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GENERAL STUDIES - I

- 1. Art And Culture**
- 2. Modern History**
- 3. World History**
- 4. Indian Society**
- 5. Geography**

Oneness of the Multitude – Indonesian Hinduism & Prambanan Temple

Subject: Art & Culture



Why in News?

Prime Minister Narendra Modi visited the Prambanan Temple Complex near Yogyakarta, Indonesia, along with Indonesian President Prabowo Subianto during a 2026 visit. During this visit, India and Indonesia announced cooperation for the conservation and restoration of the temple complex.

The Philosophical Concept: "Oneness of the Multitude"

Prambanan represents a unique interpretation of Hindu philosophy within Indonesia.

- **Core Ideology:** Although Hinduism involves the worship of numerous deities, they are understood in Indonesia as different manifestations of one ultimate divine reality.
- **Constitutional Alignment:** This specific interpretation enabled Indonesian Hinduism to align seamlessly with the country's constitutional emphasis on the belief in one Supreme God.

- **Vedic Roots:** The transition from "Many Gods" to "One Supreme Reality" reflects the classical Hindu philosophical idea from the Rig Veda (1.164.46): *"Ekam Sat Vipra Bahudha Vadanti"*, meaning "Truth is One; the wise describe it in many ways".

Indonesia's State Philosophy & The Recognition Challenge

Religion occupies a central place in Indonesian public life. An individual's religion is traditionally recorded on their National Identity Card (KTP). Religious identity directly affects civil matters such as marriage registration, birth certificates, religious education, civil service promotions, and burial rights. At the same time, Indonesia guarantees freedom of religion, creating a balance between religious liberty and state regulation.

The Pancasila Doctrine

Indonesia's national state philosophy is called Pancasila. It outlines five core principles:

1. Belief in One Supreme God.
2. Just and Civilised Humanity.
3. Unity of Indonesia.
4. Democracy through Deliberation.
5. Social Justice.

The Initial Rejection of Hinduism (1952)

- After Indonesia gained independence in 1945, the government required officially recognised religions to conform to the national ideology.
- In 1952, the Ministry of Religion established that a religion must possess monotheism, a recognised holy scripture, and a prophet or founder.
- While Islam, Christianity, and other Abrahamic traditions naturally met these conditions, Hinduism did not.
- Hinduism was viewed as polytheistic, lacking a single prophet, lacking a

central religious authority, and diverse in its practices.

- Consequently, Hinduism's application for official recognition was rejected in 1952.

The Reform Movement & Theological Adaptation

To secure state recognition, Balinese Hindu scholars created an organised reform movement. They established the Parisada Hindu Dharma in 1959, which was later renamed Parisada Hindu Dharma Indonesia (PHDI). Its primary objective was to reinterpret Hindu theology into a form that was compatible with Indonesian constitutional requirements.

Sang Hyang Widhi Wasa

- The reformers introduced a single Supreme God called *Sang Hyang Widhi Wasa*. This became the official monotheistic concept of Indonesian Hinduism.
- **Meaning:** *Sang Hyang* translates to a divine or sacred force; *Widhi* signifies cosmic law or divine order; and *Wasa* denotes supreme authority. Together, it means the Supreme Divine Reality governing the universe.
- **Philosophical Basis:** Reformers drew upon classical Hindu philosophy, specifically the Upanishadic concept of *Brahman*. *Brahman* is described as eternal, formless, infinite, and the ultimate reality. The Indonesian interpretation personified *Brahman* into the state-recognised Supreme God, equating *Brahman* to *Sang Hyang Widhi Wasa*.
- **Relation to the Trimurti:** The three principal Hindu deities—Brahma, Vishnu, and Shiva—were interpreted merely as different manifestations of *Sang Hyang Widhi Wasa*. This equivalence (Trimurti = One Supreme Divine Reality) satisfied Indonesia's

constitutional emphasis on monotheism.

The Concept of Acintya

- Another critical concept introduced was *Acintya*, which means "The Inconceivable One".
- *Acintya* is characterized as formless, infinite, and beyond human comprehension. This concept is often identified directly with *Sang Hyang Widhi Wasa*.

Conclusion

The Prambanan Temple complex stands not only as a monumental relic of classical Javanese Hindu architecture but also as a vibrant symbol of the deep-rooted civilizational heritage shared between India and Indonesia. The unique trajectory of Indonesian Hinduism—transforming through the philosophical concept of *Sang Hyang Widhi Wasa* to align with the state doctrine of *Pancasila*—demonstrates the remarkable adaptability of religious and cultural traditions to modern constitutional frameworks.

Building Water Security in a Rapidly Drying India

Subject: Geography

Why in the News?

Recent assessments by water resource experts have raised alarms over India's intensifying water crisis, exacerbated by a severe early-season monsoon rainfall deficit of over 40%. This scenario underscores an urgent need to pivot from temporary, rainfall-dependent relief measures toward long-term structural reforms in water governance.

Context: The Paradigm Shift

Building true water security in India requires a transition from the traditional approach of merely **expanding water supply** to a modern framework of **efficient, circular, and data-driven water management**. This involves a triad of conservation, wastewater reuse, and sustainable resource allocation.

The Imperative for Strong Water Security

India's water stress manifests across urban, rural, and ecological dimensions, necessitating immediate interventions:

- **Urban Climate Resilience:** Cities and hill stations (e.g., Bengaluru, Mussoorie) are facing acute seasonal shortages. There is a critical need to protect urban reservoirs through sustainable, localized water management.
- **Agricultural Efficiency:** Agriculture consumes the lion's share of India's freshwater. Transitioning away from traditional "flood irrigation" to micro-irrigation is vital to conserve resources and reduce crop losses.
- **Groundwater Sustainability:** India is the world's largest extractor of groundwater. Preventing irreversible aquifer depletion requires strictly regulated extraction paired with scientific recharge mechanisms.
- **Hydrological Accountability:** Implementing basin-level water measurement is essential to curb over-extraction and establish accountability among stakeholders.
- **Strengthening Municipal Finances:** Urban utilities must be transitioned to performance-based models to sustainably reduce Non-Revenue Water (NRW) and distribution losses.

Key Structural Bottlenecks

Despite ongoing efforts, India's water architecture is plagued by several systemic challenges:

- **Infrastructural Deficit:** Aging pipelines result in massive conveyance losses. Furthermore, the glaring lack of adequate wastewater treatment infrastructure continues to pollute critical riverine and lake ecosystems.
- **Data and Planning Asymmetry:** The absence of hyper-local climate risk data severely limits targeted flood protection and urban planning.
- **Agricultural Misalignments:** Current Minimum Support Price (MSP) and procurement policies inadvertently incentivize water-guzzling crops like sugarcane and paddy. Additionally, micro-irrigation subsidies often remain out of reach for marginal farmers.
- **Governance Fragmentation:** Resilient water governance requires a synergy of scientific planning, community participation, reliable data, and equitable pricing—elements that currently operate in silos.

Way Forward: A Multi-Pronged Strategy

To secure its hydrological future, India must adopt an integrated, technology-driven approach:

- **Technological Interventions (AI & IoT):** Deploying smart bulk water meters integrated with Artificial Intelligence (AI) to detect real-time leakages and drastically reduce distribution losses.
- **Promoting a Circular Water Economy:** Moving away from a linear model by mandating the reuse of treated municipal wastewater for industrial cooling, urban landscaping, and non-potable civic purposes.
- **Redesigning Agricultural Subsidies:** Micro-irrigation subsidies should be structurally redesigned using **0.4 hectares as the base unit**, ensuring that the benefits directly reach small and marginal farmers.

- **Incentivizing Crop Diversification:** Encouraging farmers to shift to low-water, climate-resilient crops by providing stronger support and faster claim settlements under the **Pradhan Mantri Fasal Bima Yojana (PMFBY)**.
- **Localized Climate Risk Mapping:** Expanding comprehensive risk mapping to safeguard critical public infrastructure, such as schools and electrical grids, against extreme weather events.

Conclusion

While flagship initiatives like the **Jal Jeevan Mission (JJM)** have successfully democratized household water access, the twin menaces of untreated wastewater and massive distribution losses threaten to undo these gains. Securing India's long-term water future demands a systemic overhaul—blending AI-driven monitoring, wastewater circularity, and sustainable agriculture—to ensure equitable resource management and achieve the targets outlined in **SDG 6 (Clean Water and Sanitation)**.

Kashmir's Sufiyana Music (Sufiyana Mausiki)

Subject: Art & Culture

Why in the News?

The Jammu & Kashmir Chief Minister has proposed nominating Kashmir's Sufiyana Music to **UNESCO's Intangible Cultural Heritage (ICH)** list to preserve its legacy.

Key Highlights

- **About the Art Form:** Also known as *Sufiyana Kalam*, it is a distinctive classical choral ensemble blending devotional poetry, classical melody, and mystical philosophy.

- **Cultural Synthesis:** It represents a unique amalgamation of **Indian classical** traditions with **Persian and Central Asian** (Iran, Bukhara, Samarkand) musical structures.
- **Geographical Spread:** Indigenous to the Kashmir Valley. It is kept alive through an oral tradition by specialist *gharanas* (musical lineages) located in **Budgam, Srinagar, and Anantnag**.
- **Musical Instruments:** Played using the Ney (flute), harmonium, rabab, tabla, sitar, and prominently, the **100-string Sufiana Santoor** (uniquely played on a triangular, three-legged stand).
- **Core Elements:**
 - **Maqam:** The melodic framework. (*Only 20–25 maqams remain in regular practice out of the original 50*).
 - **Tala:** The rhythmic cycle, which gradually shortens as the performance progresses.
 - Performed by a coordinated ensemble of **5 to 7 musicians** who sing and play simultaneously.

Shastrarth Tradition

Subject: Indian Heritage and Culture

Why in the News?

During the 135th episode of his monthly radio broadcast, *Mann Ki Baat*, the Prime Minister lauded the newly inaugurated Nalanda University for successfully reviving the ancient Indian epistemic tradition of **Shastrarth** (scholarly debate).

About Shastrarth

Derived from the words **Shashtra** (scriptures or systematic knowledge) and **Artha** (meaning or interpretation), *Shastrarth* represents ancient

India's highly disciplined and structured tradition of public intellectual debate.

- **Core Objective:** It acts as an ancient precursor to modern academic **peer review**. Its primary aim is to establish objective truth through rigorous logical reasoning, open inquiry, and the systematic evaluation of philosophical, spiritual, and scientific ideas before they gain wider societal or academic acceptance.

Historical Evolution & Continuum

- **Vedic Roots:** The tradition traces its origins to the philosophical dialogues found in the **Vedas** and **Upanishads**, and the democratic assemblies of early India known as **Sabhas** and **Samitis**.
- **Institutional Patronage:** It flourished globally in ancient Indian intellectual hubs (Mahaviharas) such as **Nalanda**, **Vikramashila**, and **Takshashila**, drawing scholars from across Asia.
- **Notable Historical Shastrarths:**
 - The legendary philosophical debate between **Adi Shankaracharya** and **Mandana Misra** (judged by Bharati, Mandana Misra's wife), which profoundly shaped Advaita Vedanta.
 - **Swami Dayanand Saraswati's** famous debate in Kashi (Varanasi), which critically evaluated religious practices against Vedic tenets.

The Structural Framework of Shastrarth

A traditional Shastrarth is highly methodical and is governed by strict procedural rules to ensure objectivity. Its key pillars include:

- **Purva Paksha (The Opponent's View):** A critical ethical requirement where a scholar must first accurately and comprehensively articulate the opponent's standpoint before offering any criticism.
- **Uttara Paksha (The Refutation):** The counter-argument or rebuttal presented

using flawless logic, empirical evidence, and textual support.

- **Pramana (Epistemic Proof):** Every claim must be backed by valid sources of knowledge, primarily relying on *Pratyaksha* (direct perception) and *Anumana* (logical inference).
- **Madhyastha (Neutral Adjudicator):** The proceedings are presided over by impartial, highly learned judges who evaluate the empirical reasoning and deliver a final scholarly verdict.

Contemporary Relevance and Significance

- **Promoting Intellectual Tolerance:** Historically conducted in Sanskrit but now embracing multilingual scholarship, Shastrarth teaches the art of **respectful disagreement** and intellectual humility.
- **Democratic Deliberation:** The tradition reinforces the idea that ideas should be contested through reasoning and precise language rather than coercion, forming the cultural bedrock for democratic discourse and public reasoning.
- **Refinement of Knowledge:** By encouraging rigorous questioning, it continues to inspire modern academic dialogue, jurisprudence, and ethical reasoning across disciplines.

Niokolo-Koba National Park (Senegal)

Subject: Geography

Why in the News?

The **Global Environment Facility (GEF)** has recently approved a US\$ 1.26 million grant for a new conservation initiative. Led by the **International Union for Conservation of Nature (IUCN)**, the project aims to bolster the

ecological security of the Niokolo-Koba National Park (PNNK) in Senegal.

About Niokolo-Koba National Park

Niokolo-Koba is a legally protected wildlife sanctuary, an international **Biosphere Reserve**, and a **UNESCO World Heritage Site**. Spanning nearly 913,000 hectares, it is highly significant for safeguarding one of West Africa's most expansive **Sudanian savanna** ecosystems.

Geographical Extent and Topography

- **Location:** Situated in the southeastern part of **Senegal** (West Africa), bordering Guinea. It extends across the administrative regions of Kédougou, Tambacounda, and Kolda.
- **Hydrology:** The park's lifelines are the upper reaches of the **Gambia River** and its major tributaries, the **Sereko and Niokolo**. These water bodies are crucial as they sustain permanent marshes and waterholes even during severe dry seasons.
- **Terrain:** The topography is highly diverse, featuring sprawling plains, crystalline uplands, and volcanic hills. **Mount Assirik** stands as the highest elevation point within the park.

Ecological Features and Biodiversity

- **Varied Habitats:** The park hosts a rich mosaic of ecosystems, including open savanna woodlands, dense bamboo forests, riverine gallery forests, and seasonal marshy depressions (locally referred to as *bafas*).
- **Major Ecological Threat:** The native grasslands and overall ecological balance are currently under severe threat from *Mimosa pigra*, a highly aggressive invasive plant species that alters local hydrology and outcompetes native flora.

Timeline: Conservation Journey and Heritage Status

- **1925:** Initially established as a controlled hunting reserve to combat the rapid decline of wildlife in the region.
- **1954:** Upgraded to the status of a National Park under Senegalese legal protection.
- **1981:** Inscribed as a **UNESCO World Heritage Site** in recognition of its exceptional biodiversity and ecosystem value.
- **2007 (Inscribed on Danger List):** Placed on the **List of World Heritage in Danger** due to intense anthropogenic pressures, including rampant poaching, basalt mining, and the proposed construction of a dam on the Gambia River.
- **2024 (Removal from Danger List):** Successfully removed from the Danger List, acknowledging the Senegalese government's successful conservation interventions, wildlife recovery, and improved management.

Current Conservation Focus and Way Forward

The newly funded GEF-IUCN initiative aims to consolidate the recent conservation successes. The multi-pronged strategy includes:

- Strengthening anti-poaching frameworks and biodiversity monitoring networks.
- Implementing habitat restoration programs to eradicate invasive species like *Mimosa pigra*.
- Fostering community participation and generating alternative livelihoods through sustainable eco-tourism.
- Enhancing climate resilience and promoting cross-border regional cooperation to ensure the long-term ecological security of the Sudanian savanna.

THE MAORI TRIBE

Subject: Indian Heritage and Culture



Why in the News?

During a historic state visit to Auckland, New Zealand, the Prime Minister of India addressed the Indian diaspora and invoked the traditional Māori concept of ‘Waka’. The term was used as a diplomatic metaphor to symbolize the shared journey, enduring friendship, and collective values that define the evolving India-New Zealand bilateral relationship.

About the Māori People

The Māori are the indigenous Polynesian population of mainland New Zealand, referred to in their native language as *Aotearoa*.

- **Historical Origins:** They migrated to New Zealand in successive waves of ocean-going canoe voyages between 1200 and 1300 CE, bringing with them a rich Polynesian heritage that evolved into a distinct culture characterized by a profound spiritual connection to the land.
- **Geographical Distribution:** Primarily concentrated on the **North Island** of New Zealand, where the historical subtropical and temperate climates were highly conducive to agriculture and fishing.
- **Habitat and Ecology:** Traditional Māori communities established themselves along coastal inlets, river terraces, and fertile volcanic valleys.

They utilized waterways for navigation and relied on native forests for timber, foraging, and wildlife.

Key Cultural and Social Characteristics (Prelims Fact-File)

Understanding Māori terminology is crucial for cultural mapping questions:

- **Whakapapa (Genealogy):** The foundational pillar of Māori social structure. It traces lineage back to the original ancestral canoe settlers and dictates inheritance, social status, and traditional land rights.
- **Iwi and Hapū:** The societal organization framework. **Iwi** (tribes) and **Hapū** (sub-tribes) govern community affairs, resource management, and historical defense mechanisms.
- **Marae:** The sacred communal center of a Māori settlement. It serves as the focal point for religious ceremonies, governance meetings, funerals (*tangihanga*), and formal welcomes.
- **Tā Moko:** The highly intricate traditional Māori tattooing practice. Unlike modern tattoos, *Tā Moko* is carved into the skin and serves as a visual language expressing the wearer's ancestry, identity, social rank, and achievements.
- **Pounamu:** A highly valued greenstone (nephrite jade) found in southern New Zealand, used extensively by the Māori to carve tools, ornaments, weapons, and sacred heirlooms (*taonga*).

Performative Arts and Protocol

- **Haka:** A globally recognized ceremonial posture dance. It involves rhythmic, aggressive chanting combined with powerful bodily movements (foot-stamping, body-slapping). It is performed for formal welcomes, celebrations, commemorations, and historically as a pre-battle display of strength.
- **Hongi:** The traditional, formal Māori greeting where two individuals press

their noses and foreheads together. It symbolizes the exchange of the *ha* (the breath of life), representing mutual acceptance, unity, and the bridging of two souls.

The Concept of 'Waka' and its Significance

The term highlighted by the Indian Prime Minister refers to traditional Māori canoes, which hold immense historical and symbolic weight.

1. Historical & Navigational Prowess

- Māori ancestors utilized advanced ocean-voyaging techniques to navigate the Pacific, relying purely on environmental indicators such as star constellations, ocean swells, wind directions, and bird migration patterns.
- **Types of Waka:**
 - **Waka Taua:** Massive, elaborately carved war canoes used for military expeditions.
 - **Waka Tētē:** Utility canoes utilized for fishing, trade, and transport.
 - **Waka Kōrari:** Smaller, agile crafts designed specifically for navigating inland rivers and waterways.

2. Modern and Diplomatic Symbolism

Today, the *Waka* transcends its physical form. It acts as a powerful metaphor for **collective identity, heritage, and resilience**. In the context of international relations, "being in the same Waka" signifies a shared journey, mutual cooperation, and a collective responsibility to steer toward a unified, prosperous future.

TRIBEX DIGITAL LEARNING PLATFORM

Subject: Indian Society & Government Policies

Why in the News?

Recently, the **Ministry of Tribal Affairs (MoTA)**, Government of India, launched **TribeX** during the National Workshop on Strengthening Tribal Research Institutes (TRIs) in Bhubaneswar, Odisha. It is India's first-of-its-kind centralized digital learning platform dedicated exclusively to documenting, preserving, and promoting tribal arts, culture, languages, and traditional knowledge.

About TribeX Digital Learning Platform

TribeX is envisioned as a comprehensive digital ecosystem that connects learners, researchers, and cultural enthusiasts worldwide directly with indigenous knowledge experts and master tribal artisans.

- **Nodal Ministry:** Ministry of Tribal Affairs (MoTA).
- **Core Objective:** To bridge geographical barriers using technology, empower tribal communities through sustainable livelihoods, preserve fast-disappearing indigenous knowledge and languages, and promote heritage-oriented education for future generations.

Key Features and Academic Framework (Prelims Fact-File)

The platform integrates traditional knowledge with formal educational frameworks to provide structured learning and enhance employability.

1. Dual-Tier Academic Framework

- **Certificate Courses:** TribeX currently offers **20 free certificate courses** covering subjects like tribal paintings, handicrafts, handlooms, and traditional musical instruments. There is a roadmap to expand this to over 100 courses in the future.
- **UGC-Recognized PG Diplomas:** Through an MoU with **Sampurnanand Sanskrit University (SSU)** in Varanasi, the platform offers five University Grants Commission

(UGC)-recognized one-year hybrid Postgraduate Diploma programs.

2. Core Specializations Offered

The PG Diploma programs focus on high-demand, culture-centric domains:

1. **Tribal Language:** Specifically Santali (using the Ol Chiki script).
2. **Sustainable Tribal Culture-Based Livelihood Practices.**
3. **Museology and Tribal Museum Management.**
4. **Tribal Arts and Crafts of India.**
5. **Tribal Textiles.**

3. Job-Oriented Curriculum

The courses go beyond theoretical knowledge by blending online expert lectures with practical field internships and dissertation writing. This hybrid model is designed to open career pathways in fields like cultural curation, design, tourism, and academic research.

4. Robust Digital Infrastructure

- **Learning Management System (LMS):** Provides a seamless, structured environment for online learning, course administration, and progress tracking.
- **Repository Management System (RMS):** Serves as a secure digital vault for storing and organizing educational assets.

The Digital Heritage Archive

Beyond education, TribeX functions as a monumental digital preservation project.

- **Multimedia Resources:** The platform currently hosts over **5,000 multimedia resources**—including high-quality audio recordings, video documentaries, ethnographic research, and literature.
- **Scope:** It documents tribal traditions, festivals, rituals, and oral histories that are typically passed down verbally across generations.
- **Future Expansion:** The repository is set to expand to house more than 10,000 digital artifacts, ensuring the long-term preservation of India's indigenous cultural footprint.

The rapid socio-economic transformation and mainstreaming of tribal communities have raised concerns about the erosion of their unique cultural identities. TribeX tackles this by providing **institutional backing** and **market linkages** to tribal knowledge. By transforming Tribal Research Institutes (TRIs) into hubs of digital innovation, the government aims to ensure that indigenous wisdom shapes future policy frameworks while offering sustainable economic opportunities to tribal artisans.

Significance of the Initiative

GENERAL STUDIES - II

- 1. Constitution**
- 2. Polity**
- 3. Governance**
- 4. Social Justice**
- 5. International Relations**

Criminal Justice System's Digital Push: Full Roll-Out by 2027

Subject: Polity & Governance

Context

India's criminal justice architecture is undergoing its most profound structural transformation since independence. Setting a firm deadline of **1 January 2027**, the Union government has mandated that all investigation and trial procedures under the new criminal framework will be conducted and recorded entirely in a digital format.

Background & Core Objective

The overarching goal is to transition away from archaic, paper-driven procedures toward a seamless, end-to-end digital criminal justice ecosystem. This digital overhaul is designed to eliminate systemic bottlenecks, curb procedural delays, and secure transparency, accountability, and speedy justice for citizens.

Pillars of the Digital Criminal Justice Ecosystem

1. The Interoperable Criminal Justice System (ICJS)

- **Unified Platform:** The ICJS integrates the five foundational pillars of the criminal justice system—**Police, Courts, Prisons, Prosecution, and Forensic Science Laboratories (FSLs)**—onto a single digital grid.
- **Cloud Infrastructure:** All sensitive judicial and investigative data is securely stored on **MeghRaj**, the National Government Cloud.

2. Synergy with New Criminal Laws

Implemented effectively from **1 July 2024**, the digital framework anchors itself upon

three transformative legislative statutes that replaced colonial-era laws:

- **Bharatiya Nyaya Sanhita (BNS), 2023** (Replaced the Indian Penal Code, 1860)
- **Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023** (Replaced the Code of Criminal Procedure, 1973)
- **Bharatiya Sakshya Sanhita (BSS), 2023** (Replaced the Indian Evidence Act, 1872)

Key Implementation Milestones & Metrics

- **Nationwide Progress:** National implementation efficacy has scaled up significantly, rising from **46.47% in January 2025 to 70.06% by June 2026**.
- **Volume of Cases:** Over **74.66 lakh FIRs** have already been registered under the BNS framework.
- **Digital Policing & Redressal:**
 - **Zero FIRs:** Given statutory backing under the BNSS, allowing citizens to register FIRs irrespective of territorial jurisdiction. Over **63,572 Zero FIRs** have been recorded, including 13,000 intra-State transfers.
 - **CCTNS Network:** The Crime and Criminal Tracking Network & Systems (CCTNS) now connects **over 16,000 police stations**, facilitating FIR registration across 23 regional languages.
 - **Language Barriers Broken:** Integration with the **Bhashini App** allows seamless translation of Zero FIRs across multiple languages.
- **Forensic Upgrades:**
 - Forensic examination is now **mandatory** for offenses

carrying a punishment of 7 years or more.

- FSL infrastructure expanded from 129 labs in 2023 to **154 labs in 2025**, supported by the deployment of over **700 Mobile Forensic Units (MFUs)**, resulting in reduced pendency rates despite swelling caseloads.
- **Paperless Judicial Proceedings:**
 - **46.5 lakh** Digital Evidence (*Sakshya*) IDs generated.
 - **56.74 lakh** e-summons served digitally.
 - The national repository houses a massive data footprint consisting of **37.68 crore police records, 9.9 crore FIRs, and 7.64 crore charge sheets.**

Implementation Performance across States/UTs

While States and UTs have been granted a **5-year transition window** for absolute compliance, front-runners have emerged:

- **Top Performers:** Haryana, Goa, Assam, Punjab, and Chandigarh.

Roadblocks and Challenges Ahead

Despite stellar quantitative growth, systemic roadblocks remain:

- **Integration Deficit:** Only **46% of e-FIRs** are currently digitally integrated end-to-end with the judiciary, pointing to a lag in judicial system sync.
- **Infrastructure Bottlenecks:** Persistent issues with last-mile internet connectivity continue to throttle optimal implementation in select North-Eastern States.

Way Forward

As the 2027 deadline approaches, bridging the integration gap between police databases and court servers must be prioritized. Ensuring robust cybersecurity frameworks on the MeghRaj cloud, upgrading rural digital infrastructure, and conducting rigorous capacity-building programs for law enforcement personnel and judicial officers will be critical to realizing the true promise of a digitized, citizen-centric justice delivery system in India.

Conclusion:

The 2027 digital mandate represents a monumental shift from punitive colonial policing to a citizen-centric, technology-driven justice administration. While infrastructural leaps like ICJS and CCTNS are commendable, true success lies in **seamless inter-departmental synergy, robust cybersecurity, and bridging the digital divide.** Ultimately, digitizing records is only a means to an end; the real test of this reform will be whether it successfully delivers speedy, transparent, and accessible justice to the last mile, thereby strengthening public trust in the rule of law.

FCRA 2.0 Portal & e-OCI Card Launched

Subject: Polity & Governance

Context

In a major push toward tech-driven governance and streamlined citizen services, the Union Home Minister launched the **FCRA 2.0 Portal** and the **e-Overseas Citizen of India (e-OCI) Card** initiative. This dual rollout marks a strategic step toward minimizing human intervention, enhancing transparency, and tightening

security compliance in foreign funding and diaspora management.

Part A: The FCRA 2.0 Portal & Regulatory Overhaul

1. Background & Statutory Mandate

- **Governing Statute:** The Foreign Contribution (Regulation) Act (FCRA), 2010 regulates the acceptance and utilization of foreign contributions by individuals, associations, and non-governmental organizations (NGOs).
- **Compliance Scale:** FCRA registration is compulsory for any entity receiving foreign donations. Currently, around **14,500 organizations** hold valid registrations
- **Administrative Burden:** The Ministry of Home Affairs (MHA) processes **15,000 to 20,000 applications** and reviews nearly **17,000 annual returns** every year.

2. Key Technological Features of FCRA 2.0

Hosted securely on **MeghRaj** (the National Government Cloud), the revamped portal introduces modern digital tools:

- **Process Re-engineering & Integrated Dashboard:** Streamlines backend workflows and offers a unified interface for tracking applications.
- **Smart Verification:** Utilizes **Aadhaar-based authentication, e-Sign facilities, and OCR (Optical Character Recognition)** for automated document scrutiny.

3. Benefits and National Security Significance

- **Frictionless Compliance:** Enables a fully paperless application pipeline, curtailing processing bottlenecks and reducing manual interface.
- **Real-Time Surveillance:** Empowers the state with real-time monitoring of foreign fund inflows to NGOs.
- **Balancing Act:** Strikes a critical equilibrium between fostering "ease of compliance" for genuine developmental organizations and maintaining rigorous scrutiny over suspicious transactions that could compromise national security.

Part B: The e-Overseas Citizen of India (e-OCI) Card

1. Context & Scale

The e-OCI initiative is designed to benefit the global Indian diaspora, encompassing **over 50 lakh OCI cardholders**.

2. Key Features & Benefits

- **Passport Disconnect:** Eliminates the cumbersome requirement of reissuing the physical OCI booklet every time an OCI holder obtains a new passport.
- **Unique Identification:** Allocates a distinct registration number to every cardholder.
- **Risk Mitigation:** Replaces fragile physical documents with a digital card, removing the risk of loss or physical damage.
- **Swift Verification:** Facilitates real-time, tamper-proof digital verification by border control and administrative authorities, significantly improving record management and service delivery.

Conclusion:

The simultaneous rollout of the FCRA 2.0 Portal and the e-OCI Card underscores India's resolute march toward **tech-enabled statecraft and seamless digital governance**. By harmonizing the doctrine of "*Minimum Government, Maximum Governance*," these initiatives successfully balance citizen convenience and diaspora engagement with rigorous regulatory oversight. Ultimately, leveraging cloud architecture, biometric authentication, and real-time database integration ensures that compliance becomes frictionless for legitimate entities, while erecting an impregnable digital shield against illicit financial flows and threats to national security.

Civil Registration System (CRS) Report 2024

Subject: Polity & Governance

Context

The release of the **Civil Registration System (CRS) Report 2024** highlights a dual narrative in India's demographic trajectory: a monumental leap toward near-universal administrative compliance in vital statistics, juxtaposed with persistent structural challenges regarding gender imbalances at birth.

Key Highlights: The Administrative Triumph

- **Near-Universal Coverage:** India has crossed the milestone of **99.1% birth registration** and **99.4% death registration**.
- **Data Reliability:** This unprecedented coverage reflects a robust administrative machinery, ensuring that vital events are systematically captured to strengthen national demographic databases.

Demographic Realities: Sex Ratio at Birth (SRB)

- **National Average:** India's SRB stands at **917 females per 1,000 males**. While this demonstrates improved administrative tracking and registration efficiency, it underscores a deep-seated, ongoing concern regarding societal gender preferences.
- **State-Wise Disparities:**
 - **Top Performers (Highest SRB):** Arunachal Pradesh (1050), Andaman & Nicobar Islands (984), Meghalaya (974), Mizoram (972), and Kerala (970).
 - **Bottom Performers (Lowest SRB):** Nagaland (865), Lakshadweep (865), and Jharkhand (890).

UPSC Prelims Pointer: The Biological SRB Norm

- **Natural Baseline:** The scientifically accepted natural SRB hovers between **950 and 975 females per 1,000 males** (or 102–107 boys per 100 girls).
- **Significance:** A ratio aligning with this natural bracket indicates minimal anthropogenic interference. A severely skewed, lower SRB typically points toward social malignancies such as:

- Entrenched son preference.
- Illegal sex-selective abortions (prenatal diagnostic misuse).
- Pre-natal gender discrimination.

Other Vital Parameters: Stillbirths

- **Volume:** The report recorded **81,117 stillbirths** nationwide in 2024.
- **Urban Concentration:** A striking **69% of these stillbirths occurred in urban areas**, pointing to urban healthcare stress, lifestyle factors, or better reporting mechanisms in city hospitals compared to rural hinterlands.

Significance of the CRS in Governance

The Civil Registration System serves as the bedrock of evidence-based policymaking by providing granular data essential for:

- Accurate population estimation and forecasting.
- Tailored public health planning and maternal-child healthcare (MCH) delivery.
- Effective targeting of welfare schemes and resource allocation.
- Longitudinal monitoring of shifting demographic and epidemiological trends.

Conclusion:

The 2024 CRS report marks a stellar administrative victory for India in achieving near-universal vital statistics registration, laying a firm foundation for data-driven governance. However, the depressed national Sex Ratio at Birth (917) serves as a stark reminder that administrative digitization must be matched by profound social transformation. Eradicating deep-rooted patriarchal biases requires

strict statutory enforcement of the PC&PNDT Act, rigorous social awareness campaigns, and economic empowerment of women to ensure that technology-driven development translates into true gender justice.

Protest against Government Cannot Be Ground for Externment: Bombay High Court

Subject: Polity & Governance

Context

In a landmark ruling protecting democratic freedoms, the Bombay High Court quashed an externment order issued against an individual, firmly establishing that **peaceful political protest, dissent, or slogan-raising against government policies cannot form the sole basis for restrictive state action** under preventive laws like the Maharashtra Police Act.

Key Highlights of the Judgment

- **Infringement of Fundamental Rights:** The Court ruled that the externment order directly violated the petitioner's freedoms guaranteed under:
 - **Article 19:** Freedom of speech and expression, peaceful assembly, and association (subject only to

reasonable restrictions under Article 19(2)).

- **Article 21:** Right to life and personal liberty, which encompasses the right to live with dignity, free from arbitrary state interference.
- **Core Observations of the Court:**
 - **Dissent as a Democratic Pillar:** Peaceful political dissent is an indispensable hallmark of a vibrant, functioning democracy.
 - **Protection of Democratic Action:** Participation in *morchas* (protest marches) and *dharnas* (sit-ins) are legitimate democratic exercises and cannot be weaponized as legal grounds for externment.
 - **Limits of Criticism:** Merely criticizing, opposing, or disagreeing with state policies does not justify the curtailment of a citizen's personal liberty.
- **Primal Mala Fide and Preventive Power Misuse:**
 - The order relied on five prior FIRs against the petitioner. The Court noted that the police action was *prima facie mala fide*, reflecting an alarming abuse of preventive powers.
 - It reiterated that law enforcement must act with institutional independence, absolute fairness, and strict adherence to constitutional norms, free from political pressure.
- **Judicial Reinforcement:** The judgment strongly reinforces the

judiciary's role as a sentinel on the *qui vive* against arbitrary executive overreach and arbitrary state actions.

Understanding Externment

- **Definition:** Externment is an extreme **preventive measure** wherein an individual is legally ordered to evacuate and stay out of a specified geographical jurisdiction for a designated timeframe to safeguard public order.
- **Constitutional Triad Requirements:** Any valid externment order must uncompromisingly clear the judicial tests of:
 1. **Legality** (backed by statutory authority)
 2. **Necessity** (proven threat to public peace)
 3. **Proportionality** (the restriction must be the least intrusive means possible)
- **Prohibition:** It cannot be deployed as an authoritarian tool to suppress lawful dissent or peaceful civic protests.

Constitutional Basis for Externment Laws

Under the **Seventh Schedule** of the Constitution, externment legislation falls squarely within the legislative competence of State Legislatures:

- **Entry 1 (State List) – Public Order:** Empowers States to enact laws for maintaining public peace and preventing disturbances.
- **Entry 2 (State List) – Police:** Empowers States to govern policing matters, under which executive magistrates or police commissioners issue externment orders.

Can Parliament Legislate on State List Subjects (Externment/Police)?

While Public Order and Police are strictly State subjects, the Constitution provides exceptional provisions where Parliament can legislate:

Constitutional Provision	Qualifying Circumstance	Effect on State Law
Article 249	Rajya Sabha passes a resolution (2/3rd majority present and voting) declaring it necessary in the national interest.	Parliamentary law prevails during its operation. After expiration, State law revives unless specified otherwise.
Article 250	During the proclamation of a National Emergency .	Parliamentary law prevails during the emergency and for six months post-expiry.
Article 251 / 252	Two or more States pass resolutions	Parliamentary law replaces State law <i>only</i> in the

Constitutional Provision	Qualifying Circumstance	Effect on State Law
	requesting Parliament to legislate on a State subject.	requesting States. Only Parliament can amend or repeal it.
Article 253	To implement international treaties, agreements, or conventions.	Federal law overrides conflicting State laws to fulfill international obligations.
Article 356	During President's Rule in a State, when Parliament exercises State Legislative powers.	Parliamentary law operates as State law. The restored State Legislature may later amend/repeal it, subject to constitutional bounds.

Conclusion:

The Bombay High Court's ruling serves as a timely reminder that the

architecture of preventive policing must never infringe upon the democratic breathing space guaranteed to citizens. Upholding the rule of law requires striking a delicate balance between maintaining public order and preserving constitutional liberties. Ultimately, the health of Indian democracy is measured by its capacity to tolerate, protect, and respect peaceful dissent, ensuring that state machinery remains an instrument of justice rather than an instrument of suppression.

India–New Zealand Strategic Partnership (2026)

Subject: International Relations

Context

India and New Zealand have officially elevated their bilateral engagement to a **Strategic Partnership**, marking a watershed moment in diplomatic, economic, maritime, and security cooperation. This pact is accompanied by an ambitious roadmap and a financial commitment designed to anchor stability and shared prosperity in the Indo-Pacific.

Decoding the "Strategic Partnership" Framework

- **Nature of the Partnership:** A Strategic Partnership is a structured, institutionalized framework for long-term bilateral cooperation. Crucially, **it is not a military alliance and**

carries no mutual defense obligations.

- **Core Pillars:** It transcends standard diplomatic ties through high-level mutual trust, strategic convergence, and long-term joint roadmaps spanning defense, trade, technology, climate, and counter-terrorism.

Major Outcomes of the Bilateral Agreement

- **Strategic Upgradation:** Establishment of the formal Strategic Partnership framework backed by **18 concrete outcomes, including 10 bilateral agreements.**
- **Four-Year Roadmap:** Adoption of a comprehensive roadmap to steer cooperation across political, security, economic, agricultural, educational, and cultural domains.
- **Trade and Investment Goals:**
 - A joint target to **double bilateral trade to ₹35,000 crore by 2030.**
 - A shared commitment to fast-track negotiations for a comprehensive **India–New Zealand Free Trade Agreement (FTA).**
 - A massive capital commitment by New Zealand to **invest USD 20 billion in India** over the next 15 years across infrastructure, renewable energy, and technology.

Maritime Cooperation: The Strategic Anchor

Recognizing each other as vital maritime democracies in the Indo-Pacific, both nations signed three foundational maritime agreements:

1. **Hydrographic Data Sharing:** Enables exchange of critical

oceanographic data—including bathymetry (water depth), seabed topography, and navigation hazards—crucial for safer navigation, disaster mitigation, and Blue Economy growth.

2. **Mutual Naval Logistics:** Allows both navies to access designated facilities for refueling, replenishment, maintenance, and repairs, thereby extending operational reach and boosting Humanitarian Assistance and Disaster Relief (HADR) capabilities.
3. **Institutionalized Engagement:** Establishment of a dedicated **Maritime Security Dialogue** to tackle regional maritime challenges, curb illegal fishing, combat piracy, and ensure maritime domain awareness.

UNCLOS (1982)

The partnership reaffirms adherence to the **United Nations Convention on the Law of the Sea (UNCLOS), 1982**, often termed the "Constitution for the Oceans" (adopted at Montego Bay, Jamaica; in force since 1994).

Major Maritime Zones under UNCLOS:

- **Territorial Sea:** Up to 12 NM (Full sovereignty, subject to innocent passage).
- **Contiguous Zone:** Up to 24 NM (Enforcement of customs, fiscal, immigration, and sanitary laws).
- **Exclusive Economic Zone (EEZ):** Up to 200 NM (Sovereign rights over natural resources).
- **Continental Shelf:** Up to 200 NM and beyond (Rights over seabed and subsoil resources).

Prelims Trap to Remember: Both India and New Zealand are State

Parties to UNCLOS. Conversely, the **United States has signed but not ratified UNCLOS**, though it abides by many of its provisions as customary international law.

Multi-Sectoral Engagement

- **Counter-Terrorism:** Creation of a Joint Working Group focusing on intelligence sharing, disrupting terror financing, countering cyber-enabled terrorism, and deradicalization.
- **Sports Cooperation:** Adoption of a Joint Action Plan on Sport prioritizing high-performance training, sports science, medicine, and exchange of expert coaches.

Strategic Significance for India

- **Indo-Pacific Architecture:** Deepens India's outreach to like-minded Southern Hemisphere democracies, fortifying a free, open, inclusive, and rules-based Indo-Pacific order built on freedom of navigation and respect for international law.
- **Economic Resiliency:** Diversifies supply chains, opens new market access for Indian goods, and invites substantial green-field investments from Oceania.
- **Security Synergy:** Enhances naval interoperability and joint domain awareness against emerging non-traditional maritime threats.

Conclusion:

- The elevation of the India–New Zealand bilateral relationship to a **Strategic Partnership** marks a defining milestone in India's diplomatic outreach across Oceania, effectively reinforcing the vision of a free, open, and rules-based Indo-Pacific. By synergizing maritime security frameworks, defense logistics, and an ambitious trade and

investment roadmap—anchored by a target of ₹35,000 crore and a USD 20 billion capital commitment—both nations have built a robust architecture for mutual prosperity. Ultimately, this partnership transcends regional boundaries: as like-minded democratic maritime nations, India and New Zealand are uniquely positioned to navigate evolving geopolitical currents, secure critical supply chains, and jointly uphold international law under the framework of UNCLOS for enduring regional stability.

Five Crore Indians Wait While Courts Take a Break

Subject: Polity & Governance

Context

The annual debate surrounding court summer vacations has resurfaced against the grim backdrop of India's mounting judicial pendency, which currently stands at **over 5.39 crore cases**. While judges undoubtedly require downtime to write judgments and manage stress, the institutional practice of near-total closure during recesses raises critical questions regarding citizen access to justice and constitutional rights.

Background & Core Dilemma

- **Reduced Capacity:** During summer recesses (such as the Supreme Court operating with only 3–4 vacation benches per week between 1 June

and 12 July), most courts function with severely depleted judicial strength, restricting hearings primarily to urgent matters.

- **The Institutional vs. Individual Distinction:** The core criticism is not directed at individual judges taking well-earned leave, but at the **colonial legacy of synchronized, institutional mass closures**.
- **Colonial Roots:** Long vacations originated during the British Raj because expatriate judges found India's summer climate punishing and traveled back to England. Despite the Supreme Court renaming "Summer Vacation" to "Partial Court Working Days" in 2024, the court still sits for roughly 190 days annually, leaving the core structural issue largely intact.

Major Dimensions of the Crisis

1. Staggering Judicial Pendency
According to the National Judicial Data Grid (NJDG) data from late 2025:

- **District Courts:** Over 4.76 crore cases
 - **High Courts:** Around 63.6 lakh cases
 - **Supreme Court:** More than 92,000 cases
 - **The Backlog Horizon:** Government estimates indicate that clearing the current backlog at present disposal rates could take nearly **three centuries**.
- 2. The Plight of Undertrial Prisoners**
- Nearly **three-fourths of India's prison population** consists of undertrials—individuals accused of crimes who have not been proven guilty.

- Reduced court functionality delays crucial bail hearings, habeas corpus petitions, and trials, causing many to spend years behind bars—sometimes exceeding the maximum sentence prescribed for the alleged offense. This represents a direct violation of **Article 21** (Right to Life and Personal Liberty) and the implied right to speedy justice.

Suggested Institutional Reforms

1. **Staggered Judicial Vacations (The Most Recommended Model):**
 - Recommended by the Parliamentary Standing Committee (2023), the Law Commission, and the Justice Malimath Committee.
 - Courts should function like essential public services (hospitals, police) where judges take leave in a rotational, staggered manner, ensuring **adequate benches operate continuously throughout the year**.
2. **Expediting Judicial Appointments:**
 - Filling vacancies promptly (nearly one-third of sanctioned High Court posts remain vacant due to friction between the Executive and the Collegium).
3. **Institutionalizing Alternative Dispute Resolution (ADR)**
 - Scaling up Lok Adalats, mediation, and arbitration to divert minor disputes away from formal courts. (For context, National Lok Adalats have settled crores of cases, and the *Mediation Act, 2023* provides a robust legislative push).

4. Strategic Utilization of Retired Judges:

- Deploying retired judges under a dedicated framework to monitor pendency hotspots, mentor judicial officers, and audit case-management efficiencies without altering constitutional retirement ages (62 for HCs, 65 for SCs).

Constitutional & Governance Dimensions

- **Article 21:** Guarantees life and personal liberty, within which the Supreme Court (*Hussainara Khatoon* case onwards) has repeatedly read the **right to a speedy trial** as an inalienable component.
- **Article 39A (DPSP):** Mandates the State to promote justice on a basis of equal opportunity and provide free legal aid to ensure that opportunities for securing justice are not denied to any citizen.

Conclusion

The mounting backlog of over **5.39 crore pending cases** and the vulnerability of undertrials make it imperative to rethink judicial institutional design. While synchronized court vacations are a colonial legacy, replacing mass closures with **staggered, rotational leave models** and robust ADR mechanisms will ensure continuous access to justice. Ultimately, upholding the constitutional mandate of Article 21 requires matching judicial independence with proactive institutional accountability, transforming our courts into an accessible, year-round sanctuary for the rule of law.

Trial in Absentia

Subject: Polity & Governance

Context

The issuance of a non-bailable warrant by a Special NIA Court against a key fugitive terrorist has spotlighted a paradigm shift in India's criminal jurisprudence. With the accused unlikely to submit to the jurisdiction of Indian courts, the National Investigation Agency (NIA) is positioned to invoke the provisions of **trial in absentia** under the newly enacted **Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023**.

Decoding Trial in Absentia

- **Definition:** A criminal trial conducted in the physical absence of an accused who has deliberately absconded to evade the judicial process.
- **Statutory Anchor:** Governed by **Section 356 of the BNSS, 2023**, which marks a historic departure from the colonial-era Code of Criminal Procedure (CrPC), 1973.
- **Applicability Threshold:** It does not apply to all absconders. It is restricted exclusively to a **"Proclaimed Offender"** under Section 84 of the BNSS facing serious charges carrying a punishment of **10 years or more imprisonment, life imprisonment, or the death penalty**, and who continues to evade arrest despite formal legal notices.

Evolution from the Legacy CrPC, 1973

Under the legacy CrPC, complete trials could not proceed in the absence of the accused, rendering courts dependent on interim measures:

- **Section 82(4):** Proclamation against absconding individuals.
- **Section 83:** Attachment of property belonging to the proclaimed offender.
- **Section 299:** Recording of evidence in the absence of the absconder.
- **Section 317:** Dispensing with personal attendance only in limited, non-trial situations.

The Bottleneck: Because a full trial could not advance without the accused, high-profile criminal and terror cases remained stalled indefinitely until the fugitive was apprehended or extradited, paralyzing justice delivery. Section 356 of the BNSS addresses this vacuum directly.

Procedural Safeguards under Section 356 BNSS

To ensure that procedural expediency does not compromise natural justice or constitutional guarantees, the statute builds in a multi-layered safeguard mechanism:

1. Pre-Trial Safeguards:

- Issuance of **two consecutive arrest warrants** spaced at least 30 days apart.
- Mandatory publication of a public notice in local and national newspapers, alongside physical display at the accused's last known residence, giving a 30-day window to appear.
- Mandatory notification to a designated friend or relative of the accused.

2. During Trial Safeguards:

- Trial can commence only after **90 days from the framing of charges**.
- Mandatory appointment of a **State-funded defense counsel** if the accused has no representation.
- Mandatory recording and preservation of witness testimonies via **audio-visual electronic means**, wherever practicable.

3. Post-Trial Recourse (If Apprehended Later):

If the fugitive is subsequently captured or voluntarily appears, the court is empowered to permit the **cross-examination of witnesses** and grant necessary reliefs to protect the interests of justice.

Significance for India's Criminal Justice System

- **Combating Cross-Border Terrorism:** Overcomes the limitations posed by uncooperative foreign jurisdictions sheltering high-profile fugitives.
- **Ending Impunity:** Prevents criminals and terrorists from mocking the judicial process by permanently evading arrest.
- **Timely Closure:** Speeds up adjudication in heinous crime cases, reducing systemic backlogs and delivering closure to victims.

Challenges & Concerns

- **Fair Trial Dilemma:** Critics argue that trying an individual without physical presence strains the constitutional guarantees of a robust defense under Article 21.
- **Burden of Knowledge:** Proving that a fugitive had actual, verified knowledge of ongoing trial proceedings across international borders presents practical enforcement hurdles.

- **Judicial Vigilance:** The risk of executive or procedural overreach necessitates rigorous, uncompromising judicial scrutiny to ensure every mandatory safeguard is strictly adhered to.

Conclusion

The introduction of trial in absentia under Section 356 of the BNSS represents a decisive legislative step toward dismantling the safe havens enjoyed by high-profile fugitives and cross-border terrorists. While this mechanism modernizes India's criminal justice architecture to handle modern security threats, its legitimacy hinges on strict adherence to statutory safeguards and due process. Ultimately, balancing the state's imperative for swift, decisive justice with the inviolable principles of a fair trial will determine the democratic resilience of this reform.

Corporate Social Responsibility (CSR) Spending in India

Subject: Economy

Context

According to recent Ministry of Corporate Affairs (MCA) data compiled in the Fulcrum Report, Corporate Social Responsibility (CSR) spending in India witnessed a **17% year-on-year growth to reach ₹40,794 crore in FY25**. Over the past decade, cumulative corporate contributions toward social development have touched an impressive **₹2.61 lakh crore**.

Key Highlights of the FY25 Report

- **Spending Scale:** Total CSR expenditure hit ₹40,794 crore, reflecting robust corporate engagement.
- **Project Expansion:** Total projects implemented grew by **21% to 72,233**, with an average project cost of ₹56.47 lakh.
- **Core Sectoral Focus:** Investments were heavily channeled into **education, skill development, healthcare, sanitation, and environmental conservation**—directly advancing India's inclusive growth agenda and the Sustainable Development Goals (SDGs).
- **Top Contributors:**
 - **Reliance Industries Ltd.** led the tally with **₹1,309 crore**, followed by **HDFC Bank Ltd.** at **₹1,039 crore**.
 - **Concentration Trend:** The **Top 10 companies** accounted for **17%** of the country's total CSR outlay, contributing a combined **₹7,123 crore**.

The Indian CSR Model: Statutory Framework

India holds the distinction of being the **first country in the world to mandate CSR by law**, shifting corporate philanthropy from voluntary charity to statutory obligation.

- **Legal Anchor:** Governed by **Section 135 of the Companies Act, 2013** and the Companies (CSR Policy) Rules, 2014.
- **Eligibility Criteria:** A company must comply with CSR provisions if it meets *any* of the following

financial thresholds in the preceding fiscal year:

- **Net Worth:** ₹500 crore or more
- **Turnover:** ₹1,000 crore or more
- **Net Profit:** ₹5 crore or more
- **The 2% Mandate:** Eligible companies are legally required to spend **at least 2% of their average net profits** earned over the three preceding financial years on approved CSR activities listed under **Schedule VII** (ranging from poverty eradication and healthcare to environmental sustainability, technology incubators, and Prime Minister's relief funds).
- **Compliance Evolution: From "Comply or Explain" to Penalties**
In 2021, India transitioned from a flexible "Comply or Explain" framework to a stringent **"Comply or Be Penalised"** regime:
- **Unspent Funds on Ongoing Projects:** Must be transferred to an unspent CSR account within **30 days** of financial year-end and utilized within **3 years**.
- **Other Unspent Funds:** Must be transferred within **6 months** to a specified Schedule VII Government Fund.
- **Penalties for Default:**
 - *Company:* Twice the unspent amount or **₹1 crore**, whichever is lower.
 - *Defaulting Officers:* One-tenth of the unspent amount or **₹2 lakh**, whichever is lower.

Key Challenges in India's CSR Ecosystem

- **Geographical Skewness:** Funds tend to concentrate in industrialized,

economically advanced states (such as Maharashtra, Gujarat, and Karnataka), leaving backward and aspirational districts underserved.

- **Corporate Concentration:** High dependency on a handful of mega-corporations while medium-sized eligible enterprises underperform in strategic impact.
- **Superficial Compliance vs. Outcomes:** A historical preference for short-term asset creation rather than rigorous, long-term impact assessments and capacity building.

Way Forward

- **Outcome-Based Monitoring:** Shift the evaluation metrics from mere financial expenditure to tangible, long-term socio-economic impact.
- **Targeting Aspirational Districts:** Incentivize companies to route CSR investments toward lagging regions, remote geographies, and underserved sectors.
- **Public-Private-Community Collaboration:** Foster robust tri-sector partnerships between corporations, specialized NGOs, and local self-governing bodies.
- **National Alignment:** Harmonize corporate initiatives with national missions like Skill India, Digital India, and Green Growth, ensuring transparency through technology-enabled reporting and social audits.

Conclusion

The steady rise in India's CSR spending to over ₹40,000 crore marks a maturing corporate ecosystem where social responsibility is institutionalized as a pillar of national development. While the statutory 2013 framework has successfully mobilized capital

for education, health, and sustainability, the true test of this policy lies in shifting from capital disbursement to equitable, outcome-driven governance. Ensuring that CSR funds reach India's most marginalized pockets will transform corporate philanthropy into a vital catalyst for inclusive, resilient growth.

Here is a rewritten version of the notes formatted in the analytical, structured, and comprehensive style typical of UPSC Civil Services current affairs magazines.

FCRA (Amendment) Bill, 2026- A Threat to Civil Society Organisation?

Subject: Polity & Governance

Why in News?

The **Foreign Contribution (Regulation) Amendment Bill, 2026** has been slated for consideration during the Monsoon Session of Parliament. Previously deferred due to widespread protests by civil society and minority organisations, its revival has reignited the perennial debate balancing national security and regulatory oversight against the protection of civil liberties and the functional autonomy of Non-Governmental Organisations (NGOs).

Background: Evolution of the FCRA Framework

India's regulation of foreign funding has evolved progressively to insulate domestic institutions from external interference:

- **FCRA, 1976:** Enacted during the Emergency, it marked the first statutory framework to regulate foreign contributions and hospitality, primarily to safeguard political stability and sovereignty.
- **FCRA, 2010:** Replaced the 1976 Act with a stricter, comprehensive framework. It regulates (rather than outright prohibits) foreign funds for specific sectors: *education, healthcare, humanitarian relief, religious activities, social welfare, and environmental protection.*
- **Prohibited Entities:** Under the 2010 Act, entities explicitly barred from receiving foreign funds include election candidates, political parties, legislators, judges, government employees, and media personnel.

Key Provisions of the Proposed 2026 Amendment

The 2026 Bill introduces stringent compliance and penal measures, significantly altering the regulatory landscape for the "Third Sector":

1. Vesting of Assets on Cancellation (Major Shift):

- If an organisation's FCRA registration is cancelled, all unutilised foreign contributions and assets created from them will vest in a **Designated Authority**.
- *Crucial Catch:* Even if an asset was only **partially funded** by foreign contributions, the *entire* asset becomes liable for forfeiture.

2. Permanent Acquisition of Assets:

- While initial vesting is temporary, failure to restore or renew registration within a prescribed window makes the confiscation permanent.
- The Authority can transfer these assets to the Centre, State, or Local bodies, or auction them off. Proceeds will be credited to the **Consolidated Fund of India (Article 266)**.

3. Cancellation During Mere Prosecution:

- Registration can be revoked upon the mere initiation of prosecution (e.g., for forced religious conversions or inducement). **A formal judicial conviction is no longer a prerequisite** for cancellation.

4. Penalising Voluntary Surrender:

- Organisations wishing to voluntarily exit the FCRA framework (because they no longer need foreign funds) will still face the forfeiture of their unutilised foreign contributions and the assets created from them.

5. Discretionary Exemption Clause (Clause 16):

- The Central Government retains the power to exempt any organisation, class of organisations, or individual from the Act's provisions if it deems it necessary "in the public interest."

Core Concerns & Criticisms

The proposed amendments have drawn severe criticism from legal experts and rights advocates due to

their potential "chilling effect" on civil society:

- **Excessive Executive Discretion & Vagueness:** The Bill retains the broad power to cancel registrations under the undefined guise of "**public interest.**" This vagueness reduces legal certainty and opens the door for arbitrary administrative actions.
- **Vulnerability to Misuse:** There are widespread apprehensions that motivated or fabricated complaints—particularly regarding religious conversions—could trigger immediate prosecution and asset forfeiture, disproportionately targeting minority and religious institutions.
- **Disproportionate Financial Consequences:** Confiscating an entire institutional asset (like a hospital or school) simply because a fraction of it was built with foreign funds is viewed as an excessive and financially crippling penalty.
- **Paralysis of Welfare Delivery:** NGOs working in critical sectors like disaster relief, healthcare, human rights, and education may face severe operational uncertainty, hindering grassroots welfare delivery.

Constitutional & Legal Implications

The Bill's provisions, particularly the Exemption Clause, face potential friction with **Article 14 (Equality Before the Law)** of the Indian Constitution:

- **Absence of Intelligible Differentia:** Article 14 requires that any classification made by a law must be reasonable. The Bill lacks objective criteria to differentiate between

organisations that deserve an exemption and those that do not.

- **Lack of Rational Nexus:** The power to exempt relies entirely on the subjective opinion of the Executive rather than an objective standard connected to the legislation's primary goal.

The Government's Rationale

The Centre defends the amendments as a necessary legislative upgrade to protect the state apparatus:

- **Safeguarding Sovereignty:** To prevent foreign state and non-state actors from interfering in India's internal affairs and democratic processes.
- **Financial Integrity:** To enhance transparency, ensure strict accountability in the utilisation of foreign funds, and plug loopholes that allow diversion of funds for anti-national or unlawful activities.
- **Regulatory Oversight:** To create a more robust deterrent against entities that misuse charitable status as a front for disruptive agendas.

Way Forward

While preserving national security and curbing illegal foreign interference is a non-negotiable duty of the State, regulations must pass the test of proportionality. A vibrant democracy requires a thriving civil society. The government should consider defining "public interest" clearly, ensuring that cancellation requires judicial conviction rather than mere prosecution, and introducing a proportional asset-forfeiture rule to protect grassroots welfare initiatives.

SC Restricts Retrospective Environmental Clearances

Subject: Polity & Governance

Why in News?

In a significant intervention to uphold environmental jurisprudence, the Supreme Court of India recently quashed a 2021 Office Memorandum (OM) issued by the Union Ministry of Environment, Forest and Climate Change (MoEFCC). The contentious OM had permitted *ex post facto* (retrospective) Environmental Clearances (EC) for projects that had commenced operations without obtaining prior statutory approvals.

Background: The Statutory Framework of Environmental Clearance

Environmental Clearance (EC) is a mandatory statutory approval required before commencing specified large-scale development projects (e.g., highways, airports, mining, real estate, and resource extraction).

- **Objective:** To systematically assess likely environmental impacts, prescribe mitigation measures, and ensure ecologically sustainable development.
- **Legal Backing:** The EC process is governed by the **Environmental Impact Assessment (EIA) Notification, 2006**, issued under the powers of the **Environment (Protection) Act, 1986**.

The Contentious 2021 Office Memorandum

The 2021 OM introduced a mechanism allowing defaulting projects to regularize their environmental violations after commencing operations.

- **Regularization via Fine:** It permitted violators to obtain an *ex post facto* clearance upon payment of environmental compensation.
- **Parallel Mechanism:** Effectively, the OM created a permanent, parallel route for obtaining ECs, treating environmental violations as compoundable offenses rather than strict statutory breaches.

Key Highlights of the Supreme Court Judgment

The Supreme Court dismantled the 2021 OM on multiple legal and environmental grounds, establishing crucial precedents for future regulatory governance:

1. Administrative Instructions Cannot Override Delegated Legislation

The Court emphasized the hierarchy of laws. The EIA Notification of 2006 is a form of delegated legislation. The 2021 OM, being merely an administrative executive instruction, cannot amend, override, or replace the statutory framework established by the 2006 notification.

2. Strict Mandate of Prior Clearance

The Bench reaffirmed that **prior** Environmental Clearance is a non-negotiable, mandatory legal requirement. It cannot be treated as a mere procedural formality to be fulfilled post-facto.

3. Rejection of the "Pollute and Then Pay" Principle

The Court heavily criticized the OM for commodifying environmental degradation. Allowing violations to be regularized merely through financial compensation encourages non-compliance, weakens environmental governance, and actively undermines the principle of Sustainable Development.

4. Executive Cannot Create Permanent Amnesty Routes

While acknowledging that amnesty mechanisms are sometimes needed, the Court ruled they must be **temporary, exceptional, and justified by overriding public interest**. The executive cannot institutionalize retrospective clearances as a regular, parallel alternative to prior approvals.

5. Exclusive Domain of Article 142

The judgment clarified that while the Supreme Court may grant appropriate relief to unauthorized projects in highly exceptional cases to balance public interest using **Article 142 of the Constitution**, this extraordinary power is exclusive to the Supreme Court. The Executive branch cannot arrogate this power to itself via administrative orders.

Impact and Applicability

To balance environmental protection with economic stability, the Court applied the doctrine of prospective overruling:

- **Prospective Application:** The ruling applies to future cases. New or upcoming projects must strictly comply with the prior-EC mandate.
- **Status of Existing Clearances:** Clearances already granted under the 2017 One-Time Amnesty Notification and the quashed 2021 OM will not be automatically

invalidated. This prevents the abrupt disruption of major infrastructure and public utility projects. However, these specific clearances remain open to individual legal challenges before competent courts.

Environmental Principles Reinforced

The judgment serves as a strong reiteration of foundational international environmental principles adopted by Indian courts:

1. **The Precautionary Principle:** Environmental degradation must be anticipated and prevented *before* it occurs. Post-facto remedies and financial penalties are inadequate substitutes for prior prevention.
2. **Sustainable Development:** The state must ensure that economic growth does not compromise environmental integrity or inter-generational equity.

Conclusion

The Supreme Court's judgment is a timely course correction that reinforces the sanctity of the Environmental Impact Assessment regime in India. By striking down the 2021 Office Memorandum, the Court has drawn a firm line against the dilution of statutory environmental safeguards through executive shortcuts. It sends a clear message to regulatory bodies and industries alike: environmental compliance is not a retroactive commodity that can be bought through compensation, but a preemptive duty. Going forward, this ruling will strengthen India's environmental governance, ensuring that the pursuit of economic development remains strictly

tethered to the rule of law and
ecological sustainability.



GENERAL STUDIES - III

1. Indian Economy
2. Agriculture And Food
3. Environment And Biodiversity
4. Science And Technology
5. Disaster Management
6. Internal Security

THE SHIFT IN INDIA'S SHIPBUILDING DRIVE

Subject: Economy

Why in news?

The recent historic visit of South Korean President Lee Jae Myung to India—marking the first such leadership visit in eight years—has injected fresh momentum into bilateral strategic relations. A centerpiece of this renewed engagement is a structural transformation in India's maritime sector, moving away from fragmented, slow-moving projects toward an integrated, cluster-based industrial model inspired by Ulsan, South Korea's globally renowned shipbuilding hub.

Context & Strategic Evolution

For decades, India's shipbuilding industry suffered from reliance on imported vessels, delayed project execution, and fragmented supply chains. Under the current strategic shift, India is pivoting toward a comprehensive greenfield manufacturing framework designed to establish domestic supply chains, foster advanced technology partnerships, and achieve self-reliance (**Atmanirbhar Bharat**).

Key Agreements and Highlights

- **Cochin Shipyard Limited (CSL) & HD Hyundai:** HD Korea Shipbuilding & Offshore Engineering (Hyundai), through its subsidiary, signed an accord with CSL to commit **\$4 billion** toward a modern greenfield shipyard in Thoothukudi, Tamil Nadu.
- **Samsung Heavy Industries (SHI):** Partnered with Swan Defence and Heavy Industries to manufacture advanced vessels domestically.

- **Localized Equipment Ecosystem (KOMEA):** The Korea Marine Equipment Association—representing **304 specialized firms**—has established an office in Mumbai to develop localized marine equipment clusters.
- **Institutional Collaboration:** Multiple Business-to-Business (B2B) and Government-to-Government (G2G) frameworks have been formalized to promote workforce training, maritime R&D, and the replication of the Ulsan industrial ecosystem. Long-term strategic commitments have also been reaffirmed by Hanwha Ocean.

Current Status and Policy Architecture

- **Vision Targets: Maritime Vision 2030 and the Maritime Amrit Kaal Vision 2047** target India's entry into the top ten global shipbuilding nations by 2030 and the top five by 2047.
- **Financial Mechanisms:** Introduction of the **Maritime Development Fund**, the **Shipbuilding Development Scheme**, and the **Shipbuilding Financial Assistance Policy** to catalyze Foreign Direct Investment (FDI).
- **Dedicated Financing:** The **Sagarmala Finance Corporation Limited (SFCL)** operates as India's first dedicated Non-Banking Financial Company (NBFC) tailored for maritime infrastructure.
- **Administrative Reforms:** Expedited regulatory approvals for the Tamil Nadu greenfield facility demonstrate improving ease of doing business.

Key Challenges

- **Ancillary Deficit:** Limited domestic ancillary industries create an overreliance on imported marine components.
- **Regulatory Bottlenecks:** Persistent legal complexities and prolonged approval processes risk discouraging long-term risk capital.
- **Skill Shortages:** Acute deficits in advanced ship design, hydrodynamics, and specialized marine engineering.
- **Cost Disparities:** High domestic borrowing costs undermine competitiveness against heavily subsidized shipyards in East Asia.
- **Global Competition:** Intense rivalry from established maritime superpowers, particularly China.

The India–South Korea shipbuilding partnership provides a transformative window to acquire cutting-edge maritime technology, attract sustained capital, and position India as a globally competitive, self-reliant shipbuilding powerhouse.

INDIA'S GEN Z AND UNEMPLOYMENT: THE SKILL-JOB MISALIGNMENT

Subject: Economy

Why in News?

Recent expert analyses of the **Periodic Labour Force Survey (PLFS) 2023–24** have brought renewed attention to a widening job transition crisis. Despite India sitting on a historic demographic dividend, the country's educated Gen Z faces severe structural barriers to formal employment.

Context & Dimensions of Gen Z Unemployment

- **Demographic Scope:** Generation Z in India encompasses working-age individuals aged **15–26 years** (born between 1997 and 2012), numbering approximately **29.94 crore** people.
- **The Crisis:** Rather than reaping demographic dividends, youth face delayed school-to-work transitions, pervasive underemployment, and forced dependence on informal or unpaid economic arrangements.

Way Forward

- **Streamlined Approvals:** Implement single-window clearance mechanisms via coordinated central-state frameworks for land, utilities, and environmental permits.
- **Cluster Development:** Leverage KOMEA's technical expertise to nurture localized MSME component clusters, reducing import dependency.
- **Affordable Financing:** Scale up long-term credit provisions through SFCL to lower capital costs for domestic shipbuilders.
- **Academic Partnerships:** Forge institutional linkages with South Korean maritime universities for dual-degree programs, skill enhancement, and joint R&D.
- **Measurable Targets:** Institute binding annual production metrics and technology-absorption benchmarks to rapidly scale manufacturing capacity.

Conclusion:

Implications

On Society

- **Rising Unrest:** Heightened economic anxiety manifests as labor strikes, mental health distress, and public protests over employment conditions.
- **Strained Household Finances:** Families making substantial financial sacrifices for higher education suffer poor economic returns, deepening household debt.
- **Gender Inequality:** Structural labor barriers disproportionately push young women out of the active workforce and into unpaid domestic responsibilities.

reverse female labor force dropouts.

- **Gig Economy Protections:** Establish robust urban employment frameworks offering social security, minimum wage floors, and contractual protections for gig and platform workers.

Conclusion:

Securing formal, high-quality employment for Gen Z is non-negotiable for translating India's demographic advantage into sustainable, inclusive economic growth.

On Economy

- **Wasted Demographic Dividend:** Failure to employ youth productively imposes long-term drag on per capita income growth.
- **Suppressed Consumption:** Informal, low-wage work restricts household purchasing power, undermining domestic consumption demand.
- **Productivity Deficit:** Educated youth trapped in low-skilled roles suppress industrial innovation and aggregate economic productivity.

POLYMER BANKNOTES IN INDIA: ADVANTAGES, CHALLENGES & RBI INITIATIVES

Subject: Economy

Why in News?

The Reserve Bank of India's (RBI) currency printing subsidiary—**Bharatiya Reserve Bank Note Mudran Private Limited**—has invited global Expressions of Interest (EoI) for supplying opacified polymer substrate sheets embedded with advanced security features.

Way Forward

- **Labor-Intensive Manufacturing:** Scale up employment-intensive sectors such as textiles, food processing, and construction to absorb semi-skilled and skilled youth into formal jobs.
- **Apprenticeship Pathways:** Strengthen university-industry apprenticeship networks backed by state-backed hiring incentives for seamless workforce entry.
- **Enabling Female Participation:** Scale up safe public transport, institutional childcare (Creches), and flexible work models to

Context & Technology

Polymer banknotes are manufactured using **Biaxially Oriented Polypropylene (BOPP)** rather than traditional cotton-rag paper. Adopted by over 60 countries, polymer notes offer enhanced durability, resistance to moisture and soil, robust anti-counterfeiting features, and an extended circulation lifecycle.

Key Challenges

- **High Production Costs:** Specialized polymer substrates and complex security features drive up unit manufacturing costs, particularly for low-denomination notes.
- **Petrochemical Vulnerability:** Dependence on polypropylene exposes currency production costs to global crude oil price volatility and supply chain shocks.
- **Infrastructure Upgrades:** Transitioning to polymer notes necessitates expensive retrofitting of Automated Teller Machines (ATMs), currency sorting systems, and cash-vending infrastructure.
- **Digital Displacement:** The rapid expansion of the **Unified Payments Interface (UPI)** and the **Central Bank Digital Currency (CBDC)** structurally moderates long-term demand for physical cash.

Way Forward

- **Phased Pilot Program:** Initiate targeted rollouts for ₹10 and ₹20 denominations across diverse climatic zones to accurately evaluate durability and lifecycle savings.
- **Domestic Substrate Production:** Promote indigenous polypropylene manufacturing to insulate the currency supply chain from external shocks.
- **Closed-Loop Recycling:** Establish dedicated recycling networks to convert retired polymer notes into industrial-grade plastic goods.
- **Hybrid Cash-Digital Strategy:** Harmonize polymer currency expansion with ongoing digital payment penetration to optimize national cash management efficiency.

Conclusion:

The RBI's strategic pivot toward polymer banknotes offers a pragmatic pathway to enhance currency durability and security, provided it balances cost efficiency with domestic manufacturing and rising digital adoption.

UNLOCKING GROWTH IN TOURISM AND HOSPITALITY SECTOR

Subject: Economy

Why in News?

The Ministry of Tourism, in collaboration with **NITI Aayog**, released a landmark report titled *“Unlocking Growth in Tourism and Hospitality Sector”* during a National Workshop in New Delhi, mapping out structural regulatory reforms to achieve the **Viksit Bharat 2047** vision.

Context & Potential

- **Employment Intensity:** Tourism is one of the most high-employment service sectors, absorbing labor across diverse skill spectrums.
- **Regional Balancing:** Acts as a catalyst for inclusive growth across rural, coastal, and heritage sectors, diversifying regional economies.
- **External Sector Strength:** Foreign tourist spending generates vital foreign exchange reserves.
- **Value-Driven Sectors:** High-value segments like wellness tourism, Ayurveda, luxury heritage hospitality, and spiritual circuits drive higher visitor spending.
- **Homestay Economy:** Registered homestays generated nearly **₹4,722**

crore in 2024, simultaneously providing affordable lodging and rural livelihoods.

Implementing NITI Aayog's reform roadmap will unlock the tourism sector's immense economic potential, driving ease of doing business, job creation, and inclusive development.

Key Regulatory Bottlenecks

- **Building Norms:** Restrictive, archaic real estate regulations inflate construction costs and deter project viability.
- **License Fragmentation:** Multiplicity of municipal, state, and central clearances causes severe administrative delays.
- **Compliance Burden:** Frequent license renewals inflate overhead compliance costs.
- **Interstate Transit Barriers:** Disparate state-level road taxes and permit regimes disrupt integrated interstate tourism circuits.
- **Visa Friction:** Complex e-Visa documentation requirements and payment gateway failures deter international travelers.

Way Forward

- **Single-Window Clearances:** Streamline administrative approvals through unified digital portals.
- **Rationalized Building Codes:** Modernize construction regulations while upholding safety and environmental safeguards.
- **Harmonized Permits:** Universalize interstate tourist transport permissions under the **All India Tourist Permit (AITP)** framework.
- **Frictionless Visas:** Optimize electronic Visa processing and modernize digital payment systems for global tourists.

Conclusion:

HELIUM AS A STRATEGIC RESOURCE

Subject: Science & Technology

Why in News?

China recently imposed a temporary ban on helium exports amid escalating West Asian tensions and attacks on Qatar's helium production facilities, exposing vulnerabilities for nations reliant on shipments transiting through the **Strait of Hormuz**.

Context & Physical Properties

Helium has transitioned from a routine commercial gas into a critical strategic resource essential for advanced technology, national security, and healthcare.

- **Ultra-Low Boiling Point:** Boils at **-269°C (4.2 Kelvin)**, remaining liquid near absolute zero.
- **Chemical Inertness:** A noble gas that provides stable, non-reactive operational environments.
- **High Thermal Conductivity:** Facilitates rapid heat dissipation for precision industrial cooling.
- **Atomic Size:** Extremely small atomic radius enables the detection of microscopic gas leaks.

Formation and Extraction

Helium forms over millions of years through the radioactive alpha decay of uranium and thorium within the Earth's crust. It accumulates within natural gas deposits and is commercially extracted via **cryogenic fractional distillation** when concentrations exceed **0.3% by volume**.

Strategic Importance

- **Semiconductor Fabrication:** Crucial for Extreme Ultraviolet (EUV) lithography, plasma etching, and silicon wafer cooling.
- **Quantum Computing:** Essential for maintaining superconducting qubits at cryogenic near-zero temperatures.
- **Space Technology:** Utilized by ISRO and NASA for high-pressure rocket fuel tank pressurization.
- **Medical Diagnostics:** Magnetic Resonance Imaging (MRI) systems rely entirely on liquid helium to maintain superconducting magnet states.

Key Challenges & Applications

- **Supply Concentration:** Global production remains heavily monopolized by the United States and Qatar.
- **Logistics & Evaporation:** Specialized cryogenic containers are costly, and helium's low boiling point causes constant evaporative losses.
- **Geopolitical Chokepoints:** Vulnerability of supply routes through the Strait of Hormuz.
- **Applications:** Silicon wafer production, fiber optics, rocket propulsion purge systems, weather balloons, precision leak testing, and Gas Tungsten Arc Welding (GTAW) shielding.

Way Forward

- **Domestic Recovery:** Extract and purify helium from domestic natural gas processing streams.
- **Strategic Reserves:** Build strategic cryogenic storage infrastructure.
- **Diversification:** Diversify import sources away from West Asian chokepoints to secure high-tech manufacturing supply chains.

Conclusion:

Securing helium supplies through domestic extraction and diversified sourcing is vital to insulate India's high-tech manufacturing, space, and healthcare ecosystems from global supply shocks.

INDIA'S SEMICONDUCTOR PUSH

Subject: Science & Technology

Why in News?

The Prime Minister of India inaugurated the commercial production phase of the **CG Semi Outsourced Semiconductor Assembly and Test (OSAT)** facility in Sanand, Gujarat, marking a major milestone under the **India Semiconductor Mission (ISM)**.

Context & Infrastructure Landscape

The ISM aims to transition India from an electronics importer into a self-reliant semiconductor powerhouse. Key foundational nodes include:

- **Sanand Cluster (Gujarat):** Emerging as an OSAT/ATMP hub

featuring Micron Technology, Kaynes Semicon, and CG Semi.

- **Dholera (Gujarat):** Tata Electronics (TEPL), in partnership with Powerchip Semiconductor Manufacturing Corporation (PSMC), is building India's first commercial silicon wafer fabrication plant.
- **Bhubaneswar:** Developing India's first heterogeneous integration and advanced 3D-packaging facility.
- **Design Ecosystem:** The Ministry of Electronics and Information Technology (MeitY) supports fabless startups via the **Design-Linked Incentive (DLI)** scheme and EDA tool training.

Importance

- **National Security:** Microchips underpin modern defense systems, secure communication arrays, and radar infrastructure.
- **Artificial Intelligence:** Domestic chips drive computational capacity for AI, deep learning, and supercomputing.
- **Industrial Synergy:** Fuels the Electric Vehicle (EV) revolution and 5G/6G telecommunication networks.
- **Economic Resilience:** Mitigates vulnerabilities to global supply chain disruptions.

Key Challenges

- **Capital Intensity:** Semiconductor fabrication requires astronomical, long-term capital investments.
- **Global Rivalry:** Intense competition from entrenched ecosystems in Taiwan, South Korea, and China.
- **Resource Dependency:** Requires uninterrupted, high-volume inputs of ultra-pure water, clean power,

and electronic-grade specialty gases.

- **Technology Frontier:** Achieving sub-10 nanometer fabrication nodes demands advanced technological depth.

Way Forward

- **ISM 2.0:** Expand financial outlays and tenure under a robust second phase of the semiconductor mission.
- **Green Utilities:** Establish dedicated green energy grids and advanced water recycling plants around semiconductor clusters.
- **Scale up DLI:** Broaden financial and technical support for domestic fabless chip design startups.
- **Domestic Procurement:** Enforce phased domestic sourcing policies (*Made in India* chips) to guarantee captive market demand.

Conclusion: Building an end-to-end semiconductor ecosystem is imperative for achieving technological sovereignty, supply-chain resilience, and long-term economic security.

THE GLOBAL MINING AND METALS WATER DATASET REPORT

Subject: Economy

Why in News?

The **International Council on Mining and Metals (ICMM)** released its landmark *Global Mining and Metals Water Dataset* report, revealing that nearly two-thirds of global mining and metals processing facilities face high physical

water risk. This is the first comprehensive, cross-commodity assessment of its kind, evaluating water risks across 12,000 facilities in 148 countries and regions to safeguard critical mineral supply chains.

Context & Methodology

- **Collaborative Research:** Developed by ICMM in partnership with the World Resources Institute (WRI) and the World Wide Fund for Nature (WWF) Water Risk Team.
- **Scope:** Maps geospatial data of roughly 12,000 mines, smelters, refineries, and plants against global water indicators.
- **Core Hazards Evaluated:** Baseline water stress, water depletion, drought risk, flood exposure, and interannual water variability.
- **Key Findings:** Approximately **65.7%** of global facilities face at least one major physical water hazard. Baseline water stress impacts **38.2%** of facilities, making competition for water with local communities and agriculture the primary operational threat. Vulnerabilities are acute in regions like Chile (copper/lithium), Africa, and the Middle East.

Mining Impacts on Water Resources

- **High Withdrawals:** Mineral processing, dust suppression, slurry transport, and equipment cooling place immense strain on local hydrology.

- **Aquifer Depletion:** Industrial groundwater pumping for mine dewatering permanently lowers local water tables.
- **Contamination Risks:** Tailings dam vulnerabilities and acid mine drainage threaten aquatic ecosystems with heavy metals and toxic chemicals.
- **Runoff Alteration:** Land clearing and excavation disrupt natural drainage paths, exacerbating soil erosion and flash flooding.

Implications

- **Energy Transition Bottlenecks:** Water scarcity threatens the extraction and processing of critical minerals (copper, lithium, nickel, rare earths), potentially stalling global clean energy deployment.
- **Macroeconomic Shocks:** Unpredictable droughts and floods disrupt mineral output, fueling volatile global metal prices.
- **Socio-Political Conflict:** Intense competition for water resources between mining companies, farmers, and rural communities stokes local protests and erodes social license to operate.
- **Financial Risk:** Facility shutdowns, regulatory fines, and stranded assets heighten exposure for institutional investors.

Recommendations & Way Forward

- **Catchment-Based Stewardship:** Implement integrated water

resource management (IWRM) at the river-basin scale, involving local communities and agricultural stakeholders.

- **Mineral Planning:** Factor long-term water constraints into national and international critical mineral and renewable energy strategies.
- **Circular Technologies:** Scale up zero-liquid discharge (ZLD), closed-loop recycling, and seawater desalination to minimize freshwater footprints.
- **Enhanced Transparency:** Mandate rigorous, standardized facility-level disclosure of water withdrawals, consumption, and effluent discharge.

Conclusion:

Effective water stewardship is a non-negotiable prerequisite for resilient mining operations, safeguarding critical mineral supplies, protecting fragile ecosystems, and ensuring a just clean energy transition.

THE ROADMAP TO MAKE GREEN UREA PRODUCTION A REALITY

Subject: Economy

Why in News?

To accelerate industrial decarbonization and fertilizer self-reliance, the **Department of Fertilizers (DoF)**

convened a high-level pre-Expression of Interest (EoI) meeting at the Projects and Development India Limited (PDIL) headquarters in Noida. This meeting laid the foundation for India's first commercial **Green Urea** manufacturing roadmap.

Context & Production Chemistry

- **The Technology:** Green urea is synthesized by replacing fossil fuel-derived feedstocks with clean alternatives. Renewable energy powers water electrolysis to generate green hydrogen, which is combined with atmospheric nitrogen (via green ammonia) and captured industrial carbon dioxide (CO₂) to produce low-emission urea.
- **Policy Backing:** Aligns with the **National Green Hydrogen Mission (NGHM)**, with the Ministry of New and Renewable Energy (MNRE) allocating significant outlays to build supporting clean energy infrastructure.

Need for a Green Urea Roadmap

- **Net-Zero Commitments:** Direct support for India's target of achieving **Net Zero by 2070** by greening hard-to-abate fertilizer sectors.
- **Industrial Modernization:** Replaces aging urea production plants (many over three decades old) with efficient, sustainable units.
- **CCUS Integration:** Creates a captive, high-volume market for

Carbon Capture, Utilization, and Storage (CCUS) by utilizing industrial CO₂ emissions from thermal power, steel, and cement plants.

- **Import Cushioning:** Reduces structural dependence on imported natural gas and finished urea, insulating domestic agriculture from global price volatility.

Key Challenges

- **Cost Disparities:** Green ammonia remains significantly more expensive than conventional grey ammonia due to high electrolyzer and renewable electricity costs.
- **Infrastructure Deficits:** Transporting captured CO₂ safely requires extensive, high-pressure compression pipelines and specialized logistics networks.
- **Power Intermittency:** Solar and wind power fluctuations necessitate costly battery storage systems or green hydrogen buffer reserves to ensure 24/7 continuous plant operations.
- **Retrofitting Complexity:** Modernizing legacy brownfield fertilizer plants for green hydrogen input demands heavy capital outlays and intricate engineering overhauls.

Way Forward

- **Aggressive Procurement Auctions:** Leverage the Solar Energy Corporation of India (SECI) to run competitive e-reverse auctions under NGHM (Mode 2A)

to procure targeted volumes of green ammonia.

- **Offtaker-Side Subsidies:** Implement bridging mechanisms where agencies like SECI procure green ammonia and supply it to fertilizer units at parity with grey ammonia prices, backed by 10-year binding agreements.
- **Industrial Carbon Hubs:** Establish localized industrial clusters that seamlessly link carbon-emitting sectors (steel, cement) directly with green urea production units.
- **Affordable Long-Term Finance:** Utilize specialized institutions like the **Sagarmala Finance Corporation Limited (SFCL)** and green credit frameworks to lower capital borrowing costs.

Conclusion: The operationalization of Green Urea bridges agricultural security with climate action. By marrying green hydrogen adoption, carbon capture, and robust financial incentives, India can successfully foster sustainable manufacturing, slash import dependence, and fortify long-term economic resilience.

**A UNIFIED POLICY
ARCHITECTURE FOR
INDIA'S ENERGY
FUTURE**

Subject: Economy

Why in News?

The Indian National Science Academy (INSA)—specifically through its Centre for Science, Technology, Innovation and Policy—released a milestone policy brief highlighting the critical vulnerabilities of fragmented energy planning and calling for an urgent transition to a **Unified National Energy Framework**.

Context & the 4-Pillar Architecture

India's energy landscape has long suffered from departmental silos, with separate ministries managing coal, petroleum, power, and renewables independently. To reconcile rising economic ambitions with net-zero commitments, INSA proposes a **Unified Energy Architecture** built upon four core pillars:

1. **Adequacy:** Guaranteeing uninterrupted physical availability of power and fuels to match expanding industrial and urban demand.
2. **Access:** Ensuring last-mile commercial and household energy availability, particularly in remote and rural sectors.
3. **Affordability:** Keeping energy prices competitive for vulnerable households and domestic manufacturing.
4. **Appropriate Sustainability:** Transitioning toward low-carbon options while protecting fragile local ecosystems and vulnerable communities.

Need for a Unified Energy Framework

- **Silo Elimination:** Breaks down administrative barriers across ministries, streamlining long-term national energy forecasting.

- **Demand Matching:** Addresses exponential surges in energy consumption driven by urbanization, manufacturing expansion, and population growth.
- **Import Mitigation:** Mitigates structural dependency on imported crude oil and liquefied natural gas (LNG), insulating the external account from geopolitical volatility.
- **Grid Stability:** Better integrates intermittent renewables, modern smart-grid transmission networks, and large-scale storage systems.
- **Equitable Transitions:** Supports region-specific, just transition pathways to safeguard livelihoods in fossil-fuel-dependent belts (such as coal-mining regions in Jharkhand, Chhattisgarh, and Odisha).

Key Challenges

- **Capital Intensity:** High financial outlays required to upgrade legacy coal-fired thermal plants and reinforce aging electricity distribution networks (DISCOMs).
- **Storage Deficits:** Scaling up battery energy storage systems (BESS), pumped-storage hydroelectric projects (PSPs), and grid infrastructure for 24/7 round-the-clock power.
- **Centre-State Friction:** Navigating administrative, regulatory, and political coordination challenges between the Union Government and state-level electricity boards.
- **Emerging Infrastructure Gaps:** Building dedicated pipelines and compression facilities for Carbon Capture, Utilization, and Storage (CCUS) and hydrogen networks.
- **Cost Disparities:** Absorbing the higher operational costs of green hydrogen and green ammonia.

during the interim phase of transition.

Way Forward

- **Phased Transition Strategy:** Prioritize systematic infrastructure modernization alongside phased green hydrogen scaling.
- **CCUS Deployment:** Integrate CCUS across heavy industries, including steel, cement, and thermal power generation.
- **Diversified Storage:** Fast-track the deployment of utility-scale batteries, pumped-storage plants, and decentralized small hydropower.
- **Public-Private Partnerships (PPPs):** Incentivize domestic manufacturing of electrolyzers, advanced solar cells, and energy-storage components through viability gap funding.
- **Just Transition Measures:** Establish comprehensive retraining programs, financial safety nets, and local economic diversification initiatives for workers in fossil-fuel sectors.

Conclusion:

Integrated energy planning anchored in adequacy, access, affordability, and sustainability is indispensable for strengthening India's national security, accelerating decarbonization, and achieving long-term sustainable development goals.

BIOGAS AND INDIA'S ENERGY SECURITY ARCHITECTURE

Subject: Economy

Why in News?

Escalating West Asian geopolitical conflicts have threatened India's liquefied petroleum gas (LPG) imports—**90% of which transit through the volatile Strait of Hormuz**—prompting the Government of India to aggressively accelerate domestic bioenergy alternatives, notably **Compressed Biogas (CBG)**.

Context & Formation Chemistry

- **The Technology:** Biogas is a carbon-neutral renewable fuel generated through the anaerobic decomposition of organic matter by specialized microorganisms. After extensive purification and compression, it transforms into CBG, which is chemically identical to fossil-derived Compressed Natural Gas (CNG).
- **Biochemical Stages:**
 1. *Hydrolysis & Acidogenesis:* Complex organic polymers are broken down into soluble monomers and volatile fatty acids by bacteria.
 2. *Acetogenesis:* Conversion of intermediate compounds into acetic acid, carbon dioxide, and hydrogen.
 3. *Methanogenesis:* Methanogenic archaea convert these intermediates into methane (CH₄). Advanced scrubbing systems subsequently strip out carbon dioxide, hydrogen sulfide (H₂S), and moisture to yield high-purity CBG, leaving behind a nutrient-rich organic digestate for agriculture.

Key Data & Policy Architecture

- **Import Vulnerability:** India imports nearly **85% of its crude oil**, making home-grown bioenergy a strategic imperative.
- **Crop Dynamics:** Maize-based biofuel prices registered a Compound Annual Growth Rate (CAGR) of **11.7%** between FY2022 and FY2025, significantly influencing agricultural crop choice.
- **Financial Incentives:** Under the **GOBARdhan** (Galvanizing Organic Bio-Agro Resources Dhan) scheme, capital grants of up to **₹50 lakh per district** are disbursed for community-scale biogas plants.
- **Grid Integration:** The government has allocated **₹994 crore** to expand pipeline infrastructure to integrate rural biogas production directly into the national gas grid.

Strategic Importance

- **Fossil Fuel Substitution:** CBG directly displaces imported natural gas in vehicular transport and piped natural gas (PNG) networks for cooking.
- **Decentralized Power:** Community plants generate localized electricity for farms, micro-enterprises, and rural agro-processing units.
- **Soil Restoration:** The nutrient-dense digestate acts as organic manure, cutting down costly chemical fertilizer imports and restoring degraded soils.
- **Circular Economy:** Monetizes agricultural crop residue, animal manure, municipal solid waste, and sewage sludge.

Key Challenges

- **Logistical Friction:** Assembling dispersed, seasonal agricultural residue from fragmented

landholdings remains logistically expensive.

- **Food Security Risks:** Excessive reliance on food-grade feedstocks (like maize) for industrial energy can trigger monocropping trends and distort food grain availability.
- **Capital Intensity:** Advanced gas-cleaning and pressure-swing adsorption purification systems require high initial capital, restricting participation by small-scale rural entrepreneurs.
- **Pipeline Deficits:** Inadequate grid connectivity forces producers to transport gas via road cascades, elevating operational overheads.

Way Forward

- **Feedstock Diversification:** Prioritize agricultural stubble, animal manure, and organic municipal waste over food-grade crops, drawing lessons from Denmark's successful bioenergy model.
- **Parity Incentives:** Replicate the financial and regulatory incentives of India's successful Ethanol Blending Programme (EBP) for the CBG sector.
- **Fiscal Support:** Extend accelerated depreciation benefits, tax holidays, and concessional institutional credit to attract private capital.
- **Infrastructure Infusion:** Expedite the deployment of the combined **₹1,558 crore** allocation dedicated to biomass handling equipment and pipeline integration.

Conclusion:

Scaling up biogas infrastructure, streamlining feedstock supply chains, and harnessing agricultural waste will reduce import dependency, lift rural incomes,

enhance waste management, and secure India's clean energy transition.

INDIA'S RESEARCH LEAP: WHY INNOVATION AND R&D WILL DEFINE INDIA'S STRATEGIC FUTURE

Subject: Science & Technology

Why in News?

Recent statements by the CEO of the **Anusandhan National Research Foundation (ANRF)** and India's Chief Economic Adviser emphasized that recurring global supply chain disruptions have created a historic strategic window for India to overhaul and elevate its domestic research and development (R&D) ecosystem.

Context & Current Research Landscape

Despite boasting a massive scientific talent pool, India's research metrics lag behind global economic peers:

- **Low R&D Intensity:** India spends roughly **0.64% of its Gross Domestic Product (GDP)** on R&D, considerably lower than the global average (approx. 2.7%), restricting high-end technological competitiveness.
- **Weak Private Sector Participation:** Private enterprises contribute only about **40%** of India's total R&D expenditure, compared to over **75%** in major

innovation-driven economies like the US, South Korea, and China.

- **Institutional Restructuring:** The establishment of the **Anusandhan National Research Foundation (ANRF)** as a statutory body under the ANRF Act aims to seed, fund, and foster active collaboration between academia, industry, research labs, and startups.
- **Capital Infusion:** The government has earmarked **₹1 lakh crore** through the Research, Development and Innovation (RDI) Fund to catalyze private-sector risk capital, alongside **₹50,000 crore** for ANRF Core fundamental research.

Why Private Industry Matters

- **Risk Mitigation:** ANRF funding de-risks early-stage exploratory research, encouraging firms to venture into high-risk, deep-tech domains.
- **The Multiplier Effect:** Public seed capital deployed by ANRF is projected to attract a **₹5 to ₹10 private-sector co-investment multiplier**, accelerating commercial translation.
- **Lab-to-Market Transition:** Private enterprises bring vital manufacturing scale, supply chain networks, and global commercialization capabilities.
- **Collaborative Models:** Direct engagement through co-investments, joint deep-tech ventures, and Corporate Social Responsibility (CSR) allocations toward the ANRF Innovation Fund.

Lessons from India's Pharmaceutical Success

India's pharmaceutical trajectory offers a vital blueprint. Following the adoption of strict product patent regimes under the

WTO in the mid-1990s, domestic companies mastered reverse-engineering, process chemistry, and global regulatory compliance. This transformed India into the "**Pharmacy of the World**," proving that challenging domestic industrial frameworks can stimulate world-class technological excellence.

Opportunities & Key Challenges

Opportunities

- **Talent Retention:** Scaling advanced R&D projects directly combats brain drain by offering competitive, cutting-edge domestic careers.
- **Supply Chain De-risking:** Global moves toward China-plus-one diversification open lucrative export windows for indigenous Indian technologies.
- **Digital Public Infrastructure (DPI):** India's robust DPI stack acts as a springboard for next-generation software, AI, and automated services.

Challenges

- **Incrementalism vs. Disruption:** Domestic industries often prioritize safe, incremental product upgrades over high-risk, disruptive innovation.
- **Global Disparity:** Competing economies commit vastly superior financial and corporate resources to R&D.
- **Procurement Bias:** Public and private procurement frameworks frequently favor lowest-cost bidding over innovation, intellectual property, and quality parameters.

Way Forward

- **Expedited Fund Deployment:** Fast-track the operationalization of the ₹1 lakh crore RDI Fund to support long-term private-sector R&D laboratories.
- **Insulated Corporate R&D:** Promote dedicated corporate research units protected from short-term quarterly market pressures.
- **Procurement Reform:** Overhaul public procurement guidelines to prioritize indigenous patents, domestic technology development, and quality metrics over baseline cost.
- **Deep-Tech Quadruple Helix:** Institutionalize structural frameworks integrating universities, startups, industry consortia, and government agencies.

Conclusion:

Backed by robust institutional mechanisms like ANRF and significant public funding, sustained private-sector investment and innovation-friendly policies can transform India from a consumer of global intellectual property into a globally competitive innovation superpower.

**THE KUDANKULAM
DATA LEAK: SUPPLY-
CHAIN
CYBERSECURITY**

Subject: Internal Security & Strategic Development

Why in News?

Recent reports revealed that a ransomware syndicate named **World Leaks** leaked **14.3 GB of data** comprising 18,997 files

explicitly linked to the Kudankulam Nuclear Power Plant (KKNPP) on the dark web. This incident has drawn national attention to the escalating threat of supply-chain vulnerabilities targeting India's Critical Information Infrastructure (CII).

Context & Incident Dynamics

- **Nature of the Breach:** The unauthorized extraction involved non-classified structural, architectural, and administrative documents related to **Units 3 and 4** of India's largest nuclear power facility.
- **Core Protection Maintained:** The Nuclear Power Corporation of India Limited (NPCIL) confirmed that core reactor control software, operational systems, and nuclear safety mechanisms were **completely unaffected**, as the breach was strictly confined to conventional Balance of Plant (BOP) and administrative files.
- **The Attack Vector:** The compromise bypassed direct defenses of NPCIL by exploiting a third-party supply-chain loophole. The leak originated from systems managed by **Reliance Infrastructure Limited**—which holds a \$112 million engineering and construction contract for common utilities—hosted on a commercial cloud managed by **Yotta Data Services Private Limited**. Although endpoint malware detection isolated the server, data extraction occurred prior to complete containment.

Institutional & Legal Safeguards in India

- **CERT-In:** The Indian Computer Emergency Response Team functions as the nodal agency for real-time cyber threat tracking, vulnerability coordination, and national emergency response.
- **Air-Gapped Architecture:** Critical strategic installations maintain strict physical isolation (air-gapping) between sensitive operational networks (ICS/SCADA) and public internet domains.
- **NCCC:** The National Cyber Coordination Centre strengthens meta-data intelligence sharing and early threat detection.
- **Statutory Frameworks:** The Information Technology Act, 2000, and the Digital Personal Data Protection (DPDP) Act enforce strict corporate data governance and compliance protocols.

Key Challenges

- **Third-Party Vulnerabilities:** Vendors and engineering contractors frequently maintain weaker cybersecurity hygiene, serving as open entry gates into secure enterprise networks.
- **Reconnaissance Risks:** Even non-classified structural layouts and utility blueprints aid hostile actors in mapping facilities for future cyber-physical disruptions.
- **Advanced Extortion Models:** Modern cybercriminal syndicates

utilize triple-extortion tactics (data theft, encryption, and public dark web leaks), reducing the efficacy of isolated backups.

Way Forward

- **Zero-Trust Architecture (ZTA):** Mandate ZTA across all external contractors, original equipment manufacturers (OEMs), and vendors handling critical infrastructure assets.
- **Data Sanitization Protocols:** Enforce strict document redaction, dynamic watermarking, and classification masking prior to sharing technical documents with third parties.
- **Continuous Threat Hunting:** Empower CERT-In and private data center partners to execute persistent, real-time indicator-of-compromise (IoC) searches.
- **Mandatory Compliance:** Enforce rigorous statutory penalties for supply-chain data negligence under updated cybersecurity frameworks.

Conclusion:

While core reactor systems remained safe, the Kudankulam leak exposes critical supply-chain security gaps. India must institutionalize uniform, stringent cybersecurity benchmarks across all public-private partnerships to safeguard vital national infrastructure.

THE STRATEGIC SHIFT IN INDIA'S NUCLEAR TRIAD

Subject: Internal security

Why in News?

The Stockholm International Peace Research Institute (SIPRI) released its annual global armaments yearbook, revealing a landmark assessment: for the first time in India's modern strategic history, **12 of its estimated 190 nuclear warheads** have been classified as operationally deployed.

Context & Strategic Significance

- **Posture Realities:** This limited deployment does **not** signify a departure from India's defensive posture. Instead, it reflects the maturation and operational readiness of India's **second-strike capability**, reinforcing its enduring **No First Use (NFU)** doctrine and Credible Minimum Deterrence strategy.
- **The "Recessed Deterrent" Evolution:** Since the Pokhran-II tests (1998) and the formal 2003 Nuclear Doctrine, India maintained a de-mated posture—keeping warheads physically separated from delivery systems under civilian political control (Nuclear Command Authority) to signal absolute restraint. The recent shift indicates a move toward peacetime operational readiness, particularly for sea-based platforms.

Key Data & Statistics (SIPRI 2026 Yearbook)

Indicator	Status (2026 Assessment)
Total Nuclear Warheads (India)	190 (up from 180 in 2025)
Operationally Deployed	12 warheads (linked to SSBN patrols)
Reserve / De-mated Stockpile	178 warheads
India's Defence Spending (2025)	US\$92.1 billion (+8.9%)
China's Nuclear Arsenal	620 warheads (34 deployed)
Pakistan's Nuclear Arsenal	170 warheads (None classified as deployed)

Drivers of the Shift

- Sea-Based Deterrence:** The induction and operational patrols of nuclear-powered ballistic missile submarines (SSBNs) necessitate a limited number of deployed warheads to guarantee survivable retaliatory options.
- Canisterization of Missiles:** Advanced delivery systems like the

Agni-V and Agni-P utilize sealed, climate-controlled storage canisters that enable rapid mobility and higher readiness states.

Key Challenges

- Two-Front Deterrence:** Managing complex nuclear calculations simultaneously against Pakistan's tactical nuclear weapons and China's rapidly expanding, modernized nuclear triad.
- Eroding Arms Control:** The collapse of bilateral superpower arms control frameworks (such as the expiration of New START) increases global strategic volatility.
- Technological Multipliers:** Integration of Artificial Intelligence, quantum computing, hypersonic delivery systems, and advanced anti-submarine warfare (ASW) compresses decision-making windows.

Way Forward

- Civilian Supremacy:** Ensure absolute political control over nuclear asset deployment remains vested in the Prime Minister-led Political Council of the Nuclear Command Authority.
- Naval Expansion:** Steadily induct long-range Submarine-Launched Ballistic Missiles (K-4, K-5, and K-6 series) to make the sea leg of the triad impregnable.
- Technological Hardening:** Upgrade quantum-resistant encrypted military communications, satellite early-

warning architectures, and automated command-and-control safety mechanisms.

Conclusion:

SIPRI's assessment highlights a naturally maturing nuclear deterrent. By strengthening its triad without abandoning its No First Use commitment, India successfully preserves its strategic autonomy and reinforces regional stability.

THE RBI SCAM COMPENSATION FRAMEWORK

Subject: Economy

Why in News?

The Reserve Bank of India (RBI) has issued final amendments to its **Limiting Customer Liability in Digital Transactions** framework. Set to take effect from **January 1, 2027**, this one-year pilot framework expands protections against sophisticated social engineering scams and introduces monetary compensation for victims of small-value digital frauds, replacing the narrow 2017 circular that only covered unauthorized third-party hacking.

Context & Policy Evolution

Historically, RBI guidelines required proof of systemic failure or unauthorized hacking for customers to secure refunds, leaving victims of social engineering high and dry. The updated framework introduces **Fraudulent Electronic Banking Transactions (EBTs)** as a formal

legal category. Crucially, it provides reimbursement even when customers unknowingly shared credentials under deception, coercion, or digital arrest tactics.

Key Features & Scope

- **Target Demographics:** Protects individual retail bank customers, including sole proprietors, who suffer financial losses from digital frauds.
- **Compensation Formula:** Victims losing up to **₹50,000** can claim **85% of their net loss**, subject to a maximum absolute payout of **₹25,000**.
 - Losses below **₹29,412** receive an exact 85% reimbursement.
 - Losses above ₹50,000 are excluded from this pilot safety net, and claims are restricted to **once in a customer's lifetime** (limited to one claimant for joint accounts).
- **Cost-Sharing Mechanism:**
 - **RBI bears roughly 75%** of the compensation payout.
 - Remitter banks and beneficiary banks split the remaining 25% equally.
- **Burden of Proof:** Shifts the onus onto banks, requiring them to establish clear customer negligence before rejecting claims. Customers are disqualified only if they ignored active security warnings or

failed to update registered contact details.

Strict Timelines and Accountability

- **Reporting Window:** Fraud must be reported within **5 days** to both the home bank and the National Cyber Crime Helpline (1930).
- **Resolution SLAs:** Banks must resolve domestic cases within **45 days** and cross-border cases within **60 days**, while providing temporary credit card relief and instant SMS alerts for transactions exceeding ₹500.

Conclusion:

By balancing consumer welfare with strict accountability, the RBI scam compensation framework bridges a vital regulatory gap, enhancing financial inclusion and trust in India's digital payment ecosystem.

THE INVESTMENT FRIENDLINESS INDEX (IFI)

Subject: Economy

Why in News?

NITI Aayog launched the inaugural **Investment Friendliness Index (IFI)** to benchmark, monitor, and accelerate state-level business reforms under the overarching **Viksit Bharat @2047** vision.

Context & Methodology

The IFI is a comprehensive, structured macroeconomic assessment framework designed to evaluate how effectively subnational governments create, enable, and sustain an investment-friendly climate for domestic and foreign private capital. It covers **all 28 states and 8 Union Territories**, incorporating primary survey responses from **1,850 active investors**.

Eight Evaluation Pillars

1. Infrastructure
2. Business Climate
3. Resources
4. Government Policy
5. Regulatory Ease
6. Institutional Environment
7. Financial Health
8. Environmental Resilience

Performance Cohorts & Peer Groups

- **Four-Tier Banding:** Top Performers (scores above 50), Frontrunners (45–50), Emerging Performers (≥ 40 to < 45), and Aspiring States (below 40).
- **Equitable Peer Grouping:** Recognizes structural disparities by dividing regions into three peer groups: **Large States, Hilly & North-Eastern States**, and **Union Territories & City States**.

Key Findings & Macro Insights

- **Top Performers:** Only five regions scored above 50—**Gujarat (56.6)**, **Maharashtra (53.7)**, **Tamil**

Nadu (53.3), Goa (53.1), and Odisha.

- *Gujarat* excelled in ports and logistics infrastructure.
- *Maharashtra* led in business climate and Private Equity/Venture Capital (PE/VC) investments.
- *Tamil Nadu* dominated manufacturing and export performance.
- **FDI Concentration Skew:** Maharashtra, Karnataka, Gujarat, Delhi, and Tamil Nadu account for a staggering **85% of India's total FDI inflows**, whereas the entire North-East receives less than 1%.
- **Investment & Private Capex Gap:** Total investment reached **29.9% of GDP** in FY2025, primarily driven by public infrastructure outlays and household real estate spending. However, **private capital expenditure (at 8.7% of GDP)** continues to lag behind public investment, highlighting the urgent need to crowd in private enterprise.

Conclusion:

The Investment Friendliness Index fosters healthy competitive and cooperative federalism, providing states with actionable diagnostic roadmaps to eliminate regulatory bottlenecks and attract sustainable private investments.

MINIRATNA CATEGORY-I STATUS TO MECON LIMITED

Subject: Economy

Why in News?

The **Ministry of Steel** approved the elevation of **MECON Limited** from Miniratna Category-II to **Miniratna Category-I** status, granting the public sector enterprise enhanced financial and operational autonomy.

Context & Evolution

Established in 1959 as the Central Engineering & Design Bureau (CEDB)—the erstwhile design wing of Hindustan Steel Limited (HSL)—MECON Limited is a premier multi-disciplinary design, engineering, consultancy, and contracting organization under the Ministry of Steel. It was originally conceptualized to reduce India's historical dependence on foreign technical expertise for major heavy industrial projects.

Core Functions & Miniratna-I Privileges

- **Core Mandate:** Provides end-to-end industrial consultancy from concept to commissioning, covering techno-economic feasibility studies, detailed engineering, project management, and environmental engineering. Executes complex Engineering, Procurement, and Construction (EPC) contracts across iron, steel, power, oil & gas, defense, and space infrastructure.

- **Financial & Administrative Autonomy:** The Miniratna Category-I framework empowers profit-making Central Public Sector Enterprises (CPSEs) that operate without direct budgetary support:

- The Board can approve **capital expenditures up to ₹500 crore** (or up to its net worth) without prior government clearance.
- Authority to establish joint ventures, overseas subsidiaries, mergers, acquisitions, and technology collaborations.
- Streamlined human resource policies, voluntary retirement scheme (VRS) implementations, and fast-tracked overseas official travel approvals.

Conclusion:

Elevating MECON to Miniratna Category-I status cuts bureaucratic red tape, supercharges its global competitiveness, and positions it to play a lead role in India's heavy engineering and industrial expansion.

THE EMPLOYEES' PROVIDENT FUNDS (EPF) SCHEME, 2026

Subject: Economy

Why in News?

The Ministry of Labour and Employment has officially notified the **Employees' Provident Funds (EPF) Scheme, 2026**, replacing the 74-year-old EPF Scheme of 1952 pursuant to the implementation of the **Code on Social Security, 2020**.

Context & Key Features

Administered by the **Employees' Provident Fund Organisation (EPFO)**, the 2026 framework modernizes India's primary statutory retirement savings architecture while ensuring absolute continuity for millions of workers.

- **Seamless Continuity:** Existing subscribers automatically roll over into the 2026 scheme without requiring fresh enrolment or balance transfers.
- **Contribution Structure:**
 - Employer and employee continue to contribute **12% of wages** (10% for notified establishments).
 - Mandatory contributions remain capped at the statutory wage ceiling of **₹15,000/month** (amounting to ₹1,800 each). Members can voluntarily contribute higher amounts.
- **Rationalized Withdrawals:** The cumbersome legacy framework of 13 separate withdrawal categories has been consolidated into three simplified pillars:
 1. *Essential Needs* (illness, education, marriage)

2. *Housing Needs* (purchase, construction, home loan repayment, renovation)
3. *Special Circumstances* (specified emergencies)

- **Retirement Corpus Protection:** Members must retain a **minimum retirement corpus of 25%** of total accumulated contributions, ensuring long-term financial security while permitting flexible partial withdrawals.
- **Contract Worker Protections:** Introduces the legal concept of **Principal Employer**, making the principal entity ultimately liable for PF compliance if third-party contractors default.
- **Digital & UPI Governance:** Deepens integration with Aadhaar-linked Universal Account Numbers (UAN), automated digital claims, UPI-based withdrawals, and WhatsApp-enabled member services.

Conclusion:

The EPF Scheme, 2026 represents a progressive leap toward digitized, simplified, and inclusive social security administration in India.

THE INDEX OF SERVICES PRODUCTION (ISP)

Subject: Economy

Why in News?

The Government of India released the first sub-sectoral trial **Index of Services Production (ISP)** for April 2026.

Developed by the Ministry of Statistics and Programme Implementation (**MoSPI**), it covers 19 sub-sectors representing roughly **60% of India's services sector**.

Context & Calculation Methodology

While the Index of Industrial Production (IIP) tracks industrial output, a major statistical void existed for high-frequency services tracking. The ISP fills this gap by measuring monthly short-term changes in the output volume of the formal services sector.

- **The Deflator Challenge:** Because raw service sector data is captured in nominal (value) terms, it conflates real output growth with price inflation. The ISP applies a **Deflator Allocation Matrix** using the Wholesale Price Index (WPI) for wholesale trade, and various Consumer Price Index (CPI) series (such as CPI-General and CPI-Services) to isolate real volume growth.
- **Innovative Data Pillars:** It marks the **first-ever statistical use of Goods and Services Tax (GST) data** to power calculations for trade, transport, accommodation, and real estate, alongside traditional administrative records.

Key Features & Growth Trends

- **Base Year:** 2024–25 = 100.

- **Release Schedule:** Monthly indices published with a 60-day lag.
- **April 2026 Trial Performance:** Out of 19 tracked sub-sectors, **14 recorded double-digit year-on-year growth**. The top five performing sub-sectors were:

1. *Accommodation and food services:* 37.2%
2. *Retail trade:* 30.8%
3. *Administrative and support services:* 28.7%
4. *Real estate:* 27.7%
5. *Telecommunications:* 22.8%

- **Exclusions:** Excludes public administration, defense, non-market community services, and informal-dominant domains.

Conclusion:

The Index of Services Production provides policymakers with a vital, high-frequency lens to track the pulsing heartbeat of India's dominant services-led economy.

THE NIFTY500 AHIMSA INDEX

Subject: Economy

Why in News?

NSE Indices Limited, in collaboration with the Ahimsa Foundation, launched the **Nifty500 Ahimsa Index**, India's first rules-based ethical equity benchmark

designed around the principle of non-violence (*Ahimsa*) towards animals.

Context & Screening Framework

The index tracks **326 companies** selected from the broader Nifty 500 universe using the **Ahimsa Investment Movement (AIM)** screening framework.

- **Categorization:** AIM classifies firms into Green, Orange, and Red categories based on animal welfare impacts; only **Green** companies qualify.
- **Inclusions & Exclusions:**
 - *Includes* leading Information Technology, automobile, telecommunications, and capital goods firms.
 - *Strictly Excludes* businesses involved in meat processing, dairy, poultry, leather, animal-tested pharmaceuticals, commercial banking, NBFCs, and most Reliance Group firms.
- **Governance:** Free-float market capitalization-weighted and rebalanced semi-annually, serving as a baseline for ethical Mutual Funds, ETFs, and index products.

Conclusion:

The Nifty500 Ahimsa Index reflects the rising maturity of Environmental, Social, and Governance (ESG) investing, aligning capital allocation with conscious ethical values.

THE EPFO 3.0 REFORMS

Subject: Economy

Why in News?

The Employees' Provident Fund Organisation (EPFO) announced its upcoming **EPFO 3.0** reform phase, marking a strategic evolution from a legacy claims-processing unit into a universal social security provider.

Context & Strategic Aim

EPFO 3.0 expands beyond organized salaried employees to integrate unorganised workers, Building and Other Construction Workers (BOCW), and the burgeoning **gig and platform economy** under the Code on Social Security, 2020.

Key Features

- **Core Banking Solution (CBS):** Establishes a centralized, real-time digital transaction backbone across tens of millions of active accounts.
- **Target Retirement Sum (TRS) Model:** Enables members to establish personalized retirement accumulation goals and digitally track their progress.
- **Flexible Payouts:** Offers post-retirement disbursements via traditional annuities or a structured Systematic Withdrawal Plan (SWP).
- **Multi-Source Universal UAN:** Integrates one Universal Account Number (UAN) linked to multiple concurrent employers, accepting

contributions from employers, government subsidies, CSR funds, voluntary donations, and consumer tipping models.

Conclusion:

EPFO 3.0 represents a modern, flexible, and inclusive social security safety net tailored for India's dynamic 21st-century labor market.

THE UPDATED INDEX OF CORE INDUSTRIES (ICI)

Subject: Economy

Why in News?

The Union Government released an updated series of the **Index of Core Industries (ICI)**, shifting its base year to **2022–23** (from 2011–12) to accurately reflect contemporary infrastructure growth.

Context & Structural Changes

The ICI measures monthly production performance across key core infrastructure sectors and serves as a premier leading indicator for the broader Index of Industrial Production (IIP). Compiled by the Office of Economic Adviser (OEA) under DPIIT:

- **Expanded Basket:** Expanded from 8 to **9 core sectors** with the formal inclusion of **iron ore** (carrying a weight of 4.905%).
- **Methodological Refinements:** Steel output now tracks gross

production figures, while coal monitors raw coal output to eliminate double counting.

- **Revised Sectoral Weights:** Electricity weight increased to **30.932%**, refinery products reduced to **22.572%**, while coal, natural gas, and fertilizer weights underwent rebalancing to match updated input-output tables.

Conclusion:

Recalibrating the Index of Core Industries to a modern base year ensures macroeconomic indicators accurately capture structural shifts in India's industrial landscape.

NETRA AIRBORNE EARLY WARNING AND CONTROL (AEW&C) SYSTEM

Subject: Science & Technology

Why in News?

The Defence Research & Development Organisation (DRDO) officially handed over the Final Operational Clearance (FOC) certificate of the indigenous '**Netra**' Airborne Early Warning and Control (AEW&C) system to the Indian Air Force (IAF), marking a major milestone in India's defense self-reliance.

Context & Strategic Significance

- **The Capability:** Often described as a "flying radar station," Netra

detects, tracks, and identifies airborne and maritime threats well beyond the horizon and out of range of ground-based radars.

- **Development:** Engineered by the Centre for Airborne Systems (CABS) under the DRDO, in close coordination with the IAF and domestic defense industrial partners.
- **Strategic Objective:** Reduces import dependency on foreign AEW&C platforms, securing India's airspace surveillance and network-centric warfare capabilities.

Key Technical Features

- **Airframe:** Built on a modified twin-engine **Embraer ERJ-145** airframe, retrofitted with advanced electrical power, specialized cooling, and aerodynamic modifications.
- **AESA Radar:** Features a dorsal-mounted Active Electronically Scanned Array (AESA) radar providing **240° to 270° azimuthal coverage** with a detection range of **250 to 375 km**.
- **Multi-Target Tracking:** Capable of simultaneously detecting and tracking over **200 aerial targets**, including enemy fighter aircraft, cruise missiles, and unmanned aerial vehicles (UAVs).
- **Sensor Fusion:** Integrates Electronic Support Measures (ESM) and Communication Support Measures (CSM) to

intercept hostile radar emissions and communications.

- **Extended Endurance:** Fitted with an In-Flight Refueling (IFR) probe for prolonged surveillance sorties.
- **Command Connectivity:** Interfaces with the Integrated Air Command and Control System (IACCS) via secure Line-of-Sight (LOS) and Satellite Communication (SATCOM) links.

Conclusion:

The induction of Netra FOC reinforces India's indigenous defense manufacturing footprint, ensuring round-the-clock aerial surveillance and sovereign command-and-control autonomy.

VIKRAM-1: INDIA'S FIRST PRIVATE ORBITAL ROCKET

Subject: Science & Technology

Why in News?

Hyderabad-based space-tech startup **Skyroot Aerospace** announced the launch window for the maiden orbital test flight of **Vikram-1**, designated as **Mission Aagaman**.

Context & Mission Scope

- **Transition to Orbit:** Named after Dr. Vikram Sarabhai, Vikram-1 marks India's strategic transition from suborbital experimental flights (following the successful

Vikram-S suborbital flight under Mission Prarambh in 2022) to commercial orbital launch capabilities.

- **Mission Aagaman ("Arrival"):** Designed to place payloads of up to **350 kg into a 450-km Low Earth Orbit (LEO)** at a 60-degree inclination.



Key Features & Innovations

- **Advanced Materials:** Built using ultra-lightweight carbon-composite structures to maximize structural integrity and payload efficiency.
- **Propulsion Systems:** Utilizes indigenous solid and liquid propulsion systems. The solid propulsion stages are named after Dr. A.P.J. Abdul Kalam.
- **3D-Printing Integration:** Employs state-of-the-art 3D-

printed rocket engines for rapid, cost-effective manufacturing and high-frequency launch cadence.

Conclusion:

Vikram-1 symbolizes the rise of India's private space sector, opening commercial avenues in the global small-satellite launch market.

INDIA'S FIRST eVTOL AIRCRAFT (e200X)

Subject: Science & Technology



Why in News?

Chennai-headquartered deep-tech startup **The ePlane Company** (incubated at IIT Madras) unveiled the **e200X (PT-01)**, India's first full-scale prototype of an electric vertical take-off and landing (eVTOL) air taxi.

Context & Mechanics

- **What is an eVTOL?** A battery-powered, zero-emission aircraft that takes off and lands vertically

like a helicopter while cruising horizontally like an airplane.

- **Flight Dynamics:** Employs **six vertical lift rotors** for hovering and **four forward propellers** for cruise flight. Its Distributed Electric Propulsion (DEP) architecture ensures safety by dynamically redistributing thrust in the event of a motor failure.
- **Avionics & Power:** Driven by an 800-volt electric powertrain integrated with **NVIDIA IGX Thor**, combining cameras, LiDAR, and radar for advanced situational awareness.

Key Specifications & Applications

- **Design & Payload:** Compact 8 × 11-meter footprint designed to operate from existing hospital rooftops and urban helipads. Built with carbon-fiber composites with a maximum takeoff weight of **2.2 tonnes**, carrying a pilot and 200 kg of payload for up to **110 km** on a single charge.
- **Urban Utility:** Enables rapid medical evacuation, emergency response, and decongestion of urban transit corridors.

Conclusion:

The e200X positions India at the frontier of urban air mobility (UAM) and green aviation technology.

FORWARD DEPLOYED ENGINEERING (FDE)

Subject: Science & Technology

Why in News?

Global tech giants and Indian enterprises are rapidly scaling **Forward Deployed Engineering (FDE)** roles to bridge the gap between experimental AI prototypes and measurable business value, making it one of the highest-paying technical careers today.

Context & Definition

- **What is FDE?** FDE is an interdisciplinary domain combining software engineering, artificial intelligence implementation, systems architecture, and business consulting.
- **Operational Role:** Unlike traditional software engineers who build abstract products, FDEs work directly on client sites or integrated product teams to deploy custom AI models into live, complex enterprise workflows.
- **Core Protocols:** Relies on modern interoperability standards such as the **Model Context Protocol (MCP)** and **Agent2Agent (A2A)** frameworks to seamlessly connect AI agents across diverse cloud and enterprise environments.

Conclusion:

The rise of Forward Deployed Engineering highlights the shift toward applied, enterprise-ready AI execution in the global digital economy.

CENTRE BANS 16 FIXED-DOSE COMBINATION (FDC) DRUGS

Subject: Science & Technology

Why in News?

The Union Ministry of Health and Family Welfare issued an immediate nationwide prohibition on **16 Fixed-Dose Combination (FDC) medications** found to lack therapeutic rationale and pose health risks.

Context & Regulatory Framework

- **What is an FDC?** A formulation containing two or more active pharmaceutical ingredients (APIs) combined in a fixed ratio within a single dosage form (tablet, capsule, or liquid). While designed to improve compliance, irrational combinations escalate adverse drug reactions (ADRs) and accelerate antimicrobial resistance (AMR).
- **Legal Power:** Enforced under **Section 26A of the Drugs and Cosmetics Act, 1940**, which empowers the Central Government to ban drugs lacking therapeutic efficacy or posing safety hazards.
- **Scope of Ban:** Covers 16 irrational formulations, including specific topical skin creams, compounded painkillers, antispasmodics, and unverified antibiotic mixtures.

Conclusion:

Strict regulatory scrutiny of FDCs is essential to safeguard public health and curb the growing threat of antimicrobial resistance in India.

GAIT ANALYSIS IN FORENSIC INVESTIGATIONS

Subject: Science & Technology

Why in News?

During the high-profile investigation of the Ketan Agarwal murder case at Lohagad Fort, a Pune court extended police custody to allow investigators to conduct a forensic gait analysis.

Context & Biomechanical Science

- **Definition:** Gait analysis is the systematic scientific study of human locomotion (how an individual walks, runs, or moves). It evaluates the complex biomechanical interaction between the nervous system, bones, muscles, and joints to establish a unique "**biomechanical signature**."
- **The Gait Cycle:** Divided into two main operational phases:
 1. *Stance Phase (approx. 60%):* From heel strike to toe-off, where the foot bears full body weight and absorbs impact.
 2. *Swing Phase (approx. 40%):* When the foot leaves

the ground and swings forward.

- **Parameters & Instrumentation:** Analyzes spatial metrics (stride length, toe angle) and temporal metrics (cadence, walking speed) using high-pressure mats, force plates, and 15-point body tracking systems (e.g., the Sheffield Tool).

Key Applications

- **Forensics:** Identifies suspects from CCTV footage when facial features are obscured or altered, relying on unique posture, limps, or joint angles.
- **Clinical Medicine:** Diagnoses neurological disorders (Parkinson's, stroke, cerebral palsy) and orthopedic conditions.
- **Sports:** Optimizes athletic movement mechanics and prevents injury.

Conclusion:

Forensic gait analysis bridges biomechanics and criminal investigation, providing objective corroborative evidence in complex legal trials.

AI SQUATTING: A NEW CYBER THREAT

Subject: Internal Security

Why in News?

Cybersecurity researchers have raised alarms regarding **AI Squatting**, a dangerous attack vector that weaponizes

predictable AI hallucinations rather than exploiting traditional software bugs.

Context & Mechanics

Large Language Models (LLMs) are probabilistic and prone to hallucinating non-existent software packages or web domains. Attackers exploit this by registering these fake assets before anyone else.

- **1. Phantom Squatting (Domains):** Attackers register hallucinated web domains generated by chatbots, utilizing them for phishing, credential theft, and malware distribution.
- **2. HalluSquatting (Software Supply Chain):** Attackers upload malicious packages bearing names hallucinated by AI coding assistants, tricking developers into downloading compromised software libraries.

Conclusion: AI Squatting underscores the urgent need for rigorous verification standards in the era of autonomous AI agents and code generation.

INDIA'S FIRST APPROVED DENGUE VACCINE (QDENGAR)

Subject: Science & Technology

Why in News?

The Central Drugs Standard Control Organisation (CDSCO) granted official

marketing authorization for **Qdenga®**, approving India's first-ever dengue vaccine.

Context & Vaccine Profile

- **Technology:** Developed by Takeda GmbH (Germany) and imported by M/s Takeda Biopharmaceuticals India Pvt. Ltd., Qdenga® is a live, attenuated tetravalent vaccine engineered using recombinant DNA technology. It uses a dengue virus type-2 backbone spliced with surface protein genes from DEN-1, DEN-3, and DEN-4 to provide balanced protection against all four serotypes.
- **Administration:** Indicated for individuals aged **4 to 60 years**, administered via a two-dose subcutaneous regimen spaced three months apart (Month 0 and Month 3).
- **Clinical Validation:** Approval followed successful Phase III clinical trials across diverse Indian populations, backed by WHO prequalification and global approvals in over 42 countries.

Conclusion:

The approval of Qdenga® represents a monumental breakthrough in public health management against endemic vector-borne diseases in India.

CYCLOSPORIASIS

Subject: Science & Technology

Why in News?

The U.S. Centers for Disease Control and Prevention (CDC) issued a major health advisory following a widespread outbreak of **cyclosporiasis** spanning 34 states.

Context & Transmission

- **Pathogen:** Caused by *Cyclospora cayetanensis*, a microscopic, single-celled intestinal parasite.
- **Transmission Route:** Spread strictly through the fecal-oral route by consuming food or water contaminated with infected feces. It cannot spread directly from person to person because the parasite requires external environmental maturation.
- **Common Vehicles:** Frequently linked to fresh produce such as imported leafy greens, raspberries, basil, and cilantro. Standard vegetable washes are often ineffective at eradicating the hardy parasite.
- **Clinical Presentation:** Triggers prolonged, watery diarrhea, severe cramping, fatigue, and weight loss. First-line treatment relies on a course of trimethoprim-sulfamethoxazole (TMP-SMX).

Conclusion:

Cyclosporiasis outbreaks highlight the vulnerability of global agricultural supply chains to foodborne parasitic contamination.

MAGLEV TRAINS

Subject: Science & Technology

Why in News?

Scientific and industrial interest in **Magnetic Levitation (Maglev)** technology has re-emerged in global transportation as nations pursue frictionless, ultra-high-speed transit.

Context & Working Principles

Maglev systems eliminate traditional mechanical wheels, axles, and steel tracks, relying instead on powerful magnetic fields for levitation and propulsion.

- **Levitation Systems:**

- *Electromagnetic Suspension (EMS):* Used in Shanghai Maglev. C-shaped electromagnets attract upward toward the steel guideway, hovering the train 10 mm above it.
- *Electrodynamic Suspension (EDS):* Used in Japan's SCMagLEV. Superconducting magnets induce repulsive currents in track coils, levitating the vehicle 100 mm above the track.

- **Propulsion:** Linear electric motors (LEMs) use alternating current (AC) along track walls to constantly flip magnetic poles, pulling and pushing the train forward at commercial speeds exceeding **400 km/h** (and experimental records up to **603 km/h**).

Industrial Applications Beyond Transit

- Precision factory cleanroom automation, magnetic bearings for high-speed industrial turbines, **Electromagnetic Aircraft Launch Systems (EMALS)** on modern aircraft carriers, and scientific diamagnetic levitation research.

Conclusion:

Maglev technology represents the pinnacle of high-speed, zero-friction ground transportation engineering.

BOROPHENE

Subject: Science & Technology

Why in News?

Scientists at the Institute of Advanced Study in Science and Technology (IASST), Guwahati, achieved a breakthrough by successfully applying **borophene** as a bio-lubricant additive in castor oil.

Context & Properties

- **What is Borophene?** An ultra-thin, two-dimensional (2D) crystalline allotrope of boron atoms, often considered the boron counterpart of graphene.
- **Synthesis:** Synthesized via Chemical Vapor Deposition (CVD) or Molecular Beam Epitaxy (MBE) on metallic substrates under ultra-high vacuum.

- **Key Features:** Exhibits exceptional mechanical strength, flexibility, metallic electrical conductivity, and high chemical reactivity. It forms durable tribofilms that drastically reduce friction and wear when added to lubricants.

Conclusion:

Borophene's unique thermal and mechanical properties hold immense promise for next-generation lubricants, energy storage devices, and supercapacitors.

THE CHANDIPURA VIRUS (CHPV)

Subject: Science & Technology

Why in News?

A sharp outbreak of the **Chandipura virus (CHPV)** resulted in multiple fatalities, including young children, prompting heightened epidemiological surveillance across western and southern India.

Context & Transmission

- **Pathogen:** A vector-borne virus belonging to the *Rhabdoviridae* family, causing **Acute Encephalitis Syndrome (AES)**—rapid, severe brain inflammation.
- **Vectors:** Transmitted primarily by infected female *Phlebotomine* sandflies and occasionally *Aedes* mosquitoes, peaking during the monsoon season.

- **Vulnerability:** Disproportionately targets children under 15 years. Symptoms progress rapidly from high fever and vomiting to seizures and coma within 24–48 hours. There is no specific antiviral treatment or licensed vaccine; management relies strictly on intensive supportive care.

Conclusion:

Timely vector control and intensive clinical management remain critical to mitigating mortality during seasonal Chandipura virus outbreaks.

PROTON EXCHANGE MEMBRANE (PEM) FUEL CELL

Subject: Science & Technology

Why in News?

The Prime Minister of India flagged off India's first hydrogen-powered passenger train the **NaMo Green Rail**—operating on the Jind–Sonipat section in Haryana, powered by indigenous **Proton Exchange Membrane (PEM) fuel cells**.

Context & Working Mechanism

- **Definition:** A compact electrochemical device that converts hydrogen fuel directly into electrical energy with zero harmful emissions.
- **Electrochemistry:** Hydrogen molecules split into protons and electrons at the anode. The proton-

exchange membrane permits only protons to pass, routing electrons through an external circuit to generate electricity. At the cathode, protons, electrons, and oxygen combine to produce water vapor and heat as the sole by-products.

- **Integration:** Combines PEM fuel cells with Lithium Iron Phosphate (LFP) batteries in a hybrid traction configuration, supported by high-pressure hydrogen storage cylinders.

Conclusion:

PEM fuel cell technology is central to India's transition toward zero-emission public transport and green rail corridors.

MISSION DRISHTI: INDIA'S FIRST OPTOSAR SATELLITE

Subject: Science & Technology



Why in News?

Bengaluru-based space startup **GalaxEye** reported that communication was lost with **Mission Drishti**, the world's first **OptoSAR** satellite and India's largest privately built Earth observation spacecraft.

Context & Technical Innovation

- **The Payload:** Mission Drishti integrated Electro-Optical (EO) cameras and Synthetic Aperture Radar (SAR) onto a single 190-kg satellite chassis—a breakthrough configuration known as **OptoSAR**.
- **Overcoming Obstacles:** Traditional EO cameras fail in cloud cover or darkness, whereas SAR operates in all weather conditions and at night. OptoSAR fuses both data streams simultaneously, eliminating spatial and temporal alignment errors.
- **Strategic Utility:** Designed to provide uninterrupted, all-weather sovereign surveillance of high-altitude borders and maritime zones.

Conclusion:

Mission Drishti represents a pioneering leap in indigenous space technology and multi-sensor payload integration.

UNDERWATER FIBER OPTIC SENSING SYSTEM (UFOSS)

Subject: Science & Technology

Why in News?

The DRDO initiated a major naval project to deploy an indigenous **Underwater Fiber Optic Sensing System (UFOSS)** across the Indian Ocean seabed to counter rising submarine activity.

Context & Mechanics

- **What is UFOSS?** A fixed seabed network of acoustic hydrophones and hydrographic sensors interconnected via armored fiber-optic cables.
- **Operational Flow:** Hydrophones capture submarine propeller noise, engine vibrations, and acoustic signatures. These signals are converted into optical data, transmitted to shore stations, and analyzed against reference databases to identify hostile conventional (AIP-equipped) and nuclear submarines in key maritime choke points.

Conclusion:

UFOSS significantly enhances India's underwater domain awareness (UDA) and maritime security architecture in the Indian Ocean Region.

SUB-ORBITAL LAUNCH VEHICLE FOR EXPERIMENTS (SOLVE)

Subject: Science & Technology

Why in News?

ISRO successfully conducted the first static ground test of its new solid-motor-based **Sub-Orbital Launch Vehicle for Experiments (SOLVE)** at Sriharikota.

Context & Objectives

- **What is SOLVE?** A cost-effective, solid-propellant sub-orbital test platform derived from modified Polar Satellite Launch Vehicle (PSLV) strap-on motors (PSOM).
- **Primary Role:** Designed to validate critical systems for the **Gaganyaan human spaceflight mission**, including Integrated Parachute Tests (IPT), high-altitude atmospheric re-entry dynamics, and crew module deceleration mechanics.

Conclusion:

SOLVE provides ISRO with an economical, reliable testbed for human spaceflight validation and hypersonic research.

BATTERY MANAGEMENT SYSTEM (BMS)

Subject: Science & Technology

Why in News?

Regulatory directives forced tech platforms to remove three vulnerable battery management apps (**BAT-BMS**, **Lossigy**, and **Epoch Li-ion**) due to severe cybersecurity and passenger safety risks.

Context & Function

- **What is a BMS?** An electronic control system embedded in Electric Vehicles (EVs) and lithium-ion battery packs that acts as the "brain" of the battery.
- **Core Functions:** Continuously monitors cell voltage, current, and temperature to calculate State of Charge (SoC) and State of Health (SoH). It performs active cell balancing and engages circuit disconnects via MOSFETs if thermal runaway or overcurrent conditions occur.

Conclusion:

Securing Battery Management Systems against remote cyber exploitation is vital for ensuring EV passenger safety and grid stability.

THE CE20 CRYOGENIC ENGINE

Subject: Science & Technology

Why in News?

ISRO successfully completed the flight acceptance hot test of its indigenous **CE20 cryogenic engine** for the upcoming **LVM3-M7 mission** at the ISRO Propulsion Complex in Mahendragiri.

Context & Specifications

- **Role:** Powers the upper stage of India's heaviest launcher, the **Launch Vehicle Mark-3 (LVM3)**.

- **Technology:** Utilizes a gas-generator cycle burning Liquid Hydrogen (LH₂) and Liquid Oxygen (LOX) to generate **19 to 22 tonnes of thrust**, equipped with human-rated safety features, redundant controls, and health monitoring systems for crewed missions.

Conclusion:

The proven reliability of the CE20 engine underpins India's heavy-lift launch capabilities and crewed space exploration roadmap.

IMAT-05 TEST FOR GAGANYAAN

Subject: Science & Technology



Why in News?

ISRO and DRDO successfully executed the fifth Integrated Main Parachute Airdrop Test (**IMAT-05**) at the ADRDE drop zone in Sheopur.

Context & Parachute Matrix

- **Objective:** Validates the structural integrity and disreefing sequence of the Gaganyaan crew module's deceleration system under high dynamic loads.
- **The 10-Parachute Matrix:** Utilizes apex cover separators, 2 drogue parachutes for stabilization, 3 pilot parachutes, and **3 ultra-large main parachutes** deployed sequentially to slow the capsule down to safe terminal velocity for ocean splashdown.

Conclusion:

Rigorous parachute qualification tests like IMAT-05 are essential to ensuring crew safety during the return phase of human spaceflight missions.

THE POLYGRAPH TEST

Subject: Science & Technology

Why in News?

Pune Police sought court permission to conduct a polygraph (lie-detector) test during the Ketan Agarwal murder investigation.

Context & Legal Status

- **Mechanism:** Measures involuntary physiological stress responses—breathing patterns (pneumograph), heart rate (cardiovascular cuff), galvanic skin response (sweating), and blood flow—during questioning.

- **Legal Precedent:** Under the landmark Supreme Court ruling *Selvi v. State of Karnataka (2010)*, **voluntary consent** is mandatory for administering polygraph tests, and results are generally inadmissible as standalone confessions unless corroborated under Section 27 of the Indian Evidence Act.

Conclusion:

While useful for generating investigative leads, polygraph tests occupy a legally circumscribed space focused on protecting individual fundamental rights.

BUNDIBUGYO VIRUS DISEASE (BVD)

Subject: Science & Technology

Why in News?

The World Health Organization (WHO) added the first molecular diagnostic test for **Bundibugyo virus (BVD)** to its Emergency Use Listing (EUL).

Context & Epidemiology

- **Pathogen:** A severe, often fatal zoonotic disease caused by the Bundibugyo virus, a member of the *Orthoebolavirus* genus (Ebola virus group).
- **Transmission:** Fruit bats serve as the natural reservoir. Human transmission occurs through contact with infected wildlife or

human body fluids (blood, saliva, vomit).

- **Case Fatality:** Carries a **30% to 50% case fatality ratio**. Early symptoms resemble malaria and typhoid, necessitating PCR confirmation. There is no approved antiviral treatment or vaccine.

Conclusion:

Emergency validation of diagnostic tests for ebolaviruses like BVD strengthens global outbreak containment and cross-border health security.

INDIA'S FIRST HYDROGEN TRAIN

Subject: Science & Technology



Why in News?

The Prime Minister of India inaugurated India's first passenger hydrogen-powered train on the **89-km Jind–Sonipat corridor** in Haryana.

Context & Engineering

- **The Train:** A Hydrogen-Electric Multiple Unit (HEMU) built by retrofitting conventional DEMU

coaches with hydrogen fuel cells and LFP batteries.

- **Power & Capacity:** Generates **2,400 kW of power**, carrying up to 682 passengers at a top speed of 75 km/h, with onboard storage of 440 kg of compressed hydrogen backed by a 3,000-kg refuelling station at Jind.

Conclusion:

Hydrogen trains represent a critical step toward decarbonizing non-electrified regional rail networks in India.

AIR SUVIDHA 2.0 PORTAL

Subject: Science & Technology

Why in News?

The Ministry of Civil Aviation and Delhi International Airport Limited (DIAL) launched **AIR SUVIDHA 2.0**, an upgraded health screening web portal for international arrivals.

Context & Features

- **Objective:** Automates health self-declarations to prevent cross-border transmission of infectious diseases (such as Ebola) at Indian points of entry.
- **Workflow:** Requires international travelers to submit a 21-day travel and symptom history online up to 24 hours before arrival, generating a QR-coded digital receipt that integrates instantly with Airport

Health Officers (APHOs), immigration, and the IDSP network.

Conclusion:

Air Suvidha 2.0 strengthens national biosecurity surveillance while ensuring frictionless passenger clearance at airports.

THE PABV-4 BIRD VIRUS

Subject: Science & Technology

Why in News?

For the first time in India, researchers identified and genetically characterized **parrot bornavirus 4 (PaBV-4)** circulating among captive birds.

Context & Pathology

- **Pathogen:** A contagious single-stranded RNA virus causing Proventricular Dilatation Disease (PDD)—a progressive neurological and gastrointestinal disorder affecting captive parrots, macaws, and cockatiels.
- **Impact:** Causes severe nerve inflammation, digestive failure, and high mortality in birds, threatening captive breeding programs and endangered avian species. Diagnosis relies on RT-PCR testing.

Conclusion:

The detection of PaBV-4 in India highlights the necessity of rigorous

quarantine and biosecurity protocols in avian conservation.

SULPHUR DIOXIDE (SO₂) EMISSIONS

Subject: Environment & Ecology

Why in News?

A recent analysis revealed that nearly **81 percent of SO₂ emissions** from coal plants within a 300-km radius of Delhi-NCR originate from facilities exempted from installing pollution control systems.

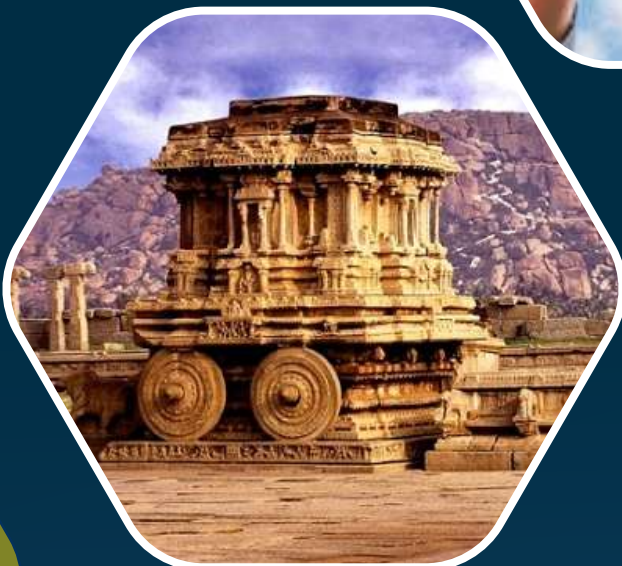
Context & Environmental Impact

- **Source & Chemistry:** Emitted primarily by coal-fired thermal power plants during fossil fuel combustion. In the atmosphere, SO₂ reacts to form fine particulate matter (PM_{2.5}) and sulphuric acid (H₂SO₄), driving acid rain and severe respiratory illnesses.
- **Mitigation:** Mandates the installation of **Flue Gas Desulphurisation (FGD)** systems to scrub up to 95% of SO₂ emissions, alongside Continuous Emission Monitoring Systems (CEMS).

Conclusion:

Enforcing stringent FGD compliance on all thermal power plants is vital to curbing toxic sulphur emissions and improving regional air quality.

PRELIMS POINTERS



Prambanan Temple Complex



Why in News?

Prime Minister Narendra Modi visited the Prambanan Temple Complex near Yogyakarta, Indonesia, along with Indonesian President Prabowo Subianto during a 2026 visit. During this visit, India and Indonesia announced cooperation for the conservation and restoration of the temple complex.

- **Location:** The complex is located near Yogyakarta on Java Island, Indonesia.
- **Historical Origins:** It was built in the 9th Century CE by the Sanjaya Dynasty of the Mataram Kingdom.
- **Significance:** It is recognized as the largest Hindu temple complex in Indonesia and was designated as a UNESCO World Heritage Site in 1991.
- **Deity Dedication:** The temple is dedicated to the Trimurti. It features shrines for Shiva, which is the largest central temple, Vishnu, and Brahma.

- **Architecture:** The structures are built in classical Javanese Hindu architecture.

Colombia



Why in News?

The Prime Minister of India extended his heartiest congratulations to Abelardo de la Espriella following his historic and narrow victory in the Colombian presidential runoff elections held on June 21, 2026. De la Espriella secured the presidency as the most voted candidate in the country's history.

Political & Cultural Profile

Colombia is a sovereign, unitary republic featuring a bicameral legislature comprising a Senate and House of Representatives. It stands as South America's most populous Spanish-speaking country, celebrated for a cultural fabric that blends its Spanish colonial heritage with rich indigenous traditions.

Location and Strategic Positioning

- **Unique Coastlines:** Situated in northwestern South America, it is the only South American country with coastlines along both the Caribbean Sea and the Pacific Ocean.
- **Capital:** Bogotá, functioning as the political, economic, and cultural center, is located high in the Andes.
- **Borders:** Shares land borders with Panama, Venezuela, Brazil, Peru, and Ecuador. It also governs the San Andrés and Providencia Islands in the Caribbean.

Key Geographic Features

- **Cordillera Occidental (Western Range):** The lowest Andean range, running parallel to the Pacific coast and reducing heavy coastal rainfall.
- **Cordillera Central (Central Range):** A volcanic spine boasting fertile, coffee-growing soils and snow-capped peaks, including Mount Huila and Nevado del Ruiz.
- **Cordillera Oriental (Eastern Range):** The widest range, housing the Sabana de Bogotá plateau and extending into neighboring Venezuela.
- **Isolated Massifs:** Features the coastal Santa Marta Mountains (home to Colombia's highest peaks, Cristóbal Colón and Simón Bolívar) and the Pacific Baudó Mountains.

- **Rivers and Lowlands:** The Magdalena River is a vital artery for inland transport and agriculture. The Atlantic Lowlands, La Guajira Peninsula, and Llanos Orientales are renowned for their savannas, deserts, and exceptional biodiversity.

Greece



Why in News?

The Union Minister of Commerce and Industry witnessed the live launch of India's Unified Payments Interface (UPI) services in Greece. This was executed through a strategic partnership between Eurobank and NPCI International Payments Limited (NIPL), expanding India's digital public infrastructure footprint in Europe.

Political & Historical Profile

Greece is a sovereign, multi-party parliamentary republic rooted in a profound maritime heritage. As the cultural bridge of Western history, it carries the legacies of Classical Greece, the Byzantine Empire, and nearly four centuries of Ottoman rule.

Location and Strategic Positioning

- **Juncture of Continents:** Occupies the strategic southernmost tip of the

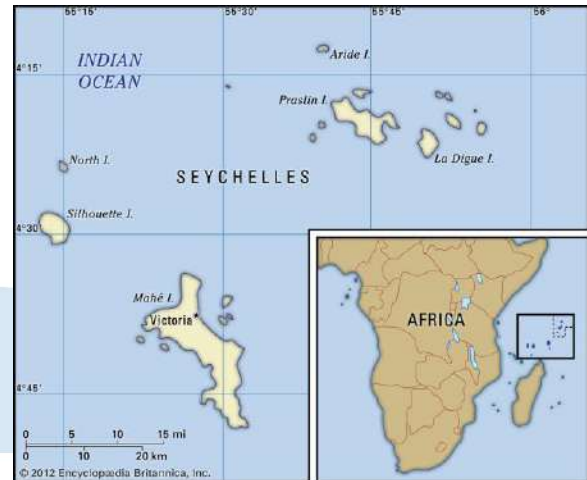
Balkan Peninsula, connecting Europe, Asia, and Africa.

- **Maritime Borders:** Bounded by the Aegean Sea (east), the Mediterranean Sea (south), and the Ionian Sea (west).
- **Capital & Borders:** Headquartered in Athens, it shares land boundaries with Albania, the Republic of North Macedonia, Bulgaria, and Turkey.

Key Geographic Features

- **Active Tectonic Zone:** Greece lies at the volatile collision of tectonic plates, driving frequent earthquakes and sustaining active volcanoes in Santorini (Thíra) and Mílos.
- **Mountainous Landscape:** The Píndos Range acts as the mainland's spine, while Mount Olympus (2,917 m) stands as the highest geographic and cultural landmark.
- **Peloponnese Peninsula:** Separated from mainland Greece by the Corinth Canal, granting it an island-like character.
- **Archipelagos:** Over 2,000 islands form nearly one-fifth of Greece's land area across the Ionian, Aegean, and Cyclades groups, with Crete being the largest.

Seychelles



Why in News?

The Prime Minister of India recently concluded a three-day official state visit to Seychelles, participating as the Guest of Honour for the island nation's Golden Jubilee National Day celebrations, highlighting the deepening maritime security and diplomatic ties in the Indian Ocean.

Political & Ecological Profile

Seychelles is a sovereign, multi-party island republic with a single legislative house (the National Assembly). Though one of the world's smallest nations by land area, it commands a massive maritime footprint and sets global benchmarks for ecological preservation and pristine coral system protection.

Location and Strategic Positioning

- **Coordinates:** Located in the western Indian Ocean between 4°S–11°S latitude and 46°E–56°E longitude.
- **Proximity:** Situated roughly 1,600 km east of Kenya and 1,100 km northeast of Madagascar.

- **Capital:** Victoria, located on the highly populated Mahé island.

Key Geographic Features

- **Granitic Inner Islands:** Comprising over 40 islands, these are the world's only mid-ocean islands formed from ancient continental granite. They feature rugged terrain and Morne Seychellois, the highest peak at 905 meters.
- **Coralline Outer Islands:** Over 70 low-lying coral atolls that are largely uninhabited due to a lack of natural water catchments.
- **Distinct Flora & Fauna:** Home to the strictly protected Coco de Mer Palm (producing the world's largest wild fruit) and the UNESCO-listed Aldabra Atoll, a sanctuary for native giant tortoises.

The Gulf of Aden



Why in News?

The Indian Navy's mission-deployed stealth frigate, INS Trikanth, successfully foiled a

piracy attempt on the merchant vessel MV Golden Arsenal in the Gulf of Aden, reinforcing the Indian Navy's role as a net security provider in the region.

Location and Strategic Positioning

- **Hydrographic Gateway:** A deep-water marine basin covering 530,000 sq km, connecting the Red Sea to the Arabian Sea and the Indian Ocean.
- **Borders:** Bounded by Yemen (north) and Somalia/Somaliland (south). It connects to the Red Sea via the Bab el-Mandeb Strait.
- **Dimensions:** Measures roughly 1,480 km in length with an average width of 480 km.

Key Geographic Features

- **The Sheba Ridge:** An active mid-ocean ridge where tectonic activity and seafloor spreading continuously create new oceanic crust.
- **The Alula-Fartak Trench:** The gulf's deepest point, reaching 5,360 meters due to faulting along the Sheba Ridge.
- **Continental Drift:** Formed roughly 35 million years ago following the separation of the Arabian Plate from the African Plate.
- **Hydrographic Flows:** Indian Ocean waters rush in through the Bab el-Mandeb Strait to balance heavy Red Sea evaporation, fostering a highly productive marine ecosystem rich in

plankton, tuna, sea turtles, and whales.

Mali



Why in News?

India and Mali institutionalized their growing economic partnership by holding the inaugural India–Mali Forum for the Promotion of Exports in the capital city of Bamako, paving the way for deeper trade across key sectors.

Political & Cultural Profile

Mali is a sovereign, landlocked West African nation presently managed by a transitional government. Heir to the historical Ghana, Mali, and Songhai empires, its cultural fabric is dominated by the Bambara language alongside Fulani, Dogon, and Tuareg communities.

Location and Strategic Positioning

- **Geographic Span:** Stretches across the hyper-arid Saharan desert in the

north and the semi-arid Sahelian transition zone in the south.

- **Capital:** Bamako.
- **Bordering Nations:** Algeria, Niger, Burkina Faso, Côte d'Ivoire, Guinea, Senegal, and Mauritania.

Key Geographic Features

- **Twin Fluvial Arteries:** The Niger River (flowing over 1,600 km to form the Inland Niger Delta) and the Sénégal River (vital for regional irrigation).
- **Plains and Plateaus:** Includes the Mandingue Plateau, the rugged Iforas Massif in the Saharan north, and the dramatic Dogon Plateau & Bandiagara Escarpment (home to Mount Hombori Tondo, Mali's highest peak).
- **Soil Conditions:** Dominated by shallow, iron-rich, infertile soils in the south and vast sand dunes and gravel plains in the north.

Indonesia



Why in News?

India's Ambassador to Indonesia announced that the nation will host a 15-month commemoration (2026–2027) marking the centenary of Gurudev Rabindranath Tagore's historic 1927 visit, underscoring deep civilizational ties.

Political & Cultural Profile

Indonesia is the world's largest island country, a massive sovereign archipelago comprising over 17,000 islands. Tagore's 1927 visit to Java, Bali, and Sumatra explored ancient epics and introduced Javanese Batik to Bengal, heavily influencing Shantiniketan art and local holistic education (Taman Siswa).

Location and Strategic Positioning

- **Maritime Bridge:** Straddles the equator between the Indian and Pacific Oceans, bridging Asia and Oceania (Melanesia).
- **Capital:** Jakarta (currently being relocated to Nusantara).
- **Borders:** Shares land borders with Malaysia, Papua New Guinea, and East Timor.

Key Geographic Features

- **Ring of Fire:** Positioned at the convergence of the Eurasian, Indo-Australian, and Pacific tectonic plates, hosting 120 active volcanoes.
- **Shelves and Straits:** Built on the fertile Sunda Shelf and the rugged Sahul Shelf (hosting Puncak Jaya). The Sunda and Lombok Straits are critical to global trade.

- **Wallace Line:** A biogeographical boundary dividing Asian and Australian fauna.

Australia



Why in News?

The 3rd India-Australia Annual Summit was convened in Melbourne by the Prime Minister of India and Australian Prime Minister Anthony Albanese, focusing on defense, critical minerals, and Indo-Pacific security.

Political & Historical Profile

Recognized as the world's smallest continent and sixth-largest country, Australia was formed in 1901 through the federation of six British colonies. It has been inhabited by First Nations Aboriginal and Torres Strait Islander peoples for over 65,000 years.

Location and Strategic Positioning

- **Indo-Pacific Anchor:** Positioned in the Southern Hemisphere, bordered by the Indian Ocean (west/south) and the Pacific Ocean's Coral and Tasman Seas (east).

- **Capital:** Canberra.

Key Geographic Features

- **The Western Plateau (Outback):** Covers two-thirds of the landmass with ancient rocks, deserts, and landmarks like Uluru.
- **The Central Lowlands:** Contains the Great Artesian Basin, Lake Eyre Basin, and the highly fertile Murray–Darling Basin.
- **The Eastern Highlands:** The 3,700-km Great Dividing Range, which dictates the rain shadow and houses Mount Kosciuszko.
- **Geopolitics:** A critical QUAD member ensuring maritime security, and a powerhouse for critical minerals like lithium, cobalt, and rare earths.

New Zealand



Why in News?

The Prime Minister of India arrived in Auckland for a high-stakes two-day state visit at the official invitation of New Zealand Prime Minister Christopher Luxon, aimed at boosting trade and geopolitical alignment.

Political & Historical Profile

Known in Māori as Aotearoa, New Zealand is a highly developed constitutional monarchy and parliamentary democracy (recognizing King Charles III). Settled by Polynesian navigators in the 1200s, it achieved full legislative independence via the Statute of Westminster in 1947.

Location and Strategic Positioning

- **Polynesian Anchor:** Situated in the southwestern Pacific Ocean, surrounded by the Tasman Sea to the west and the open Pacific to the east.
- **Capitals:** Wellington (Administrative) and Auckland (Commercial Hub).

Key Geographic Features

- **North Island:** Dominated by the Pacific Ring of Fire, featuring Lake Taupō's caldera, Mount Ruapehu, Mount Taranaki, and geothermal fields.
- **South Island:** Defined by the 480-km-long glaciated Southern Alps, deep fjords, and Aoraki/Mount Cook.
- **Tectonic Grid:** Lies squarely on the collision zone of the Pacific and

Australian plates, generating frequent earthquakes and active faulting.

South China Sea



Why in News?

China strongly renewed its rejection of the historic 2016 Permanent Court of Arbitration ruling on its South China Sea claims on its 10th anniversary, officially declaring the legal decision “illegal and invalid.”

Strategic & Geographic Positioning

- **Location:** A critical marginal sea in the western Pacific Ocean, positioned south of China, east of Vietnam, west of the Philippines, and north of Borneo.
- **Choke Points:** Linked to the East China Sea via the Taiwan Strait, the Philippine Sea via the Luzon Strait, and the Indian Ocean via the Strait of Malacca.

Key Geopolitical Features

- **The Nine-Dash Line:** China's historically derived boundary used to claim sovereign rights over roughly 90% of the entire sea.
- **Contested Island Networks:** Includes the Spratly Islands, the Paracel Islands (controlled by China since 1974 but claimed by Vietnam/Taiwan), and Scarborough Shoal.
- **Economic Value:** Holds estimated reserves of 11 billion barrels of oil and 190 trillion cubic feet of natural gas. It accounts for over 10% of global wild-capture fisheries.

Mount Olympus vs. The Tibetan Plateau

Feature	Mount Olympus (Greece)	The Tibetan Plateau (China)
Why in News	Greece’s nomination to place the massif on the UNESCO World Heritage List as a mixed site is currently under	A new international study published in <i>Nature Geoscience</i> by UK and Chinese geoscientists revealed direct

Feature	Mount Olympus (Greece)	The Tibetan Plateau (China)	Feature	Mount Olympus (Greece)	The Tibetan Plateau (China)
	formal review by the World Heritage Committee in Busan, South Korea.	structural evidence detailing how the plateau was formed.		and carved by glaciers.	Eurasian Plate.
Geographic Core	Northern Greece, spanning the regional border of Macedonia and Thessaly near the Aegean Sea.	Southwestern China, bounded by the Kunlun Mountains (north) and the Himalayas (south/southwest).	Key Topography	Highest peak is Mytikas (2,918 m). Features the distinct "Throne of Zeus" (Stefani) and the deep Enipeas Gorge.	Covers 2.5 million sq km with an average elevation over 4,500 m. Features the cold, high-altitude Qiangtang lake region.
Formation	Triassic/Cretaceous sedimentary limestone thrust upward by African-Eurasian plate collision	Formed ~50 million years ago via the Indian Plate colliding with and subducting beneath the			



The Falkland Islands (Islas Malvinas)



Strait of Magellan. The capital is Stanley (East Falkland).

- **Environment:** Covers 12,200 sq km of rolling hills, deep peatlands, and a cool, windy maritime climate.
- **Economy & Ecology:** Devoid of trees, the islands rely on sheep farming, offshore oil exploration, and rich fisheries (squid). They host massive colonies of penguins, sea lions, and albatrosses.

Why in News?

During Argentina's celebrations after reaching the 2026 FIFA World Cup final, national players displayed a banner reading "The Falkland Islands are Argentine," prompting a formal FIFA review for violating rules against political messages in sporting events.

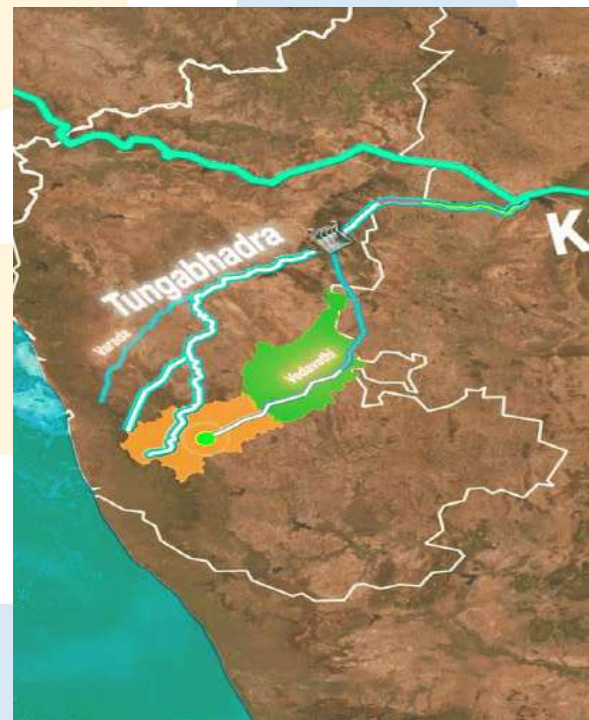
Geopolitical Profile

- **Status:** A self-governing British Overseas Territory. In a 2013 referendum, 99.8% of residents voted to remain under British sovereignty—a claim fiercely rejected by Argentina.
- **History:** Initially settled by the French in 1764, leading to periods of British and Spanish control. The 74-day Falklands War in 1982 solidified British control.

Key Geographic Features

- **Location:** South Atlantic Ocean, located about 480 km east of the

The Tungabhadra River



Why in News?

The Chief Ministers of Karnataka, Andhra Pradesh, and Telangana achieved a breakthrough administrative consensus to pursue joint desilting operations in the

Tungabhadra basin to protect downstream farming interests and reservoir capacity.

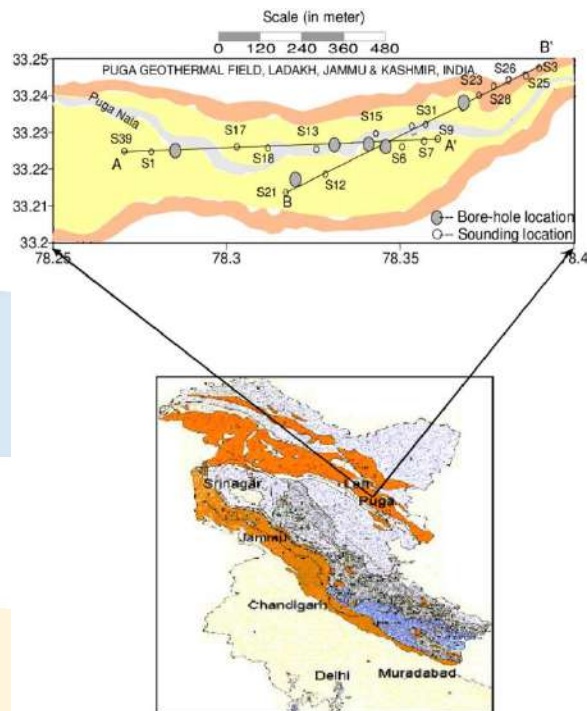
River Course and Geography

- **Origin:** Formed in the Western Ghats by the confluence of the Tunga River (rising near Varaha Parvatha) and the Bhadra River (rising at Gangamoola near Kudremukh).
- **Flow:** The rivers unite at Kudli near Shivamogga, traversing 531 km through Karnataka, bordering Telangana, and entering Andhra Pradesh to join the Krishna River at Sangamaleshwaram.
- **Key Features:** The Tungabhadra Reservoir (Pampa Sagar) regulates interstate water. The basin sustains smooth-coated otters, mugger crocodiles, and the enduring irrigation heritage of the ancient Vijayanagara Empire.

Puga Valley Geothermal Wells

Why in News?

Ladakh Lieutenant Governor VK Saxena officially commissioned India's first and deepest (1,000 meters) twin geothermal wells at Puga Valley in July 2026. Executed by the ONGC Energy Centre, these wells will serve as the backbone for India's first 1 MW demonstration-scale geothermal power plant.



Geological Formation & Technical Details

- **Tectonic Heat Source:** The Indian plate's collision with the Eurasian plate drives magmatic activity along the Indus Suture Zone, pushing mantle heat close to the crust.
- **Mechanism:** Meteoric snowmelt seeps into rock fractures, superheats, and is driven upward under high pressure, trapping steam in permeable reservoirs.
- **Milestones:** Completed at a high altitude of over 14,000 feet, the drilling recorded a maximum temperature of 135°C at a shallow depth of 400 meters, with deep sections expected to exceed 200°C–240°C. This breakthrough proves the viability of base-load clean energy in the Himalayas.

The Borjuli Wetland Biodiversity Heritage Site (BHS)



Why in News?

The Borjuli wetland in Assam was officially notified as a Biodiversity Heritage Site (BHS) to legally protect its unique population of *Oryza rufipogon*, a disease- and pest-resistant wild rice variety essential for global food security.

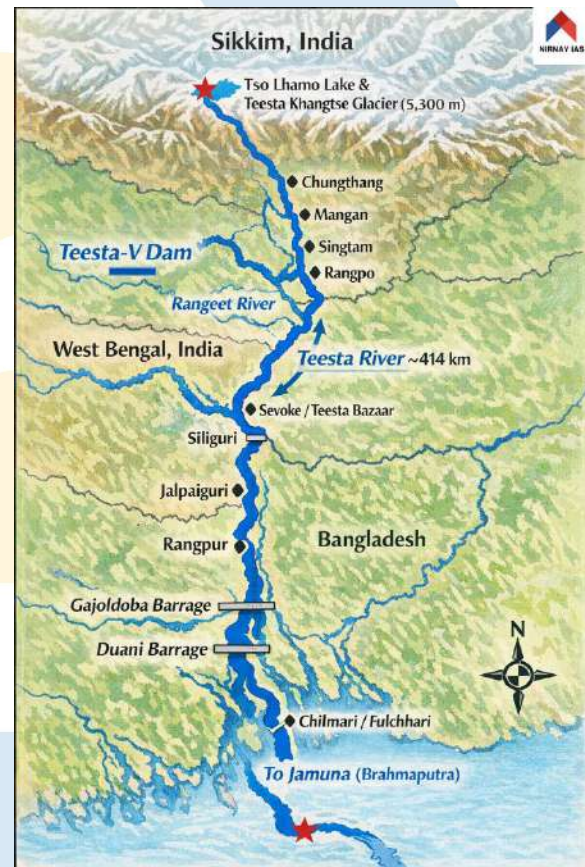
Ecological & Legal Framework

- **Location:** Sonitpur district, Assam, embedded in the flood-prone plains of the Brahmaputra River valley.
- **Species Value:** *Oryza rufipogon* is the direct evolutionary progenitor of domestic rice. Evolving in local alluvial floodplains, it possesses strong genetic resistance to

agricultural pests, fungal diseases, and extreme salinity.

- **BHS Statutory Status:** Declared under Section 37 of the Biological Diversity Act, 2002. These sites are governed locally by Biodiversity Management Committees (BMCs) with technical oversight from the National Biodiversity Authority (NBA).

The Teesta River



Why in News?

During an official state visit to China, the Bangladesh Prime Minister signed a strategic agreement with Beijing to accelerate a comprehensive feasibility study

for the Teesta River Comprehensive Management and Restoration Project (TRCMRP), escalating regional geopolitical competition.

River Course and Geography

- **Origin:** Rises at over 5,000 meters from Tso Lhamo Lake in the Eastern Himalayas, fed heavily by the Teesta Khangse glacier in North Sikkim.
- **Path:** Navigates steep Himalayan gorges in Sikkim, slows at the Sevoke transition in West Bengal to form braided alluvial channels, and crosses into Bangladesh to join the Jamuna River.
- **Tributaries:** Right-bank (Dik Chhu, Kanaka Chhu, Rangeet) and Left-bank (Lachung Chhu, Lachen Chhu).

Geopolitical Significance

- **Security Concerns:** The basin's proximity to India's highly strategic Siliguri Corridor makes Chinese infrastructure involvement in Bangladesh a critical security flashpoint.
- **Water Sharing:** Dry-season water allocation remains a deeply unresolved core dispute between India (West Bengal) and Bangladesh.

The Narmada River

Why in News?

In a major breakthrough for inter-state water relations, the Chief Ministers of Madhya Pradesh, Gujarat, Rajasthan, and

Maharashtra signed a historic agreement in New Delhi under the oversight of the Union Home Minister, resolving a long-pending dispute over cost-sharing and rehabilitation (R&R) expenses for the Sardar Sarovar Project.



River Course and Geography

- **Origin:** Rises from the sacred Narmada Kund at Amarkantak in the Maikal Hills (elevation 1,057 m).
- **Flow Dynamics:** Known as the "Lifeline of Madhya Pradesh," it travels westward for 1,312 km through an ancient tectonic rift valley (graben) flanked by the Vindhya and Satpura ranges.
- **Key Features:** Unlike delta-forming rivers, the Narmada drops its limited sediment over hard rock to form a deep estuary. It is celebrated for dramatic waterfalls like Kapildhara and the marble gorge at Dhuandhar. Key tributaries include the Tawa, Hiran, and Barna.

Kamarajar Port



Why in News?

Kamarajar Port Limited (KPL) has successfully completed its Capital Dredging Phase VI project, officially becoming India's second major port (after Visakhapatnam) to achieve a deep 18-meter operational draft capability.

Structural Profile

- **Location:** Situated on the Coromandel Coast, roughly 24 km north of Chennai in Tamil Nadu.
- **Operational Framework:** The first corporatized Major Port in India, operating on the Landlord Port Model. KPL manages the dredged basins and core navigation, while private entities operate the multi-cargo terminals via PPP models.
- **Capabilities:** An artificial deep-water harbor featuring breakwaters. It handles Cape-size vessels transporting bulk thermal coal, LNG,

general break-bulk cargo, and automobiles.

Debrigarh Wildlife Sanctuary



Why in News?

Odisha's Forest Minister announced that a formal proposal will be sent to the Central Government to elevate the Debrigarh Wildlife Sanctuary to the higher protected status of Debrigarh-gaur National Park.

Ecological & Historical Profile

- **Location:** Bargarh district, western Odisha, strategically flanked by the expansive Hirakud Dam and Reservoir.
- **Historical Significance:** Housed the rugged Barapathara hills, the guerrilla warfare base of revered Indian freedom fighter Veer Surendra Sai against the British.
- **Habitat Metrics:** The proposed 290.65 sq km core area is entirely

free of human settlements. Dominated by tropical dry deciduous forests, it supports exceptional densities of large herbivores, leopards, bisons, and endangered antelopes.

The Karlapat Bauxite Block



Why in News?

India's top industrial giants—including Adani, Reliance Industries, Hindalco, and Vedanta—are fiercely competing in state auctions to acquire the unallotted Karlapat bauxite block in Odisha, driven by the surging global demand for aluminium.

Geological & Commercial Profile

- **Location:** Kalahandi district, Odisha, located within the mineral-dense Eastern Ghats Mobile Belt. Crucially, it sits adjacent to the ecologically sensitive Karlapat Wildlife Sanctuary and a vital elephant corridor.
- **Formation:** Created through the in-situ lateritization (chemical weathering) of Precambrian khondalite and charnockite rocks.

- **Resource Scale:** Holds an estimated 207–220 million tonnes of greenfield bauxite capping high-altitude plateaus (900–1,400 meters).
- **Ore Quality:** Features extremely high commercial grades (45.2%–47% Al_2O_3) predominantly made of gibbsite, with low reactive silica. This significantly reduces energy and caustic soda consumption during alumina processing.



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MCQs, Assertion-Reason,
Case Studies & Descriptive
Questions



CONCEPT BASED & ANALYTICAL

Strengthen understanding
and application



PRACTICE MORE SCORE HIGHER

Boost accuracy, speed
and confidence

PRACTICE QUESTION

Q. Consider the following statements:

1. Statement one is written here.
2. Statement two is written here.

Which of the statements given above
is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2



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Prelims Practice Questions (MCQs)

Q1. Consider the following statements regarding the Interoperable Criminal Justice System (ICJS):

1. It integrates the five foundational pillars of the criminal justice system onto a single digital grid hosted on the MeghRaj cloud.
2. The Crime and Criminal Tracking Network & Systems (CCTNS) enables FIR registration across 23 regional languages with integration via the Bhashini App.

Which of the statements given above is/are correct?

- A) 1 only
- B) 2 only
- C) Both 1 and 2
- D) Neither 1 nor 2

Q2. With reference to the e-Overseas Citizen of India (e-OCI) Card initiative, which of the following is a primary benefit?

- A) It grants voting rights in Indian general elections to diaspora members.
- B) It eliminates the requirement of reissuing the physical OCI booklet every time an OCI holder obtains a new passport.
- C) It automatically confers Indian dual citizenship upon all cardholders.
- D) It exempts OCI holders from paying income tax in India on foreign-earned income.

Q3. According to the Civil Registration System (CRS) Report 2024, what is India's national Sex Ratio at Birth (SRB)?

- A) 950 females per 1,000 males
- B) 933 females per 1,000 males
- C) 917 females per 1,000 males
- D) 975 females per 1,000 males

Q4. Under the Seventh Schedule of the Constitution, "Public Order" and "Police"—the legislative subjects governing externment laws—fall under which list?

- A) Union List
- B) State List
- C) Concurrent List
- D) Residuary Powers

Q5. Consider the maritime zones established under UNCLOS (1982):

1. **Territorial Sea:** Extends up to 12 nautical miles (NM) from the baseline with full sovereignty.
2. **Contiguous Zone:** Extends up to 24 NM where coastal states can enforce customs, fiscal, and immigration laws.
3. **Exclusive Economic Zone (EEZ):** Extends up to 200 NM granting sovereign rights over natural resources.

Which of the statements given above are correct?

- A) 1 and 2 only
- B) 2 and 3 only
- C) 1 and 3 only
- D) 1, 2, and 3

Q6. In the context of "Trial in Absentia" under Section 356 of the Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023, which of the following is correct?

- A) It applies to any individual who fails to appear after a single police summons.
- B) It is restricted exclusively to a "Proclaimed Offender" facing serious charges carrying a punishment of 10 years or more, life imprisonment, or death.
- C) It permits trials to be completed without appointing any defense counsel if the accused is untraceable.
- D) It can be initiated immediately on the first day of filing an FIR.

Q7. Which of the following financial thresholds triggers mandatory Corporate Social Responsibility (CSR) compliance under Section 135 of the Companies Act, 2013?

- A) Net worth of ₹500 crore or more, or Turnover of ₹1,000 crore

- or more, or Net profit of ₹5 crore or more.
- B) Net worth of ₹1,000 crore or more only.
- C) Net profit of ₹50 crore or more.
- D) Annual turnover exceeding ₹5,000 crore.

Q8. The Foreign Contribution (Regulation) Amendment Bill introduces provisions regarding asset vesting upon cancellation of registration. Where are the auction proceeds of confiscated assets ultimately credited under the proposed framework?

- A) Prime Minister's National Relief Fund
- B) Consolidated Fund of India (Article 266)
- C) Reserve Bank of India contingency reserve
- D) Ministry of Home Affairs discretionary account

Q9. With reference to the Supreme Court's ruling on Environmental Clearances (EC), why did the Court strike down the 2021 Office Memorandum (OM)?

- A) It sought to abolish the Ministry of Environment, Forest and Climate Change.
- B) It permitted ex post facto (retrospective) environmental clearances through administrative executive instructions, overriding delegated legislation like the EIA Notification, 2006.
- C) It mandated zero industrial activity across all eco-sensitive zones.
- D) It transferred environmental jurisdiction exclusively to High Courts.

Q10. Consider the following statements regarding Indonesian Hinduism and the concept of "Sang Hyang Widhi Wasa":

1. It represents the single Supreme God concept introduced by reformers to align with the national state philosophy, Pancasila.

2. It draws directly upon the classical Upanishadic concept of Brahman, personifying it into a state-recognised Supreme Divine Reality.

Which of the statements given above is/are correct?

- A) 1 only
- B) 2 only
- C) Both 1 and 2
- D) Neither 1 nor 2

Q11. With reference to Kashmir's Sufiyana Music (Sufiyana Kalam), consider the following statements:

1. It is a classical choral ensemble that blends Indian classical traditions with Persian and Central Asian musical structures.
2. It is performed without any musical instruments, relying purely on vocal chanting and oral traditions.

Which of the statements given above is/are correct?

- A) 1 only
- B) 2 only
- C) Both 1 and 2
- D) Neither 1 nor 2

Q12. In the framework of traditional Indian *Shastrarth*, what does the term *Purva Paksha* signify?

- A) The final scholarly verdict delivered by a neutral adjudicator.
- B) The counter-argument or rebuttal presented using flawless logic.
- C) A critical ethical requirement to first accurately and comprehensively articulate the opponent's standpoint before offering criticism.
- D) The direct perception method of knowledge (*Pratyaksha*).

Q13. Niokolo-Koba National Park, which was recently removed from the UNESCO List of World Heritage in Danger, is located in which of the following countries?

- A) Kenya
- B) Senegal
- C) Brazil

- D) Indonesia

Q14. With reference to the Māori people of New Zealand, consider the following terms and their descriptions:

1. **Whakapapa:** The foundational genealogy tracking lineage back to ancestral canoes.
2. **Tā Moko:** The traditional carved tattooing practice expressing ancestry and social rank.
3. **Hongi:** The traditional greeting involving the pressing of noses and foreheads together to exchange the breath of life.

Which of the statements given above are correct?

- A) 1 and 2 only
- B) 2 and 3 only
- C) 1 and 3 only
- D) 1, 2, and 3

Q15. The "TribeX" digital learning platform, recently launched by the Ministry of Tribal Affairs, offers UGC-recognized PG Diplomas in collaboration with which institution?

- A) Indira Gandhi National Open University (IGNOU)
- B) Sampurnanand Sanskrit University (SSU)
- C) Jawaharlal Nehru University (JNU)
- D) Tata Institute of Social Sciences (TISS)

Q16. Consider the following statements regarding the Ulsan-inspired shipbuilding framework and bilateral cooperation with South Korea:

1. HD Korea Shipbuilding & Offshore Engineering committed \$4 billion toward a modern greenfield shipyard in Thoothukudi, Tamil Nadu, in partnership with Cochin Shipyard Limited (CSL).
2. The Korea Marine Equipment Association (KOMEA) has established an office in Mumbai to develop localized marine equipment clusters.

Which of the statements given above is/are correct?

- A) 1 only
- B) 2 only
- C) Both 1 and 2
- D) Neither 1 nor 2

Q17. With reference to the Periodic Labour Force Survey (PLFS) data concerning Generation Z in India, what is the defined age bracket for Gen Z?

- A) 10–18 years
- B) 15–26 years
- C) 18–35 years
- D) 21–40 years

Q18. Consider the following statements regarding polymer banknotes:

1. They are manufactured using Biaxially Oriented Polypropylene (BOPP) rather than traditional cotton-rag paper.
2. They offer enhanced durability, resistance to moisture and soil, and an extended circulation lifecycle compared to paper notes.

Which of the statements given above is/are correct?

- A) 1 only
- B) 2 only
- C) Both 1 and 2
- D) Neither 1 nor 2

Q19. What is the primary physical property that makes helium essential for applications like quantum computing and MRI scanners?

- A) High electrical resistance at room temperature
- B) Extremely low boiling point (-269°C / 4.2 Kelvin), remaining liquid near absolute zero
- C) Heavy atomic weight and radioactive instability
- D) High combustibility and flammability

Q20. Consider the following statements regarding the Global Mining and Metals Water Dataset report:

1. It was developed by the International Council on Mining and Metals (ICMM) in partnership with WRI and WWF.

2. It reveals that nearly two-thirds of global mining and metals processing facilities face high physical water risk.

Which of the statements given above is/are correct?

- A) 1 only
- B) 2 only
- C) Both 1 and 2
- D) Neither 1 nor 2

Q21. In the context of India's energy security, what is Compressed Biogas (CBG) chemically identical to?

- A) Liquefied Petroleum Gas (LPG)
- B) Compressed Natural Gas (CNG)
- C) Liquefied Natural Gas (LNG)
- D) Synthetic Diesel

Q22. Which statutory body functions as India's nodal agency for real-time cyber threat tracking, vulnerability coordination, and national emergency response?

- A) National Investigation Agency (NIA)
- B) Indian Computer Emergency Response Team (CERT-In)
- C) National Technical Research Organisation (NTRO)
- D) Central Bureau of Investigation (CBI)

Q23. According to the SIPRI 2026 Yearbook assessment, what structural shift occurred in India's nuclear posture?

- A) Total abandonment of the No First Use (NFU) doctrine
- B) Formal declaration of tactical nuclear weapons for battlefield use
- C) Classification of a limited number of warheads as operationally deployed, reflecting mature sea-based deterrence
- D) Complete dismantling of the recessed deterrent architecture without civilian control

Q24. Under the RBI's updated Limiting Customer Liability framework set for 2027, what is the maximum absolute payout for a retail victim losing up to ₹50,000 in fraudulent EBTs?

- A) ₹10,000
- B) ₹25,000
- C) ₹50,000
- D) ₹1,00,000

Q25. What is the primary purpose of the newly introduced Index of Services Production (ISP) developed by MoSPI?

- A) To measure agricultural crop yields across districts
- B) To track monthly short-term changes in the output volume of the formal services sector
- C) To calculate retail consumer price inflation in urban areas
- D) To monitor industrial factory power consumption

Q26. Consider the following statements regarding the Nifty500 Ahimsa Index:

1. It is India's first rules-based ethical equity benchmark designed around non-violence toward animals.
2. It strictly includes companies involved in dairy, leather, and animal-tested pharmaceuticals.

Which of the statements given above is/are correct?

- A) 1 only
- B) 2 only
- C) Both 1 and 2
- D) Neither 1 nor 2

Q27. What characterizes the "Netra" Airborne Early Warning and Control (AEW&C) system developed by DRDO?

- A) It is an uncrewed underwater submarine surveillance drone.
- B) It is an indigenous "flying radar station" built on an Embraer ERJ-145 airframe with a dorsal AESA radar.
- C) It is a surface-to-air ballistic missile defense battery.
- D) It is an AI-powered cyber defense firewall for power grids.

Q28. In the context of modern cybersecurity threats, what is "AI Squatting"?

- A) Physical trespassing into server rooms housing AI hardware
- B) An attack vector that weaponizes predictable AI

hallucinations by registering fake software packages or web domains

- C) A technique used to compress large language model datasets
- D) A method for encrypting enterprise cloud storage

Q29. Consider the following statements regarding Proton Exchange Membrane (PEM) fuel cells:

1. They convert hydrogen fuel directly into electrical energy with zero harmful emissions.
2. Water vapor and heat are produced as the sole by-products at the cathode.

Which of the statements given above is/are correct?

- A) 1 only
- B) 2 only
- C) Both 1 and 2
- D) Neither 1 nor 2

Q30. What is "Borophene"?

- A) A synthetic polymer used for manufacturing currency notes
- B) An ultra-thin, two-dimensional (2D) crystalline allotrope of boron atoms
- C) A rare gas extracted from natural gas deposits
- D) A chemical compound used in water purification filters

Mains Practice Questions

Q1. *"Adopting an integrated, cluster-based industrial model is vital for transforming India's shipbuilding sector into a globally competitive manufacturing powerhouse."* Examine the strategic significance of the recent India–South Korea maritime partnerships and evaluate the structural bottlenecks hindering domestic shipbuilding.

Q2. Despite economic growth, India's educated Gen Z faces severe structural barriers to formal employment. Analyse the underlying causes of this skill-job misalignment and discuss policy measures required to harness the demographic dividend.

Q3. Supply-chain cybersecurity vulnerabilities pose an unprecedented threat to India's Critical Information Infrastructure (CII). Discuss the implications of recent cyber breaches on strategic installations and outline robust defence strategies.

Q4. Examine the unique socio-religious trajectory of Indonesian Hinduism, focusing on its theological adaptation to modern constitutional frameworks and its role in cementing civilizational ties between India and Indonesia

Q5. Discuss the structural methodology of the ancient Indian *Shastrarth* tradition. How can the revival of such disciplined intellectual discourse enrich contemporary academic and democratic public reasoning?

Q6. Critically evaluate India's compounding water security challenges. Examine the necessity of transitioning from traditional supply-augmentation models to a circular, data-driven water management framework.

Q7. *"The 2027 digital mandate for India's criminal justice system represents a monumental shift from punitive colonial policing to a citizen-centric,*

technology-driven justice architecture." In light of this statement, examine the foundational pillars of the new digital framework, and discuss the structural bottlenecks that threaten its seamless implementation.

Q8. Balance between national security oversight and civil society autonomy is critical for a robust democracy. Critically analyse the key provisions and potential legal hurdles associated with the proposed Foreign Contribution (Regulation) Amendment framework.

Q9. Peaceful political dissent and criticism of government policies are foundational pillars of a vibrant democracy and cannot form the sole

basis for restrictive state action under preventive laws. Discuss in the context of recent judicial rulings on externment.

Q10. Staggering judicial pendency and institutional mass closures during court vacations raise critical questions regarding citizen access to justice under Article 21. Examine the proposed structural reforms to tackle judicial backlogs in India.

Q11. Retrospective environmental clearances erode the sanctity of the Precautionary Principle and commodify ecological degradation. Critically analyze the Supreme Court's recent ruling restricting ex post facto Environmental Clearances in India

ANSWER KEY PRELIMS PRACTICE QUESTION

1. c	2. b	3. c	4. b	5. d	6. b	7. a	8. b	9. b	10. c
11. a	12. c	13. b	14. d	15. b	16. c	17. b	18. c	19. b	20. c
21. b	22. b	23. c	24. b	25. b	26. a	27. b	28. b	29. c	30. b