent on marine resources.
- National Security Risks: Strategic minerals such as rare earth elements could be accessed by private players, raising security concerns.
- Federalism Issue: States have limited say in offshore resource management, despite bearing direct consequences.

Gum Arabic

Context:

Sudan's ongoing conflict has halted the global trade of gum arabic, a critical ingredient in food, beverages, and cosmetics.

- With 70% of the world's supply coming from Sudan, major companies like Coca-Cola and PepsiCo face potential shortages in the coming months.

About Gum Arabic

Gum Arabic is a natural resin derived from the Acacia trees found in the Sahel region of Africa. It is used as a stabilizer, emulsifier, and thickening agent in various industries.

Usage of Gum Arabic

- Food & Beverages: Prevents ingredient separation in soft drinks, candies, and baked goods.
- Cosmetics: Used in lotions, creams, and makeup for consistency.
- Pharmaceuticals: Acts as a binding agent in medicines and capsules.
- Printing & Textiles: Used in inks and dyes for better adhesion.



Where is Gum Arabic Mainly Found?

- Sudan: Supplies 70% of global demand.
- Other Countries: Chad, Nigeria, Senegal, and Mali also produce gum arabic, but in smaller quantities.

Significance of Gum Arabic

- No Viable Substitute: Essential for carbonated drinks, ensuring proper ingredient blending.
- Economic Importance: A major export commodity for Sudan.
- Global Supply Chain Dependency: Disruptions in Sudan directly impact multinational corporations like PepsiCo and Coca-Cola.

Reciprocal Tariffs

Context:

U.S. President Donald Trump announced reciprocal tariffs on nations imposing higher levies on American goods, targeting India, China, the EU, Canada, and Mexico.

- The move aims to match import tariffs with export tariffs, reshaping global trade dynamics and potentially triggering retaliatory actions.

Trade in numbers

Tables show top exports and imports between the U.S. and India from April 2024 to Nov. 2024

India's total exports to the U.S.

\$52.9 billion

TOP EXPORTS TO U.S.

Electrical machinery	\$7.6bn
Precious stones/metals	\$6.3bn
Pharmaceuticals	\$5.9bn

India's total imports from the U.S.

\$29.6 billion

TOP IMPORTS FROM U.S.

Mineral fuels and oils	\$9.9bn
Precious stones/metals	\$3.2bn
Nuclear reactors & boilers	\$2.8bn

About Reciprocal Tariffs:

What is a Reciprocal Tariff?

- A reciprocal tariff is a trade policy where a country imposes import duties equal to the tariffs charged on its exports by other nations.
- It is designed to counter trade imbalances and discourage unfair tariff policies by foreign governments.

How Does It Work?

- If a country imposes higher tariffs on U.S. goods, the U.S. will match the rate on imports from that nation.
- The policy applies to goods, services, and non-tariff barriers restricting U.S. market access.
- It aims to reduce trade deficits and encourage countries to lower their tariffs to maintain access to the U.S. market.

Does It Violate WTO Rules?

- Yes, it may contradict WTO principles, which advocate non-discriminatory trade policies under the Most-Favored-Nation (MFN) rule.

- However, the U.S. can justify it under Article XXI (national security exception) or Article XX (general exceptions) of the WTO agreement.

Consequences of Reciprocal Tariffs

- Escalation of Trade Wars: Countries like China, Canada, and Mexico may impose retaliatory tariffs, leading to supply chain disruptions and higher global trade tensions.
- Increase in Consumer Prices: Tariffs raise import costs, which businesses pass on to consumers, causing inflation and reduced purchasing power.
- Economic Volatility: Unpredictable trade policies create market instability, lowering investor confidence and slowing economic growth.
- Strained Diplomatic & WTO Disputes: Countries may challenge U.S. tariffs at the WTO, worsening bilateral relations and risking trade retaliation.
- Boost to U.S. Manufacturing: Higher tariffs on imports may push companies to manufacture domestically, creating jobs and reducing trade deficits.

Urban Trap

Context

Across India, rural communities are resisting forced urbanization due to fears of losing economic security, agricultural rights, and local governance autonomy. Protests, such as those in Rajasthan's Hanumangarh district, highlight the negative impact of village-to-town conversions, including the loss of welfare benefits and increased financial burdens.



What is the Issue?

1. Forced urbanization without consent – Rural areas are converted into towns without community participation, disrupting traditional economies.
2. Loss of welfare benefits – Programs like MGNREGA, which ensure 100 days of employment, become inaccessible after urban reclassification.
3. Threat to agricultural livelihoods – Land-use policies change, leading to forced conversion of farmlands into residential or commercial spaces.
4. Weakening of local governance – Panchayats dissolve, and decision-making shifts to municipal councils, increasing bureaucratic detachment.
5. Higher cost of living – Newly urbanized areas face increased taxation, including property tax, water fees, and waste management levies.

Why is Urbanization Considered Necessary?

1. Demographic shifts – Rising population density in villages necessitates urban expansion for better planning.
2. Infrastructure development – Urban areas receive better roads, sanitation, and public services than rural regions.
3. Economic growth & job creation – Urbanization attracts investments, creating opportunities in industries and services.
4. Streamlined administration – Larger municipal bodies can standardize governance and improve service delivery.
5. Alignment with national urbanization goals – India's urban population is projected to reach 38.2% by 2036, requiring expanded urban governance.

Challenges associated

1. Economic insecurity – Over 3,100 families in Rajasthan lost MGNREGA benefits after reclassification, impacting rural employment stability.

2. Agricultural decline – Farmers struggle as land-use changes restrict agricultural activities and increase land acquisition risks.
3. Bureaucratic alienation – Rural residents lose access to hyperlocal governance, facing delays and inefficiencies in municipal bodies.
4. Financial burden – Residents must pay higher taxes and urban service fees, increasing their cost of living.
5. Lack of transparent planning – Many urban expansions lack master plans, leading to haphazard growth and mismanaged resources.

What Can Be Done?

1. Mandatory community consultation – Policy frameworks must ensure local participation before changing rural status.
2. Hybrid governance models – Retain gram panchayat roles while integrating essential urban services.
3. Legal protections against arbitrary reclassification – Strengthen Article 243Q(2) enforcement to prevent unregulated urban expansion.
4. Urban employment alternatives – Introduce structured urban employment schemes with benefits equivalent to MGNREGA.
5. Planned & inclusive urban expansion – Urbanization must be systematic, transparent, and inclusive of rural economic realities.

Conclusion

Forced urbanization, if done without inclusive planning and local engagement, disrupts livelihoods, governance, and economic stability. While urban expansion is inevitable, it should be structured, participatory, and sensitive to rural concerns. A balanced policy approach will ensure development without marginalizing rural populations.

USAID Funding Cuts and Their Impact on India

Context

USAID has been a key contributor to India's health, environmental, and technological sectors, providing \$2.8 billion in aid since 2001. The US administration's January 20, 2025, executive order aims to halt foreign aid, significantly impacting USAID-supported programs in India. A U.S. Supreme Court ruling on March 5, 2025, upheld the decision, raising concerns about the future of critical health and development projects.

USAID INDIA PROJECTS UNDER THREAT		
HEALTH Momentum 3B for Overcoming Entrenched Obstacles in Routine Immunization GOAL: Strengthen immunisation programs, remove bottlenecks in planning, delivery, demand, uptake of immunisation services. FUNDING: \$20,596,671 SCHEDULED END: June 2026 Reaching Impact, Saturation and Epidemic Control (RISE) GOAL: Five-year PEPFAR-USAID-funded project to reduce new HIV infections, HIV-related morbidity & mortality. FUNDING: \$7,163,483 SCHEDULED END: December 2025 Suwasri: Support To Water and Sanitation in India GOAL: Support sustainable sanitation and safe drinking water in pursuit of sustainable development goals. FUNDING: \$4,050,001 SCHEDULED END: March 2026 ENVIRONMENT Strengthening Landscape Management and Conservation GOAL: Five-year program that supports Government of India, other	stakeholders in protecting landscapes, improving biodiversity conservation. FUNDING: \$2,695,142 SCHEDULED END: April 2028 Cleaner Air and Better Health GOAL: Improve air quality and reduce air pollution exposure in selected Indian locations. FUNDING: \$1,500,000 SCHEDULED END: October 2026 BASIC EDUCATION Scaling up Early Learning GOAL: Facilitate creation of reading rooms to improve basic education. FUNDING: \$2,115,879 SCHEDULED END: September 2025 Udyami: Building Resilience of Women Micro-entrepreneurs FUNDING: \$3,000,000 SCHEDULED END: November 2027 ENERGY South Asia Regional Energy Partnership (SAREP) GOAL: Improve access to affordable, secure, reliable and sustainable energy in South Asia. FUNDING: \$5,196,278 SCHEDULED END: September 2028	BUSINESS O-RAN Research Labs GOAL: To explore creation of a tech platform for secure and trustworthy alternate 5G O-RAN; part of US efforts to facilitate "Free and open Indo-Pacific". FUNDING: \$3,300,000 SCHEDULED END: September 2025 GOVT & CIVIL SOCIETY Central Tibetan Administration Capacity Building & Sustainability Initiative GOAL: Strengthen Central Tibetan Administration for delivering services to Tibetans and achieving community self-reliance. FUNDING: \$2,898,081 SCHEDULED END: August 2026 OTHER SOCIAL STRUCTURE Development Partnership Activity for Indo Pacific Region GOAL: USAID-Indian development agencies' partnership to provide technical assistance to Indo-Pacific countries in energy, natural resource management, digital tech, connectivity, trade and competitiveness. FUNDING: \$1,676,960 (2024), \$962,488 (2023), \$881,455 (2022) SCHEDULED END: August 2025

What is it About?

1. **USAID's Financial Contribution** – India received \$228 million in 2022, ranking USAID fourth among global donors.
2. **Health & Population Programs** – Funding focused on TB, HIV/AIDS, maternal health, and Covid-19, with \$180 million allocated in 2022.
3. **Environmental & Technological Aid** – USAID invested \$17.12 million in 2024 for clean air, water, and sustainable development projects.
4. **Executive Order on Aid Reduction** – The U.S. government reassessed 5,800 foreign aid projects, retaining only 500 to cut spending.
5. **Legal Battles Over Funding Cuts** – A U.S. Federal Court stay on February 13, 2025, was overturned by the Supreme Court on March 5, 2025.
6. **Impact on NGOs & Public Health** – Programs like Breaking the Barriers (TB awareness in India) and HIV/AIDS prevention under PEPFAR face discontinuation.

Benefits of USAID in India

1. **Public Health Strengthening** – Support for polio eradication, TB control, and HIV/AIDS prevention, with \$7 million allocated in 2022-23.
2. **Covid-19 Response Enhancement** – USAID provided \$120 million in 2022 for vaccines, medical infrastructure, and pandemic relief.
3. **Environmental Sustainability** – Funded pollution control, clean water initiatives, and climate resilience projects, boosting India's ecological security.
4. **Economic & Institutional Development** – Strengthened public health systems, research collaborations, and NGO capacity building.
5. **Technology & Digital Infrastructure** – Supported secure 5G O-RAN development, enhancing India's telecom security and digital sovereignty.

Challenges Due to USAID Funding Cuts

1. **Health Sector Crisis** – The sudden halt affects programs addressing TB, HIV/AIDS, and maternal health, previously funded with \$180 million in 2022.
2. **Increased Disease Burden** – Loss of \$12.13 million for HIV/AIDS in 2023 could lead to rising infections and mortality rates.
3. **NGO Funding Shortfall** – Organizations like Karnataka Health Promotion Trust (KHPT) face operational uncertainty and layoffs.
4. **Strategic Influence Shift** – The withdrawal of U.S. aid could create a vacuum for China to expand its economic and geopolitical influence in South Asia.
5. **Legal & Policy Instability** – The March 5, 2025, Supreme Court ruling causes uncertainty in global development partnerships and aid negotiations.

Way Forward

1. **Diversify Global Funding Sources** – India must engage with alternative donors like Japan (\$2.97B), EU (\$383.5M), and Germany (\$235M) to sustain development efforts.
2. **Enhance Domestic Investment** – The government should increase financial allocations for public health, infrastructure, and environmental projects.
3. **Strengthen NGO & Private Partnerships** – Collaboration with corporations, philanthropic organizations, and CSR initiatives can fill funding gaps.
4. **Develop Indigenous Technological Capabilities** – Boosting R&D in public health, digital infrastructure, and clean energy will reduce reliance on external aid.
5. **Diplomatic Engagement with the U.S.** – India should negotiate with policymakers to restore funding for critical programs through alternate diplomatic channels.

Conclusion

USAID's funding withdrawal presents a major challenge for India's healthcare, environmental sustainability, and technological progress. To mitigate the impact, India must expand international partnerships, boost domestic investment, and enhance self-reliance. A proactive approach will ensure continued progress in public health, environmental resilience, and digital transformation.

Autonomous District Councils

Context:

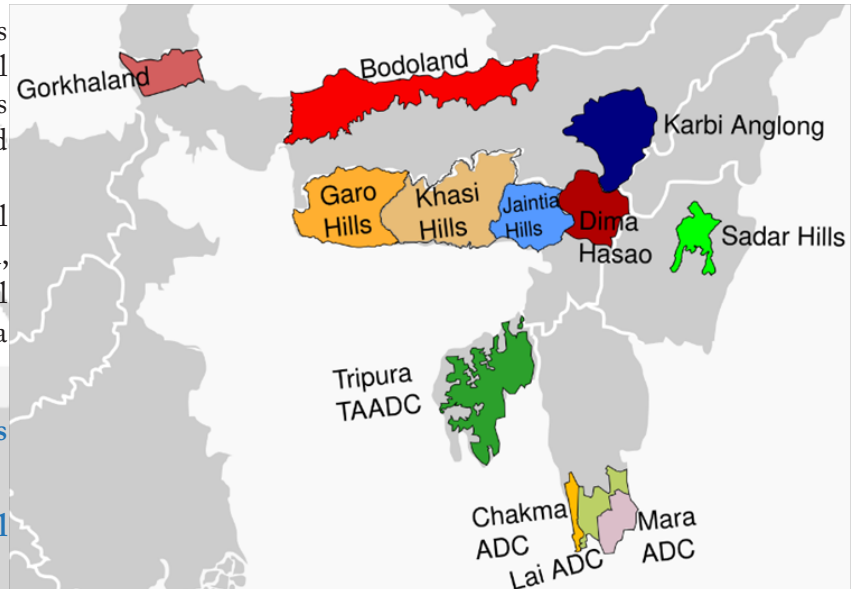
The Assam Assembly passed amendments allowing the Governor to assume control over seven autonomous councils if elections remain unfeasible even after the mandated extension period.

- These amendments impact tribal councils like Mising, Bodo Kachari, Thengal Kachari, Deori, Sonowal Kachari, Rabha Hasong, and Tiwa Autonomous Councils.

About Autonomous District Councils (ADCs):

What is an Autonomous District Council (ADC)?

- ADCs are self-governing tribal administrative bodies established under the Sixth Schedule of the Indian Constitution.
- They provide autonomy in governance, land management, and cultural preservation for Scheduled Tribes (STs) in Assam, Meghalaya, Mizoram, and Tripura.



Membership of Autonomous Councils

- Elected Members: The majority of members are democratically elected for a five-year term.
- Nominated Members: The Governor nominates a limited number of members to ensure representation of marginalized groups.

Powers of ADCs

Legislative Powers:

- Can frame laws on land, forests, water resources, agriculture, public health, sanitation, and social customs.
- Have judicial powers to settle disputes among tribal communities.

Executive Powers:

- Administer village councils, traditional chiefs, policing, inheritance laws, and local governance.

Judicial Powers:

- Can establish tribal courts to handle disputes where both parties belong to Scheduled Tribes, provided the sentence is under five years of imprisonment.

Functions of ADCs

- Govern tribal areas while preserving traditional customs and practices.
- Manage resources such as forests, water bodies, and minerals.
- Develop local infrastructure, including education, healthcare, and rural roads.
- Promote local governance through the formation of village councils.

Revenue Sources of ADCs

- Power to levy taxes, fees, and tolls on:
- Land, buildings, vehicles, boats, and animals.

- Goods entering the district.
- Ferries, roads, and employment-based income.
- General taxation for the maintenance of local infrastructure.

UN Report on Gender Equality

Context:

A United Nations report has revealed that women's rights have been weakened in nearly 25% of countries, with growing gender discrimination in political, economic, and social spheres.

- The report highlights alarming statistics, including a 50% rise in conflict-related sexual violence since 2022 and persistent gender-based inequality in governance and resources.



About UN Report on Gender Equality:

What is This Report?

- A comprehensive assessment of gender equality and women's rights worldwide, marking 30 years since the 1995 Beijing Declaration.
- Evaluates progress, setbacks, and threats to women's rights, legal protections, and policy advancements.

Published By

- UN Women, the United Nations entity for gender equality and women's empowerment.
- Released ahead of International Women's Day 2025.

Key Findings of the Report

- Widespread Gender Discrimination: Women have only 64% of the legal rights that men have globally.

Increase in Gender-Based Violence:

- A woman or girl is killed every 10 minutes by a partner or family member.
- Conflict-related sexual violence has surged by 50% since 2022, with 95% of victims being women and girls.

Limited Representation in Leadership:

- Only 87 countries have ever had a female head of state.
- Women hold just 26% of parliamentary seats worldwide.

Educational and Workplace Progress:

- 88% of countries have enacted laws against violence towards women.
- 44% of nations are improving education and training for women.

Persisting Economic Disparities:

- 10% of women and girls live in extreme poverty.
- Female youth (ages 15-24) have limited access to modern family planning.

CAMPA Funds

Context:

The Supreme Court has directed the Uttarakhand Chief Secretary to respond to allegations of financial irregularities in the Compensatory Afforestation Fund Management and Planning Authority (CAMPA) funds, highlighted in a CAG report.

- The report claims misuse of funds by the Forest Department, including unauthorized purchases of iPhones, laptops, fridges, and office renovations, instead of afforestation activities.



About CAMPA Funds:

What is CAMPA?

- Compensatory Afforestation Fund Management and Planning Authority (CAMPA) is a mechanism for afforestation and forest conservation to compensate for the diversion of forest land for non-forest purposes.
- Established by the Supreme Court in 2009, it operates at both national and state levels.

Objectives of CAMPA

- Compensate forest loss by promoting afforestation and natural regeneration.
- Ensure effective fund utilization for forest and wildlife conservation.
- Provide financial support for forest protection, research, and training.
- Strengthen institutions responsible for forest management.

Provisions Under CAMPA

- Funds Collection: Money is collected from project proponents seeking forest clearance under the Forest (Conservation) Act, 1980.
- Utilization of Funds: Used for compensatory afforestation, additional afforestation, penal compensatory afforestation, and wildlife conservation.
- State CAMPA: Receives funds from the Adhoc CAMPA and administers their utilization for forest development.
- Monitoring & Accountability: An independent system is set up for concurrent monitoring and evaluation.

Role of CAMPA

- National CAMPA Advisory Council: Provides guidelines and oversight for State CAMPA bodies.
- State CAMPA: Implements afforestation, conservation, and forest protection programs at the state level.
- Funds Distribution: Allocates funds for infrastructure development, wildlife protection, and training of forest officials.

Significance of CAMPA

- Promotes Sustainable Development: Balances economic growth with environmental conservation.
- Enhances Forest Cover: Aims to regenerate lost forests due to industrial and infrastructural projects.
- Strengthens Wildlife Protection: Supports habitat conservation and biodiversity restoration.
- Improves Livelihoods: Generates employment in afforestation and forest management activities.

Limitations & Challenges

- **Misuse of Funds:** Reports of financial mismanagement and fund diversion for non-forestry activities.
- **Slow Implementation:** Delays in fund disbursement and project execution reduce effectiveness.
- **Lack of Transparency:** Insufficient monitoring mechanisms allow for misallocation of resources.
- **State-Level Discrepancies:** Uneven implementation and fund utilization across different states.

Closing the gender gap in the higher judiciary

Context

The Indian judiciary has witnessed notable progress in women's representation over the past century, starting with Cornelia Sorabji becoming India's first woman lawyer in 1924. However, despite increased participation in the legal profession, women remain significantly underrepresented in the Supreme Court and High Courts, reflecting systemic inequalities and procedural opacity.



Current Status of Women in the Higher Judiciary

- **High Courts:** Women account for only 14.27% of judges (109 out of 764). Several High Courts, including Uttarakhand, Meghalaya, and Tripura, have no women judges. The Allahabad High Court, India's largest High Court, has just 3 women judges out of 79 (approximately 2%).
- **Supreme Court:** The top court currently has only two women judges — Justice B.V. Nagarathna and Justice Bela Trivedi. With Justice Bela Trivedi's impending retirement in June 2025, the Supreme Court will be left with only one woman judge.
- **Age Disparity:** Women judges are appointed at an average age of 53, while men are appointed at an average age of 51.8, reducing their prospects of reaching seniority or leadership roles.
- **Leadership Deficit:** Out of 25 High Courts, only the Gujarat High Court has a woman Chief Justice.

Challenges Leading to Gender Imbalance

1. **Systemic Inequality:** Women lawyers face heightened scrutiny in judicial appointments. While men's merit is often presumed, women are frequently required to prove their competence to a greater degree.
2. **Opaque Collegium System:** The collegium lacks clear eligibility criteria and fails to ensure gender-inclusive recommendations. This opacity disproportionately affects women candidates.
3. **Gender Bias in Recommendations:** Since 2020, nine women recommended for High Court judgeships were not confirmed by the government. Among these, five were the only names rejected in their respective lists, underscoring systemic bias.
4. **Limited Elevation from the Bar:** Over 75 years, only one woman has been elevated directly from the Bar to the Supreme Court, whereas nine men have been elevated via this route.
5. **Institutional Barriers:** Women lawyers face fewer networking opportunities, insufficient mentorship, and limited access to senior roles, reinforcing exclusion from higher judicial positions.

Significance of Greater Women's Representation

1. **Enhances Judicial Legitimacy:** A gender-balanced judiciary enhances inclusivity and aligns courts with the diverse socio-economic realities they adjudicate.
2. **Improved Decision-Making:** Greater diversity promotes balanced perspectives and fosters judgments that are more reflective of ground realities.
3. **Strengthens Public Trust:** Women's presence on the Bench signals greater fairness and impartiality, improving citizens' trust in judicial processes.
4. **Encourages Gender-Sensitive Jurisprudence:** Women judges are more likely to influence cases involving gender rights, family law, and sexual violence, enriching the court's approach to justice delivery.

Way forward for achieving gender parity

1. **Transparent Collegium process:** The collegium must establish clear criteria for judicial appointments, including a structured application process for women lawyers to express their interest.
2. **Mandatory gender representation:** The judiciary must institutionalize a policy ensuring that at least one-third of judges in the higher judiciary are women.
3. **Merit-based selection with diversity:** Diversity and merit must be seen as complementary, ensuring selection is based on excellence and integrity while prioritizing gender inclusion.
4. **Mentorship and leadership support:** Dedicated programs to mentor and train women lawyers for leadership roles will help break systemic barriers.
5. **Review of rejected recommendations:** The government must adopt a policy requiring clear explanations when rejecting candidates recommended by the collegium, especially women.

Conclusion

Achieving gender parity in the higher judiciary is vital to upholding constitutional values of equality, inclusiveness, and justice. As Justice Indira Banerjee rightly emphasized, women's appointments must become normalized rather than celebrated as exceptional. By ensuring a transparent, merit-driven, and gender-conscious appointment process, India's higher judiciary can better reflect the diverse society it serves.

Judicial Transfers in India

Context:

The transfer of Justice Yashwant Varma from the Delhi High Court to the Allahabad High Court has sparked protests and reignited debates on judicial transfers.

About Judicial Transfers in India:

What are Judicial Transfers?

- Transfers involve the relocation of a High Court judge from one High Court to another, either in the interest of public administration or judicial functioning.



Constitutional Provision:

- Article 222(1) of the Constitution empowers the President to transfer a judge from one High Court to another in consultation with the Chief Justice of India (CJI).

Key Supreme Court Judgments:

1. **First Judges Case (1981) — S.P. Gupta v. Union of India**
 - Held that the executive had primacy, and CJI's opinion was not binding.
2. **Second Judges Case (1993)**
 - Overturned earlier ruling, giving primacy to judiciary via the collegium system.
 - Stressed that transfers should be in public interest and with wider consultation.
3. **Third Judges Case (1998)**
 - Expanded collegium to CJI + 4 senior-most judges.
 - Required opinion of judges familiar with the concerned High Court.
 - Authorities Involved in Judicial Transfers:
 - Judiciary: Chief Justice of India initiates the transfer.

Consults:

- Chief Justices of both transferring and receiving High Courts.
- One or more Supreme Court judges familiar with the judge's service record.
- Collegium (for Chief Justices' transfer): CJI + 4 senior-most SC judges.

Executive:

- Law Minister reviews and forwards Collegium's recommendation to the Prime Minister.
- President of India gives final approval.
- Department of Justice issues official transfer notification.

Procedure of Judicial Transfer:

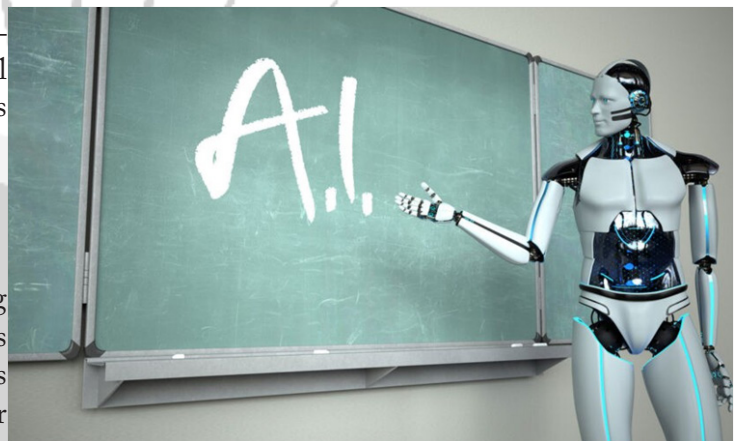
- Initiation: CJI assesses and proposes transfer based on judicial and administrative grounds.
- Consultation: Mandatory consultation with relevant High Court and Supreme Court judges.
- Recommendation: Finalised by the Collegium and forwarded to the Law Ministry.
- Approval: PM advises the President, who approves the transfer.
- Notification: Department of Justice publishes in the Gazette of India.

AI Literacy**Context:**

India faces a critical choice in the AI revolution—remain a service provider or emerge as a global innovator. AI literacy is now essential to harness this transformative technology equitably.

About AI Literacy:**What is AI Literacy?**

- Human-AI Collaboration: Understanding how to effectively partner with AI systems rather than just use them passively. This enables professionals across fields to enhance their work through AI assistance.
- Critical AI Awareness: Developing the ability to assess AI outputs for potential biases, errors or ethical concerns. This is crucial in an era of AI-generated content and automated decisions.
- Problem-Solving with AI: Applying AI tools creatively to address real-world challenges, regardless of one's technical background. This makes AI accessible beyond just computer scientists.
- Beyond Just Coding: Focusing on conceptual understanding and application rather than just programming skills. AI literacy is about mindset more than specific technical abilities.
- Universal Competency: Becoming as fundamental as traditional literacy across all professions and demographics. AI understanding should not be limited to tech specialists.

**Why Growing Focus on AI Literacy?**

- Economic Imperative: AI adoption could add nearly \$1 trillion to India's economy by 2035, making literacy essential for workforce participation in this growth.
- Employment Transformation: With automation changing job requirements, workers across sectors need AI skills to remain relevant in the labor market.
- Global Leadership Race: Countries investing in AI education are pulling ahead in innovation and economic competitiveness on the world stage.
- Democratic Access: Widespread AI literacy prevents concentration of benefits among tech elites and ensures equitable distribution of opportunities.
- National Security Needs: Understanding AI is becoming crucial for cybersecurity, misinformation detection and strategic decision-making.

Challenges to AI Literacy in India:

- Digital Divide: Uneven internet access and device availability creates disparities in AI education opportunities across regions.
Example: Only 38% of rural schools have computer labs versus 72% urban schools.
- Education System Gaps: Most Indian schools still focus on rote learning rather than critical thinking skills needed for AI comprehension.

Example: Less than 5% of schools have AI in their curriculum.

- **Skilling Shortages:** India faces a severe shortage of qualified instructors who can teach AI concepts effectively.

Example: Many engineering colleges lack faculty trained in machine learning.

- **Ethical Concerns:** Potential biases in AI systems and lack of transparency raise important questions about responsible use.

Example: Facial recognition systems showing racial bias in trials.

- **Funding Limitations:** Inadequate investment in AI research and infrastructure hampers widespread literacy efforts.

Example: Government spending on AI is just 0.1% of the education budget.

India's Current AI Literacy Landscape:

- **Innovation Examples:** Homegrown solutions demonstrate India's potential when combining AI with local needs.

Example: Kisan AI providing voice-based agricultural advice in regional languages.

- **Policy Initiatives:** Government programs are beginning to address AI education at various levels.

Example: National Education Policy 2020's emphasis on emerging technologies.

- **Private Sector Role:** Tech companies are contributing through training programs and tools development.

Example: Google's AI literacy workshops for small businesses.

- **State-Level Experiments:** Some regions are pioneering localized approaches to AI education.

Example: Karnataka's AI curriculum pilot in 1,000 schools.

- **Persistent Gaps:** Implementation challenges prevent benefits from reaching all segments equally.

Example: Tribal schools lacking even basic computer infrastructure.

Measures Needed for AI Literacy Growth:

- **Education Integration:** Systematically incorporate AI concepts across school and college curricula nationwide.

Example: CBSE's new AI subject for grades 8-10.

- **Public-Private Models:** Combine government resources with industry expertise for scalable solutions.

Example: Microsoft's partnership with states for AI labs in colleges.

- **Localized Content:** Develop teaching materials in regional languages to improve accessibility.

Example: IIT Madras's Tamil-language AI learning platform.

- **Workforce Programs:** Create targeted upskilling initiatives for professionals across industries.

Example: NASSCOM's FutureSkills Prime platform for working adults.

- **Governance Frameworks:** Establish guidelines for ethical AI development and deployment.

Example: Draft National AI Strategy's principles for responsible AI.

Conclusion:

India's AI literacy journey will shape its technological sovereignty and economic future. Strategic investments in education, infrastructure and governance can position India as an AI leader rather than follower. The window for action is now – delay risks permanent disadvantage in the global AI race.

Section 44(3) of the Digital Personal Data Protection (DPDP) Act

Context:

Activists and Opposition leaders have raised alarm over Section 44(3) of the Digital Personal Data Protection (DPDP) Act, 2023, citing threats to transparency under the Right to Information (RTI) Act, 2005.



About Section 44(3) of the Digital Personal Data Protection (DPDP) Act:

What is Section 44(3)?

- This clause amends Section 8(1)(j) of the RTI Act to restrict disclosure of personal information, removing earlier safeguards like public interest tests and legislative access exceptions.

Features of the Clause:

- Replaces the original wording with a broader exemption:
- “(j) information which relates to personal information.”

Removes clauses that:

- Balanced privacy with public interest,
- Allowed disclosure if information was relevant to public activity,
- Mandated non-denial of info to citizens if not denied to Parliament.

Why It's Controversial?

- It expands the scope of denial under RTI.

About Section 8(1)(j) of the Right to Information (RTI) Act, 2005:

What is Section 8?

- Lists exemptions where public authorities can refuse disclosure of certain information.

Key Exemptions under Section 8(1):

1. National security and sovereignty (Clause a)
2. Judicial restrictions or contempt of court (Clause b)
3. Parliamentary privilege (Clause c)
4. Commercial confidence or IP (Clause d)
5. Fiduciary relationships (Clause e)
6. Foreign government communications (Clause f)
7. Threat to life or safety of informants (Clause g)
8. Ongoing investigations (Clause h)
9. Cabinet deliberations (Clause i)

10. Personal information with public interest override (Clause j)

Impact of DPDP's Section 44(3) on RTI Act's Section 8(1)(j):

- Dilutes transparency by eliminating the public interest balancing clause.
- Hampers access to key data on public officials' assets, salaries, and misconduct cases.
- Overrides judicial precedents that interpreted Section 8(1)(j) in favour of public disclosure.
- May lead to blanket denials of legitimate information requests, weakening democratic accountability.

Asset Declaration Norms for Judges

Context:

Discovery of unaccounted cash at Delhi High Court judge Yashwant Varma's residence has renewed debate on mandatory disclosure of judges' assets.

About Asset Declaration Norms for Judges:

Restatement of Values of Judicial Life (1997)

- Judges must declare all movable and immovable assets (in their name, spouse's or dependents') to the Chief Justice.
- It does not mandate public disclosure.



Supreme Court Resolution (2009)

- Judges' asset disclosures were made voluntarily available on the Supreme Court's website.
- No statutory compulsion; updates have ceased since 2018.

RTI Act Interpretation (2019)

- Supreme Court ruled that judges' asset details do not constitute personal information, bringing them within the RTI ambit.

Judicial Standards and Accountability Bill, 2010

- Proposed mandatory public declaration of assets by judges.
- Bill lapsed with the dissolution of the 15th Lok Sabha; never reintroduced.

Parliamentary Committee Recommendation (2023)

- Urged the introduction of legislation to ensure mandatory disclosures by SC and HC judges.
- Awaiting legislative action.

About Asset Declaration by Public Officials:

RTI Act, 2005

- Promotes transparency; citizens can access details of public servants' assets via RTI applications.

All India Services (Conduct) Rules, 1968

- Rule 16(1): Mandatory annual declaration of assets and liabilities to the cadre-controlling authority.

Political Candidates & MPs/MLAs

- Based on SC ruling (2002), mandatory disclosure at the time of nomination.
- Submitted to Speaker (Lok Sabha) or Chairperson (Rajya Sabha); publicly accessible.

Union Ministers & Bureaucrats

- Declare assets to PMO or respective state departments.
- Information is often published online (e.g., PMO website, IAS officers list).

Judicial Accountability in India

Context:

Vice-President Jagdeep Dhankhar met key political leaders to discuss judicial accountability amid allegations of large-scale cash recovery from the residence of Delhi High Court Judge Yashwant Varma, with the judiciary's internal probe underway.



What is Judicial Accountability?

Definition:

- Judicial accountability refers to holding judges answerable for their conduct and decisions within constitutional and legal frameworks.

Features of Judicial Accountability:

- Ensures transparency and integrity in the judiciary.
- Balances independence with public responsibility.
- Includes adherence to ethical codes and judicial discipline.
- Allows inquiry mechanisms for misconduct.
- Prevents misuse of judicial power.

Need for Judicial Accountability in India:

Public Trust:

- Accountability strengthens public faith in the justice delivery system.
Example: The Justice Nirmal Yadav case highlighted the damage to institutional credibility due to delayed action.
- Prevention of Corruption: Curb corruption and misuse of power in the higher judiciary.
- Checks on Unreviewable Power: As Justice V.R. Krishna Iyer emphasized, unreviewable power requires more scrutiny.
- Enhancing Judicial Efficiency: Ensures judges uphold efficiency, ethics, and constitutional values.
- Institutional Integrity: Prevents misuse of constitutional safeguards to protect personal interests.

Laws and Constitutional Articles to Ensure Judicial Accountability:

- Articles 124(4) and 218: Provide for the removal of Supreme Court and High Court judges on grounds of proved misbehaviour or incapacity.
- Judges (Inquiry) Act, 1968: Specifies procedures for investigation and impeachment of judges.
- Articles 227 and 235: Empower High Courts to supervise subordinate courts.
- In-house Procedure (1999): Established by the Supreme Court for internal inquiries against judges.
- RTI Act: Intended to promote transparency in judicial functioning, though implementation remains weak.

Challenges to Judicial Accountability:

- Lack of Transparency: Outcomes of in-house probes are often kept secret.
Example: Justice Soumitra Sen resigned before the impeachment motion could reach Lok Sabha.
- Contempt Powers: Fear of contempt discourages public discussion on judicial misconduct.
- Misuse of Constitutional Protection: Judges sometimes misuse independence clauses for personal shelter.
- Delays in Proceedings: Judicial misconduct cases drag on for years, reducing deterrence.
Example: The Justice Nirmal Yadav case has remained unresolved for over 14 years.
- No Dedicated Ombudsman: Absence of an independent judicial accountability authority.

Way Ahead:

- Establish Judicial Ombudsman: A dedicated body to independently investigate complaints against judges.
- Strengthen In-house Procedure: Ensure findings are made public to foster transparency.

- Revisit NJAC or Judicial Appointment Reforms: Balance independence with accountability through transparent judicial appointments.
- Use of Technology: Digital monitoring and tracking of case timelines for efficiency.
- Regular Ethics Training: Periodic orientation for judges on judicial ethics and public accountability.

Conclusion:

Judicial accountability is key to maintaining the judiciary's integrity, independence, and public trust. Institutional safeguards must adapt to ensure accountability without compromising judicial freedom. Transparent procedures and strong oversight will strengthen democracy and public confidence in the judiciary.

Unified Pension Scheme

Context:

The Pension Fund Regulatory and Development Authority (PFRDA) has issued guidelines for the implementation of the Unified Pension Scheme (UPS), which will come into effect from April 1, 2025, offering an alternative to the existing National Pension Scheme (NPS) for central government employees.



About Unified Pension Scheme (UPS):

What it is:

- A contributory pension scheme for central government employees providing guaranteed monthly payouts and flexible investment options.
- Announced in: January 2025 via official government notification.

Implemented from: April 1, 2025.

- Implementing Agency: Pension Fund Regulatory and Development Authority (PFRDA).

Key Features of UPS:

Eligibility:

- Central government employees in service as of April 1, 2025, already under NPS.
- New central government recruits joining on or after April 1, 2025 (option within 30 days).
- Retired or voluntarily retired employees under NPS as of March 31, 2025.
- Legally wedded spouse of eligible deceased retirees.

Choice and Irrevocability:

- Option once exercised is final and irreversible.
- Decision must be made within three months from April 1, 2025.

Contribution Requirement:

- Employee contribution: 10% of basic pay + dearness allowance.
- Government contribution: 10% match + additional 8.5% to ensure guaranteed payout.

Guaranteed Assured Payout:

- Minimum assured payout of 10,000/month after 10 years of qualifying service.
- Full payout calculated as 50% of 12-month average basic pay before retirement (subject to 25 years of service).

Other features:

- PRAN Number Continuation from NPS: The Permanent Retirement Account Number (PRAN) issued under the NPS continues to be used without any changes. Subscribers do not need a new PRAN for this scheme.

- Choice of Pension Funds: Subscribers can select their preferred pension fund managers from the list of PFRDA-registered pension funds.

Investment Change Flexibility:

- Subscribers are allowed to change their investment choice (pension fund or asset allocation) once per financial year.
- Additionally, they can adjust their portfolio allocation (switching between asset classes) up to two times in a financial year.
- Partial Withdrawal Facility: Subscribers can withdraw up to 60% of the accumulated pension corpus upon exit or retirement.

The Global Environmental Data Strategy (GEDS)

Context:

The Global Environmental Data Strategy (GEDS) is in the spotlight as the United Nations Environment Programme (UNEP) works to finalize it by December 2025.

- This strategy aims to address the triple planetary crises of climate change, pollution, and biodiversity loss by leveraging high-quality, accessible environmental data for informed decision-making and innovative solutions.

What is GEDS Strategy?

The Global Environmental Data Strategy (GEDS) is a comprehensive framework developed by UNEP to enhance the use of environmental data.

- It focuses on overcoming barriers like data fragmentation, lack of interoperability, and limited access to support global efforts in tackling environmental crises.
- The strategy is built on five key pillars: data quality, governance, interoperability, access, and capacity-building.



Key Pillars of GEDS:

- Data Quality and Provenance:** Establishes frameworks and standards to ensure accurate classification and quality of environmental data.
- Data Governance:** Promotes ethical and sustainable methodologies for managing environmental data.
- Data Interoperability:** Federates global and thematic data standards to enable seamless data sharing and integration.
- Inclusive Data Access:** Advocates for open, affordable, and machine-readable data to ensure accessibility for all stakeholders.
- Capacity-Building:** Focuses on enhancing skills and knowledge for effective data collection, governance, and use, particularly in Global South countries.

Advantages of GEDS:

- Informed Decision-Making:** Provides high-quality data to support evidence-based policies and actions.
- Global Collaboration:** Encourages international cooperation and data sharing to address environmental challenges.
- Innovation:** Facilitates the development of AI and data analytics tools for environmental solutions.
- Equity:** Ensures inclusive access to data, particularly for developing nations.

Limitations and Challenges:

- Implementation Barriers:** Differences in technological capabilities and resources among countries may hinder uniform adoption.
- Data Privacy Concerns:** Balancing open access with ethical data governance remains a challenge.

- Coordination Issues: Achieving global consensus on data standards and interoperability can be complex.
- Resource Constraints: Limited funding and technical expertise, especially in the Global South, may slow progress.

Significance of GEDS:

- Addressing Triple Planetary Crises: Provides a data-driven approach to combat climate change, pollution, and biodiversity loss.
- Sustainable Development: Aligns with the UN Sustainable Development Goals (SDGs) by promoting responsible data use.
- Empowering Stakeholders: Enhances the capacity of governments, organizations, and communities to make informed environmental decisions.

Conclusion:

The Global Environmental Data Strategy (GEDS) is a transformative initiative to harness the power of environmental data for global sustainability. By addressing data quality, governance, and accessibility, GEDS aims to foster innovation and collaboration. Its success will depend on overcoming implementation challenges and ensuring inclusive participation from all stakeholders.

CAG (Comptroller and Auditor General of India)

Context:

The Supreme Court has issued notice to the Centre on a Public Interest Litigation (PIL) questioning the executive-dominated process of appointing the Comptroller and Auditor General (CAG) of India.

- The petition demands a non-partisan selection committee to safeguard the independence of the CAG, a key constitutional authority.

About CAG (Comptroller and Auditor General of India):

What is the CAG?

- The CAG is India's apex constitutional audit authority, known as the watchdog of the public purse.
- It oversees the financial accountability of both Union and State governments and reports to Parliament.
- Constitutional Article: Articles 148 to 151 (Part V) of the Indian Constitution define the appointment, powers, duties, and audit reporting process of the CAG.

Appointment Process:

- The President of India appoints the CAG by warrant under his hand and seal (Article 148).
- Current practice is executive-controlled; calls for reform suggest an independent panel including the Prime Minister, Leader of Opposition, and Chief Justice of India.

Term of Office:

- Six years or until the age of 65, whichever is earlier.
- The CAG is ineligible for any future office under the Government of India or any State after demitting office.

Service Conditions:

- Salary is equal to that of a Supreme Court judge, determined by Parliament.
- Administrative expenses are charged on the Consolidated Fund of India, ensuring financial independence.
- Service conditions for staff are prescribed by the President in consultation with the CAG.

Removal Process:

- Can be removed only by the President, following the same grounds and process as a Supreme Court judge.
- Removal requires a special majority resolution in both Houses of Parliament for proven misconduct or incapacity.

Powers and Functions:

Audit Authority:

- Audits all expenditures from the Consolidated Fund of India and State funds.
- Audits accounts of government corporations, PSUs, and government-funded bodies.

Reporting Role:

- Submits audit reports to the President or Governors, who lay them before Parliament or State Legislatures.
- Reports are scrutinized by the Public Accounts Committee (PAC).

Fiscal Oversight:

- Certifies the net proceeds of taxes and duties.
- Reviews government transactions related to debts, advances, and suspense accounts.

Legal and Discretionary Audits:

- Conducts compliance audits, performance audits, and financial audits.
- Can conduct propriety audits to evaluate the wisdom, faithfulness, and economy in government spending.

Role in Accountability:

- Acts as an agent of Parliament, ensuring public funds are used legally and efficiently.
- Does not control fund issuance (unlike Britain's CAG), functioning solely as Auditor-General.

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RAO'S ACADEMY

Chapter- 3

GEOGRAPHY

Zambia

Context:

The Government of India has secured a 9,000 sq. km block in Zambia for copper and cobalt exploration, marking a strategic move in securing critical minerals.

- The project will be led by the Geological Survey of India (GSI), supporting India's clean energy and EV battery industries.

About Zambia:

- Location: Landlocked country in Southern Africa.

Capital:

- Neighbouring Countries: Borders Angola, Democratic Republic of the Congo (DRC), Tanzania, Malawi, Mozambique, Zimbabwe, Botswana, and Namibia.



Geographic Features:

- Major Rivers – Zambezi River, Kafue River, Luangwa River
- Mountains – Nyika Plateau, Mafinga Hills
- Minerals – Rich in copper, cobalt, nickel, and uranium

Copper Mine in News:

- Northwestern Province: India's newly acquired copper exploration block is located here.
- Zambia is the 7th largest copper producer globally.
- Chile is the world's largest producer of copper.

About Increasing Demand for Copper:

Why is Copper Demand Rising?

- Growth of EV batteries and clean energy technologies requires large amounts of copper.
- Infrastructure development, defense, and advanced electronics fuel global demand.
- Projected supply shortage by 2035 is driving countries to secure copper reserves.
- India's Copper Status & Existing Mines:
- India's copper production has declined by 8% since 2018-19.
- Hindustan Copper Ltd (HCL) is the only government-owned producer.

Key Copper Mines in India:

- Malanjkhand (Madhya Pradesh): Largest open-pit copper mine.
- Khetri (Rajasthan): Key underground copper mine.
- Singhbhum Belt (Jharkhand): One of the oldest copper-producing regions.

Kabul

Context:

A key suspect in the Abbey Gate bombing during the U.S. withdrawal from Afghanistan in August 2021 has been captured and is en route to the United States for prosecution.



About Kabul

Location & Geography:

- Country: Afghanistan
- Region: Located in eastern Afghanistan, nestled in the Kabul River valley.
- Elevation: 1,790 meters (5,873 feet) above sea level.

Neighbouring Provinces:

- Borders Parwan, Logar, Kapisa, and Nangarhar provinces.

Geographic Features:

- Major River: Kabul River, a tributary of the Indus River.

Mountain Ranges:

- Hindu Kush Mountains (north and west of Kabul).
- Paghman Range (southwest of the city).
- Climate: Continental climate with cold winters and hot summers.

Strategic and Economic Importance of Kabul

- Political and Administrative Centre: Houses the Afghan government, international embassies, and diplomatic missions.
- Economic Hub: Major commercial and trade centre with industries in textiles, food processing, and handicrafts.

Transport & Trade:

- Central node in Afghanistan's highway network linking major cities.
- Kabul International Airport serves as a key aviation hub.
- Security & Geopolitical Challenges:
- Frequent conflicts, insurgencies, and terrorist activities impact stability.
- Strategic interest for global powers, including India, China, Russia, and the U.S.

The Wallace Line

Context:

The Wallace Line, first identified by Alfred Russel Wallace, explains species distribution between Asia and Australia, with new studies refining our understanding of its evolutionary significance.



About the Wallace Line:

What is the Wallace Line?

- A biogeographical boundary that separates the eco-zones of Asia and Australia.
- Identified by Alfred Russel Wallace in 1863, it runs between Bali and Lombok, and continues north through the Makassar Strait between Borneo and Sulawesi.

Formation of the Wallace Line:

- Result of continental drift: Australia split from Antarctica and drifted northward, colliding with Asia around 35 million years ago.
- This movement formed deep-water channels that still act as barriers, preventing species migration.
- During the Pleistocene Epoch, land bridges emerged due to lower sea levels, yet the deep waters between Asia and Australia maintained the boundary.

Uniqueness of the Wallace Line:

- Sharp distinction in species: To the west, Asiatic species like tigers and elephants dominate, while to the east, Australian fauna such as kangaroos and marsupials thrive.
- Narrow geographical divide: Despite being just 20 km apart, islands on either side have distinct biodiversity.
- Birds and mammals are heavily influenced, with few species crossing the line, while marine species remain unaffected due to the high connectivity of ocean ecosystems.

Significance of the Wallace Line:

- Supports the theory of evolution by showing how geographical barriers drive species diversification.
- Essential for conservation: Understanding species migration helps predict biodiversity responses to habitat loss and climate change.
- Highlights the impact of continental drift on global ecosystems and the role of natural barriers in shaping evolution.

Japan

Context:

Japan is facing its biggest forest fire in three decades, with over 2,000 firefighters deployed to control the flames in Iwate Prefecture.

About Places in News:

Ofunato, Iwate Prefecture:

- Location: Situated in northern Japan, within Iwate Prefecture on the Honshu Island.
- Habitat: A coastal city with dense forests, mountainous terrain, and a humid climate.
- Significance: Known for fisheries, tourism, and rich biodiversity, now battling an unprecedented wildfire.

About Japan:

- Located in: East Asia, surrounded by the Pacific Ocean.
- Capital: Tokyo, one of the world's largest metropolitan areas.

Neighbouring Countries:

- China: Separated by the East China Sea to the southwest.
- South Korea: Lies across the Korea Strait and the Sea of Japan (East Sea).
- North Korea: Shares maritime boundaries via the Sea of Japan (East Sea).



- Russia: Separated by the La Perouse (Sōya) Strait, Sea of Okhotsk, and Kuril Islands dispute.
- Taiwan: Lies to the south across the Philippine Sea.
- Japan is surrounded by multiple seas, including the Sea of Japan, East China Sea, Pacific Ocean, and Sea of Okhotsk, which define its maritime boundaries.

Geological Features:

1. Mountains & Volcanoes

- Over 80% of Japan is covered in mountains.
- Mount Fuji (3,776 meters): The highest peak and a dormant volcano.
- Lies on the Pacific Ring of Fire, making it prone to earthquakes and volcanic activity.

2. Islands

- Main Islands: Honshu, Hokkaido, Kyushu, Shikoku.
- Other Notable Islands: Ryukyu (including Okinawa), Izu, Bonin (Ogasawara), and Volcano Islands.

3. Rivers & Climate

- Major Rivers: Shinano River (longest), Tone River, Kiso River.
- Climate: Varies from humid subtropical in the south to cold continental in the north.

Sagar Island

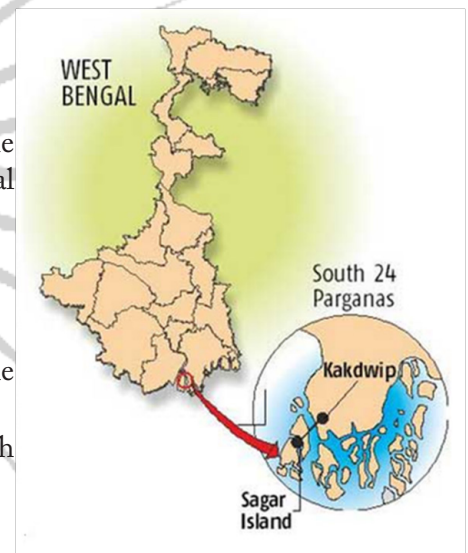
Context:

Authorities have taken multiple measures to address coastal erosion and saline ingress on Sagar Island, West Bengal, following directives from the National Green Tribunal (NGT).

About Sagar Island

Geographical Location

- Sagar Island (Sagardwip) is located in the Bay of Bengal at the confluence of the Hooghly River and the Ganges Delta.
- It is the largest island in the Sundarbans region and falls under South 24 Parganas district, West Bengal.



Environmental and Economic Significance

- Home to Gangasagar Mela, one of India's largest religious pilgrimages, attracting millions of devotees annually.
- Vital fishing and agricultural hub, sustaining the coastal economy.
- Highly vulnerable to climate change, facing severe coastal erosion, salinity intrusion, and extreme weather events.

Vanuatu

Context:

Vanuatu Prime Minister Jotham Napat revoked Lalit Modi's citizenship, stating that acquiring Vanuatu's passport should not be a means to avoid extradition.

- This move brings global attention to Vanuatu's Citizenship by Investment (CBI) program, which has been criticized for being exploited by individuals facing legal issues.

About Vanuatu:

Geographical Location

- Vanuatu is an island nation in the South Pacific Ocean, situated approximately 1,750 km east of Australia.
- It consists of 83 volcanic islands, covering a total land area of 12,189 sq. km.



Capital: Port Vila

- Neighboring Countries: Australia, Fiji, New Caledonia, and Solomon Islands.

Geographical Features

- Major Islands: Efate, Espiritu Santo, Malekula, Tanna, Pentecost.
- Volcanic Activity: Home to active volcanoes like Mount Yasur (Tanna) and Ambae Volcano.
- Climate: Tropical climate with frequent cyclones and earthquakes due to its location in the Pacific Ring of Fire.
- Marine Ecosystem: Rich in coral reefs, deep-sea fisheries, and marine biodiversity.

Political & Economic Structure

- Government: Parliamentary Democracy under a Constitutional Republic.
- Official Languages: Bislama, English, French.
- Currency: Vanuatu Vatu (VUV).

Key Economic Sectors:

- Tourism: Major contributor to GDP, with cruise ships and eco-tourism playing vital roles.
- Agriculture: Exports coconuts, kava, cocoa, coffee, and beef.
- Fisheries & Forestry: Support local livelihoods and trade.
- Offshore Financial Services: Vanuatu is known for tax haven policies, attracting foreign investments.

Vanuatu's Citizenship by Investment Program (CBI):

- Allows foreign nationals to acquire citizenship through investment or financial contributions.
- Often used by individuals seeking visa-free travel or tax advantages.

Lalit Modi Controversy:

- Former IPL chairman Lalit Modi's Vanuatu citizenship was revoked by Prime Minister Jotham Napat on March 10, 2025.
- Authorities cited concerns over using citizenship to evade extradition.

Jhelum River

Context:

The Jammu & Kashmir government has admitted in the Assembly that untreated wastewater from towns like Anantnag, Bijbehara, and Mattan is being discharged into local streams leading to the Jhelum River.

About Jhelum River:

- Origin: Verinag spring, at the foot of the Pir Panjal Range in Anantnag district, Jammu & Kashmir.
- Length: Approximate length: 725 km (450 miles).
- States/ UT flowed through: Jammu & Kashmir
- Tributaries: Kishanganga River, Kunhar River, Other tributaries include the Sandran River, Bringi River, Arapath River.
- Jhelum is a tributary of: Chenab River, which further merges into the Indus River system in Pakistan.



Key Geographical Features:

- Flows through Wular Lake at Srinagar, acting as a natural regulator.
- Forms deep gorges while crossing the Pir Panjal mountains.
- Enters plains at Mangla, where Mangla Dam supports irrigation and hydroelectricity.
- Major canals: Upper Jhelum Canal (Mangla to Chenab at Khanki) and Lower Jhelum Canal (from Rasul for irrigation).

Kasampatty Sacred Grove

Context:

Kasampatty Sacred Grove in Dindigul district has been officially notified as Tamil Nadu's second Biodiversity Heritage Site (BHS) under the Biological Diversity Act, 2002.

About Biodiversity Heritage Sites (BHS):

Definition:

- Biodiversity Heritage Sites are ecologically fragile areas possessing rich biodiversity, endemism, and cultural importance, often conserved by local communities.
- Declared Under: Section 37 of the Biological Diversity Act, 2002.



Criteria for Declaration:

Areas with:

- Rich wild and domesticated species diversity
- High endemism or rare species
- Cultural or sacred significance (e.g., sacred groves)
- Ecological corridors or habitats for threatened species

Procedure for Declaration:

- Suggestions invited by State Biodiversity Boards (SBBs) through Panchayats or Biodiversity Management Committees (BMCs)
- Ecological and cultural studies conducted in consultation with local communities
- Government Gazette notification issued by the State after public consultation
- Management plan implemented by local bodies and monitored by State Biodiversity Boards (SBBs).

About Kasampatty Sacred Grove (Veera Kovil Grove):

Location:

- Kasampatty village, near Alagarmalai Reserve Forest, Dindigul district, Tamil Nadu
- Total area: 4.97 hectares
- First BHS in Tamil Nadu: Arittapatti village in Madurai district, declared in 2022

Key Features of Kasampatty Grove:

Cultural Significance:

- Locals worship deity Veeranan at the Veera Kovil Temple

Ecological Importance:

- Acts as an ecological bridge, supporting pollination and soil fertility in nearby mango plantations
- Enhances local climate stability and wildlife connectivity

Community-Led Conservation:

- Protected following a resolution by Reddiyapatty Panchayat Council
- Supported by the Tamil Nadu Biodiversity Board and District Collector.

Kasungu National Park

Context:

Kasungu National Park is in news as communities along the Malawi-Zambia border have initiated legal action against the International Fund for Animal Welfare (IFAW) due to increased human-elephant conflicts after relocating 263 elephants into the park.

About Kasungu National Park:

- Location: Central Region of Malawi, west of Kasungu town, approximately 175 km north of Lilongwe, bordering Zambia.
- Established: 1970, second-largest park in Malawi, covering 2,316 sq km.
- Controlled by: Malawi's Department of National Parks and Wildlife (DNPW).
- Rivers within Park: Dwangwa, Lingadzi, Lifupa (important for hippo sightings at Lifupa Lodge).
- Local Tribes: Predominantly inhabited by Chewa people.



Key Features

Flora:

- Primarily Miombo woodland.
- Grassy wetlands or dambos along river channels.

Fauna:

- Major Wildlife: Elephants, Sable antelope, Roan antelope, Kudus, Impalas, Hartebeest, Zebras, African Buffaloes.
- Conservation: Designated Lion Conservation Unit since 2005.

Current Issue:

- Elephant Relocation: 263 elephants moved from Liwonde National Park to Kasungu in 2022 by Malawi's DNPW, African Parks, and IFAW.
- Elephants frequently enter nearby villages, causing at least 12 deaths and crop damage affecting over 11,000 villagers, leading to significant financial losses.

About International Fund for Animal Welfare (IFAW):

What is IFAW?

- A leading global non-governmental organization (NGO) dedicated to animal welfare and conservation.
- Established: In 1969 by Brian Davies.
- Headquarters: Based in the USA, with operations spanning over 40 countries.

Objective:

Protect and rescue individual animals and wildlife populations globally.
Conserve natural habitats to maintain ecological balance.

Key Functions:

Wildlife Rescue: Saving animals from emergencies, natural disasters, or exploitation.
Habitat Preservation: Ensuring safe ecosystems through habitat restoration projects.
Advocacy: Promoting strong legal frameworks and public policies to protect animals.
Public Awareness: Educating communities on coexistence and animal welfare.

Anthurium Flowers

Context:

The first-ever export consignment of Anthurium flowers from Mizoram to Singapore was flagged off in February.

About Anthurium Flower:

- Scientific Name: Anthurium (family: Araceae).

Grown In:

- Native region: Americas, from northern Mexico to northern



Argentina and parts of the Caribbean.

- In India: Widely cultivated in Mizoram and other North Eastern states.

Features of the Plant:

- Herbaceous plants that can grow as epiphytes or terrestrially.
- Inflorescence consists of a spadix and colorful spathe (red, pink, orange, and other colors).
- Produces juicy berries containing seeds.
- Toxic in nature due to calcium oxalate crystals; sap can irritate skin and eyes.

Significance:

- Significant contribution to India's floriculture exports (USD 86.62 million in FY 2023–24).
- 'Anthurium Festival' is an annual cultural and tourism event celebrated in Mizoram. It showcases the beauty and commercial potential of Anthurium flowers grown in the region.
- Floriculture is commercially cultivated in several states with Tamil Nadu (21%), Karnataka (16%), Madhya Pradesh (14%) and West Bengal (12%).
- The major importing countries from India were U.S.A, Netherland, United Arab Emirates, U.K and Canada.

George VI Ice Shelf

Context:

Scientists discovered thriving ecosystems with potential new species beneath the Antarctic ice shelf after the A-84 iceberg broke away from the George VI Ice Shelf.

- The findings, part of UNESCO's Challenger 150 initiative, offer new insights into life under ice-covered seafloors.

About George VI Ice Shelf:

Located in:

- Situated in Antarctica, occupying George VI Sound, which separates Alexander Island from Palmer Land.

Nation controlling it:

- Governed under the Antarctic Treaty System, with research presence and exploration led by United Kingdom and United States.
- Neighbouring Sea: Lies adjacent to the Bellingshausen Sea in the Southern Ocean.

Geographical Features:

- Stretches from Ronne Entrance in the southwest to Niznik Island in the north, covering around 30 nautical miles.
- Ice thickness exceeds 150 metres, with underlying waters reaching depths of 1,300 metres.
- Characterized by extensive floating ice shelves, subglacial ecosystems, and complex underwater geography.

Recent Discoveries Beneath George VI Ice Shelf:

- New Species Found: Discovery of giant sea spiders, octopi, corals, and a giant phantom jellyfish at depths of up to 1,300 meters.
- Unexplored Ecosystems: Accessed after the break-away of the A-84 iceberg, revealing life in previously inaccessible regions.
- Nutrient Transport Mystery: Possible unknown nutrient transport mechanisms sustaining life under 150-meter-thick ice.

Significance of Discoveries:

- Scientific Breakthrough: Challenges existing assumptions about life in extreme, nutrient-deprived environments.
- Climate Insights: Offers clues on how ecosystems may respond to melting ice shelves and climate change.
- Marine Conservation: Underlines the need to protect fragile Antarctic marine ecosystems.



Wular Lake

Context:

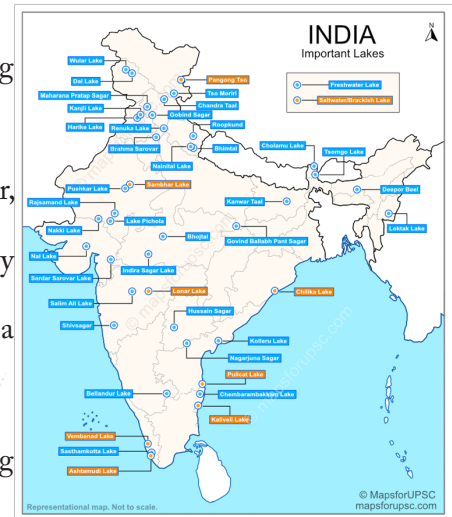
Wular Lake, India's largest freshwater lake in Jammu & Kashmir, is facing shrinkage and siltation, raising serious flood risks for the Kashmir Valley.

About Wular Lake:

- Located in: Situated in Bandipore district of Jammu & Kashmir, approximately 50 km northwest of Srinagar.
- River fed: Fed by the Jhelum River, playing a vital role in the hydrology of the Kashmir Valley.
- Lake formation: Formed due to tectonic activity and believed to be a remnant of the ancient Satisar Lake.

Unique features of the lake:

- Largest freshwater lake in India and the second largest in Asia, spanning 200 sq. km.
- Lies at an altitude of 1,580 m at the foothills of Haramuk Mountain.
- Hosts Zaina Lank, an artificial island built by King Zainul-Abi-Din.
- Acts as a natural flood absorption basin for the Kashmir Valley.
- Home to rich biodiversity, including Himalayan monal, short-toed eagle, black-eared kite, and many migratory birds.
- Contributes to 60% of total fish production in the region.
- Recognition: Declared a Wetland of International Importance under the Ramsar Convention in 1990.



Betwa River

Context:

The Betwa River in Madhya Pradesh is drying up due to illegal sand mining, deforestation, and over-extraction through borings.

About Betwa River:

Origin:

- The Betwa River originates from Jhiri village in Raisen district, Madhya Pradesh. It rises at an elevation of 470 metres in the Vindhya Range.
- States Flow Through:
- Flows through Madhya Pradesh and Uttar Pradesh, covering districts like Bhopal, Vidisha, Orchha, and Hamirpur.
- The river travels 590 kilometres before meeting the Yamuna.

Tributaries of Betwa:

- Major tributaries: Halali and Dhasan rivers.
- Halali River is the longest tributary, measuring 32 kilometres in length.
- The basin includes 14 tributaries, with 11 entirely in Madhya Pradesh and 3 partially shared with Uttar Pradesh.
- Betwa is a Tributary of: The Betwa River is a right-bank tributary of the Yamuna River, meeting it near Hamirpur in Uttar Pradesh.

Causes of River Betwa's Slow Death:

- Illegal Sand Mining: Rampant sand extraction from the riverbed has disrupted natural water flow and damaged the river's ecological balance.
- Deforestation in Catchment Areas: Unchecked cutting of forests around the river's origin has reduced natural water recharge and soil retention.
- Excessive Groundwater Borings: Over-extraction of water through illegal borewells has depleted the river's natural sources and blocked surface flow.
- Encroachment and Concrete Construction: Cement walls and construction near the river's origin have choked the natural channels, affecting the river's ability to replenish itself.

The Ken-Betwa River Linking Project



Chapter- 4

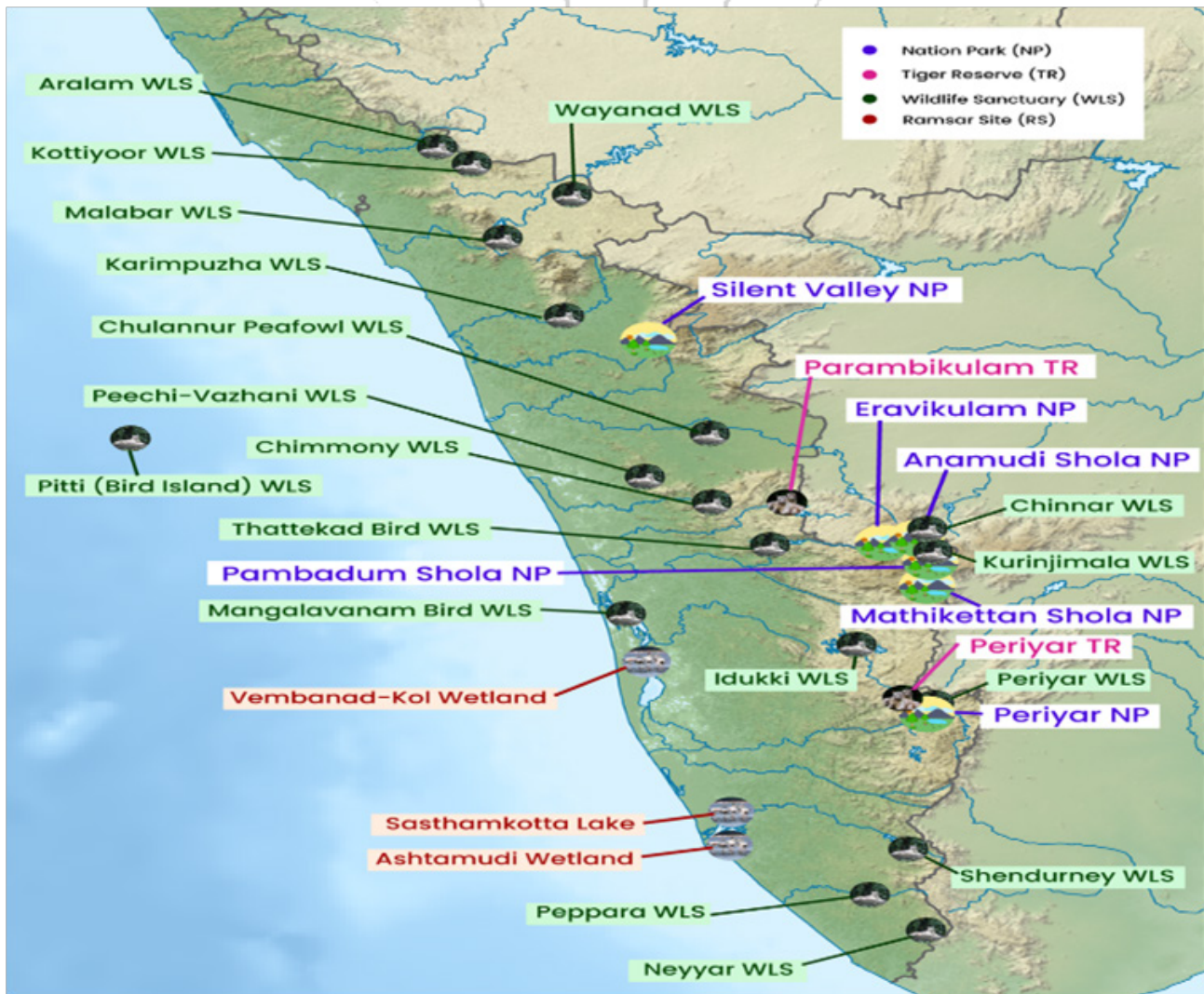
ENVIRONMENT

Shendurney Wildlife Sanctuary

Context:

Researchers from University of Kerala have discovered two new species of jumping spiders from Shendurney Wildlife Sanctuary, Kerala, marking the first record of the *Epidelaxia* genus in India.

- The species, *Epidelaxia falciformis* sp. nov. and *Epidelaxia palustris* sp. nov., extend the known range of the genus beyond Sri Lanka, enhancing the biodiversity records of the Western Ghats.



About Newly Identified Jumping Spider Species:

What are they?

- These belong to the *Epidelaxia* genus, a group of jumping spiders previously believed to be endemic to Sri Lanka.
- Discovered in Kulathupuzha, Kollam.

Names & Classification:

- Epidelaxia falciformis* sp. nov.
- Epidelaxia palustris* sp. nov.

Unique Features:

- falciformis*: Males have brown carapace with a yellow stripe, and females exhibit a yellow triangular-shaped marking on the prosoma.

- palustris: Males have pale brown bands on the sides, and females have white orbital setae (hairs) around their eyes.
- Adaptation: Highly specialized for survival in dense foliage of Western Ghats.

About Shendurney Wildlife Sanctuary:

Location:

- Located in Kollam district, Kerala, under Agasthyamalai Biosphere Reserve.
- Declared a wildlife sanctuary on August 25, 1984, covering 4 sq. km.
- Encompasses Thenmala Dam reservoir (~18.69 sq. km).

Major Flora & Fauna:

- Flora: Tropical evergreen & semi-evergreen forests, home to 1,257 flowering plant species, with 309 endemic to the Western Ghats.

Fauna:

- Mammals – Lion-tailed macaque (endangered), Indian bison, Malabar giant squirrel.
- Birds – 267 species, including the Great Eared Nightjar, first recorded in Kerala here.

Rivers & Unique Aspects:

- Rivers: Mansar & Manhar flow through the sanctuary.

Unique Aspects:

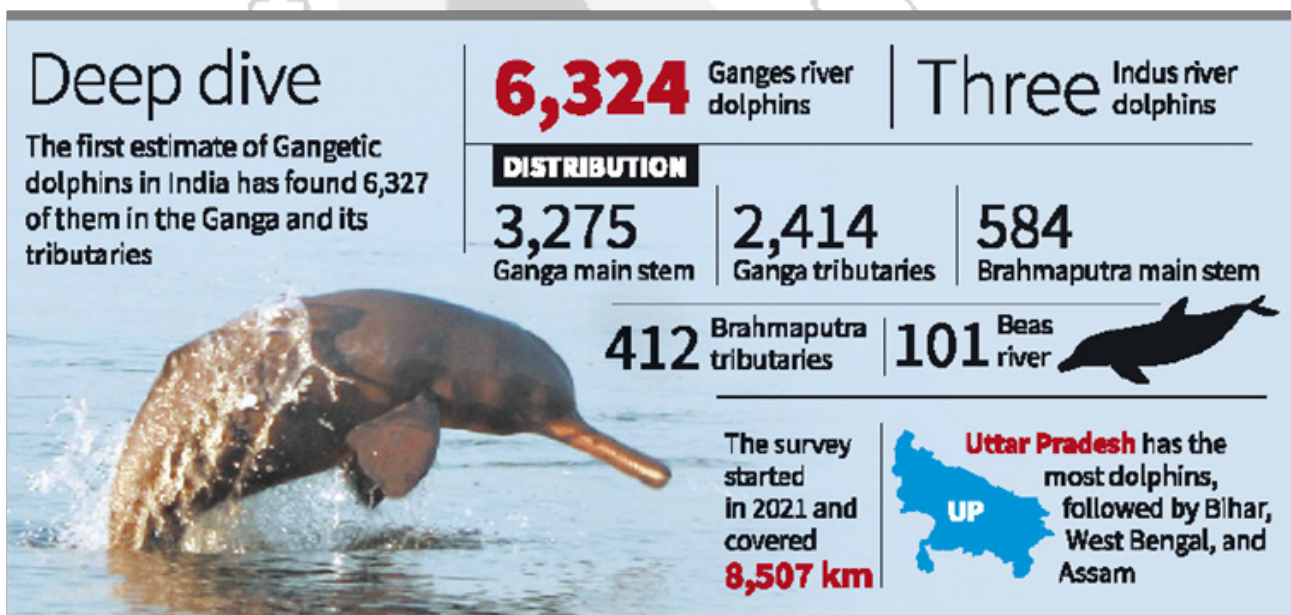
- First eco-tourism project in India (Thenmala Eco-Tourism).
- No sandalwood trees, a rare characteristic among Kerala's forests.

Dolphin Survey

Context:

A comprehensive survey under Project Dolphin (2020) estimated 6,327 Gangetic dolphins across eight Indian states.

- The survey provides the first systematic population estimate of river dolphins in India, aiding conservation efforts.



About Dolphin Survey:

Survey Conducted By:

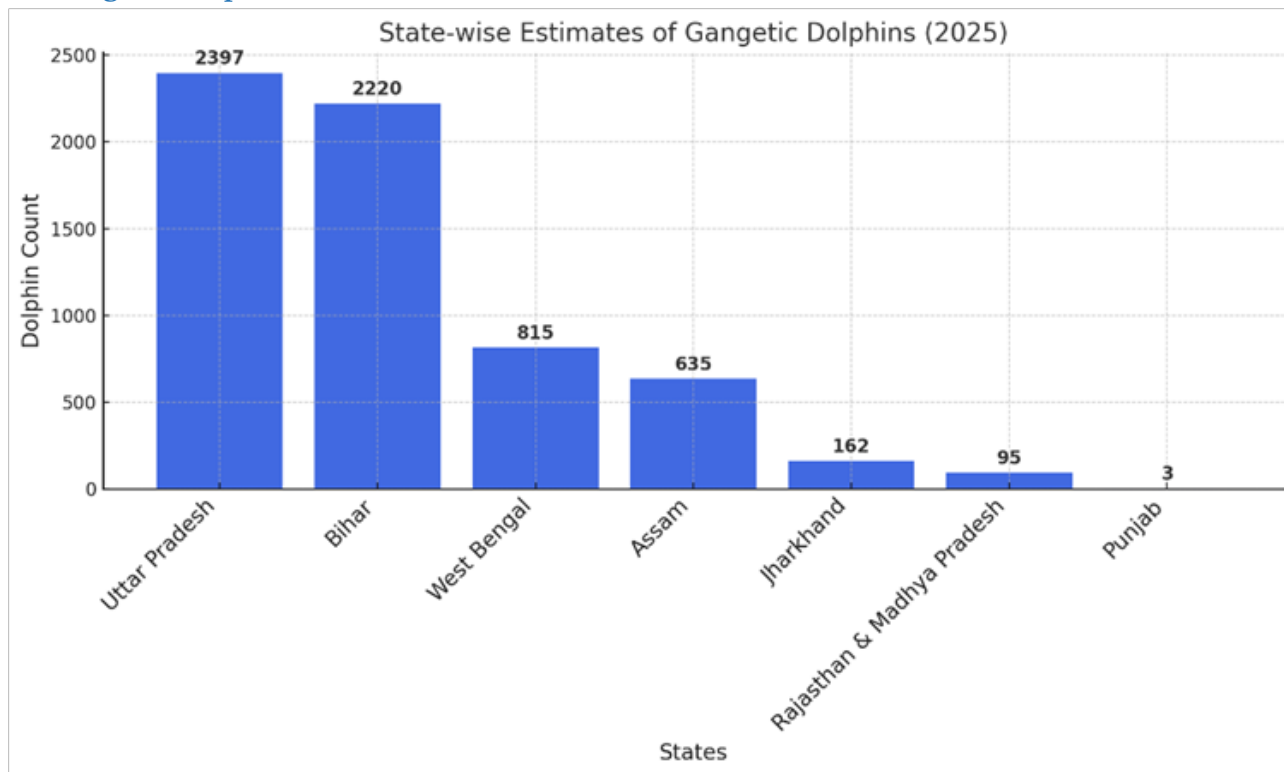
- Ministry of Environment, Forest & Climate Change (MoEFCC) under Project Dolphin (2020).
- Conducted with support from Wildlife Institute of India (WII) and various state forest departments.

Survey Coverage:

- Covered 28 rivers across eight states, spanning 8,507 km.
- Major river basins: Ganga, Brahmaputra, and Indus.

Key Findings:

- Total Dolphins: 6,327 (6,324 Gangetic dolphins + 3 Indus dolphins).

State-wise estimates:**About Gangetic Dolphin:****What is the Gangetic Dolphin?**

- A freshwater river dolphin, one of the few river dolphins in the world.
- Known as “Susu” due to the sound it makes while surfacing.

Rivers found in:

- Ganga-Brahmaputra-Meghna and Karnaphuli-Sangu River systems of India, Nepal, and Bangladesh.
- Extinct in many parts of its original range.

Key Features:

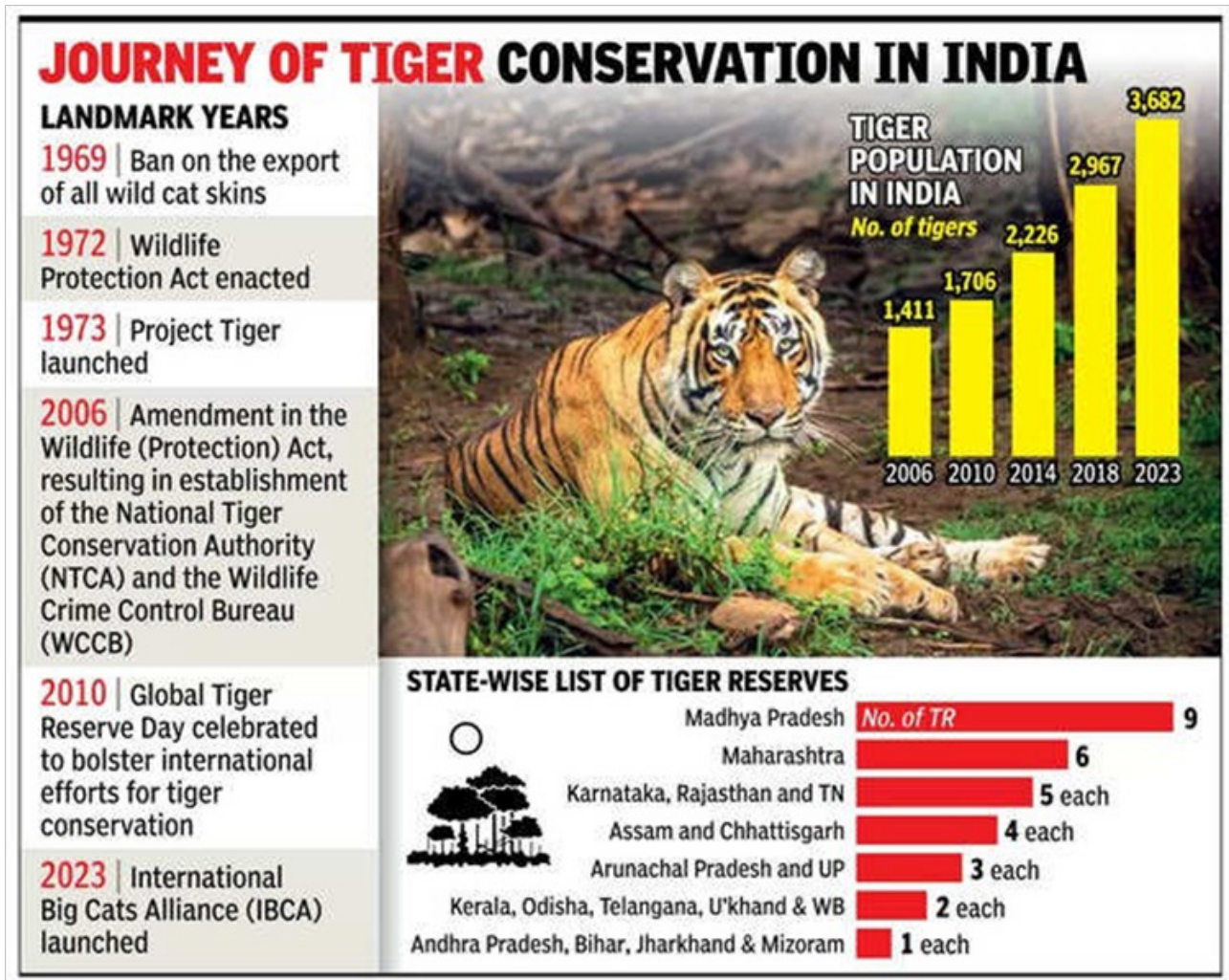
- Blind dolphin: Has no lens in its eyes, relies on echolocation for movement and hunting.
- Feeds on fish and prefers counter-current systems of main river channels.
- Surfaces every 30-120 seconds to breathe, as it cannot survive underwater.

IUCN Status & National Recognition:**IUCN Red List: Endangered**

- Wildlife Protection Act, 1972: Schedule I species (highest protection).
- National Aquatic Animal of India – Declared in 2009.

Madhav National Park**Context:**

The Madhav National Park in Madhya Pradesh has been declared India’s 58th Tiger Reserve and the 9th in the state.



About Madhav National Park:

- Location: Shivpuri district, Chambal region, Madhya Pradesh.
- Established: 1958.
- Area Covered: 354 sq km.
- Flora and Fauna: Dry deciduous forest with teak, sal, and dhok trees; home to tigers, leopards, wolves, chinkara, nilgai, and crocodiles.
- Historical Significance: Named after Maharaja Madhav Rao Scindia; earlier used as a royal hunting ground.
- Reintroduction of Tigers: Started in 2023, with three tigers (including two females) introduced.
- Major Attraction: Sakhya Sagar Lake, George Castle, and eco-tourism activities.

What is a Tiger Reserve?

- A Tiger Reserve is a protected area meant for the conservation of Bengal tigers and their ecosystem.
- It falls under Project Tiger (1973), a centrally sponsored scheme by the National Tiger Conservation Authority (NTCA).
- These reserves ensure tiger population growth, habitat conservation, and human-wildlife conflict mitigation.

Procedure to Designate a Tiger Reserve in India

- Proposal & Identification:-The State Government proposes a region based on the viability of the tiger population, habitat conditions, and biodiversity value.
- Approval by the National Tiger Conservation Authority (NTCA):-NTCA evaluates the proposal, considering factors such as tiger presence, ecological balance, and community impact.
- Central Government Notification:- After NTCA's approval, the Union Ministry of Environment, Forest, and Climate Change (MoEFCC) declares the area as a Tiger Reserve under Section 38V of the Wildlife Protection Act, 1972.

Core & Buffer Zone Demarcation:

The reserve is divided into:

- Core Zone: Strictly protected for wildlife, with zero human disturbance.
- Buffer Zone: Allows regulated human activities to support conservation while considering local livelihoods.
- Conservation Measures & Monitoring:- Regular population surveys, habitat management, and anti-poaching measures are implemented.
- NTCA oversees monitoring through the M-STrIPES (Monitoring System for Tigers – Intensive Protection and Ecological Status) program.

Satkosia Tiger Reserve

Context:

Satkosia Tiger Reserve (STR) in Odisha faces human-wildlife conflict as 674 families have been relocated from forest areas under the tiger conservation initiative.

- Despite resettlement efforts, STR remains one of the four notified tiger reserves in India without a single tiger.

About Satkosia Tiger Reserve:

- Location: Spans Angul, Cuttack, Boudh, and Nayagarh districts in Odisha.
- Established: 2007, by merging Satkosia Gorge Sanctuary (1976) and Baisipali Wildlife Sanctuary (1981).
- Total Area: 1,136.70 sq. km.
- Geographical Significance: A transitional zone between Eastern Ghats and Deccan Plateau, promoting rich biodiversity.
- Fauna: Previously home to 12 tigers (2007), but the 2022 census found none; shelters elephants, leopards, mugger crocodiles, wild dogs, and 200+ bird species.
- Flora: Houses 400+ plant species, including Sal, Mahua, Bamboo, and medicinal plants.
- Ramsar Site: Recognized as a wetland of international importance.
- Tiger Reintroduction: Initiated in 2018 with two tigers from Madhya Pradesh; failed due to poaching and mismanagement.
- Human Settlements: 234 villages in the surrounding impact zone, creating conflicts over land and resources.



National Tiger Conservation Authority (NTCA)

What is NTCA?

The National Tiger Conservation Authority (NTCA) is a statutory body under the Ministry of Environment, Forest and Climate Change (MoEFCC), responsible for tiger conservation and habitat management in India.

Established In:

- 2006, under Section 38L of the Wildlife Protection Act, 1972 (Amendment 2006).

Chaired By:

- Union Minister of Environment, Forest & Climate Change.
- Vice-Chairperson: Minister of State (MoEFCC).
- Members: Includes experts in wildlife, ecology, and environmental law.

Structure of NTCA:

1. Chairperson: Minister of Environment, Forest & Climate Change.
2. Vice-Chairperson: Minister of State (MoEFCC).
3. Members: –Secretary (MoEFCC), Director General of Forests & Special Secretary, Chief Wildlife Wardens from Tiger Reserve States, Experts from Wildlife, Tribal Affairs, and Environmental Law, NGO Representatives in Wildlife Conservation

Functions & Powers of NTCA:

1. Implementation of Project Tiger: -Oversees funding and management of all 58 tiger reserves.
2. Approval of Tiger Conservation Plans (TCPs): Ensures scientific management of tiger habitats.
3. Habitat Protection & Corridor Development:-Focuses on minimizing human-wildlife conflict and expanding buffer zones.
4. Monitoring & Evaluation: -Conducts tiger population assessments every four years using M-STrIPES technology.
5. Human-Wildlife Conflict Mitigation: -Relocation of villages from core zones under voluntary resettlement programs.
6. Legal Authority: -Empowers states to declare, demarcate, and manage tiger reserves.
7. Public Awareness & Capacity Building: -Promotes eco-tourism, community involvement, and anti-poaching initiatives.

Impact Of Deep-Sea Mining

Context:

A new study published in Nature reveals that a Pacific Ocean seabed mined in 1979 has not recovered after 40+ years, raising alarm over the long-term ecological impact.

- This comes amid global discussions at the UN's International Seabed Authority (ISA) on regulating or halting deep sea mining activities.

What is Deep Sea Mining?

- Definition: Extraction of mineral-rich nodules, sulphides, and crusts from the ocean floor at depths of over 200 meters.

Methods:

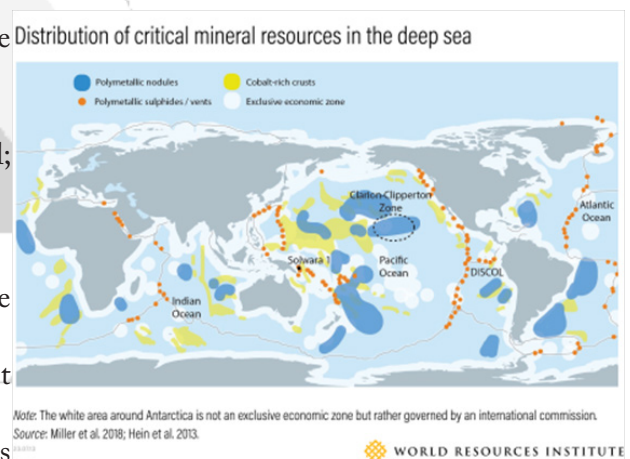
- Using robotic vehicles to collect polymetallic nodules like a plough.
- Employing AI-controlled machines and vacuum pumps to extract minerals.
- Processing is done on surface vessels; waste discharge is often returned to the sea.
- Resources Targeted: Cobalt, nickel, lithium, rare earths, gold, copper—essential for EVs, solar panels, wind turbines, and electronics.

Distribution:

- Richest deposits in the Clarion-Clipperton Zone (Pacific Ocean).
- Also found near hydrothermal vents and seamounts.
- Technological Frontier: Techniques are still experimental; most operations remain in the exploratory phase.

Current Status of Deep-Sea Mining:

- Commercial mining not yet started; only small-scale tests have been conducted.
- ISA Regulation pending: Deadline to finalize rules is set for 2025.
- UNCLOS Oversight: High-seas mineral wealth is designated as the "common heritage of mankind".



Benefits of Deep-Sea Mining:

- Critical Mineral Supply: Can meet surging global demand for EVs and green tech.
- Alternative to Land Mining: Avoids deforestation and freshwater contamination from terrestrial mining.
- Controlled Labor Conditions: Offshore mining could reduce human rights violations seen in land-based mining.
- Strategic Security: Reduces reliance on geopolitically sensitive land reserves.

E.g. Demand for cobalt is expected to rise by 400-600% by 2040 due to clean energy transitions.

- High Resource Concentration: Polymetallic nodules offer rich deposits in compact areas.

Impacts of Deep Sea Mining:

- Ecological Damage: Physical disturbance can destroy fragile ecosystems and smother marine life.
E.g. The new study found no biological recovery after 44 years in an 8-metre-wide mining site in the Pacific.
- Species Loss: Many deep-sea species are rare, slow-reproducing, and nodule-dependent—mining risks extinction.
- Food Chain Disruption: Waste plumes can affect fish species crucial for fisheries in Pacific Island nations.
- Carbon Cycle Threat: Disturbance of deep-sea life can reduce ocean's carbon absorption capacity.
- Social Inequity: Benefits may be skewed towards developed nations or private corporations.

Way Ahead:

- Scientific Pause & Research First: Impose a precautionary moratorium until robust ecological data is available.
- Develop Inclusive Regulations: ISA must create transparent, enforceable laws with equitable benefit sharing.
- Promote Circular Economy: Boost battery recycling and recover minerals from e-waste and mine tailings.
- Explore Alternate Tech: Support sodium-ion batteries and LFP batteries that reduce need for cobalt/nickel.
- Global Collaboration: Engage all stakeholders—scientists, policymakers, coastal nations—for sustainable ocean governance.

Conclusion:

Deep sea mining presents a paradox—promising resources for green energy but risking irreversible ecological damage. The world must balance economic ambition with planetary responsibility. Only a science-led, equitable, and precautionary approach can safeguard ocean ecosystems while meeting global energy goals.

Light Fishing

Context:

Despite being banned in India's Exclusive Economic Zone (EEZ) since 2017, light fishing continues unchecked, damaging marine biodiversity.

- Centre has banned light fishing in all coastal states in 2017.

About Light Fishing:

What is Light Fishing?

- A fishing method using high-intensity artificial lights (often powered by generators) to attract fish to the water surface during night operations.
- Predominantly used by mechanised trawlers, especially for catching squid, sardines, and juvenile fish.
- LED light fishing usually takes place between December and February, a season which sees meagre catches.

How It Works:

- LED or halogen lights are suspended over the water or placed underwater.
- The bright light disturbs the fish's natural orientation and attracts entire shoals.
- Fish, including juveniles, are easily netted, increasing bycatch and unsustainable harvest.
- Impacts on the Marine Ecosystem:
 - Juvenile Fish Depletion: Removes immature fish before reproduction, reducing future fish populations.
 - Biodiversity Loss: Attracts non-target species, disturbing the marine food web.
 - Spawning Disruption: Artificial lights interfere with natural spawning cycles.
- International Trade Risks: Overfishing can impact seafood exports, especially to the EU and Japan.



Indian Coastal Crisis

Context:

India's coastal regions face a dual crisis—illegal light fishing depleting marine life and erosion threatening 33.6% of the coastline, as revealed by recent government data.

About India's Coastal Region:

- **Extensive Coastline:** India has 7,500 km of coastline, spanning 9 states and 4 UTs, supporting livelihoods, trade, and biodiversity.
- **Economic Hub:** Contributes 4% to India's GDP through fisheries, tourism, and shipping.
E.g., Mumbai and Chennai ports handle 70% of trade.
- **Biodiversity Hotspots:** Home to mangroves (Sundarbans), coral reefs (Gulf of Kutch), and endangered species like Olive Ridley turtles.
- **Population Pressure:** Over 250 million people live within 50 km of the coast, increasing vulnerability to disasters.
- **Climate Vulnerability:** Faces rising sea levels (3.2 mm/year) and cyclones.

Significance of Coastal Ecosystems:

- **Carbon Sequestration:** Mangroves absorb and store 4x more carbon than terrestrial forests, mitigating climate change.
E.g., Example: Bhitarkanika mangroves (Odisha) act as a major carbon sink.
- **Fisheries Support:** Coastal waters contribute 70% of India's fish production, sustaining millions of livelihoods.
E.g., 16 million fishers depend on coastal fishing for income.
- **Natural Barriers:** Coral reefs and sand dunes reduce wave impact, preventing coastal erosion.
E.g., Gulf of Mannar's reefs protect Tamil Nadu's shoreline.
- **Tourism Revenue:** Coastal tourism generates \$11 billion annually, boosting local economies.
E.g., Goa and Puri beaches attract millions of tourists yearly.
- **Cultural Heritage:** Coastal regions host UNESCO sites and indigenous fishing traditions.
E.g., Chola temples (Tamil Nadu) and Koli fishing communities.

Government Initiatives to Protect Coastal Ecosystems:

1. **Coastal Regulation Zone (CRZ) 2019:** Restricts construction, promotes sustainable development.
2. **Integrated Coastal Zone Management (ICZM):** World Bank-funded projects in Gujarat, Odisha, and West Bengal.
3. **Mangrove Initiative (MISHTI):** Aims to plant mangroves across 540 sq km by 2030.
4. **National Centre for Coastal Research (NCCR):** Monitors erosion using satellite data (e.g., 33.6% erosion mapped).
5. **Blue Economy Policy:** Focuses on sustainable marine resource use (e.g., deep-sea fishing guidelines).

Issues Plaguing Indian Coastal Systems:

- **Illegal Light Fishing:** Despite bans, mechanized boats use bright LED lights to attract fish, depleting juvenile populations.
E.g., Maharashtra and Andhra Pradesh face rampant violations, harming traditional fishers' livelihoods.
- **Coastal Erosion:** Rising sea levels and human activities like sand mining accelerate shoreline loss.
E.g., Dakshina Kannada (Karnataka) lost 48.4% of its coast in 30 years.
- **Pollution:** Plastic waste and industrial effluents choke marine life and degrade water quality.
E.g., Versova Beach (Mumbai) required massive cleanups to restore ecosystems.

- **Habitat Destruction:** Mangroves and wetlands are cleared for infrastructure, reducing natural storm buffers. E.g., Mumbai lost 40% of its mangroves since 1987 due to urban expansion.
- **Weak Enforcement:** Lack of monitoring allows illegal construction and fishing to thrive unchecked. E.g., Adani port in Kerala faced CRZ violations due to poor oversight.

Way Forward:

- **Strict Enforcement:** Deploy AI drones and increase Coast Guard patrols to detect illegal activities. E.g., Kerala's crackdown on LED-equipped boats reduced light fishing.
- **Eco-Friendly Infrastructure:** Artificial reefs and sand replenishment can stabilize eroding coastlines. E.g., Puducherry's submerged breakwaters reduced erosion by 30%.
- **Community Participation:** Engage local fishers in conservation to ensure sustainable fishing practices. E.g., Tamil Nadu's fisher unions actively patrol against illegal trawling.
- **Climate Adaptation:** Relocate high-risk coastal settlements to safer inland areas. E.g., Odisha built cyclone-resistant homes for vulnerable communities.
- **Research & Funding:** Expand scientific studies on erosion and allocate budgets for mangrove restoration. E.g., NCCR's satellite mapping helps track erosion hotspots.

Conclusion:

India's coasts are vital for ecology, economy, and culture, but face threats from erosion, pollution, and overfishing. Stricter enforcement, community involvement, and sustainable policies can safeguard these ecosystems for future generations.

Commission on Genetic Resources for Food and Agriculture

Context:

The 20th meeting of the Commission on Genetic Resources for Food and Agriculture (CGRFA-20) has commenced in Rome, where global leaders will discuss strategies for conserving plant and forest genetic resources and release two major global reports.

About Commission on Genetic Resources for Food and Agriculture (CGRFA):

- **What it is:** A permanent intergovernmental body that focuses on conserving and sustainably using biodiversity essential for food security and agriculture.
- **Established in:** 1983, initially as the Commission on Plant Genetic Resources; expanded in 1995 to cover all genetic resources relevant to food and agriculture.
- **Headquarters:** Rome, Italy.
- **Parent Organization:** Food and Agriculture Organization (FAO) of the United Nations.



Aim of the Commission:

- To promote the sustainable use of biodiversity for food, agriculture, and human well-being.
- To foster global cooperation in conserving genetic resources and enhancing food security.
- To guide the fair and equitable sharing of benefits derived from the use of genetic resource

Key Functions:

- **Global Policy Development:** Formulates international policies and strategies for biodiversity conservation in food and agriculture.
- **Monitoring and Coordination:** Oversees the implementation of conservation policies and coordinates efforts between member nations.
- **Negotiation of Key Treaties:** Guided negotiations for the International Treaty on Plant Genetic Resources for Food and Agriculture.

- Biodiversity Data Management: Supports the creation of global databases and information systems for better resource management.
- Biennial Meetings: Conducts regular sessions every two years, with special sessions when needed.

White Hydrogen

Context:

France has discovered the world's largest white hydrogen deposit in the Moselle region, estimated at 46 million tons, valued at \$92 trillion.

- Found beneath the soil of Folschviller in the Moselle region.



About White Hydrogen:

What it is:

- White hydrogen is naturally occurring pure hydrogen found underground, formed due to geological reactions. It emerges when minerals react with water deep beneath the Earth's crust.

Key Features:

- Zero-emission: It occurs naturally without requiring industrial production, avoiding CO₂ emissions.
- Low cost: White hydrogen production costs around \$1 per kilogram, making it highly affordable.
- Renewable source: White hydrogen constantly regenerates within the Earth, unlike exhaustible fossil fuels.
- Combustion output: When used as fuel, white hydrogen produces only water vapor after combustion.

Significance:

- Clean energy alternative: Can reduce reliance on fossil fuels for heavy industries like aviation, shipping, and steel.
- Energy security: Potential game-changer for energy independence in hydrogen-importing countries.
- Cost-effectiveness: Could significantly lower global hydrogen prices compared to synthetic alternatives.
- Sustainability: Supports climate action with its low carbon footprint and renewable nature.

Limitations:

- Exploration difficulty: Hard to locate deposits due to specific geological conditions.
- Environmental risks: Potential hydrogen leakage could disrupt greenhouse gas reduction efforts.
- Storage and transport challenges: Requires extremely low liquefaction temperatures (-253°C) and robust pipelines.
- Regulatory barriers: Absence of clear guidelines for extraction and safe handling.

Increasing Water Gap in India

Context:

India is grappling with a severe water crisis exacerbated by rising temperatures, with 2024 being the hottest year since 1901, intensifying heatwaves and widening the water gap.



What is Water Gap?

The water gap refers to the difference between renewable water availability and water consumption in a specific region, indicating unsustainable water use when demand exceeds supply.

Data Insight: Heat's Role in Water Gap

- 2024 was India's hottest year since 1901, with temperatures rising by 0.9°C in January 2025 compared to the previous year.
- Heatwaves caused 733 deaths in 2024, highlighting the extreme stress on water resources.
- Under 1.5°C warming, India's water gap is projected to increase by 11.1 cubic km/year, worsening to 17.2 cubic km/year at 3°C warming.

Causes of Increasing Water Gap:

- **Climate Change:** Rising temperatures disrupt rainfall patterns, leading to reduced water availability and prolonged droughts.
Example: In 2024, India recorded its hottest year since 1901, with heatwaves causing a 0.9°C temperature rise in January 2025.
- **Overexploitation:** Excessive groundwater extraction for irrigation and urban expansion depletes natural reserves.
Example: India accounts for 25% of global groundwater extraction, with 21 major cities expected to run out of groundwater by 2030.
- **Population Growth:** Rapid urbanization and industrialization increase water demand, worsening scarcity.
- **Inefficient Water Management:** Poor infrastructure and wastage in supply systems lead to significant water loss.
Example: Only 8% of wastewater in India is treated, leading to significant water loss and pollution.
- **Pollution:** Industrial and agricultural runoff contaminate rivers and lakes, reducing usable freshwater resources.

Example: The Central Pollution Control Board states that 75% of India's rivers are unfit for drinking due to contamination.

Consequences of Water Gap:

- **Agricultural Stress:** Reduced irrigation water lowers crop yields, threatening food security and farmers' livelihoods.

Example: In 2024, 60% of India's districts faced drought-like conditions, affecting crop yields and increasing food prices.

- **Health Risks:** Water scarcity compromises sanitation, increasing cases of waterborne diseases.

Example: Over 163 million Indians lack access to clean water, contributing to 21% of communicable diseases.

- **Economic Losses:** Water shortages disrupt industries, halting production and causing financial losses.

- **Ecological Damage:** Overuse of water bodies dries up rivers and wetlands, harming biodiversity.

Example: The Ganga-Brahmaputra basin, home to 10% of the world's biodiversity, faces a water gap of 56.1 cubic km/year.

Measures to Counter Water Gap:

- **Sustainable Water Use:** Adopt efficient irrigation techniques and promote rainwater harvesting for conservation.

Example: Tamil Nadu's rainwater harvesting mandate increased groundwater levels by 50% in urban areas.

- **Policy Interventions:** Implement stricter regulations on groundwater extraction to prevent overuse.

- **Infrastructure Development:** Construct reservoirs, check dams, and recharge wells to improve water storage.

Example: The Jal Shakti Ministry reported a 15 billion cubic metre increase in groundwater recharge in 2024 due to government initiatives.

- **Public Awareness:** Educate citizens on water-saving techniques and responsible consumption.

- **Climate Adaptation:** Develop resilient strategies to mitigate the effects of rising temperatures on water availability.

Example: The National Action Plan on Climate Change focuses on water resource management to combat climate-induced water stress.

Conclusion:

Water scarcity is one of India's biggest climate challenges. Immediate policy interventions and sustainable water management are critical to closing the water gap. Strong adaptation strategies can mitigate risks and protect vulnerable communities.

Summary of ICAR Report on Climate Change Impact

Context:

The Union Minister for Rural Development informed the Lok Sabha that climate change will lead to increased rainfall, resulting in higher soil erosion and rising salinity, based on the ICAR report on the impact of climate change.

Summary of ICAR Report on Climate Change Impact:

- **Increase in Kharif Rainfall:** Projected rise of 9–10.1% by 2050 and 5.5–18.9% by 2080, leading to excess surface runoff and soil displacement.
- **Increase in Rabi Rainfall:** Expected to grow by 12–17% by 2050 and 13–26% by 2080, affecting moisture balance and crop patterns.
- **Soil Erosion:** Estimated soil loss of 10 tonnes per hectare per year from croplands by 2050 due to heavier rainfall.



- Salinity-affected Areas: Expansion from 7 million hectares to 11 million hectares by 2030, reducing arable land availability.

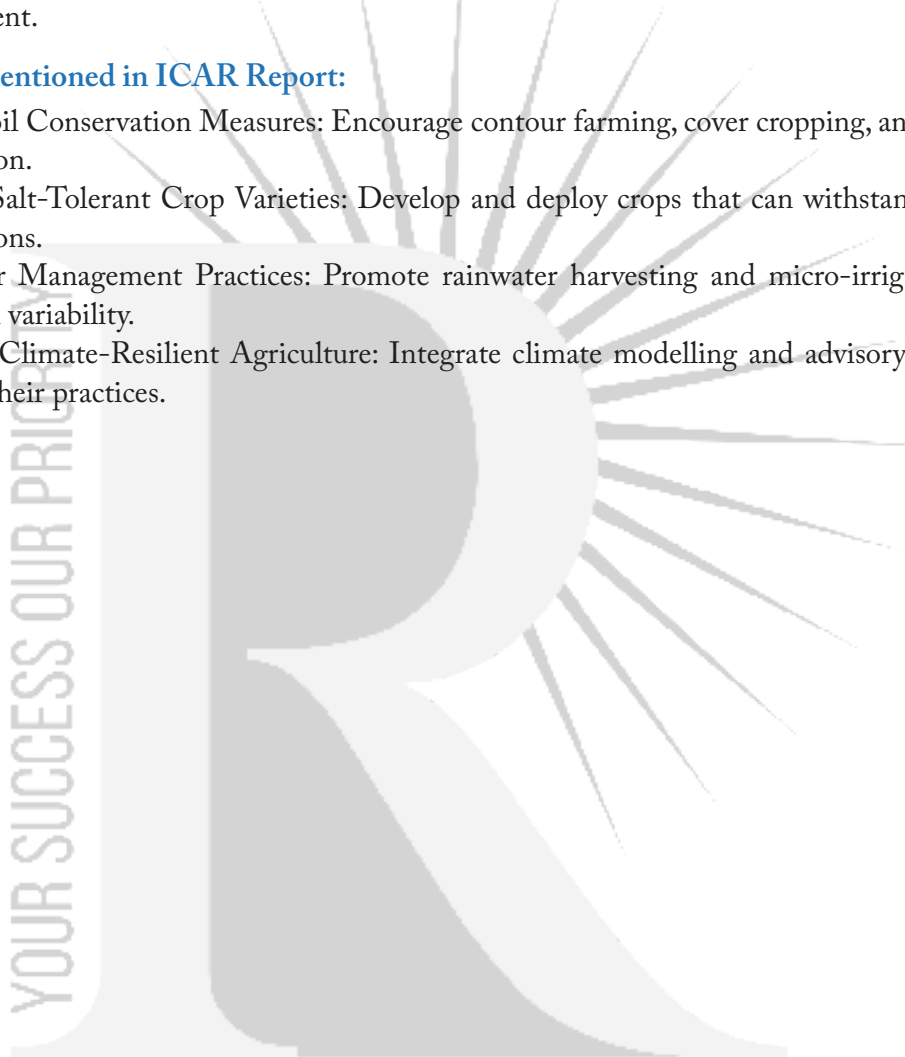
Overall Concerns Mentioned in ICAR Report:

- Accelerated Soil Erosion: Increased rainfall will lead to significant topsoil loss, reducing soil fertility and crop productivity.
- Rising Soil Salinity: Expansion of salinity-affected areas will make large agricultural lands unproductive, impacting food security.
- Increased Crop Vulnerability: Erratic rainfall patterns and soil degradation will disrupt crop cycles and lower yields.
- Threat to Livelihoods: Degraded soil and reduced farm outputs will negatively affect farmers' incomes and rural employment.

Recommendations Mentioned in ICAR Report:

- Adoption of Soil Conservation Measures: Encourage contour farming, cover cropping, and agroforestry to minimize erosion.
- Promotion of Salt-Tolerant Crop Varieties: Develop and deploy crops that can withstand increasing soil salinity conditions.
- Efficient Water Management Practices: Promote rainwater harvesting and micro-irrigation systems to manage rainfall variability.
- Strengthening Climate-Resilient Agriculture: Integrate climate modelling and advisory services to help farmers adapt their practices.

YOUR SUCCESS OUR PRIORITY



RAO'S ACADEMY

Chapter- 5

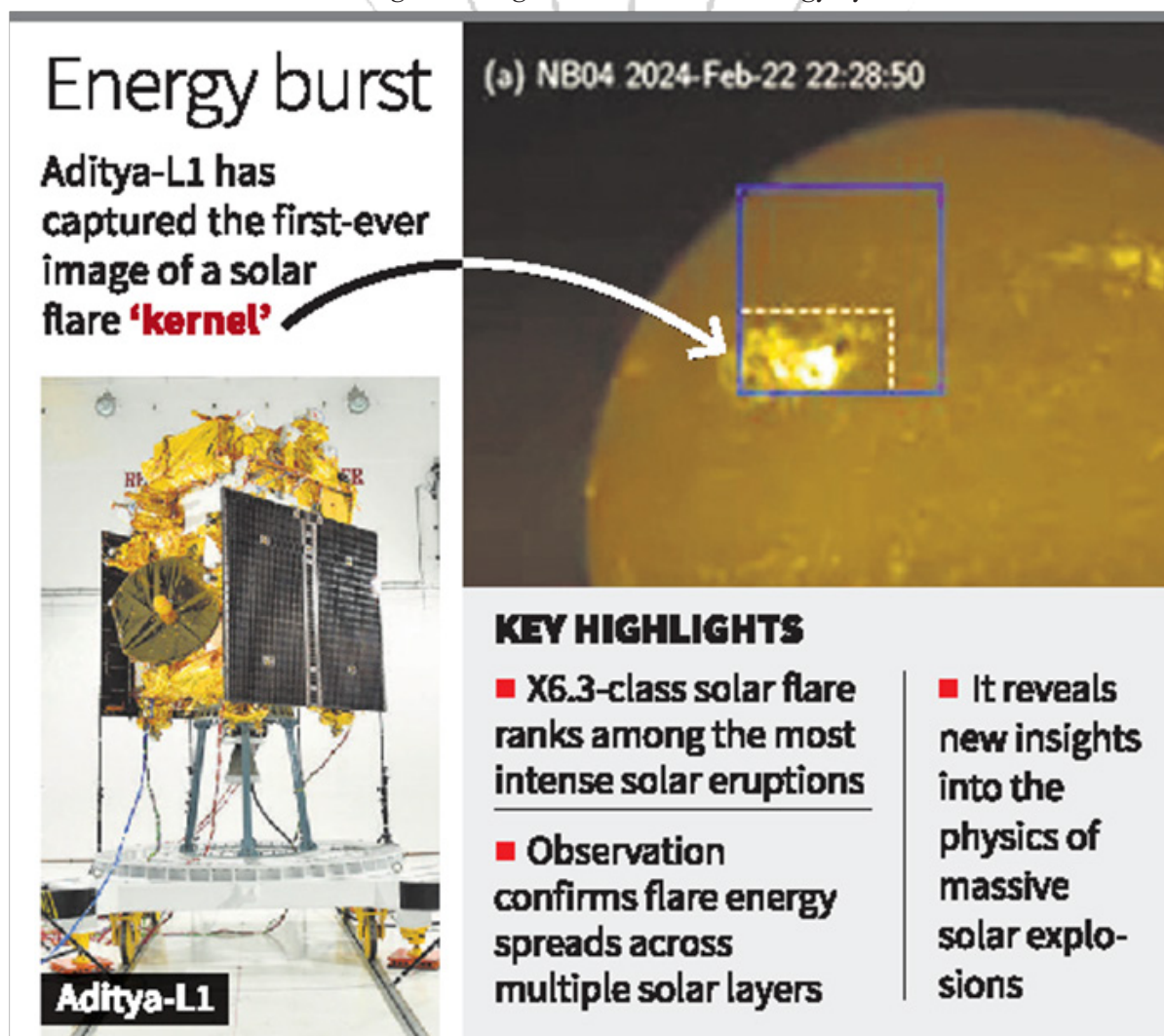
SCIENCE & TECHNOLOGY

Solar Flare Captured by Aditya L1 Mission

Context:

ISRO's Aditya-L1 mission captured the first-ever image of a solar flare 'kernel', marking a significant breakthrough in solar physics research.

- The Solar Ultraviolet Imaging Telescope (SUIT) onboard Aditya-L1 recorded the brightening in the Near Ultraviolet (NUV) band, offering new insights into solar flare energy dynamics.



About Aditya-L1:

What is Aditya-L1?

- India's first space-based solar mission, launched to study the Sun's outer layers and solar activity.
- Positioned at Lagrange Point L1, about 1.5 million km from Earth, enabling continuous solar observation without eclipses.

Launched In:

- September 2, 2023, aboard PSLV C-57 rocket.
- Successfully placed in halo orbit around L1 on January 6, 2024.

Aim of the Mission:

- Study solar dynamics, including flares, coronal mass ejections (CMEs), and magnetic field variations.
- Observe solar radiation and its impact on Earth's climate and space weather.

What are Solar Flares?

- Sudden bursts of intense energy from the Sun's atmosphere, caused by magnetic field interactions.
- Release X-rays, ultraviolet light, and charged particles, which can disrupt satellite communications and power grids on Earth.

How Aditya-L1 Studies Solar Flares?

- SUIT (Solar Ultraviolet Imaging Telescope): Captures UV images of the lower solar atmosphere.
- SoLEXS (Solar Low Energy X-ray Spectrometer) & HEL1OS (High Energy L1 Orbiting X-ray Spectrometer): Monitor solar X-ray emissions to detect flares.
- Continuous observation from L1 provides a real-time picture of solar activity.

About Solar Ultraviolet Imaging Telescope (SUIT):

What is SUIT?

- A specialized telescope on Aditya-L1, developed by Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune.
- Captures high-resolution images in 11 different NUV wavebands, covering the photosphere and chromosphere.

Recent Observations:

- SUIT detected an X6.3-class solar flare, one of the most intense solar eruptions recorded.
- Observed brightening in the Near Ultra-Violet (NUV) band (200-400 nm), a wavelength never studied in such detail before.
- Provided clear evidence of energy transmission from the solar surface to the corona.

Significance of the Discovery:

- Validates long-standing theories about solar energy transfer.
- Helps predict solar storms and space weather to protect satellites and power grids.
- Advances global solar physics research, enhancing our understanding of the Sun's impact on Earth's climate.

Blue Ghost

Context:

Firefly Aerospace's Blue Ghost successfully landed upright on the Moon, becoming the second private spacecraft to achieve this feat.



About Blue Ghost:

What is Blue Ghost?

- Blue Ghost is a privately developed lunar lander designed for scientific exploration and technology demonstration on the Moon.
- The mission is part of NASA's Commercial Lunar Payload Services (CLPS) program, which partners with private companies to advance lunar exploration.
- Developed By: Firefly Aerospace, a Texas-based private space company.

Mission Aim:

- Scientific Research: Conduct lunar soil analysis and test radiation-tolerant technology.
- Navigation Experiments: Evaluate global satellite navigation feasibility on the Moon.
- Artemis Program Support: Help develop cost-effective solutions for future human missions.

Key Features:

- Landing Location: Mons Latreille, a volcanic formation in the Mare Crisium
- Size: Comparable to a hippopotamus (compact but robust design).
- Instruments: Equipped with 10 scientific payloads, including lunar dust analysis tools.
- Operational Timeline: Designed to function for one full lunar day (14 Earth days).
- Eclipse & Sunset Imaging: Will capture a total lunar eclipse on March 14 and a lunar sunset on March 16.

1st Private Moon Mission:

- Intuitive Machines' Odysseus became the first private spacecraft to land on the Moon (February 2024), but it landed sideways.
- Blue Ghost is the first commercial lander to achieve a stable and upright lunar landing, improving mission success rates.

Payodhi Milk Bank

Context:

AIIMS launched 'Payodhi', a human milk bank, to provide pasteurised donor human milk for critically ill preterm babies in the NICU.

About Payodhi Milk Bank:

What is Payodhi?

- Payodhi is a human milk bank and lactation management centre at AIIMS, New Delhi.
- It collects, processes, and stores pasteurised donor milk for premature and critically ill newborns.
- Launched at: AIIMS Neonatology Division, Department of Pediatrics, after acquiring a pasteuriser in September 2024.



Aim of Payodhi:

- To provide safe and processed human milk to preterm and critically ill NICU babies.
- To support lactating mothers through counselling, milk donation, and storage facilities.

Significance of Payodhi:

- Lifesaving Nutrition: Ensures better survival, immunity, and brain development for premature infants.
- Supports NICU Babies: Addresses cases where mothers cannot breastfeed due to medical reasons.
- Prevents Milk Wastage: Utilises excess breast milk from donors to help other newborns.
- Free-of-Cost Service: Ensures equitable healthcare access to critically ill infants.
- Aligns with Global Standards: Follows WHO and Government of India guidelines on infant nutrition.

Bose Metal

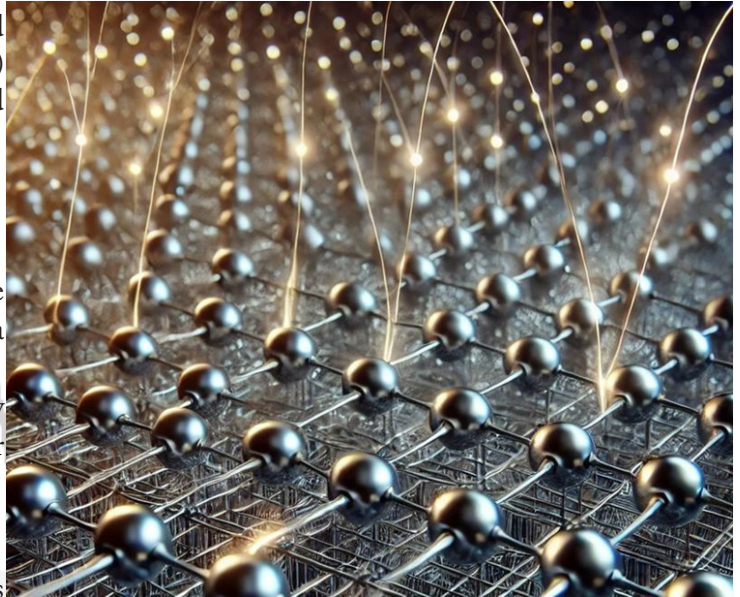
Context:

A research team from China and Japan has found strong evidence that niobium diselenide (NbSe_2) exhibits properties of a Bose metal, a long-theorized but unproven quantum state.

About Bose Metal:

What is a Bose Metal?

- A Bose metal is a quantum metallic state where Cooper pairs exist but fail to condense into a superconducting phase.
- Unlike traditional metals, its conductivity remains between zero and infinity at near absolute zero temperature.



Key Features of Bose Metals:

- Formation of Cooper Pairs: Electrons experience a net attractive force, forming Cooper pairs.
- Absence of Superconducting Coherence: Despite pairing, these particles do not form a long-range superconducting state.
- Intermediate Conductivity: Conductivity neither reaches infinity (superconductor) nor zero (insulator).
- Magnetic Field Sensitivity: Strong magnetic fields influence the formation and behavior of Bose metals.

Limitations of Bose Metals:

- No Practical Applications Yet: Theoretical concept with no direct industrial use.
- Experimental Challenges: Requires precise control of temperature, thickness, and magnetic field.
- Ambiguous Definition: Scientists debate whether Bose metals are distinct quantum states or transitional phases.

Role of AI in Justice Delivery

Context

Artificial Intelligence (AI) is transforming governance, with major powers investing heavily in AI-led justice reforms. The US government's \$100 billion Stargate AI Initiative and China's rapid AI development with LLMs like QWQ and DeepSeek showcase the global AI race. India, too, must leverage AI to address its judicial backlog of over 50 million cases and improve law enforcement.



AI in Law Enforcement and Crime Prevention

Enhancing Police Operations with AI

- AI in SMART Policing: The Government of India's SMART policing initiative (Strategic, Meticulous, Adaptable, Reliable, Transparent) can benefit from AI in crime detection and predictive policing.
- Automated FIR Registration: AI chatbots in police stations, like Mumbai Police's AI-assisted e-FIR system, can reduce paperwork and speed up case filings.
- Predictive Policing: AI-driven Crime Mapping tools, like those used by the Delhi Police, analyze NCRB data trends to identify high-crime zones.
- Facial Recognition for Law Enforcement: AI-powered systems like "AFRS" (Automated Facial Recognition System) deployed by the National Crime Records Bureau (NCRB) aid in identifying criminals.

AI in Cybercrime Prevention and Investigation

- AI-Based Fraud Detection: Banks and law enforcement agencies use AI-powered fraud detection, as seen in RBI's AI-driven fraud monitoring system (CRILC).

- Deep Fake Detection: AI tools like Microsoft's Video Authenticator help in spotting manipulated content and deep fakes, which are increasingly used for cybercrimes.
- AI-Powered Cybersecurity: Agencies like CERT-In (Indian Computer Emergency Response Team) use AI to detect phishing, ransomware, and digital threats.

AI in Judicial System and Courtroom Efficiency

1. Reducing Judicial Backlogs with AI

- E-Courts Initiative: Under the Supreme Court's E-Courts Mission Mode Project, AI tools like SUPACE (Supreme Court Portal for Assistance in Court Efficiency) assist judges in case research and legal precedent identification.
- AI-Powered Document Management: AI assists in digitizing court records under Phase III of the e-Courts Project, reducing paperwork and case delays.

2. AI in Courtroom Operations

- Real-Time Transcription: AI-driven tools like "JudiBot" being tested in US courts could be adopted in India for automatic transcription of hearings.
- AI in Bail & Sentencing Decisions: The Delhi High Court explored AI-based risk assessment models to ensure consistency in bail and parole decisions.
- AI Fraud Detection in Legal Documents: AI verifies legal document authenticity, reducing delays due to fake affidavits and forged contracts.

Challenges in AI Adoption for Justice Delivery

1. Accuracy & Ethical Issues

- Bias in AI Models: AI-driven risk assessment models in the US, like COMPAS (Correctional Offender Management Profiling for Alternative Sanctions), have faced racial bias issues. India must ensure bias-free AI training data.
- Privacy Risks: AI adoption must comply with India's Digital Personal Data Protection Act (2023) to prevent misuse of sensitive citizen data.

2. Implementation & Policy Roadblocks

- Lack of AI Training in Law Enforcement: AI in policing requires massive training programs, similar to Singapore's AI for Justice Initiative.
- Regulatory Gaps: The B.N. Srikrishna Committee on AI Governance has emphasized the need for a legal framework for AI in the judiciary.

Way Forward

- Establish an AI Justice Task Force: A central agency should oversee AI integration in policing and courts.
- Expand AI Usage in Judiciary: AI-driven legal analytics should be mandated across all high courts.
- Develop Ethical AI Guidelines: AI regulations must align with NITI Aayog's AI strategy to prevent algorithmic biases.
- Invest in AI Training Programs: Law enforcement and judiciary personnel must be trained in AI-based crime and case analysis.

Conclusion

AI is reshaping the legal landscape worldwide, and India must harness its potential for faster case resolution, efficient policing, and improved judicial transparency. While challenges like bias, data privacy, and ethical concerns remain, a structured AI framework and policy-driven implementation can make AI a powerful tool for justice. India must act swiftly to integrate AI responsibly, ensuring justice is both timely and fair.

Space Debris

Context:

A 500-kg metal object, suspected to be space debris, crashed in Kenya, raising concerns over accountability and legal gaps in space governance.



Understanding Space Debris:

What is Space Debris?

- Man-made objects in Earth's orbit or re-entering the atmosphere that are non-functional.
- Includes defunct satellites, spent rocket stages, and collision fragments.

Types of Space Debris:

1. Large Debris: Defunct satellites, rocket boosters, fuel tanks that survive reentry.
2. Small Debris: Fragments from satellite collisions, disintegrated spacecraft.
3. Microscopic Debris: Paint flakes, dust particles, and metal fragments from damaged satellites.

Laws Governing Space Debris:

- Outer Space Treaty (1967): Holds states responsible for national space activities by both government and private entities.
- Liability Convention (1972): Imposes absolute liability on launching states for damage caused by space objects on Earth.
- Space Debris Mitigation Guidelines (UN COPUOS): Encourages safe disposal of satellites but remains non-binding.
- 25-Year Rule (UN & IADC): Recommends deorbiting satellites within 25 years, with only 30% compliance globally.
- National Regulations (U.S., EU, China): Mandate tracking, disposal, and deorbiting plans, but enforcement is weak.

Challenges in Space Debris Governance:

- Lack of Binding International Regulations: No enforceable global framework for debris mitigation and liability enforcement.
- Attribution Issues: Difficulty in identifying the source of debris, especially for older, fragmented objects.
- Rising Space Traffic: Increasing satellite mega-constellations (Starlink, OneWeb, Kuiper) escalate the risk of collisions.

- Uncontrolled Reentries: No penalties for countries allowing uncontrolled descents of space objects.
- Enforcement & Compensation Gaps: Past incidents (e.g., Cosmos 954 crash in Canada, 1978) show delays in compensation settlements.

India's Initiatives for Space Debris Management:

- ISRO System for Safe & Sustainable Operations Management (IS4OM) (2022): Monitors space objects that pose collision threats to Indian satellites.
- Project Netra (Network for Space Object Tracking and Analysis): Detects, tracks, and catalogs debris as small as 10 cm up to a range of 3,400 km.
- Collision Avoidance Manoeuvres: ISRO performed 21 collision avoidance manoeuvres in 2022 to prevent space debris impact.
- Space Situational Awareness (SSA) Control Centre (2020): Functions as India's central hub for monitoring and managing space traffic.
- International Collaboration: India actively engages in UN discussions on space debris mitigation and sustainability.

Way Ahead:

- Binding Global Regulations: UN COPUOS must introduce mandatory disposal rules for satellites and penalties for uncontrolled re-entries.
- Enhanced Tracking & Prediction Systems: Expanding advanced monitoring networks (e.g., Space Fence, AI-based tracking) to trace debris origins.
- Mandatory Deorbiting Plans: Launch approvals must require clear disposal strategies such as controlled re-entry or graveyard orbits.
- Independent Liability Tribunal: A global arbitration body should ensure quick compensation settlements for damage caused by space debris.
- Sustainable Space Practices: Promote reusable rocket technology, debris-removal missions, and cleaner propulsion systems.

Conclusion:

With rising space activity, uncontrolled reentries pose increasing risks to Earth. The lack of binding international rules has left affected communities without legal recourse. Strengthening global cooperation, enforcing strict disposal rules, and establishing a liability framework are crucial to ensuring long-term space sustainability.

National Gene Bank

Context:

The Union Government has announced the establishment of a Second National Gene Bank to conserve 10 lakh crop germplasm, under the theme "Investing in Innovations" in Budget 2025–26.

- The initiative aims to safeguard India's agricultural biodiversity and ensure long-term food and nutritional security.



About National Gene Bank (NGB):

What is a Gene Bank?

- A repository of plant genetic material (seeds, tissue, pollen) designed to conserve biodiversity and protect crop varieties from extinction.
- Organisation Involved: Managed by ICAR – National Bureau of Plant Genetic Resources (NBPGR), under the Ministry of Agriculture & Farmers' Welfare.
- Aim: To conserve genetic resources of cultivated and wild crops, enabling sustainable agriculture, food security, and resilience against climate change.

Technology & Facilities:

- Uses cryogenic storage, long-term seed preservation chambers, DNA fingerprinting, and digital databases for germplasm management.
- Facilitates distribution to breeders, scientists, and global researchers.

Key Features:

- Strengthens national and international biodiversity initiatives (e.g., SAARC, BRICS).
- Supports public-private partnerships in crop improvement and seed conservation.
- Acts as a fail-safe genetic vault to secure heritage and climate-resilient varieties.

About India's First National Gene Bank:

- Location: New Delhi, at ICAR-NBPGR headquarters
- Established in: 1996

Features:

- Stores 4.71 lakh accessions from 2157 species.
- Includes cereals (1.7 lakh), legumes (69,200+), oilseeds (63,500+), millets (60,600+), vegetables (30,000).
- Operates with 12 regional stations across India.
- Second-largest gene bank globally, contributing to international PGR conservation.

About India's Second National Gene Bank:

- Location: Yet to be finalised
- Announced in: Union Budget 2025–26

Key Features:

- Capacity to conserve 10 lakh germplasm lines, doubling India's gene banking capability.
- Equipped with state-of-the-art infrastructure, focused on advanced genetic storage technologies.
- Supports future-ready agriculture, climate adaptation, and nutritional security goals.
- Serves as a safety duplicate gene vault, ensuring redundancy against natural or man-made threats.

Supersolid Light

Context:

Italian scientists have demonstrated that light can exist as a supersolid, combining solid-like structure with frictionless flow.

About Supersolid light:

What is Supersolid Light?

- Supersolid light is a rare quantum state where light exhibits both the rigid structure of a solid and the frictionless flow of a superfluid.
- Previously, supersolidity had only been observed in Bose-Einstein condensates (BECs) a state of matter that forms when a collection of bosons is cooled to nearly absolute zero, causing them to share the same quantum state.



How is Supersolid Light Formed?

- Platform Used: Researchers used a semiconductor gallium arsenide structure embedded with microscopic ridges.
- Creation of Polaritons: By firing a laser, they generated polaritons — hybrid particles made from light and matter.
- Observation of Satellite Condensates: As the photon count increased, satellite condensates appeared, showing symmetric energy but opposite wavenumbers — a key indicator of supersolidity.

Key Characteristics of Supersolid Light:

- Solid-like lattice arrangement in spatial patterns.
- Frictionless flow, mimicking superfluid behavior.
- Exhibits quantum coherence and long-range order at near absolute zero temperatures.
- Demonstrates simultaneous symmetry breaking and superfluid properties.

Significance of the Discovery:

- Quantum Computing Advancement: Supersolid light can enhance qubit stability and lead to more reliable quantum computing systems.
- Optical Devices Innovation: Potential to revolutionize photonic circuits and next-generation optical technologies.
- Fundamental Quantum Research: Opens avenues for exploring quantum phase transitions and new quantum states of matter.
- Precision in Quantum Control: Allows scientists to control and manipulate quantum states of light with unprecedented stability.

Chandrayaan-5 Mission And India's Second Spaceport

Context:

ISRO Chief V. Narayanan announced the Centre's approval for the Chandrayaan-5 mission, advancing India's lunar exploration goals.

- He also confirmed that India's second spaceport at Kulasekarapattinam, Tamil Nadu, will see its first SSLV launch in 2027.



About Chandrayaan-5:

What is Chandrayaan-5?

- Chandrayaan-5 is India's upcoming lunar mission aimed at deploying a 350 kg rover on the Moon.

Nations Involved:

- The mission is part of a collaborative venture between India and Japan, enhancing space research partnerships.

Aim:

- To deploy a larger lander and rover with the goal of collecting extensive lunar data.
- Strengthen technologies necessary for potential human landing missions by 2040.

Key Features:

- 350 kg advanced rover for detailed lunar exploration.
- Features a high-capacity lander suitable for future crewed missions.
- Supports sample return missions and technology demonstration for safe landings.
- Follows the success trajectory of Chandrayaan-3 and builds upon Chandrayaan-4 sample collection goals.

About India's Second Spaceport:

- Location: Kulasekarapattinam, Thoothukudi district, Tamil Nadu.

Aim:

- To support launches of Small Satellite Launch Vehicles (SSLVs) and strengthen India's presence in the global small satellite market.
- Reduce dependence on Sriharikota and facilitate direct southward launches over the Indian Ocean.

Key Features:

- Spread across 2,350 acres.
- Equipped with 35 major facilities, including: Dedicated launchpad, Rocket integration facilities, Ground range and checkout facilities and Mobile Launch Structure (MLS) integrated with advanced checkout systems.
- Launch capacity of 24 satellites annually using SSLVs.
- Strategic location minimizes fuel consumption and avoids overflight of landmasses.



Green Revolution

Context:

The term 'Green Revolution', coined 57 years ago, transformed global agriculture and secured India's food self-sufficiency.

What is the Green Revolution?

- A scientific and policy-driven agricultural movement launched in the 1960s to increase food production through High-Yielding Variety (HYV) seeds, mechanization, and chemical inputs.
- Coined by: William S. Gaud in 1968.
- India's Architect: M.S. Swaminathan (Father of the Green Revolution).
- Supported by: Chidambaram Subramaniam (then Food and Agriculture Minister).



Need for the Green Revolution in India:

- Food Insecurity: Post-independence India faced severe food shortages and relied on imports under PL-480 from the U.S.
- Bengal Famine Legacy: The 1943 famine exposed India's vulnerability to crop failures.
- Growing Population: Rising food demand requires a sustainable increase in production.
- Economic Stability: Reducing dependency on imports was crucial for national security and economic sovereignty.

Green Revolution Transformed Indian Agriculture:

- Increase in Food Production: Wheat output rose from 12 million tonnes (1965) to 110 million tonnes (2023), and rice from 35 million tonnes (1960) to 138 million tonnes.
- Introduction of HYV Seeds: Boosted wheat and rice yields in Punjab, Haryana, and western Uttar Pradesh.
- Irrigation Expansion: Major projects like Bhakra-Nangal Dam ensured year-round farming.
- Farm Mechanization: Increased use of tractors, harvesters, and tube wells improved efficiency.
- Minimum Support Price (MSP): Assured income security for farmers and promoted market stability.
- Institutional Credit: NABARD and cooperative banks replaced exploitative moneylenders, facilitating farm investments.

Unintended Consequences of the Green Revolution:

- Groundwater Depletion: Excessive irrigation led to 80% of Punjab's water units being overexploited (CGWB, 2023).
- Soil Degradation: Overuse of chemical fertilizers and pesticides reduced soil fertility.
- Regional Disparities: Benefited irrigated states (Punjab, Haryana) while rain-fed regions (e.g., eastern India) lagged behind.
- Debt & Farmer Suicides: Small farmers struggled with rising costs, leading to financial distress.
- Biodiversity Loss: Monoculture of wheat and rice reduced crop diversity, making agriculture less resilient.

Way Ahead: Sustainable Agricultural Reforms

- Second Green Revolution (GR 2.0): Focus on sustainable farming, crop diversification, and climate resilience.

- **Efficient Water Management:** Promote micro-irrigation, rainwater harvesting, and solar-powered irrigation.
- **Organic & Natural Farming:** Encourage zero-budget natural farming (ZBNF) to reduce chemical dependency.
- **Income Support for Farmers:** Strengthen crop insurance (PMFBY), MSP reforms, and direct income transfers.
- **Agroforestry & Renewable Energy:** Integrate agrivoltaics and inland aquaculture to increase farm incomes.

Conclusion:

India's Green Revolution ensured food security but came at a high environmental and social cost. A balanced approach integrating sustainability, farmer welfare, and technological advancements is needed to secure India's agricultural future while protecting its natural resources.

World Bank Recommendations for India to Achieve Developed Status by 2047

Context:

The World Bank's India Country Economic Memorandum (2025) states that India needs an average growth rate of 7.8% until 2047 to achieve high-income status.

About World Bank Recommendations for India to Achieve Developed Status by 2047:

1. Increase Investment & Capital Formation:

- Raise investment from 33.5% to 40% of GDP by 2035 through private and public sector participation.
- Improve financial sector regulations and ease FDI restrictions.
- Boost MSME credit access and streamline business regulations.

2. Enhance Labor Force Participation:

- Increase overall labor force participation from 56.4% to 65%.
- Raise female workforce participation from 35.6% to 50%.
- Encourage job-rich sectors like manufacturing, hospitality, transportation, and the care economy.

3. Boost Structural Transformation & Trade Integration:

- Reduce agriculture employment from 45% by shifting labor towards manufacturing & services.
- Strengthen infrastructure, adopt new technology, and simplify labor regulations.
- Enhance Global Value Chain (GVC) participation to compete with Vietnam, Thailand, and China.

4. Promote Balanced Growth Among States:

- Support less developed states in improving health, education, and infrastructure.
- Encourage industrialized states to deepen business reforms & GVC participation.
- Expand incentive-driven federal programs like the Urban Challenge Fund.

Challenges to Achieving High-Income Status:

1. **Slow Employment Growth:** Job creation has not kept pace with GDP growth, leading to high informal sector dependency.
2. **Low Female Workforce Participation:** Cultural and economic barriers restrict women's workforce engagement, limiting economic expansion.
E.g. Female LFPR in urban areas (Oct-Dec 2024) was 25.2%, far below male LFPR at 75.4%.
1. **Investment & Infrastructure Bottlenecks:** Slow industrial growth, land acquisition issues, and infrastructure deficits hinder long-term investments.
E.g. GDP growth slowed to 5.4% in Q2 FY 2024-25 from 8.1% a year earlier.
1. **Unequal Growth Among States:** Low-income states lag behind in productivity and human capital development.
2. **Trade & Productivity Gaps:** India's Global Value Chain (GVC) participation is lower than peers like China & Vietnam, limiting global trade integration.

Way Ahead:

1. **Accelerate Infrastructure & Investment Reforms:** Improve land & labor laws, ease FDI norms, and reduce compliance burden for businesses.

2. **Expand Employment & Women's Workforce Participation:** Implement targeted policies to boost job-rich sectors and enhance childcare & safety measures for women.
3. **Strengthen Global Trade & Manufacturing:** Increase export competitiveness by integrating into Global Value Chains (GVCs).
4. **Ensure Equitable Growth Among States:** Improve health, education, and infrastructure in lagging states while empowering developed states with advanced reforms.
5. **Promote Technology & Innovation:** Enhance AI, automation, and digital transformation to boost productivity and economic efficiency.

Conclusion:

India's goal of achieving high-income status by 2047 is ambitious but achievable with strategic reforms in investment, labor markets, trade, and state-level development. A balanced growth model, supported by strong governance and global integration, will be key to transitioning into a developed economy.

Taxing Virtual Digital Assets

Context:

The Income Tax Bill, 2025 classifies Virtual Digital Assets (VDAs) as property and capital assets, bringing them under capital gains taxation and regulatory scrutiny.

- The bill imposes a 30% tax on VDA transfers, 1% TDS on transactions, and mandates reporting, ensuring transparency and preventing financial misuse.



About Taxing Virtual Digital Assets:

What are Virtual Digital Assets (VDAs)?

- Virtual Digital Assets (VDAs) refer to digitally represented assets that use blockchain or cryptographic technology for transactions.
- Defined under Section 2(111) of the Income Tax Bill, 2025, VDAs include cryptocurrencies, NFTs, and similar digital assets.

Types of VDAs:

- Cryptocurrencies: Bitcoin, Ethereum, Ripple, Solana, etc.
- Non-Fungible Tokens (NFTs): Unique digital collectibles and assets.
- Stablecoins: Crypto assets pegged to fiat currencies (e.g., USDT, USDC).
- Tokenized Assets: Digital representations of real-world assets (e.g., tokenized stocks, real estate).

Reasons Behind the Proposal to Tax Virtual Digital Assets:

- Aligning with Global Practices: Countries like the U.K., U.S., Australia, and New Zealand tax crypto assets as property or securities.
- Revenue Generation: High trading volumes in crypto markets present a new tax revenue stream for the government.
- Preventing Tax Evasion: Unreported crypto gains pose a risk of black money accumulation and illicit transactions.
- Ensuring Regulatory Oversight: Tracking large crypto transactions through 1% TDS and mandatory reporting reduces financial misuse.
- Reducing Financial Fraud & Risks: Unregulated crypto trading can lead to fraud, Ponzi schemes, and investor losses.

Challenges in Taxing Virtual Digital Assets:

- Lack of Comprehensive Regulations: Taxation is in place, but market regulation, investor protection, and enforcement mechanisms remain weak.
- Absence of Deductions: Unlike other assets, crypto investors cannot claim deductions for transaction fees, mining costs, or commissions.

- **High Tax Burden:** Flat 30% tax discourages retail investors and crypto startups from participating in the market.
- **Compliance Complexity:** Mandatory TDS and reporting requirements increase the burden on traders, exchanges, and businesses.
- **Global Crypto Mobility:** Investors may move funds to tax-friendly countries, reducing India's potential tax revenue.

Way Ahead:

- **Comprehensive Regulatory Framework:** Establish clear rules for investor protection, fraud prevention, and stablecoin regulations.
- **Balanced Taxation:** Introduce progressive tax rates and allow deductions for transaction costs to improve compliance.
- **Strengthening Enforcement:** Enhance AML (Anti-Money Laundering) and KYC (Know Your Customer) norms to prevent misuse.
- **International Collaboration:** Align policies with G20 and FATF recommendations to create a harmonized global crypto taxation model.
- **Consumer Awareness & Protection:** Educate investors on risks, legal obligations, and compliance requirements for safer participation.

Conclusion:

The taxation of Virtual Digital Assets under the Income Tax Bill, 2025 is a major step toward regulatory clarity, ensuring financial transparency and government oversight. A balanced approach integrating taxation, financial regulation, and consumer rights is necessary to build a secure and inclusive digital asset ecosystem.

Income-Tax Bill, 2025

Context

The Income-Tax Bill, 2025, was introduced in Parliament to replace the Income-Tax Act, 1961, aiming for a simplified structure, clearer language, and reduced litigation.

- A key highlight is the introduction of the 'tax year' concept, replacing the existing 'assessment year.' However, while the Bill streamlines provisions, experts argue that it lacks major structural changes in compliance and penalties.

INSIDE BILL INTRODUCED IN PARLIAMENT

Particulars	Income-tax Act, 1961	Bill tabled in LS
Chapters	47	23
Sections	819*	536
Words	5.12 lakh	2.60 lakh

* Effective sections. About 1200 provisos and 900 sections have been removed in the new Bill.

SCHEDULE II (16 ROWS) Incomes exempt, such as agricultural income

SCHEDULE III (39 ROWS) Certain persons eligible for exemption on certain income such as partners of firms and HUF, etc.

SCHEDULE IV (14 ROWS) Exemptions to non-residents

SCHEDULE V (8 ROWS) Exemption to business trusts, Sovereign Wealth Funds, etc.

SCHEDULE VI (12 ROWS) Exemptions to IFSC units

SCHEDULE VII (48 ROWS) Persons exempt from tax

Key Provisions of the Bill

1. Introduction of the 'Tax Year' Concept – The 'assessment year' has been removed, and the 'tax year' now aligns with the financial year (April 1 – March 31). For businesses or newly set up professions, the tax year begins from their establishment date.
2. Expanded Definition of Income – Virtual digital assets (VDAs) like cryptocurrency and NFTs are now considered capital assets, similar to land, shares, and bullion, affecting tax calculations.
3. Simplified and Concise Drafting – The Bill reduces the number of provisos and cross-references, making it easier to interpret without relying on multiple sections and rules.
4. Consolidation of Tax Compliance Requirements – Provisions related to TDS, assessment timelines, dispute resolution, and deductions have been tabulated for easier access.
5. Removal of Outdated Exemptions – Provisions like Section 54E (capital gains exemption for pre-1992 asset transfers) and redundant sections from past amendments have been eliminated.
6. Integration of Other Tax Laws – Provisions from Wealth Tax and rules for inventory valuation and revenue recognition for service contracts have been incorporated within the Bill for uniformity.

Advantages associated with the Bill

1. Better Readability and Clarity – The removal of complex legal language and cross-references makes it easier for taxpayers to understand their liabilities.
2. More Organized Tax Structure – Tax deductions, exemptions, and compliance timelines are now grouped into schedules and tables, reducing confusion.
3. Alignment with Digital Economy – Tax laws now recognize virtual digital assets (VDAs) as taxable capital assets, making tax regulations more contemporary.
4. Faster Compliance and Processing – Consolidation of tax rules reduces administrative delays, making compliance more efficient.
5. More Comprehensive Framework – The Bill integrates rules from other tax laws, such as wealth tax and inventory valuation, avoiding the need for separate legislation.

Challenges and Concerns

1. Minimal Structural Reforms – The Bill largely retains existing tax policies, offering no significant changes in compliance burdens or penalty structures.
2. Potential for Increased Litigation – While the Bill simplifies text, some broad terms remain undefined, leaving scope for legal disputes.
3. Digital Privacy Concerns – Authorities now have expanded search and seizure powers, including the ability to override passwords to access emails and digital accounts.
4. Lack of Taxpayer Relief Measures – The Bill does not address concerns related to high compliance costs, dispute resolution inefficiencies, or tax burden reductions.
5. Uncertainty Over Implementation – The transition from 'assessment year' to 'tax year' could create confusion, requiring businesses to adjust their tax planning strategies.

Way Forward

1. Strengthen Digital Privacy Protections – The Bill should include judicial oversight for digital searches to prevent misuse of government powers.
2. Improve Dispute Resolution Frameworks – Mediation mechanisms should be introduced to reduce tax litigation and resolve cases faster.
3. Clarify Tax Definitions – Key terms like "risk management strategy" in assessments should be clearly defined to avoid legal ambiguity.
4. Introduce Compliance Relief Measures – Reducing documentation requirements and providing simpler tax return processes can ease taxpayer burdens.
5. Ensure Smooth Transition to Tax Year System – Clear guidelines are needed to help businesses adjust to the new tax year model without compliance confusion.

Conclusion

The Income-Tax Bill, 2025, marks a shift toward simplification and modernization, but it lacks deep structural reforms. The new tax year concept and removal of outdated provisions are steps forward, yet privacy concerns and litigation risks remain. To maximize its effectiveness, the government must ensure transparency, reduce compliance burdens, and introduce stronger taxpayer protections.

Parvatmala Pariyojana

Context:

The Cabinet Committee on Economic Affairs (CCEA) approved two major ropeway projects in Uttarakhand under the Parvatmala Pariyojana, connecting Govindghat-Hemkund Sahib (12.4 km) and Sonprayag-Kedarnath (12.9 km).



About Hemkund Sahib Ji:

- Location: Situated in the Chamoli district of Uttarakhand, at an altitude of 4,632 meters in the Garhwal Himalayas.
- Connectivity: Currently accessible via a 21-km trek from Govindghat, soon to be connected via ropeway.

Features:

- One of Sikhism's holiest shrines, dedicated to Guru Gobind Singh Ji.
- Also, a gateway to the Valley of Flowers, a UNESCO World Heritage Site.

About Parvatmala Pariyojana:

What is Parvatmala Pariyojana?

- A National Ropeways Development Programme aimed at boosting ropeway connectivity in hilly areas.

Launched In:

- Announced in the Union Budget 2022-23 by the Ministry of Road Transport and Highways (MoRTH).

Ministry:

- Implemented by MoRTH under the National Highways Logistics Management Limited (NHLML).

Aim:

- To enhance connectivity in difficult terrains and reduce travel time in hilly areas.
- To promote eco-friendly and cost-effective transport solutions.
- To boost tourism and the local economy by facilitating better access to remote locations.

Key Feature:

- 200+ Ropeway Projects Planned: Over the next five years with a budget of 1.25 lakh crore.
- Public-Private Partnership (PPP) Model: Encourages private sector participation for economic viability.
- Monocable & Tricable Gondola Technology: Ensures high capacity, better efficiency, and safety.
- Hybrid Annuity Mode (HAM) Support: 60% construction funding by the government, making projects more feasible.
- Make in India Initiative: Focus on indigenous manufacturing to boost local industries.
- Multi-Utility Benefits: Ropeways to be used for tourism, urban transport, and logistics in remote areas.

AI Kosha

Context:

The Ministry of Electronics & IT (MeitY) launched AI Kosha, a secured AI datasets platform, along with the IndiaAI Compute Portal and other initiatives to accelerate AI innovation and research in India.

- The initiative, announced on the IndiaAI Mission's anniversary, aims to democratize AI access, enhance AI competency in governance, and support AI startups and research.

About AI Kosha

What is AI Kosha?

AI Kosha is a secure AI innovation platform designed to provide seamless access to datasets, models, and AI development tools. It serves as a centralized repository to enable AI research and innovation in India.

Developed By- Ministry of Electronics & Information Technology (MeitY) under the IndiaAI Mission.

Key Features

- AI Dataset Repository:** Hosts over 300 datasets and 80+ AI models for research and development.
- AI Sandbox Environment:** Provides an integrated development environment (IDE) with tools and tutorials for AI model training.
- Content Discoverability:** Uses AI-readiness scoring to help researchers identify relevant datasets.
- Security & Access Control:** Features data encryption (at rest & in motion), API-based secure access, and real-time malicious traffic filtering.
- Permission-Based Access:** Allows tiered access for different user groups like researchers, startups, and government bodies.

Benefits of AIKosha

- Accelerates AI Research:** Provides high-quality datasets and pre-trained models, reducing time for AI development.
- Enhances AI Innovation:** Enables startups, researchers, and enterprises to develop AI solutions with real-world data.
- Strengthens AI Security:** Promotes ethically sourced, consent-based datasets, ensuring responsible AI practices.
- Boosts Public Sector AI Adoption:** Supports government AI applications in governance, healthcare, and education.

Limitations

- Limited Dataset Variety:** Initial datasets are sourced from government and research institutions, reducing availability of real-world commercial data.
- Access Restrictions:** Strict security protocols may limit ease of data retrieval for private-sector innovators.
- Early Stage Development:** AIKosha is still evolving, and wider industry participation is required for expansion.

Impact of Climate Change on India's Wheat Production

Context:

India's wheat production faces severe risks due to climate change, with February 2025 recorded as the hottest in 124 years. Rising temperatures during critical growth stages threaten yield, quality, and food security.

What's Happening and Why?

Stages	Optimum Temperature (°C)	Minimum Temperature (°C)	Maximum Temperature (°C)
Seed germination	20–25 ± 1.2	3.5–5.5 ± 0.44	35 ± 1.02
Root growth	17.2 ± 0.87	3.50 ± 0.73	24.0 ± 1.21
Shoot growth	18.5 ± 1.90	4.50 ± 0.76	20.1 ± 0.64
Leaf initiation	20.5 ± 1.25	1.50 ± 0.52	23.5 ± 0.95
Terminal spikelet	16.0 ± 2.30	2.50 ± 0.49	20.0 ± 1.60
Anthesis	23.0 ± 1.75	10.0 ± 1.12	26.0 ± 1.01
Grain filling duration	26.0 ± 1.53	13.0 ± 1.45	30.0 ± 2.13

- **Record-Breaking Temperatures:** February 2025 was India's hottest February in 124 years, with March expected to see excessive heat waves.
- **Delayed Sowing Patterns:** Indian Ocean warming has disrupted the kharif season, delaying wheat sowing and exposing crops to early-season heat stress.
- **Frequent Marine Heat Waves:** IITM forecasts up to 250 marine heat wave days per year by the century's end, intensifying climate risks.
- **Lower Procurement Targets:** Despite a 115 million tonnes production target for 2024-2025, the government reduced procurement expectations to 30 million tonnes due to climate concerns.
- **Export Restrictions:** Wheat exports were banned in May 2022 to control domestic supply after reduced production from climate impacts and geopolitical disruptions.

Impact of Climate Change on Wheat Production

- **Reduced Yield:** Rising temperatures accelerate ripening, causing early flowering and shorter grain-filling periods, reducing yield.
- **Degraded Grain Quality:** Heat stress reduces starch content, producing harder grains with lower milling value and reduced market demand.
- **Resource Misuse:** Farmers' overuse of fertilisers, pesticides, and fungicides to counter climate stress leads to soil degradation.
- **Economic Distress:** Wheat procurement in 2024-2025 was 26.6 million tonnes, below the 34.15 million tonnes target, causing farmer income loss.
- **Threat to Food Security:** Lower wheat availability strains the Public Distribution System (PDS) and risks domestic price inflation.

Adaptation and Mitigation Strategies

- **Heat-Resilient Crop Varieties:** Developing wheat varieties with shorter growth cycles reduces exposure to peak heat periods.
- **Early Sowing Practices:** Encouraging earlier sowing in heat-vulnerable regions can prevent crops from maturing during extreme temperatures.
- **Enhanced Weather Monitoring:** Strengthening real-time advisory systems helps farmers make informed decisions on sowing and irrigation.
- **Precision Farming Techniques:** Techniques such as drip irrigation, soil sensors, and controlled fertiliser use improve efficiency.
- **Policy Support:** Expanding compensation schemes, climate-specific insurance, and credit facilities can protect farmers from climate-induced losses.

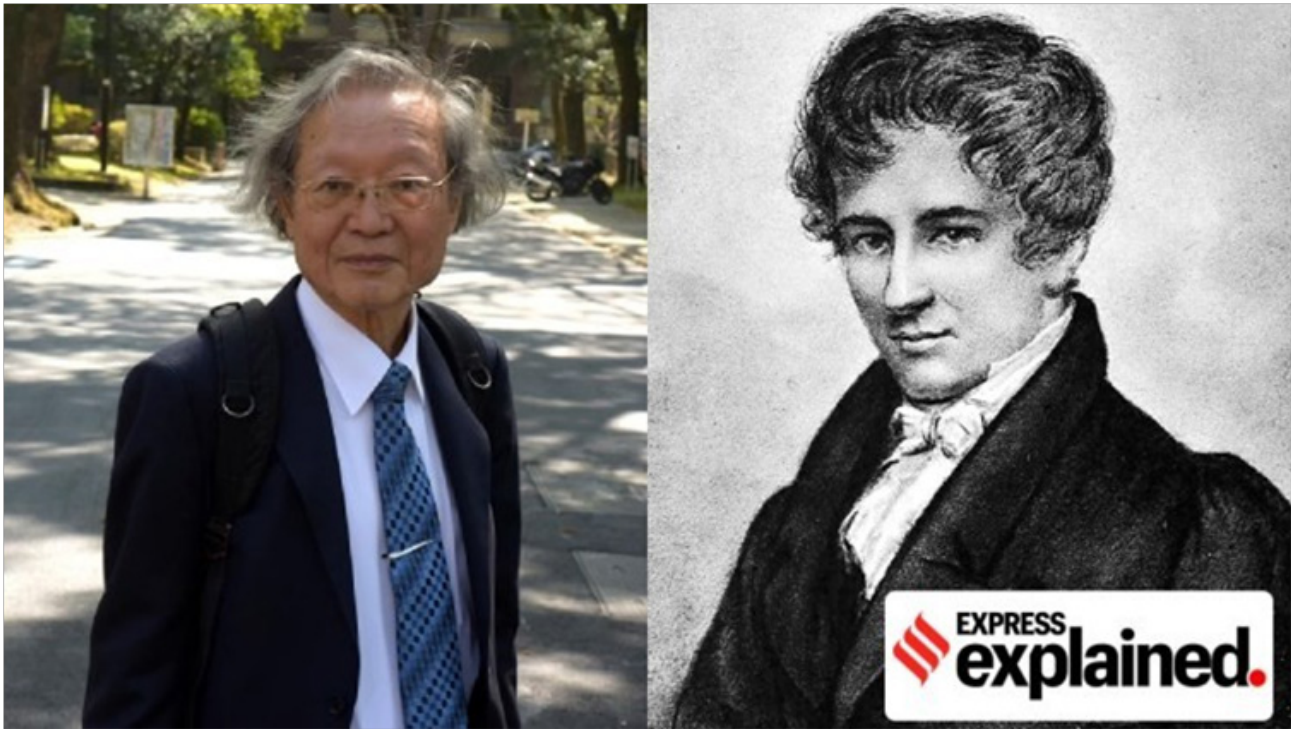
Conclusion

Climate change is increasingly threatening India's wheat production, reducing yields, compromising quality, and straining farmer incomes. While immediate financial aid is crucial, long-term solutions such as climate-resilient crops, improved weather advisories, and precision farming methods are vital for sustaining wheat production and ensuring food security.

Abel Prize 2025

Context:

Japanese mathematician Masaki Kashiwara has been awarded the Abel Prize 2025. He was recognized for foundational work in algebraic analysis and representation theory, especially for the theory of D-modules and crystal bases.



About Abel Prize:

What it is?

- It is a global award recognizing outstanding achievements in mathematics, considered the equivalent of a Nobel Prize in this field.
- Established in: In 2002 by the Norwegian Parliament to mark the 200th birth anniversary of Niels Henrik Abel.
- Administered by: The Norwegian Academy of Science and Letters, based on the recommendations from IMU and EMS.
- Criteria: Awarded for pioneering contributions in pure and applied mathematics.
- Prize Money: 7.5 million Norwegian kroner (~\$720,000), along with a custom-designed glass plaque.

About Abel Prize 2025:

- Recipient: Masaki Kashiwara (Japan), aged 78.

Recognized For:

- Development of D-modules, a powerful tool connecting differential equations with algebraic geometry.
- Discovery of crystal bases, enabling simpler graph-based solutions in complex calculations.

Significance:

- His work bridged isolated fields like algebra, geometry, and mathematical physics.
- Opened new avenues of research and helped solve long-standing mathematical problems.

Viksit Bharat Meets Green Growth

Context:

India's ambitious goal of becoming a developed nation (Viksit Bharat) by 2047 and achieving net-zero emissions by 2070 has brought green growth into focus.

- Balancing rapid economic development with sustainable practices is critical to ensuring long-term prosperity and environmental resilience.



Idea of Viksit Bharat:

- Goal: Transform India into a fully developed economy by 2047, with sustained high growth and inclusive development.
- Key objectives: High GDP growth (over 8%), world-class infrastructure, poverty elimination, and social equity.
- Pillars: Digital revolution, industrial strength, innovation, and climate resilience.
- Global positioning: Aim for India to become a leading geopolitical power and technology hub.

How Green Growth Fuels India to Viksit Bharat:

- Job creation: Green sectors are expected to generate 50 million new jobs by 2070 (WEF's Mission 2070 report).
- Economic value addition: Estimated \$1 trillion in additional economic value by 2030 from green investments.
- Energy security: Reduces dependency on 85% crude oil imports, stabilizing the economy.
- Export competitiveness: Decarbonized manufacturing helps avoid future carbon penalties (potential \$150 billion annual loss by 2040).

Measures Taken by Government So Far:

1. National Green Hydrogen Mission: Targets 5 MMT of green hydrogen production annually by 2030.
2. 500 GW renewable energy goal: To be achieved by 2030; currently progressing with 180+ GW installed.
3. Production Linked Incentive (PLI): Launched for solar modules, advanced battery storage, and green technologies.
4. Budget 2025 provisions: Announced 100 GW nuclear energy plan, grid-scale battery production support.

Challenges:

- High Carbon Dependency: Coal accounts for 55-60% of power generation, with demand peaking only by 2030-2035.
- Funding Gaps: Requires \$290 billion in renewable energy investments by 2030, posing financial challenges.
- Skill Deficit: Need to train 3.7 million skilled workers for the renewables sector by 2030.
- Climate Risks: Extreme heat could reduce GDP by 2.5-4.5% by 2030, impacting agriculture and labor productivity.
- Policy Implementation: Balancing fast growth with green transition requires careful planning and execution.

Way Ahead:

- **Holistic Strategy:** Combine renewable energy capacity-building with climate adaptation measures and ecosystem development.
- **Demand-Side Focus:** Provide farmers and MSMEs access to affordable, climate-resilient technologies and green finance.
- **International Collaboration:** Partner with global experts for technical support, skill development, and innovative financing.
- **Innovation:** Invest in green hydrogen, grid modernization, and carbon capture technologies to drive sustainable growth.
- **Policy Tools:** Use carbon pricing, green bonds, and blended finance models to incentivize decarbonization.

Conclusion:

Green growth and the vision of Viksit Bharat are not opposing paths but complementary goals. Accelerating green investments and building resilient infrastructure will drive sustainable growth. A well-planned green transition will place India on a stronger global footing by 2047.

Revision of MSME Definition**Context:**

The Government of India has notified revised criteria for MSME classification, increasing investment and turnover limits.

Rs. in Crore	Investment		Turnover	
	Current	Revised	Current	Revised
Micro Enterprises	1	2.5	5	10
Small Enterprises	10	25	50	100
Medium Enterprises	50	125	250	500

- The Finance Minister had announced new classification criteria for MSMEs, with investment and turnover limits for the classifications proposed to be increased to 5 times and 2 times, respectively.

About Revision of MSME Definition:**What it is:**

- A policy update amending the thresholds for classifying Micro, Small, and Medium Enterprises based on investment and turnover.
- **Announced In:** Announced during the Union Budget speech by the Finance Minister.
- **Amended By:** The Ministry of MSME under Section 7 of the Micro, Small, and Medium Enterprises Development (MSMED) Act, 2006.
- **New Revision Effective From:** Effective from April 1, 2025.

Purpose of Revision:

- To align MSME classification with current business realities and growth trends.
- To facilitate scaling-up, better credit access, and market expansion.
- To promote resilience, employment, and self-reliance in the MSME sector.
- **Features of New MSME Definition:**

1. Micro Enterprises:

- Investment limit raised from 1 crore to 2.5 crore.

- Turnover limit increased from 5 crore to 10 crore.

2. Small Enterprises:

- Investment threshold increased from 10 crore to 25 crore.
- Turnover ceiling raised from 50 crore to 100 crore.

3. Medium Enterprises:

- Investment limit revised from 50 crore to 125 crore.
- Turnover limit doubled from 250 crore to 500 crore.

Anti-Dumping Duties

Context:

India has imposed anti-dumping duties on five Chinese products to safeguard domestic industries from low-priced imports.

- These duties will be applicable for up to five years based on recommendations from the Directorate General of Trade Remedies (DGTR).

About Anti-Dumping Duties:

What it is

- Anti-dumping duty is a protectionist tariff imposed on imports priced below their normal value in the exporting country.
- It aims to protect domestic industries from injury caused by unfairly priced imports.

Authority to impose in India

- The Directorate General of Trade Remedies (DGTR) under the Ministry of Commerce and Industry recommends anti-dumping duties.
- The Ministry of Finance notifies and levies these duties based on DGTR's investigation and recommendation.

When it is imposed:

- Imposed after evidence of material injury to domestic industry from cheap imports sold at below market price.
- Duties are typically levied for a period of up to five years and periodically reviewed.

Does it violate WTO rules?

- No, it is permitted under Article 6 of the General Agreement on Tariffs and Trade (GATT), 1994.
- The WTO Anti-Dumping Agreement allows members to impose duties to ensure fair trade practices.
- Recent Chinese goods with anti-dumping duty imposed:
 - Soft Ferrite Cores (used in EVs, chargers, telecom equipment)
 - Vacuum Insulated Flasks
 - Aluminium Foil
 - Trichloroisocyanuric Acid (used in water treatment)
 - Poly Vinyl Chloride (PVC) Paste Resin.

Farmer Producer Organizations (FPOs)

Context:

The Government of India has successfully achieved the target of forming 10,000 Farmer Producer Organizations (FPOs) under its Central Sector Scheme for Formation and Promotion of FPOs, launched in 2020 with a ₹6,865 crore budget.

- The 10,000th FPO was launched in Khagaria district, Bihar, focusing on maize, banana, and paddy, marking a milestone in the Atmanirbhar Krishi initiative.

About Farmer Producer Organisation:

What is an FPO?

- **Definition:** A Farmer Producer Organization (FPO) is a collective of farmers registered under the Companies Act or Co-operative Societies Act to enhance bargaining power, market access, and productivity.
- **Objective:** To reduce input costs, improve productivity, and enable better price realization for small and marginal farmers.
- **Role:** Acts as a bridge between farmers and markets by facilitating bulk procurement, value addition, storage, processing, and direct market linkages.

Features of FPOs:

- **Collective Strength:** Empowers small and marginal farmers through collective marketing and procurement.
- **Institutional Credit Support:** Access to loans via ₹2 crore credit guarantee cover and ₹18 lakh management support per FPO.
- **Market Linkages:** Integration with e-NAM, ONDC, APEDA, and other e-commerce platforms.
- **Value Addition & Processing:** Infrastructure for grading, sorting, storage, and primary processing of agricultural produce.
- **Gender Inclusion:** 40% of members in registered FPOs are women, promoting gender empowerment.

Need for FPOs in India:

- **Fragmented Land Holdings:** 86% of farmers in India are small and marginal, lacking economies of scale.
- **Market Access Issues:** Farmers struggle with low bargaining power, price fluctuations, and dependence on middlemen.
- **Limited Credit Availability:** Lack of formal financial support forces farmers to rely on informal lending sources.
- **High Input Costs:** Difficulty in procuring quality seeds, fertilizers, and pesticides at affordable prices.
- **Lack of Storage & Processing Facilities:** Leads to post-harvest losses, reducing farmer income.

Challenges Faced by FPOs:

- **Complex Regulations:** Multiple agencies like FSSAI, BIS, APEDA impose different compliance standards, creating confusion for FPOs.
- **Low Digital Adoption:** Despite ONDC & eNAM, most FPOs lack digital literacy, limiting their ability to leverage e-commerce platforms.
- **Limited Market Linkages:** 80% of FPOs struggle to connect with buyers, processors, and exporters, reducing their revenue potential.
- **Traceability & Export Barriers:** Lack of quality certification and traceability systems restricts access to international markets.
- **Lack of Product Information:** No centralized database on FPO products, leading to poor visibility and reduced market access.

Way Forward

- Strengthen E-commerce Integration: Train FPOs on digital marketing, e-NAM, and ONDC platforms to expand their reach.
- Simplified Compliance Process: Create a unified regulatory framework to streamline export and domestic trade compliance.
- Scaling Best Practices: Replicate successful models like Kandhamal Turmeric FPO (Odisha) and Thailand's One Village, One Product (OVOP) initiative.
- Database for FPOs: Develop a centralized, product-specific database for better buyer-seller matchmaking and market integration.
- Capacity Building & Training: Implement specialized training programs on global compliance, food safety, and quality certification.

Conclusion:

The achievement of 10,000 FPOs marks a transformative shift in Indian agriculture towards self-reliance and economic sustainability. By enhancing market access, ensuring financial support, and fostering collective strength, FPOs can significantly boost farmer incomes.

Obesity

Context:

Prime Minister Narendra Modi has launched a nationwide anti-obesity campaign, urging Indians to reduce oil consumption by 10%.

About Obesity:

What is Obesity?

- According to the World Health Organization (WHO), obesity is defined as an abnormal or excessive fat accumulation that presents a risk to health.
- The commonly used metric to classify obesity is Body Mass Index (BMI), where a BMI of 25 or above is considered overweight, and a BMI of 30 or above is classified as obese.

NOTE: Body Mass Index (BMI), previously known as the Quetelet index, is a simple way to check if an adult has a healthy weight. It is calculated by dividing a person's weight in kilograms by their height in meters squared (kg/m^2).

In India, a person is considered:

- Overweight if their Body Mass Index (BMI) is between 25 and 24.9 kg/m^2
- Obese if their BMI is 30 kg/m^2 or higher.
- Morbid obesity occurs when a person's BMI is 35 or more.

Global and National Obesity Statistics:

1. Global Obesity Trends:

- Between 1990-2022, childhood obesity (ages 5-19) increased fourfold from 2% to 8%.
- Adult obesity more than doubled, rising from 7% to 16%.

2. Obesity in India:

NFHS-5 (2019-21) Data:

- 24% women and 23% men are overweight or obese.
- 4% women and 4% men (aged 15-49) are obese.
- Overweight children under 5 years increased from 1% (2015-16) to 3.4% (2019-21).

Key Drivers Behind Rising Obesity in India

- Unhealthy Diets: Increased consumption of processed foods, high sugar, salt, and trans fats leads to weight gain.
- Sedentary Lifestyles: Technology-driven habits reduce physical activity, promoting obesity.

- Urbanization: Shift to fast food and reduced active commuting contributes to weight gain.
- Genetic and Metabolic Factors: Family history and hormonal imbalances affect metabolism and fat storage.
- Mental Stress: Stress triggers binge eating and poor dietary habits, leading to obesity.
- Lack of Awareness: Limited nutritional knowledge results in unhealthy food choices and lifestyle habits.

Government Initiatives to Counter Obesity:

- National Health Mission (NHM) – NP-NCD: Focuses on screening, early diagnosis, and behavior change to prevent obesity and related diseases under the National Programme for Prevention and Control of Non-Communicable Diseases (NP-NCD).
- Fit India Movement & Khelo India Programme: Encourages physical activity in daily life through Fit India School Certification, while Khelo India promotes sports participation and athletic excellence with modern facilities.
- POSHAN Abhiyaan (2018): Aims to combat childhood obesity by promoting balanced nutrition and initiatives like Poshan Vatikas (Nutri-Gardens) for homegrown healthy food.
- Eat Right India Movement (FSSAI): Includes the 'Aaj Se Thoda Kam' campaign to reduce fat, salt, and sugar intake, along with Front-of-Pack Labelling (FOPL) to identify High-Fat, Salt, and Sugar (HFSS) foods.
- RUCO Initiative (FSSAI): Repurposes Used Cooking Oil to prevent harmful fat consumption, converting it into biofuel instead of allowing reuse in the food chain.

Challenges in Controlling Obesity:

- Cultural Dietary Habits: High consumption of carbs, fried, and sugary foods leads to excess calorie intake.
- Limited Policy Implementation: Awareness programs exist but lack enforcement and community engagement.
- Economic Factors: Healthy foods are costlier than processed and fast foods, making unhealthy options more accessible.
- Lack of Physical Infrastructure: Few parks, walkways, and fitness spaces discourage active lifestyles.
- Marketing Influence: Aggressive fast-food ads encourage poor eating habits, especially in children.

Way Forward:

- Nutritional Education: Schools and workplaces must promote healthy eating habits and portion control.
- Policy Reforms: Tax sugary foods, subsidize healthy options, and improve affordability of nutritious food.
- Fitness Promotion: Mandate physical activity programs in schools, offices, and urban planning.
- Stringent Food Regulations: Ban trans fats, enforce clear labeling, and regulate misleading ads.

Conclusion:

With strategic policies, strong awareness campaigns, and community-driven action, India can reverse obesity trends and build a healthier future. A collective approach integrating nutrition, exercise, and policy enforcement will ensure sustained impact.

Swavalambini Scheme

Context:

Swavalambini, a Women Entrepreneurship Programme, was launched at Chaudhary Charan Singh University, Meerut, to empower female entrepreneurs across India.

About Swavalambini:

What is Swavalambini?

- A structured entrepreneurship initiative for young women in Higher Education Institutions (HEIs).
- Provides skill development, mentorship, funding support, and incubation opportunities.
- Implemented by: National Institute for Entrepreneurship and Small Business Development (NIESBUD) and NITI Aayog.



- Ministry: Ministry of Skill Development and Entrepreneurship (MSDE).

Aim of the Initiative:

- Enhance women's participation in entrepreneurship through structured training and mentorship.
- Promote self-employment and economic independence among young women.
- Encourage at least 10% of trained participants to establish successful enterprises.

Key Features of Swavalambini:

Multi-Stage Training Approach:

- Entrepreneurship Awareness Programme (EAP): 2-day workshop for 600 students on business fundamentals.
- Entrepreneurship Development Programme (EDP): 40-hour advanced training for 300 students covering finance, market linkages, compliance, and legal aspects.
- Six-Month Mentorship Support: Helps participants transition from ideation to enterprise creation.

Faculty Development Programme (FDP):

- Trains educators to mentor and guide women entrepreneurs within HEIs.

Recognition & Rewards:

- Award to Rewards Initiative: Recognizes top-performing women entrepreneurs.

Nationwide Implementation:

- Initially launched in Eastern HEIs (IIT Bhubaneswar, NEHU Shillong, Gauhati University, etc.).
- Now expanded to BHU, University of Hyderabad, Maulana Azad National Urdu University, and more.

One Day as a Scientist Initiative

Context:

In response to PM Mann Ki Baat appeal, Ayush institutions opened their research labs to students under the 'One Day as a Scientist' initiative.

About One Day as a Scientist initiative:

What is it?

- A government initiative allowing students to experience real-world scientific research for a day in Ayush laboratories.
- Provides hands-on exposure to advanced lab equipment and modern research methodologies.



Ministry: Ministry of Ayush

- Implemented by: Leading Ayush research institutes, universities, and specialized labs.

Aim & Objectives:

- Encourage youth participation in scientific research and Ayush healthcare advancements.
- Bridge traditional and modern medicine through scientific validation and innovation.
- Develop scientific temperament among students by providing lab exposure and expert interactions.

Key Features:

- Hands-on Lab Experience: Students visit Ayush research institutions and explore cutting-edge scientific tools.
- Mentorship by Scientists: Experts provide insights into research methodologies and technology.
- Integration of Modern & Traditional Sciences: Focus on Ayush therapies, advanced diagnostic tools, and scientific validation.
- Nationwide Participation: Conducted across multiple institutions, including National Institute of Ayurveda, CCRH, and CRIYN.

- Inspiring Future Careers: Encourages students to pursue careers in scientific research and innovation.

National Green Hydrogen Mission

Context:

The Government of India has sanctioned five pilot projects for using hydrogen in buses and trucks under the National Green Hydrogen Mission.

- These projects will deploy 37 hydrogen-powered vehicles across 10 major routes, supported by 208 crore in funding.

About National Green Hydrogen Mission:

What is the Green Hydrogen Mission?

- A flagship initiative aimed at making India a global hub for green hydrogen production, usage, and export.
- Focuses on decarbonization, clean energy adoption, and reducing fossil fuel dependency.
- Launched In: 4th January 2023
- Ministry: Ministry of New and Renewable Energy (MNRE)
- Budget Outlay: 19,744 crore (2023-2030)



Aim of the Mission:

- Develop India as a global green hydrogen hub.
- Reduce carbon emissions and fossil fuel imports.
- Promote clean energy transition and self-reliance (Aatmanirbhar Bharat).
- Enable India's leadership in green hydrogen technology and markets.

Key Features of the Mission:

- Demand Creation: Government to mandate minimum green hydrogen consumption for key industries.
- SIGHT Programme: Financial incentives for electrolyser manufacturing and hydrogen production.
- Green Hydrogen Hubs: Development of two large-scale hubs for production and usage.
- Policy Support: Waiver of interstate transmission charges for renewable energy use in hydrogen production.
- Infrastructure Development: Support for pipelines, tankers, and storage facilities.
- Research & Development (SHIP): Public-private collaboration for hydrogen technology advancements.
- Skill Development: Industry-focused training programs in collaboration with MNRE.
- International Cooperation: Partnerships for hydrogen technology transfer and exports.

Hydrogen-Powered Truck Trials

Context:

Union Minister Pralhad Joshi flagged off India's first fleet of hydrogen-powered heavy-duty truck trials in New Delhi.

- The trials align with the National Green Hydrogen Mission (NGHM), reinforcing India's commitment to clean mobility and energy security.

About Hydrogen-Powered Trucks

Hydrogen-powered heavy-duty trucks use fuel cell technology, converting hydrogen into electricity to power vehicles. These trucks offer a zero-emission alternative to diesel-powered transportation.



Launched By

- Ministry of New and Renewable Energy (MNRE).
- Supported by Indian Oil Corporation Limited (IOCL).

Key Features

- Zero Emissions: No carbon emissions, reducing air pollution and dependency on fossil fuels.
- Long Range & Fast Refueling: Hydrogen-powered trucks offer a longer driving range and quicker refueling times compared to battery-electric vehicles.
- Operational Routes: Initially deployed on the Faridabad–Delhi NCR and Ahmedabad–Surat–Vadodara routes.
- Hydrogen Refueling Stations: IOCL is setting up hydrogen refueling infrastructure in Faridabad, Vadodara, Pune, and Balasore.
- Energy Security: Reduces India's oil import dependency, supporting clean energy transition.

Part of

- National Green Hydrogen Mission (NGHM).
- India's Hydrogen Mobility Initiative to promote sustainable transport.
- Government's Net-Zero Emission Goals for 2070.

Revised Livestock Health and Disease Control Programme (LHDCP)

Context:

The Union Cabinet approved the revision of the Livestock Health and Disease Control Programme (LHDCP) with an outlay of ₹ 3,880 crore for 2024–26 to enhance livestock disease control.

- A new component, Pashu Aushadhi, has been introduced to provide affordable generic veterinary medicines through PM-Kisan Samridhi Kendra and cooperatives.



About Revised Livestock Health and Disease Control Programme (LHDCP):

What is LHDCP?

- A centrally sponsored scheme aimed at improving livestock health through vaccination, disease control, and veterinary infrastructure enhancement.
- It ensures higher productivity, economic growth for farmers, and disease prevention in livestock.

Developed By: Department of Animal Husbandry & Dairying.

Aim:

- To prevent, control, and eradicate major livestock diseases through vaccination, surveillance, and veterinary services.
- To improve veterinary healthcare accessibility via Mobile Veterinary Units (MVUs).

Diseases Covered:

- Foot and Mouth Disease (FMD), Brucellosis, Peste des Petits Ruminants (PPR), Classical Swine Fever (CSF), Lumpy Skin Disease (LSD), Anthrax, Rabies, and other livestock diseases.

Key Features:

- National Animal Disease Control Programme (NADCP): Focuses on FMD and Brucellosis eradication through mass vaccination.
- Critical Animal Disease Control Programme (CADCP): Targets PPR and CSF through 100% vaccination coverage.
- Mobile Veterinary Units (MVUs): Doorstep veterinary care through customized vehicles with diagnostic and treatment facilities.

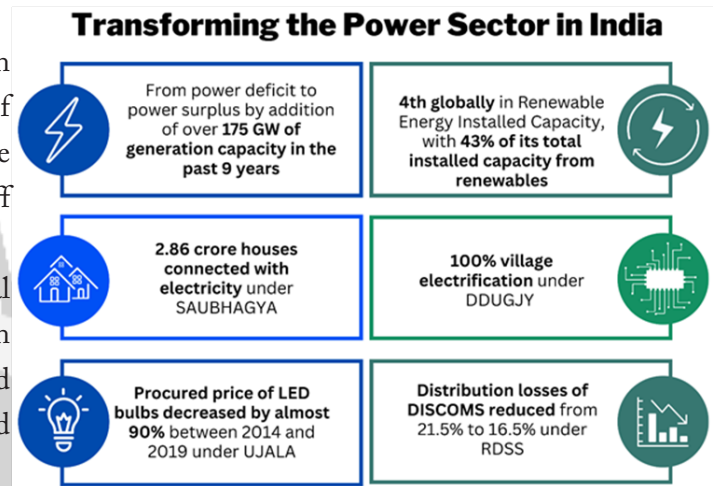
- Pashu Aushadhi Initiative: 75 crore allocated for providing affordable generic veterinary medicines.
- Strengthening Veterinary Infrastructure: Upgrading veterinary hospitals, dispensaries, and diagnostic labs.
- Surveillance & Disease Reporting: Strengthening real-time disease monitoring via the Information Network for Animal Productivity and Health (INAPH).
- Public Awareness & Capacity Building: Training farmers and veterinarians on disease prevention and biosecurity measures.
- Central-State Fund Sharing: 60:40 for states, 90:10 for Northeast & Himalayan states, 100% for UTs.

5th Edition of Lineman Diwas Celebrated

Context:

The Central Electricity Authority (CEA), in collaboration with Tata Power-DDL, celebrated the 5th edition of Lineman Diwas on March 4, 2025, to recognize the contributions of linemen and ground maintenance staff in India's power sector.

- Lineman Diwas was first organized by Central Electricity Authority (CEA) in collaboration with Tata Power-DDL in March, 2021, and subsequent editions were held in 2022, 2023 and 2024.
- Theme: 'Seva, Suraksha, Swabhiman'



About Central Electricity Authority (CEA):

The Central Electricity Authority (CEA) is a statutory body responsible for power sector planning, development, and regulation in India. It advises the government on electricity policy and technical standards.

- It was established under the Electricity (Supply) Act, 1948 and was later reconstituted under the Electricity Act, 2003.

Nodal Ministry–Operates under the Ministry of Power, Government of India.

Headquarters– New Delhi, India.

Structure & Composition

- Chairperson: Heads the authority and oversees policy implementation and technical regulations.
- Members: Comprises technical and regulatory experts from different domains of the power sector.

Divisions:

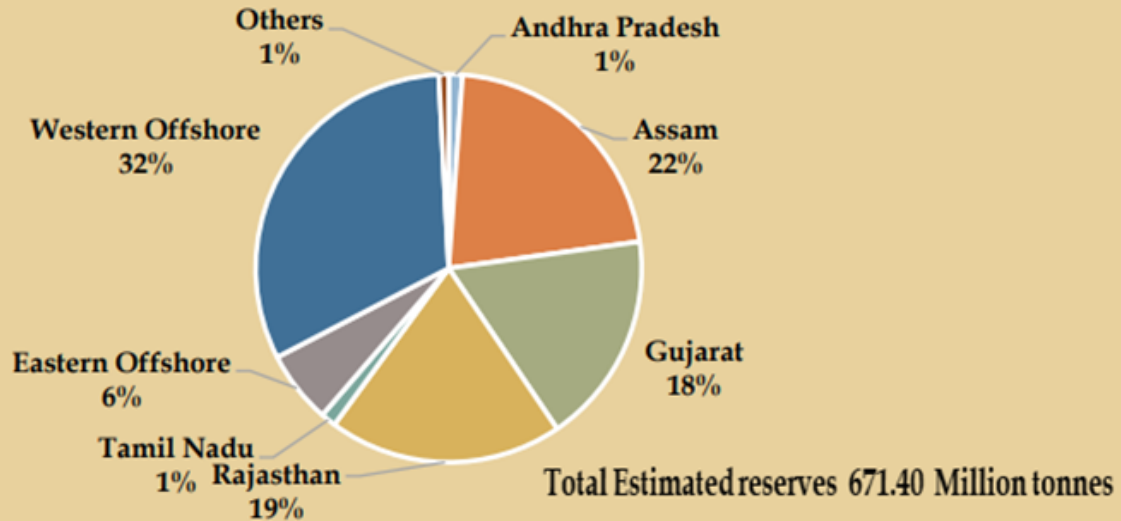
- Power Planning & Monitoring Division: Oversees power sector development.
- Grid Operations & Transmission Division: Manages grid stability and interconnectivity.
- Distribution & Regulatory Affairs: Ensures efficient electricity distribution and policy compliance.
- Safety & Training Division: Focuses on workforce training, safety protocols, and best practices.

Energy Statistics India 2025

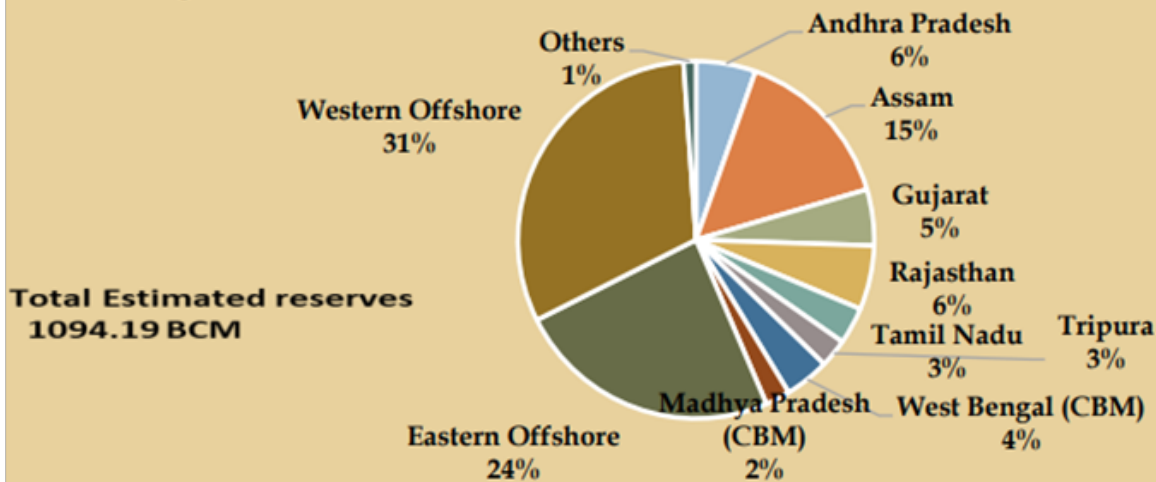
Context:

The National Statistics Office (NSO) released the Energy Statistics India 2025, detailing energy production, consumption, and import trends for FY 2023–24.

- The data shows India's strong energy recovery post-COVID and reflects efforts toward Viksit Bharat 2047 vision.

Fig 1.3: Estimated Reserves of Crude Oil in India as on 01.04.2024**Summary of Energy Statistics India 2025:**

1. Primary Energy Supply rose by 7.8%, reaching 9,03,158 KToE, showcasing resilience and recovery.
2. Coal remains dominant, with 79% of total domestic energy supplied and 60.21% share in TPES.
3. Renewable energy potential reached 21,09,655 MW, with wind and solar leading.
4. Electricity from renewables rose from 2,05,608 GWh (2014-15) to 3,70,320 GWh (2023-24) at a 6.76% CAGR.
5. Per capita energy consumption increased to 18,410 MJ/person, a 25% rise in 10 years.

Fig 1.4 : Estimated Reserves of Natural Gas in India as on 01.04.2024**Positives in the Report:**

- Renewables expanding fast: Installed capacity rose from 81,593 MW in 2015 to 1,98,213 MW in 2024, CAGR of 10.36%.
E.g., Rajasthan, Gujarat, Maharashtra lead in wind and solar installations.
- Industry-led growth: Final energy use by industry rose by 13.2%, driving economic productivity.
E.g., From 2.4 lakh KToE (2014-15) to 3.1 lakh KToE (2023-24).
- Reduced T&D losses: Losses fell from 23% (2014-15) to 17% (2023-24), improving efficiency.
- Renewables outperform fossil fuels in pace: Non-hydro renewables grew by over 210% in 10 years.
- Improved energy intensity: Energy required per INR of GDP dropped to 0.2180 MJ/INR, showing decoupling of energy from growth.

Negatives in the Report:

- High coal dependency: Coal still contributes 79% of energy supply and 60% of TPES.
E.g, Non-coking coal alone accounts for 93.3% of coal production.
- Heavy import reliance: India imports 89% crude oil, 46.6% natural gas, and 25.86% coal.
- Per capita electricity uses still low: At 1,106 kWh/person, India trails global average (~3,000 kWh).
- Slow renewable share in actual generation: Despite capacity growth, renewables still not mainstream in total energy mix.
- Urban-rural divide: Rural consumption and accessibility lag behind urban industrial and residential demand.

Way Ahead:

- Diversify energy mix: Reduce coal dependence by accelerating green hydrogen, offshore wind, and battery storage.
- Localised energy models: Promote decentralised solar, especially in rural/agricultural sectors.
- Improve grid infrastructure: Invest in smart grids and regional interconnectivity to reduce losses.
- Boost domestic production: Enhance exploration of oil & gas reserves in Assam, Rajasthan, and offshore zones.
- Align with SDG & Net Zero: Use SEEA framework and energy indicators to guide climate-compatible development.

Conclusion:

The Energy Statistics India 2025 reflects India's robust progress toward energy security, renewable transition, and higher efficiency. However, challenges remain in balancing growth with sustainability. A coherent long-term energy policy, rooted in equity and innovation, is essential for India's Viksit Bharat 2047 ambition.

Technical Textiles in India

Context:

India is strengthening its position as a global leader in technical textiles through strategic initiatives like the National Technical Textiles Mission (NTTM) and state-level investments, aiming to unlock innovation, exports, and employment.

Data/Stats on Technical Textiles in India:

- Global Ranking: India is the 6th largest textile exporter with a 3.9% share in global textile trade.
E.g.: Exports include automotive, healthcare, and industrial textiles.
- Contribution to GDP: The textile sector contributes ~2% of India's GDP, with technical textiles gaining increasing weight.
- Sectoral Growth Target: The Indian textile market is projected to reach USD 350 billion by 2030, generating 3.5 crore jobs.
- Government Funding: The NTTM was allocated 1,480 crore from 2020–26; 517 crore released, and 393.39 crore utilized till now.
- R&D Push: 168 R&D projects worth 509 crore approved under NTTM to develop new materials and market applications.

Potential of Technical Textiles in Indian Economy:

- Diverse Industrial Application: Used in automotive, construction, defence, agriculture, and healthcare sectors for enhanced functionality.
E.g.: Use of geotextiles in roads, and agro-textiles for better yield.
- Employment Generator: Expected to train and employ over 50,000 professionals in niche textile applications.
- Export Booster: Dedicated export promotion council to tap new markets and meet global demand.
- Startup Innovation: Schemes like GREAT support early-stage innovations with up to 50 lakh funding.
E.g.: Mahina, India's first bonded period underwear, launched by Eicher Goodearth.
- Support for Make in India: Strong thrust on local innovation and manufacturing, aligned with Aatmanirbhar Bharat.

Initiatives to Promote Technical Textiles

1. **National Technical Textiles Mission (NTTM)**: Structured across four pillars—R&D, market expansion, exports, and skills.
2. **GREAT Scheme (2023)**: Provides funding for startups and research institutes to commercialize prototypes.
3. **GIST 2.0**: Industry-academia internships that promote hands-on learning and innovation in textiles.
4. **Skill Development Drive**: Collaboration with institutes like SITRA, NITRA, SASMIRA to train workforce in 12 niche textile areas.
5. **Technotex 2024**: A major expo under Bharat Tex showcasing 71 innovation projects and global partnerships.

Challenges to Technical Textiles:

- Limited Awareness: End-users, especially in MSMEs, lack knowledge of technical textiles' utility and scope.
- Skilled Workforce Gap: Shortage of trained professionals in advanced textile technologies and applications.
- High R&D Costs: Research in advanced fibres and coatings is capital intensive, limiting startup participation.
- Import Dependency: Several raw materials and machinery still need to be imported, raising production costs.
- Market Penetration Issues: Domestic market acceptance is still slow due to conservative procurement practices.

Way Ahead:

- Incentivize Domestic Manufacturing: Expand capital subsidies and tax reliefs to attract investments. E.g.: Tamil Nadu increased spinning modernization subsidy from 2% to 6%.
- Boost Exports via FTAs: Leverage free trade agreements to reduce entry barriers for Indian tech-textile products.
- Public Procurement Mandates: Mandate use of technical textiles in government infrastructure and health projects.
- Global Collaborations: Partner with international firms for tech transfer, certifications, and co-development.
- Awareness Drives: Conduct nationwide awareness campaigns targeting industries and consumers.

Conclusion:

India's rise in the technical textiles sector reflects a shift from traditional to functional fabrics, aligning with modern industrial needs. Through policy backing, R&D, and startup encouragement, the nation is on track to emerge as a global hub for technical textiles. With continued focus, this sector can become a cornerstone of India's economic and export strategy.

BioSaarthi Mentorship Initiative

Context:

Union Minister unveiled the BioSaarthi Mentorship Initiative at the 13th Foundation Day of BIRAC, highlighting India's rapid rise in the global bioeconomy.

About BioSaarthi Mentorship Initiative:

What is BioSaarthi?

- A structured global mentorship program aimed at nurturing India's emerging biotech startups through expert guidance and capacity building.
- Ministry Involved: Ministry of Science and Technology, Government of India.
- Implementing Agency: Biotechnology Industry Research Assistance Council (BIRAC) under the



Department of Biotechnology (DBT).

Objective:

- To strengthen India's biotechnology ecosystem by supporting startups, fostering innovation, and promoting global competitiveness through mentorship.

Key Features

- Six-Month Cohort Model:** Structured sessions for selected startups with dedicated mentor-mentee engagements.
- Global Mentor Pool:** Involvement of overseas experts, especially from the Indian diaspora, volunteering to support India's innovation ecosystem.
- Startup-Centric Approach:** Personalized mentoring to address entrepreneurial challenges in biotech, including R&D, scaling, regulation, and funding.
- Innovation Ecosystem Linkage:** Promotes collaboration between industry, academia, and government institutions.
- Nationwide Outreach:** Complements initiatives like BioE3 (Biotech for Economy, Employment, Environment) for inclusive sectoral growth.

BAANKNET portal

Context:

The government launched the revamped BAANKNET portal and e-BKray platform to enhance transparency, efficiency, and value realization in PSU bank e-auctions of non-performing assets.

About BAANKNET Portal:

What it is:

- An advanced, integrated e-auction portal for Public Sector Banks and financial institutions to auction properties for recovery of NPA loans.
- Ministry:** Launched under the Ministry of Finance, Department of Financial Services.

Aim:

- To ensure transparent, efficient, and secure e-auctions.
- To enhance stakeholder trust and maximize value realization from asset sales.

Key Features:

- Cutting-edge Platform:** Advanced property listing and e-auction system for easy, secure NPA recovery.
- Automated KYC & Secure Payments:** Built-in KYC tools with reliable payment gateways for safe transactions.
- All-India Property Listings:** Comprehensive database for smooth property search and sale across the country.
- Smart Auctions:** Intelligent bidding with real-time updates to ensure fair pricing.
- Transparency:** Bank-verified property titles to build confidence in buyers.
- Widespread Adoption:** Used by all 12 PSBs and Insolvency and Bankruptcy Board of India (IBBI).



About e-BKray Platform:

- What it is:** A digital auction platform for disposing of assets under recovery proceedings by PSU banks.

Aim:

- To standardize and simplify e-auction processes across public sector banks.
- To ensure competitive bidding and higher asset value realization.

- Developed by: Launched by the Department of Financial Services on 28th February 2019.

Functions:

- Centralized e-auction of bank properties under recovery proceedings.
- Reduces administrative burden by standardizing property auction procedures.
- Real-time auction tracking and transparent bidding processes.
- Helps banks recover NPA assets efficiently and quickly.



Chapter- 8

INTERNATIONAL RELATION

India's growing role as a unifier in The Indian Ocean Region (IOR)

Context:

India's growing role as a unifier in the Indian Ocean Region (IOR) has gained attention, with recent initiatives like the Indian Ocean Conference (IOC) and SAGAR doctrine highlighting its efforts to foster regional cooperation and maritime security.



About India's growing role as a unifier in The Indian Ocean Region (IOR):

Importance of IOR to India:

- **Strategic Maritime Security:** The Indian Ocean serves as a buffer against threats and a pathway for projecting naval power.
- **Economic Lifeline:** 80% of India's external trade and 90% of energy imports transit through the IOR.
- **Energy Security:** Securing sea lanes of communication (SLOCs) is critical for India's energy needs.
- **Geopolitical Influence:** The IOR is a platform for India to counter China's "String of Pearls" strategy.
- **Environmental and Disaster Management:** The IOR is vital for climate stability and disaster response.

Measures Taken by India in IOR:

- **Maritime Diplomacy:** India conducts 17 multilateral and 20 bilateral naval exercises annually.
- **Infrastructure Development:** The Sagarmala Programme aims to modernize ports and enhance connectivity.
- **Maritime Domain Awareness (MDA):** The Information Fusion Centre – Indian Ocean Region (IFC-IOR) enhances real-time surveillance.
- **Humanitarian Assistance and Disaster Relief (HADR):** India acts as a "first responder" in regional crises.

- Blue Economy Initiatives: India's Deep Ocean Mission explores polymetallic nodules in the Central Indian Ocean Basin.

Challenges to India in Acting as a Unifier in IOR:

- Growing Chinese Influence: China's "String of Pearls" strategy and military base in Djibouti challenge India's dominance.
Example: Chinese investments in Hambantota (Sri Lanka) and Gwadar (Pakistan) encircle India.
- Maritime Security Threats: Piracy, terrorism, and illegal fishing persist in the IOR.
Example: The 2023 attack on MV Chem Pluto highlighted evolving maritime terrorism.
- Geopolitical Tensions: Strained relations with neighbors like Maldives and Sri Lanka hinder regional cooperation.
Example: The Maldives' "India-Out" campaign reflects fragile bilateral ties.
- Climate Change and Environmental Degradation: Rising sea levels and cyclones threaten coastal security and economies.
Example: Cyclone Remal in May 2024 strained India's disaster response capabilities.
- Non-Traditional Security Threats: Cyberattacks and drug trafficking pose new challenges.
Example: A ransomware attack on Jawaharlal Nehru Port Trust in 2017 exposed vulnerabilities.

Way Ahead and Role of India as a Unifier in IOR

- Enhance Naval Capabilities: Accelerate the production of indigenous aircraft carriers and submarines.
Example: INS Vikrant's success should be replicated for a stronger naval presence.
- Expand Strategic Partnerships: Strengthen ties with IOR littoral states and major powers like the US and France.
Example: The India-France-UAE trilateral initiative fosters regional cooperation.
- Boost Maritime Infrastructure: Fast-track projects like the Great Nicobar transshipment hub.
Example: The Sittwe Port in Myanmar enhances connectivity under the Kaladan project.
- Promote Blue Economy: Focus on sustainable resource exploitation and marine tourism.
Example: India's Deep Ocean Mission explores polymetallic nodules for economic gains.
- Strengthen Disaster Response: Develop forward operating bases and enhance NDRF capabilities.
Example: INS Jalashwa's aid delivery to Madagascar showcases India's HADR leadership.

Conclusion:

India's role as a unifier in the IOR is crucial for regional stability and security. By addressing challenges and leveraging its strengths, India can emerge as a net security provider and a leader in maritime diplomacy. A cohesive strategy and enhanced partnerships will ensure India's dominance in the Indian Ocean Region.

India-New Zealand Relations

Context:

Prime Minister of New Zealand, Christopher Luxon, visited India from 16–20 March 2025. Both nations agreed to strengthen bilateral cooperation across trade, defence, technology, and multilateral engagement.

About India–New Zealand Bilateral Relations:

Historical Overview

- Early connections: Relations date back to the 1800s, with Indian immigrants settling in New Zealand, particularly in Christchurch by 1850.
- Wartime cooperation: Indian troops fought alongside ANZAC forces in Gallipoli in 1915.
- Diplomatic ties: India established a trade commission in New Zealand in 1950, later upgraded to a High Commission.
- Common platforms: Both countries are members of the Commonwealth and share democratic values and parliamentary governance.
- Global commitment: Both support global peace, disarmament, ecological preservation, and combat international terrorism.

Significance of India–New Zealand Bilateral Relationship:

- Economic potential: India is New Zealand's 11th largest trading partner; bilateral trade valued at USD 1.80 billion (2020).
- Strategic alignment: Shared interest in maintaining a stable Indo-Pacific and freedom of navigation under UNCLOS.
- Diaspora connection: Approximately 2,50,000 persons of Indian origin live in New Zealand, strengthening people-to-people ties.
- Tourism growth: 67,953 Indian visitors to NZ (2018); direct flight operations between both nations encouraged.
- Climate and disaster cooperation: New Zealand supports India in the International Solar Alliance (ISA) and has joined the Coalition for Disaster Resilient Infrastructure (CDRI).

Challenges in India–New Zealand Relations:

- Trade imbalances: India primarily imports logs and wood pulp; balanced trade requires diversification and value addition.
- FTA delays: Previous attempts for an FTA have seen slow progress despite potential benefits.
- Limited defence depth: Although engagements are growing, full-spectrum military cooperation remains limited compared to other Quad members.
- Visa and mobility issues: Indian students and skilled workers face procedural hurdles; irregular migration concerns noted.
- Underutilised cultural diplomacy: Despite strong diaspora ties, Indian cultural promotion in New Zealand could be more dynamic.

Way Ahead:

- Accelerate FTA conclusion: Conclude comprehensive and mutually beneficial FTA negotiations promptly.
- Boost defence engagements: Conduct regular bilateral military exercises and staff exchanges.
- Enhance educational ties: Promote Indian students' mobility with robust scholarship schemes and simplified visa processes.
- Strengthen climate partnership: Joint research in green tech, horticulture, and disaster mitigation must be scaled up.
- Expand maritime collaboration: Leverage IPOI membership and bilateral naval dialogues for Indo-Pacific maritime security.

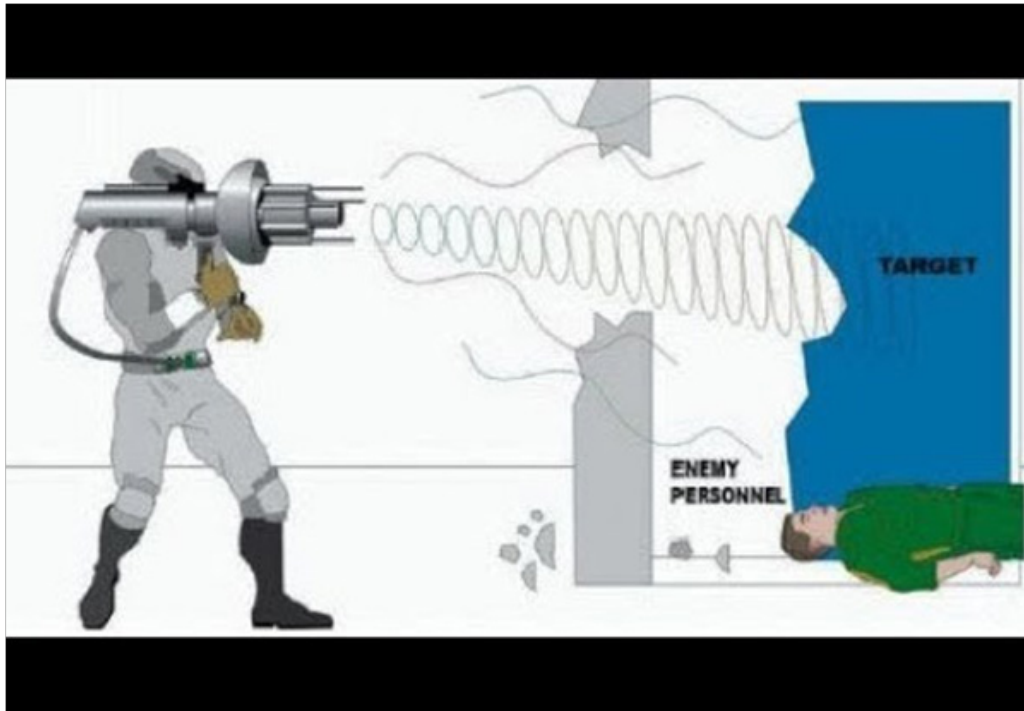
Conclusion:

India and New Zealand relations are rooted in shared democratic values, trade, and strategic alignment in the Indo-Pacific. The recent meeting marks a renewed commitment to expand cooperation in defence, trade, climate, and education. With proactive engagement and addressing key challenges, this partnership can become a model in the Indo-Pacific landscape.

Sonic Weapons

Context:

Serbia's government has been accused of using illegal sonic weapons against protesters in Belgrade.



About Sonic Weapons:

What are Sonic Weapons?

- Devices that emit extremely loud sounds over long distances to disperse crowds or disorient individuals.
- They can deliver either audible or inaudible frequencies, causing pain or discomfort.

How Do Sonic Weapons Work?

- Use of Transducers: Hundreds of electronic transducers convert energy to produce focused sound beams.
- Controlled Output: Authorities can adjust frequency, volume, and direction to target specific areas.
- Directional Sound Beam: A narrow beam ensures targeted impact without spreading in all directions.

Different Types of Sonic Weapons:

Long-Range Acoustic Device (LRAD):

- Emits sound up to 160 dB with an 8,900-meter range.
- Used for crowd control and voice communication in military and police operations.

Mosquito Device:

- Produces high-frequency sounds audible only to youth below 30 years.
- Deployed to deter gatherings of teenagers in public spaces.

Infrasonic Weapon:

- Emits very low-frequency, inaudible sound waves.
- Causes disorientation and discomfort; still experimental and not fully weaponized.

Applications of Sonic Weapons

- Crowd Control: Used by law enforcement to disperse large protests.
- Military Use: Deployed for security alerts and communication over long distances.
- Property Protection: Mosquito devices prevent loitering around sensitive locations.

Harmfulness on Health:

- Hearing Damage: Prolonged exposure above 120 dB can cause permanent hearing loss.
- Tinnitus: Continuous loud sound causes ringing in the ears that can last for hours or days.
- Physical Symptoms: Includes headaches, nausea, sweating, vertigo, and disorientation.
- Severe Injury: In extreme cases, may lead to vomiting and bleeding from the ears.
- Indiscriminate Effect: Can harm not just protesters but also bystanders and enforcement personnel.

9

DISASTER MANAGEMENT

Avalanche**Context:**

A massive avalanche struck a BRO project site near Mana village in Chamoli district, Uttarakhand, trapping 22 workers under ice, with ongoing rescue operations by the Indian Army and ITBP.

About Avalanche:**What is an Avalanche?**

- A sudden and rapid descent of snow, ice, and debris down a mountain slope, triggered by natural or human-induced factors.
- Can cause widespread destruction by burying people, structures, and transport routes under tons of snow.

Types of Avalanches:**1. Loose Snow Avalanche:**

- Forms when loosely bonded snow starts sliding from a single point.
- Common in steep slopes ($>40^\circ$) with fresh snowfall.

2. Slab Avalanche:

- Occurs when a cohesive layer of snow breaks away as a single slab.
- Responsible for most fatalities, reaching speeds of 100 km/h.

3. Gliding Avalanche:

- Involves entire snowpack sliding over a smooth surface (grass, rock).
- Occurs at slopes $>15^\circ$ and leads to large-scale destruction.

4. Powder Avalanche:

- High-speed avalanches suspending snow particles in air, creating a powder cloud.
- Can reach speeds of 300 km/h, causing severe shockwave impact.

5. Wet Snow Avalanche

- Triggered by melting snow due to temperature rise or rain.
- Slower but more destructive due to its high density and force.

Causes of Avalanches**1. Natural Causes:**

- Heavy Snowfall & Wind Direction: Unstable snowpack due to uneven accumulation.
- Steep Slopes: Avalanches commonly occur at 30° - 45° inclinations.
- Temperature Fluctuations: Melting snow weakens internal layers, increasing instability.
- Earthquakes & Vibrations: Trigger snow movement on unstable slopes.

2. Human-Induced Causes:

- Winter Sports & Tourism: Skiing, snowmobiling, and trekking destabilize snow layers.
- Construction & Deforestation: Removal of trees weakens slope stability.
- Military Operations: High-altitude warfare and detonations can trigger slides.

Consequences & Impact of Avalanches:

- Loss of Life & Injuries: Avalanches cause suffocation, hypothermia, and fatal trauma, with survival chances dropping significantly after 15 minutes of burial.

- **Destruction of Infrastructure:** Snow slides block roads, railways, and highways, cutting off access and burying homes, BRO camps, and tourist shelters under heavy snow.
- **Disruptions in Communication & Utilities:** Avalanches damage power lines, water supply, and communication networks, delaying rescue operations and emergency responses.
- **Environmental Hazards:** Melting avalanche snow can trigger landslides and flash floods, leading to severe ecological damage and displacement of local communities.
- **Economic Impact:** Avalanches cripple winter tourism, disrupt livelihoods, and result in economic losses, requiring huge recovery costs for damaged infrastructure and services.

Precautionary & Control Strategies:

1. **Avalanche Early Warning Systems:**

- **IMD Avalanche Forecasting:** Tracks snowfall, slope stability, and temperature fluctuations.
- **Remote Sensing & AI-Based Prediction Models:** Used for real-time avalanche detection.

2. **Structural Protection Measures:**

- **Snow Barriers & Fences:** Installed on avalanche-prone slopes to prevent snow buildup.
- **Deflecting Structures:** Direct the avalanche path away from inhabited zones.

3. **Artificial Avalanche Triggers:**

- **Controlled Explosions:** Initiates small avalanches to prevent larger, unmanageable ones.

4. **Zoning & Land Use Planning**

- **Avoidance of Construction in Avalanche-Prone Areas.**
- **Ski Resorts & Highways Must Follow Risk Assessment Reports.**

Way Ahead:

1. **Enhancing Real-Time Avalanche Forecasting:** Strengthening satellite-based avalanche monitoring systems for early warnings.
2. **Improving Infrastructure Resilience:** Constructing avalanche protection tunnels and snow-retention fences along highways.
3. **Stronger Coordination Between Agencies:** Integrating IMD, BRO, NDMA, and ITBP efforts for better disaster response.
4. **Community Training & Awareness Programs:** Educating local residents, trekkers, and military personnel on avalanche survival skills.
5. **Encouraging Climate-Resilient Development:** Limiting deforestation and unplanned construction in high-risk zones.

Conclusion:

Avalanches pose a significant threat in India's Himalayan region, impacting human lives, infrastructure, and economic activities. Advanced forecasting, structural protection, and rescue preparedness are critical for minimizing avalanche disasters. Strengthening inter-agency collaboration and public awareness will further enhance India's avalanche resilience.

Heatwave

Context:

The India Meteorological Department (IMD) has forecast 10–12 heatwave days in northwest India this summer, nearly double the usual average of 5–6 days.

- A recent study found that many Indian cities lack long-term strategies in their Heat Action Plans (HAPs) to address rising heat stress.

About Heatwaves:

- **Temperature Threshold:** Heatwaves occur when temperatures cross 40°C in plains or 30°C in hills, persisting for ≥2 days.

- **Geographic Hotspots:** Northwest India (Rajasthan, Delhi) faces highest frequency due to arid climate and urbanization.
- **Humidity Impact:** Coastal areas face “wet bulb” threats where high humidity makes 35°C feel like 50°C.
- **Climate Change Link:** Rising global temperatures and El Niño events intensify heatwave frequency/duration.
- **Urban Heat Islands:** Concrete-dominated cities are 4-5°C hotter than rural areas due to heat absorption.

Effects of Heatwaves:

On People:

- **Heatstroke & Dehydration:** Can cause fainting, organ failure, and even death.
E.g. 733 heatstroke deaths were reported across 17 states in 2024 (HeatWatch).
- **Mental Health Stress:** Sleep disturbances and heat anxiety increase during extreme heat spells.
- **Reduced Work Productivity:** Affects daily wage workers, especially in agriculture and construction.

On Ecology:

- **Water Stress:** Increased evaporation leads to dry rivers and lakes.
- **Forest Fires:** Drought-like conditions promote the spread of wildfires, especially in central India.
- **Crop Failure:** Heatwaves during flowering stages harm wheat, pulses, and vegetables.

On Wildlife:

- **Mass Bird Deaths:** Birds die due to dehydration and heat stress (e.g., 100+ birds died in Gujarat, 2023).
- **Aquatic Mortality:** Fish kills occur due to oxygen depletion in warm water bodies.
- **Human-Wildlife Conflict:** Animals enter cities in search of shade and water.

Loopholes and Challenges:

- **Lack of Long-Term Strategies:** Most HAPs focus on emergency response, not resilience building.
E.g. The SFC study found no long-term cooling or insurance initiatives in 9 major cities.
- **Poor Implementation:** Even well-drafted plans fail in execution due to poor inter-agency coordination.
- **Urban Planning Gaps:** Lack of green spaces, poor building design, and inadequate ventilation.
- **Insufficient Data Tracking:** Underreporting of heat-related deaths distorts real impact (e.g., 2024 NDMA vs HeatWatch gap).
- **Limited Budget Allocation:** No dedicated funding lines for HAPs in many municipalities.

Way Forward:

- **Integrate HAPs into Master Plans:** Make heat resilience part of city development frameworks.
- **Expand Green Infrastructure:** Promote urban forests, reflective rooftops, and water conservation systems.
- **Strengthen Data Systems:** Create a unified national database for heatwave mortality and hospitalizations.
- **Community Awareness Programs:** Launch heat literacy drives and targeted awareness campaigns.
- **Climate-Smart Infrastructure:** Retrofit buildings with passive cooling, improve electricity access and backup systems.

Conclusion:

The rise in heatwave frequency is a stark warning of the climate crisis unfolding in India. Without robust long-term planning, vulnerable populations will bear the brunt of this avoidable public health emergency. A proactive, inclusive, and science-based approach is the only sustainable solution.

Chapter- 10

INTERNAL SECURITY

Quantum Technology in Defence

Context:

Niti Aayog has released a strategic paper on the rapid evolution of quantum computing and its implications on national security in New Delhi.

What is Quantum Computing?

- Quantum computing leverages quantum bits (qubits), which exist in multiple states simultaneously due to superposition and entanglement.
- Unlike classical computers that process bits as 0 or 1, quantum computers perform parallel computations, exponentially increasing processing power.



Recent Advancements & Breakthroughs:

- Longer Qubit Coherence:** Innovations by Atom Computing and ColdQuanta have improved qubit stability, allowing longer computations.
- High-Fidelity Qubit Control:** IBM and Quantinuum are enhancing qubit accuracy, reducing errors.
- Error Correction Progress:** Google's Willow chip introduced a self-correcting quantum system, accelerating fault-tolerant quantum computing.
- Topological Qubits:** Microsoft's Majorana-1 improves stability, reducing the need for complex error correction.
- Diverse Qubit Modalities:** Superconducting circuits, trapped ions, photonic qubits, and neutral atoms create a multi-approach ecosystem.

India's Quantum Journey:

- Early Developments:** India has a strong theoretical foundation in quantum physics but lags in commercial applications.
- National Quantum Mission (2023):** 6,003 crore allocated to boost quantum computing, communication, cryptography, and workforce development.
- Quantum Startups:** Indian startups like QpiAI, BosonQ Psi, and TCS Quantum Computing Lab are driving innovation.
- Public-Private Collaboration:** Partnerships between academia, industry, and government to enhance quantum capabilities.
- International Engagements:** India collaborates with US, Europe, and Japan on quantum research.

Role of Quantum Technology in Defense:

- Cybersecurity & Cryptography:** Quantum computing can break current encryption standards, making Post-Quantum Cryptography (PQC) essential.
- Intelligence & Surveillance:** Enables advanced signals intelligence (SIGINT) by processing vast amounts of data in real-time.

- **Military Hardware:** Quantum materials enhance stealth detection, autonomous weapons, and precision navigation.
- **Defense Logistics Optimization:** Quantum AI improves battlefield resource allocation and strategic planning.
- **Economic Warfare Protection:** Secures financial markets, critical infrastructure, and government data.

Challenges in Quantum Computing:

- **High Error Rates:** Quantum computations are susceptible to noise, requiring complex error correction.
- **Hardware Scalability:** Developing large-scale fault-tolerant qubit systems remains a challenge.
- **High Cost & Infrastructure Needs:** Requires cryogenic cooling, precision control, and extensive research funding.
- **Cybersecurity Risks:** Nations must transition to quantum-safe encryption before quantum decryption capabilities emerge.
- **Geopolitical Competition:** The US, China, and Europe are investing heavily, leading to export restrictions and technology protectionism.

Way Ahead for India:

- **Strengthen National Quantum Mission:** Increase funding, foster indigenous R&D, and enhance public-private partnerships.
- **Invest in Quantum Cryptography:** Accelerate Post-Quantum Cryptography (PQC) adoption across critical infrastructure.
- **Develop Quantum Workforce:** Expand quantum education and training programs to build skilled talent.
- **Boost Indigenous Quantum Hardware:** Support domestic quantum chip fabrication and supply chain.
- **International Collaboration:** Engage in technology-sharing agreements to stay competitive in the quantum race.

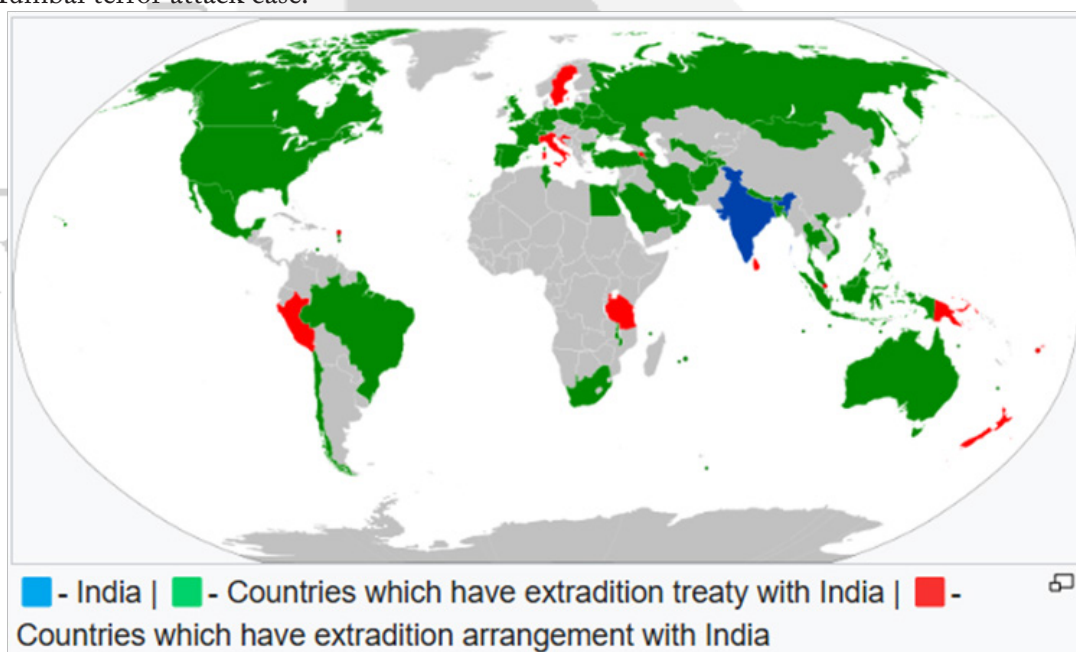
Conclusion:

Quantum computing is no longer a futuristic concept—it is a strategic necessity. With breakthroughs in qubit stability, error correction, and quantum AI, nations are racing to secure technological supremacy. India's National Quantum Mission must ensure self-reliance in quantum technologies to safeguard national security, defense, and economic stability.

Extradition Treaty

Context:

The US Supreme Court rejected Tahawwur Rana's plea against extradition to India, clearing the way for his trial in the 26/11 Mumbai terror attack case.



- India has been pursuing Rana's extradition since 2011, but delays in the US legal system prolonged the process.

About Extradition Treaty:

- An extradition treaty is a formal agreement between two countries to transfer individuals accused or convicted of serious crimes.
- It ensures that fugitives cannot evade justice by crossing international borders.

Countries with Which India Has an Extradition Treaty

- India has extradition treaties with 48 countries, including:
- United States, United Kingdom, Canada, Australia, UAE, France, Germany, Russia, and South Korea.
- India also has extradition arrangements with 12 additional countries, allowing case-specific extradition.

Challenges in Extradition:

- Legal hurdles in foreign courts delaying the process.
- Political and diplomatic considerations influencing decisions.
- Human rights concerns, such as the risk of torture or unfair trials.

The Extradition Act, 1962:

- The Extradition Act, 1962, governs extradition procedures in India.
- It defines how fugitives can be extradited from India and how India can request extradition from other countries.

Key Provisions of the Act

- Applicability: Covers both treaty-based and non-treaty extradition cases.
- Dual Criminality Principle: The offense must be a crime in both India and the requesting country.
- Extradition Offenses: Covers terrorism, organized crime, drug trafficking, and financial fraud.
- Bar on Political Offenses: Individuals cannot be extradited for political offenses.
- Rule of Specialty: The fugitive can only be tried for the crime they were extradited for.
- Human Rights Considerations: No extradition if there is a risk of torture or an unfair trial.

Nodal Authority for Extradition

- Ministry of External Affairs (MEA): Processes extradition requests from foreign governments.
- Central Bureau of Investigation (CBI): Handles extradition-related investigations.
- National Investigation Agency (NIA): Pursues cases related to terrorism and national security.

Implementation of the Act

- India initiates extradition through diplomatic channels after verifying legal requirements.
- The request is forwarded to the foreign country's legal system for approval.
- If approved, law enforcement agencies coordinate the fugitive's transfer to India.

KHANJAR-XII

Context:

The Indian Army contingent has departed for the 12th edition of the India-Kyrgyzstan Joint Special Forces Exercise KHANJAR-XII, scheduled from March 10–23, 2025, in Kyrgyzstan.



About KHANJAR-XII:

What is KHANJAR-XII?

- KHANJAR-XII is a bilateral military exercise between India and Kyrgyzstan, focusing on counter-terrorism and special forces training.
- Started in 2011, the exercise has since become an annual event, alternating between India and Kyrgyzstan.
- The Indian contingent is represented by troops from the Parachute Regiment (Special Forces) and the Kyrgyzstan contingent is represented by Kyrgyz Scorpion Brigade.

Objective of KHANJAR-XII

- Strengthen military cooperation between India and Kyrgyzstan.
- Enhance interoperability in counter-terrorism operations and special forces tactics.
- Develop advanced combat skills for mountain warfare, sniping, and close-quarter combat.
- Exchange best practices in urban intervention, hostage rescue, and complex building operations.
- Improve coordination in multinational security efforts against terrorism and extremism.

First Person View Kamikaze Anti-Tank Drone

Context:

The Indian Army has successfully developed and tested a First-Person View (FPV) kamikaze-role drone equipped with anti-tank munition.

About First Person View Kamikaze Anti-Tank Drone:

What is it?

- A low-cost, First-Person View (FPV) drone equipped with impact-based anti-tank munition developed for kamikaze-style tactical warfare.



Developed by:

- Indian Army's Fleur-De-Lis Brigade, in collaboration with DRDO's Terminal Ballistics Research Laboratory (TBRL), Chandigarh.
- Aim: To enhance India's capability in modern drone warfare through indigenous, cost-effective, and

precision-strike systems.

Features and Functions:

- **First-Person View Control:** Operated using FPV goggles that stream live visuals, providing real-time battlefield awareness and control.
- **Kamikaze Strike Role:** Acts as a single-use drone carrying impact-explosive payloads designed to destroy armoured targets like tanks.
- **In-House Fabrication:** Assembled at the Rising Star Drone Battle School, with over 100 units fabricated by March 2025 for training and trials.
- **Dual-Safety Mechanism:** Prevents accidental detonation; payload can only be activated via pilot's radio controller under controlled conditions.
- **Real-Time Feedback Relay:** Live status updates of payload visible through FPV interface for safe and accurate deployment.
- **Technical Optimization:** Focus on weight balance, flight stability, and manoeuvrability for effective tactical deployment.
- **Low-Cost Innovation:** Estimated cost of 1.4 lakh per drone, with 5 inducted and 95 more being procured.

Applications:

- **Anti-Tank Missions:** Effective against armoured targets in tactical zones
- **Urban Warfare:** Can fly through narrow spaces with precision control
- **High-Risk Terrain Operations:** Remote strike capability reduces soldier casualties.
- **Surveillance and Target Elimination:** Offers both eye-in-the-sky and direct kill capability.

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RAO'S ACADEMY

Chapter- 11

Kurukshetra April 2025

1-Union Budget 2025-26: Development Dimensions

Introduction

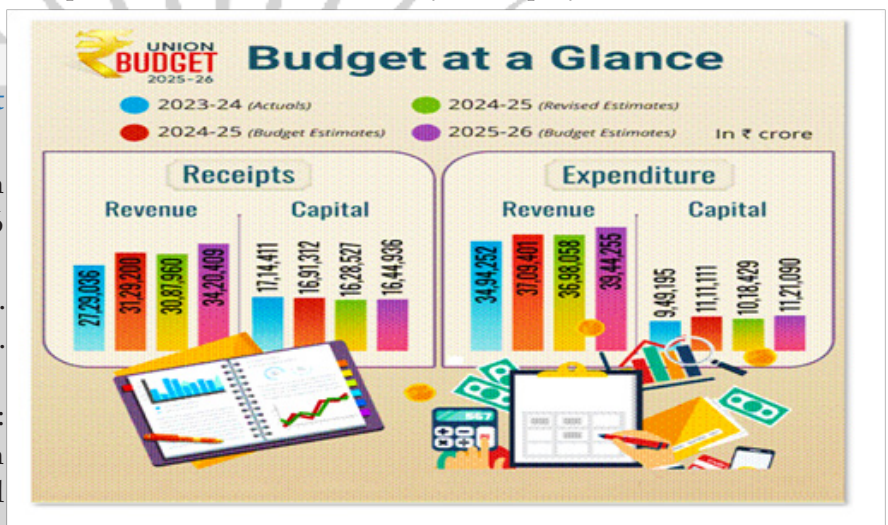
The Economic Survey 2024-25, tabled in Parliament, highlighted India's steady economic growth amid global manufacturing slowdowns. Citizens' expectations from the budget included income growth, employment, infrastructure development, and an enabling business environment.

- The Union Budget 2025-26 aligns with the Economic Survey 2024-25, emphasizing resilient growth amid global manufacturing slowdowns (Europe/Asia) and supply chain disruptions.
- It prioritizes rural development, agriculture, and inclusive growth to achieve Viksit Bharat by 2047, aiming for India to become a global economic powerhouse with sustainability and equity.

Key Budget Highlights

Higher Allocation & Development Push:

- Total expenditure: Rs. 50.65 lakh crore (2025-26 BE) vs. Rs. 47.16 lakh crore (2024-25 RE).
- Effective capital expenditure: Rs. 15.48 lakh crore (2025-26) vs. Rs. 10.18 lakh crore (2024-25 RE).
- Vision of 'Viksit Bharat 2047': Sustainable, inclusive growth through infrastructure, social welfare, and economic reforms.
- Rural Development Allocation: Rs. 1.87 lakh crore (5.75% from 2024-25).



Sectoral Allocations & Priorities:

- Skill Development & Entrepreneurship (35%) leads the priority list.
- Other increases: Rural Development (5.7%), MSME (4.7%), Agriculture & Farmers' Welfare (3.9%), Women & Child Development (3.1%).
- Rs. 3.83 lakh crore allocated for food & fertilizer subsidies, rural development, employment, and skill programs.

Key Sectoral Interventions

1. Agriculture & Farmers' Welfare

- PM Dhan-Dhaanya Krishi Yojana: Integrated agriculture development in 100 districts.
- Focus on crop diversification, sustainable farming, irrigation, post-harvest infrastructure, and farmer credit access.
- Reduction in Urea Subsidy, shift to nutrient-based subsidies to promote organic farming & soil health.
- PM Krishi Sinchai Yojana (PMKSY): Rs. 8,260 crore for improved irrigation & water conservation.

2. Food Processing & Rural Enterprises

- PM Formalization of Micro Food Processing Enterprises (PMFME) Scheme (4.8%) for technology upgrades, quality improvements, and market linkages.

3. Rural Employment & Livelihoods

- MGNREGA: Retained at Rs. 86,000 crore, with emphasis on better execution & asset creation.

- DAY-NRLM: Allocation increased by 26.3% (Rs. 19,005 crore) for women entrepreneurship & skill development.

Conclusion

Budget 2025-26 reflects India's commitment to rural development, agriculture, infrastructure, and human capital investment. Higher allocations aim to boost productivity, job creation, entrepreneurship, and sustainable economic growth, aligning with the long-term vision of 'Viksit Bharat 2047'.

2-Government Initiatives to Boost Rural Economy

The rural economy is crucial to India's employment and GDP. To boost inclusive growth and livelihoods, the government focuses on agriculture, MSMEs, fisheries, and self-reliance initiatives.

- Key measures include enhancing rural infrastructure, increasing consumption, and fiscal policies to strengthen economic activities.

Government's Fiscal Strategy for Economic Growth

The government aims to drive economic growth by enhancing revenue collection and public expenditure. A higher tax collection target enables increased public spending, which in turn stimulates demand in a consumption-driven economy like India.

Taxation and Revenue Targets

For FY 2025-26, the government has set an ambitious revenue collection target of Rs. 42.70 lakh crore, marking an 11% increase over the previous year. The breakdown is as follows:

- Direct Tax Collection Target: Rs. 25.20 lakh crore (from income tax and corporate tax).
- Indirect Tax Collection Target: Rs. 17.50 lakh crore (from GST, excise duty, and customs).

Higher tax revenues ensure greater fiscal space for public investment, allowing the government to allocate more funds towards rural development schemes, infrastructure, and welfare programs.

Economic Growth and Associated Challenges

Current Growth Projections

The National Statistical Office (NSO) and the Reserve Bank of India (RBI) project India's GDP growth rate as follows:

- 2024-25: 6.4% (NSO), 6.6% (RBI).
- 2025-26: 6.7% (RBI).

Despite positive growth trends, the economy has witnessed a slowdown in the last two quarters. This necessitates strong interventions in investment, consumption, and exports to sustain long-term growth.

Key concerns include:

- Declining rural demand, particularly in agriculture-dependent regions.
- Slow growth in MSME and informal sectors affecting employment generation.
- Supply chain bottlenecks, especially in logistics and storage.

To address these concerns, the government has rolled out several initiatives to increase farmers' income, promote agro-industries, and enhance financial access for rural entrepreneurs.

Budgetary Measures to Strengthen the Rural Economy

1. Increased Allocation for Agriculture and Allied Sectors

The government has allocated Rs. 2.66 lakh crore for agriculture and allied sectors, an increase of Rs. 1000 crore from the previous year. The aim is to enhance agricultural productivity, improve market linkages, and ensure fair prices for farmers.

Key initiatives include:

2. Expansion of Kisan Credit Card (KCC) Loans

- The KCC loan limit has been increased from Rs. 3 lakh to Rs. 5 lakh, benefiting 7.75 crore farmers across the country.
- This initiative provides farmers with easy access to credit at lower interest rates, helping them manage input costs, invest in better technology, and mitigate financial distress.

3. Pradhan Mantri Dhan-Dhaanya Krishi Yojana

- Focuses on 100 low-yield districts to improve productivity through:
- Financial assistance for better-quality seeds, fertilizers, and irrigation
- Enhanced storage and logistics support to prevent post-harvest losses.
- Market access improvements to ensure farmers get fair prices.
- This scheme aims to benefit 1.7 crore farmers and reduce regional agricultural disparities.

4. Cotton and Pulses Missions

5-year Cotton Technology Mission:

- Aims to improve cotton quality and yield.
- Focus on introducing high-yielding seed varieties and better irrigation techniques.

6-year Pulses Mission:

- Targets self-sufficiency in pulses like tur, urad, and masoor.
- Includes a 100% procurement guarantee through NAFED and NCCF, ensuring price stability for farmers.

5. Boosting the Fisheries Sector

Fisheries contribute significantly to India's economy, with India being the second-largest producer of aquaculture fish. The government is introducing:

- Special Economic Zones (SEZs) for fisheries to boost exports and employment.
- Subsidized credit and infrastructure development for fisherfolk.

These measures will enhance inland and marine fisheries, increasing rural employment opportunities.

6. Promoting MSMEs and Ease of Doing Business

MSMEs are crucial for employment generation in rural and semi-urban areas. The government aims to:

- Simplify business laws and remove regulatory hurdles to encourage entrepreneurship.
- Expand financial support through subsidized credit schemes and digital banking.
- Boost rural industries like handicrafts and food processing to enhance local employment.

The focus is on expanding credit access and easing compliance, enabling small businesses to thrive in rural areas.

7. Self-Reliance in Urea Production

To reduce import dependence and ensure affordable fertilizer supply, the government has:

- Proposed setting up new urea manufacturing plants.
- Aimed at stabilizing fertilizer prices for farmers.
- Promoted the use of nano-fertilizers to improve soil health.

This initiative aligns with Atmanirbhar Bharat, reducing costs for farmers while ensuring adequate fertilizer supply.

Conclusion

The government's rural economic strategy emphasizes agriculture, MSMEs, fisheries, infrastructure, and financial empowerment. Increased budgetary support, credit access, and productivity enhancements aim to boost incomes, employment, and rural industries. Effective implementation can drive sustainable growth, reduce the rural-urban divide, and support India's \$5 trillion economy vision.

3-Budgetary Initiatives for Women Empowerment in India

Women's empowerment is a crucial aspect of inclusive development, ensuring gender equality and economic participation. Budgetary provisions aimed at women's welfare play a pivotal role in achieving these objectives. Over the years, India has implemented gender-responsive budgeting (GRB) to allocate resources effectively for women's development.

Gender Budgeting in India

Introduced in 2005-06, Gender Budgeting (GB) is an analytical tool to assess the impact of government budgets on women and ensure gender equity. It focuses on planning, allocating, and auditing public expenditure to address gender disparities across sectors.

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Objectives of Gender Budgeting:

- Enhancing women's participation in economic activities.
- Ensuring better access to education, healthcare, and social welfare schemes.
- Addressing gender gaps in workforce participation and wages.
- Strengthening institutional frameworks for gender mainstreaming in policies.

Key Budgetary Initiatives for Women Empowerment

1. Beti Bachao Beti Padhao (BBBP)

Launched in 2015, this scheme aims to address declining child sex ratios and promote education for girls. The initiative works through coordinated efforts of education, health, and social sectors.

2. National Mission for Empowerment of Women (NMEW)

A holistic scheme to facilitate inter-ministerial coordination for policy-making, implementation, and monitoring of women-centric programs.

3. Pradhan Mantri Matru Vandana Yojana (PMMVY)

A conditional cash transfer scheme providing financial support to pregnant and lactating women for improved health and nutrition.

4. Mahila Shakti Kendra (MSK)

A grassroots-level initiative offering skill development, employment opportunities, and digital literacy to rural women.

5. One Stop Centres (OSCs)

Established to provide integrated support to women facing violence, including legal aid, medical assistance, and counseling.

6. Working Women Hostel Scheme

Aims to provide safe and affordable accommodation for working women, particularly in urban areas.

7. National Creche Scheme

Supports working mothers by providing daycare facilities for children, facilitating women's workforce participation.

8. Support to Training and Employment Programme for Women (STEP)

Enhances women's skills through vocational training, increasing their employability in various sectors.

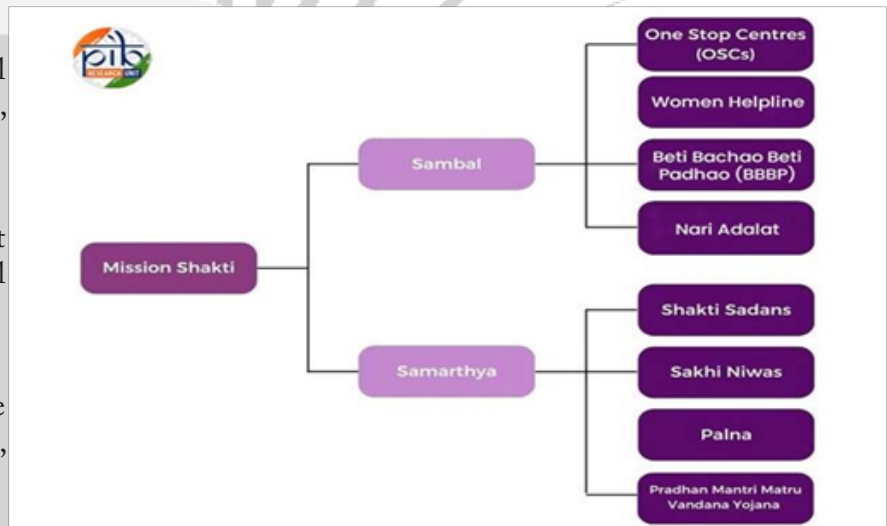
Impact of Gender Budgeting

- Increased Female Workforce Participation: Policies like MGNREGA and Mudra Yojana have contributed to higher employment rates for women.
- Improved Health Outcomes: Maternal mortality rates have declined due to healthcare schemes like PMMVY and Janani Suraksha Yojana.
- Enhanced Financial Inclusion: The rise in women-led enterprises, backed by credit support under Stand-Up India and self-help group (SHG) programs.
- Reduction in Gender-Based Violence: Schemes like OSCs and Women Helpline have strengthened institutional mechanisms to protect women's rights.

Challenges:

Despite progress, several challenges remain:

- Insufficient Allocation: Budgetary constraints limit the scope of gender-responsive programs.
- Lack of Awareness: Women in rural areas remain unaware of available schemes.
- Poor Monitoring & Evaluation: Gaps in implementation and accountability hinder effectiveness.
- Societal Barriers: Patriarchal norms still restrict women's participation in decision-making.



Way Forward

- **Increased Budgetary Allocation:** A higher percentage of the GDP should be earmarked for women-centric programs.
- **Strengthening Institutional Frameworks:** Gender-sensitive governance and policy implementation need to be reinforced.
- **Capacity Building & Awareness:** Grassroots campaigns and digital literacy programs can bridge information gaps.
- **Incentivizing Women's Participation:** Policies should encourage women's entrepreneurship and leadership roles in governance.

Conclusion

Budgetary initiatives for women's empowerment are essential for inclusive and sustainable development. While significant strides have been made, enhanced resource allocation, effective implementation, and societal change are required to bridge gender gaps. A comprehensive approach, combining policy reforms with financial support, will ensure that women play an equal role in India's socio-economic progress.

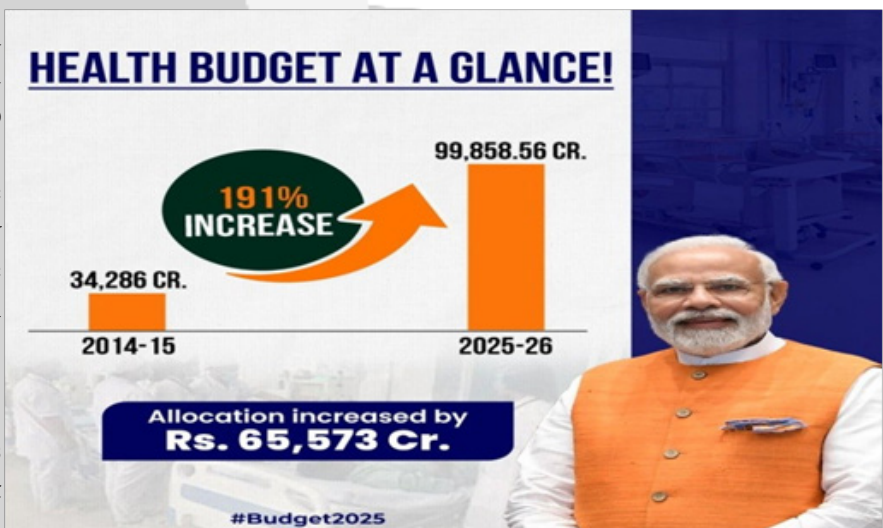
4- Strengthening Healthcare Infrastructure and Access

The Union Budget 2025-26 underscores the government's commitment to strengthening healthcare access and infrastructure, with significant allocations for medical education, cancer care, digital health initiatives, and medical tourism.

Key Budgetary Allocations and Initiatives

1. Increased Health Budget

- The Ministry of Health and Family Welfare has been allocated Rs. 99,858.56 crore, an 11% increase from the previous year.
- Rs. 95,957.87 crore for the Department of Health & Family Welfare and Rs. 3,900.69 crore for the Department of Health Research.



2. Medical Education Expansion

- Addition of 10,000 medical seats in the coming year, with a target of 75,000 new seats over five years.
- Aims to address the doctor shortage and strengthen public healthcare, particularly in rural areas.

3. Cancer Care and Day-Care Cancer Centres

- 200 district-level day-care cancer centres to be set up within three years, improving access to treatment in tier-2 and tier-3 cities.
- Expected to reduce the financial burden on patients and decentralize healthcare services.

4. Ayushman Bharat Initiative

- **Ayushman Arogya Mandir:** Establishment of wellness centers focusing on preventive healthcare and early diagnosis.
- **PM-JAY (Ayushman Bharat Yojana):** Increased allocation to expand financial protection against catastrophic health expenditures, covering Rs. 5 lakh per family annually.
- **PM-ABHIM (Health Infrastructure Mission):** Strengthening critical care units, public health labs, and disease surveillance systems (Rs. 4,758 crore allocated).
- **Ayushman Bharat Digital Mission (ABDM):** Promoting digital health records and seamless healthcare access.

5. Medical Tourism and Global Healthcare Hub

- “Heal in India” initiative to simplify visa procedures, upgrade medical facilities, and promote private-public partnerships.
- Aims to boost India’s position as a global destination for quality healthcare services.

6. Social Security for Gig and Platform Workers

- Identity cards and registration on the e-Shram portal to formalize gig workers.
- Health coverage under PM-JAY to provide medical security
- Potential pension and social welfare benefits for financial stability.

7. Customs Duty Exemptions for Life-Saving Drugs

- 36 life-saving medicines fully exempted from basic customs duty
- 6 additional medicines at concessional 5% customs duty to make essential drugs more affordable.

Significance and Implications

- Addresses doctor shortages and strengthens India’s medical education framework.
- Enhances cancer care accessibility, reducing the burden on metro hospitals.
- Strengthens digital health infrastructure, enabling seamless patient records and diagnosis.
- Boosts medical tourism, increasing foreign exchange earnings and healthcare investments.
- Ensures financial protection for vulnerable groups, including gig workers and underprivileged patients.

Conclusion

The Union Budget 2025-26 prioritizes a holistic healthcare approach, integrating infrastructure expansion, medical education, digital transformation, and financial inclusion. These initiatives align with universal health coverage goals, reinforcing India’s long-term vision of a resilient and inclusive healthcare system.

5- Union Budget 2025-26: A Boost to Swachh Bharat and Jal Jeevan Missions

The Union Budget 2025-26 underscores the government’s commitment to sustainable development, particularly in sanitation and water security. With an increased focus on flagship schemes like the Swachh Bharat Mission (SBM) and the Jal Jeevan Mission (JJM), the budget aims to accelerate India’s progress towards universal sanitation coverage and potable water accessibility

Budgetary Allocations and Key Announcements

Table 1: Differences and overlaps between JJM and SBM 2.0 under Budget 2025

S.N.	Dimensions	Jal Jeevan Mission (JJM)	Swachh Bharat Mission (SBM 2.0)- Gramin
1	Budget Allocation	Rs. 67,000 crore	Rs. 7,192 crore (Gramin); additional funds for urban sanitation in excess of previous estimates
2	Primary Objective	Provide functional household tap water supply to all rural households	Sustain ODF status and implement comprehensive solid/liquid waste management
3	Timeline	Extended till 2028	Ongoing with focus on sustaining and upgrading ODF to ODF Plus
4	Key Focus Areas	Infrastructure quality, regular water supply, water quality monitoring, Jan Bhagidari for community participation	Toilet sustainability, waste management (solid, liquid, and greywater), capacity building at local levels
5	Integrated Planning	Emphasizes WASH integration with community-led planning at the village level	Aligns with urban planning, emphasizing convergence of sanitation, waste management, and hygiene
6	Wastewater Reuse	Incorporates advanced monitoring to ensure safe water delivery and potential reuse of treated wastewater	Increasing focus on establishing wastewater treatment plants and reuse mechanisms for water conservation
7	Capacity Building	Extensive training modules and institutional support for local bodies, including Gram Panchayats	Similar emphasis on building local capacities with added focus on waste management and behavioural change initiatives

Swachh Bharat Mission (SBM)

1. **Increased Allocation:** The SBM has received a budgetary allocation of Rs X crore, reflecting a Y% increase from the previous year. This increment is directed towards ensuring 100% solid and liquid waste management in rural and urban areas.
2. **Urban Sanitation Drive:** Special emphasis is placed on urban sanitation, with incentives for waste segregation at the source, waste-to-energy projects, and scientific landfill management.
3. **ODF Plus Villages:** The government continues its focus on making villages Open Defecation Free (ODF) Plus, emphasizing greywater management and faecal sludge treatment.
4. **Behavioral Change Initiatives:** A renewed push is given to behavioral change campaigns through community-led awareness programs to sustain sanitation gains.

Jal Jeevan Mission (JJM)

1. **Higher Budgetary Support:** The JJM, which aims to provide piped water to every rural household by 2026, has seen an allocation of Rs Z crore, up from Rs W crore last year.
2. **Technology Integration:** Funds have been earmarked for sensor-based monitoring of water supply, ensuring realtime data collection for transparency and efficiency.
3. **Climate-Resilient Water Supply:** A significant portion of the budget is dedicated to creating climate-resilient infrastructure, such as rainwater harvesting systems and groundwater recharge projects.
4. **Capacity Building and Skilling:** Training programs for local water management committees have been expanded to improve community ownership and maintenance of water supply systems.



Why is This Important?

1. **Health and Hygiene Improvements:** Improved sanitation and clean water access significantly reduce waterborne diseases, thereby improving public health indicators.
2. **Environmental Sustainability:** Proper waste management and water conservation efforts contribute to environmental sustainability and resource efficiency.
3. **Rural and Urban Equity:** The budget ensures that both rural and urban areas benefit from sanitation and water supply schemes, reducing disparities in public service delivery.
4. **Employment Generation:** Infrastructure development under SBM and JJM creates job opportunities, particularly in rural areas, through construction and maintenance activities.

Challenges and the Way Forward

1. **Implementation Gaps:** Despite increased funding, challenges such as delays in fund disbursement and project execution need to be addressed.
2. **Quality Assurance:** Ensuring water quality and sustainable sanitation practices remains a key concern, requiring stricter monitoring and evaluation.
3. **Community Participation:** Greater community engagement is necessary to enhance the long-term sustainability of these initiatives.
4. **Innovative Financing Models:** Leveraging public-private partnerships (PPP) and international funding sources can help bridge financial gaps.

Conclusion

The Union Budget 2025-26 reaffirms the government's commitment to improving sanitation and water accessibility through the Swachh Bharat and Jal Jeevan Missions. While the increased funding and policy focus are commendable, their success hinges on effective implementation, quality assurance, and active community participation. With a holistic approach, these initiatives can significantly enhance public health, environmental sustainability, and socio-economic development in India.

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