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**VIDHVATH IAS KAS ACADEMY
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STUDY CENTRE**

DAILY CURRENT AFFAIRS

FOR UPSC CIVIL SERVICE EXAMINATION

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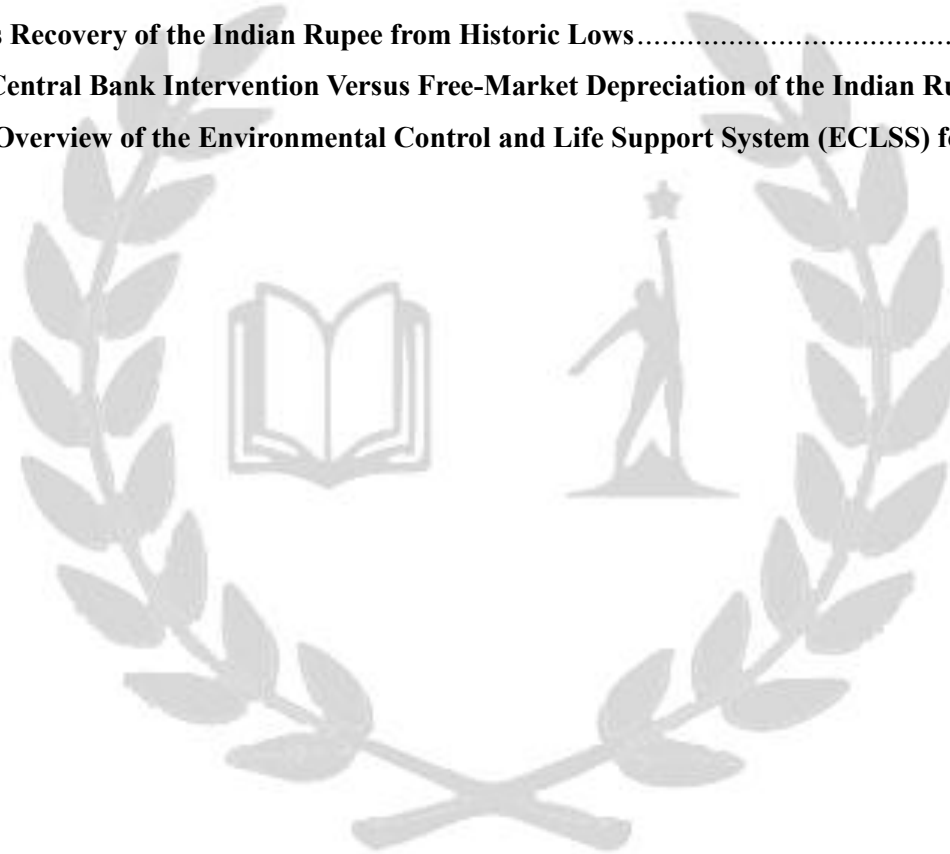
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VIDHVATH IAS ACADEMY



1. Postponement of 4th India-Africa Forum Summit (IAFS-IV)

Key Summary Points

- **Event Postponement:** The Ministry of External Affairs (MEA) and the African Union (Union) have officially postponed the 4th India-Africa Forum Summit (IAFS-IV), which was originally scheduled to take place in New Delhi from May 28 to 31.
- **Primary Cause:** The decision was taken jointly following extensive consultations regarding the evolving Ebola public health emergency and its wider ramifications across parts of the African continent.
- **Historical Parallel:** This mirrors a historical precedent from over a decade ago when the 3rd India-Africa Forum Summit (held in 2015) was also delayed by a year due to a major Ebola outbreak in West Africa.
- **India's Humanitarian Commitment:** India has officially pledged robust medical, financial, and technical assistance to affected African nations to help contain the spread of the virus and manage the healthcare crisis.
- **Diplomatic Impact:** While the postponement temporarily disrupts India's high-level diplomatic calendar, both sides have reaffirmed their strategic partnership and indicated that fresh dates will be finalized in due course through mutual consensus.

Definitions of Key Terms

- **India-Africa Forum Summit (IAFS):** The official platform for African-Indian relations, held periodically to design structured cooperation frameworks spanning trade, technology, energy, and capacity building.
- **Public Health Emergency of International Concern (PHEIC):** A formal declaration by the World Health Organization (WHO) identifying an extraordinary event that constitutes a public health risk to other states through international spread, requiring a coordinated international response.
- **Ebola Virus Disease (EVD):** A severe, often fatal illness in humans caused by the Ebola virus, transmitted to people from wild animals and spread through human-to-human transmission via direct contact with bodily fluids.



Key Institutional and Framework Provisions

- **African Union (AU) & Africa CDC:** The premier continental body consisting of 55 member states. The Africa Centres for Disease Control and Prevention (Africa CDC) acts as the specialized technical institution supporting public health initiatives and emergency responses across the continent.
- **International Health Regulations (IHR 2005):** A legally binding instrument of international law that requires WHO member states to report specific disease outbreaks and public health events to strengthen global health security.



- **Disaster Management Act, 2005 (India):** While domestic in scope, this Act governs India's overarching institutional capacity to deploy medical relief, National Disaster Response Force (NDRF) modules, or material aid during international humanitarian assistance and disaster relief (HADR) operations.
- **Epidemic Diseases Act, 1897:** India's foundational legal framework used to scale up domestic bio-security, quarantine protocols, and surveillance at international ports of entry during global pandemics or outbreaks.

UPSC Relevance

- **GS Paper II (International Relations):** Bilateral, regional, and global groupings involving India and affecting India's interests; India's soft-power diplomacy, South-South cooperation, and strategic engagement with Africa.
- **GS Paper III (Science & Technology / Security):** Science and Technology developments and their applications in everyday life; issues relating to intellectual property rights and healthcare; biological threats, global health security, and pandemic management.

Conclusion

The postponement of the IAFS-IV underscores the growing intersection between global health security and international diplomacy. While the delay challenges immediate diplomatic timelines, it highlights India's role as a responsible global stakeholder prioritizing human-centric development. Moving forward, India's proactive medical diplomacy and commitment to vaccine equity and healthcare capacity building will remain fundamental to deepening its strategic, multi-sectoral partnership with the African continent.

2. Supreme Court Clarification on Sedition Trials (Section 124A IPC)

Key Summary Points

- **Procedural Modification:** The Supreme Court of India clarified that pending trials, appeals, and legal proceedings involving the offence of sedition under Section 124A of the Indian Penal Code (IPC) can proceed on merits if the accused explicitly states they have no objection.
- **The Origin of the Stay:** This ruling modifies the apex court's historic interim order passed on May 11, 2022 (in the *S.G. Vombatkere v. Union of India* case), which had placed all pending sedition trials and investigations across the country in abeyance.
- **Context of the Clarification:** The decision was delivered by a three-judge Bench comprising Chief Justice of India Surya Kant, Justice Joymalya Bagchi, and Justice Vipul M. Pancholi during the hearing of a petitioner who has been incarcerated for 17 years and wished for his appeal to be heard on its merits.
- **Judicial Rationale:** The Bench noted that if an undertrial or convict does not object to the continuation of the proceedings, there should be no structural impediment for courts to decide the matter, ensuring that the stay does not inadvertently prolong the incarceration of an accused.
- **The Original Mandate:** The 2022 freeze was intended to allow the Union Government time to re-examine and reconsider the colonial-era law, with the court expecting the Centre and states to refrain from registering fresh FIRs or taking coercive actions under Section 124A during the review period.



Definitions of Key Terms

- **Sedition (Section 124A IPC):** A colonial-era provision that criminalizes any act, speech, or visual representation that attempts to bring hatred, contempt, or excites disaffection towards the Government established by law in India.
- **Abeyance:** A state of temporary disuse, suspension, or inactivity. In legal terms, the 2022 order meant the enforceability and trial mechanisms of the sedition law were frozen, though the law itself was not struck down.
- **Incarceration:** The state of being confined in prison or detained as an undertrial or a convicted prisoner.

Evolution of the law

Sedition is a cognisable, non-bailable and non-compoundable offence under Section 124A of Indian Penal Code

BEFORE INDEPENDENCE

1870: The section on sedition is introduced by the British to the IPC

The British rulers used the law to muzzle demands for freedom. For instance, Bal Gangadhar Tilak was the first person to be convicted of sedition in colonial India.

AFTER INDEPENDENCE

1948: In discussions, Indian leaders agree to drop "sedition" from the Constitution

1949: "Sedition" is no longer part of the Indian Constitution adopted on November 26 this year. However, Section 124A remains in the IPC

1951: Nehru govt brings in first amendment under Article 19(1)(a), and puts in "reasonable restrictions" on the right to free speech

1974: Indira Gandhi govt makes Section 124A a cognisable offence that authorises police to make arrests without a warrant

PRESENTLY

2019 data shows that sedition cases rose by 25% and arrests by 41% over the previous year. However, only 3% of cases led to convictions

Key Constitutional and Legal Provisions

- **Article 19(1)(a) of the Constitution:** Guarantees the fundamental right to freedom of speech and expression. The constitutional validity of Section 124A is frequently challenged on the grounds that it imposes an unreasonable restriction on this right.
- **Article 19(2) of the Constitution:** Permits the State to impose "reasonable restrictions" on free speech in the interests of the sovereignty and integrity of India, the security of the State, friendly relations with foreign States, or public order.
- **Section 124A of the Indian Penal Code, 1860:** The statutory provision defining sedition as a non-bailable, cognizable offence punishable with imprisonment ranging from three years to life.
- **Section 152 of the Bharatiya Nyaya Sanhita (BNS):** The provision in the updated criminal code that addresses acts endangering the sovereignty, unity, and integrity of India. Though the term "sedition" is avoided, it covers similar substantive actions.

Landmark Judicial Precedents

- **Kedar Nath Singh v. State of Bihar (1962):** A five-judge Constitutional Bench upheld the validity of Section 124A but severely restricted its application. The court ruled that sedition is only applicable when the speech or action involves an incitement to violence or a tendency to create public disorder.
- **Vinod Dua v. Union of India (2021):** The Supreme Court reiterated the *Kedar Nath* guidelines, firmly stating that journalists are protected from sedition charges unless their expressions directly incite violence against the state.

UPSC Relevance

- **GS Paper II (Polity and Governance):** Indian Constitution—significant provisions and basic structure; judicial review; balancing individual civil liberties with national security interests; and the evolution of criminal law reforms.
- **GS Paper II (Executive and Judiciary):** Role of the judiciary in protecting fundamental rights, handling undertrial pendency, and checking the potential misuse of state machinery.



Conclusion

The Supreme Court's recent clarification introduces a pragmatic equilibrium to the ongoing sedition debate. By allowing trials to proceed when the accused consents, the judiciary ensures that a mechanism meant to protect citizens from a sweeping law does not inadvertently result in prolonged detention without trial. As India transitions into newer statutory frameworks like the Bharatiya Nyaya Sanhita (BNS), balancing national security with the foundational right to dissent remains crucial to upholding constitutional democracy.

3. Impact of Geopolitical Tensions on India's Oil and Gas Import Bill

Key Summary Points

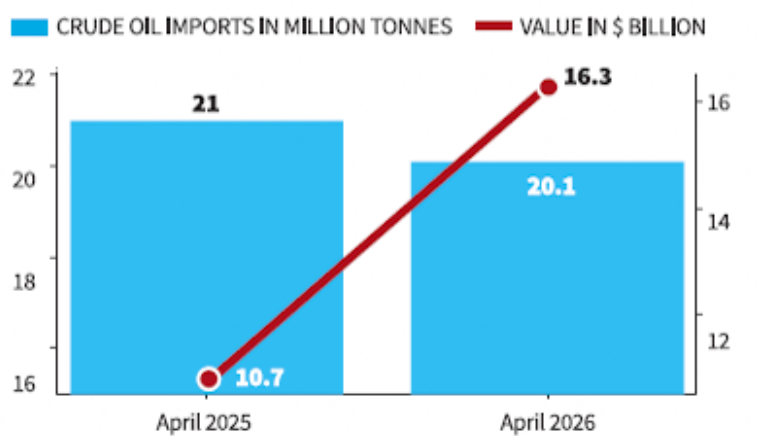
- **Value-Volume Paradox:** India's crude oil import volumes fell by 4.3% year-on-year in April (declining to 20.1 million metric tonnes), yet the monetary value of these imports surged by approximately 50% to \$16.3 billion due to soaring global oil prices.
- **Geopolitical Drivers:** The massive inflationary pressure on crude oil and natural gas prices stems directly from the escalating West Asia conflict and the prolonged physical closure of the Strait of Hormuz, a critical maritime trade chokepoint.
- **Contraction in Natural Gas:** Liquefied Natural Gas (LNG) import volumes dropped significantly by nearly 30% to 1,954 million standard cubic metres, driven primarily by lower domestic consumption and altered supply priorities.
- **Domestic Production Trajectory:** Domestic net production of natural gas experienced a decline of 4.2% during the month, which reflected overall weaker industrial demand and tighter allocation strategies rather than immediate structural improvements.
- **Net Fiscal Drain:** Factoring in the deductions from India's petroleum product exports, the overall net import bill for oil and gas expanded by 23% to \$13.9 billion, putting immediate fiscal strain on the country's trade balance.

Definitions of Key Terms

- **Indian Crude Basket:** A derived numerical indicator representing a weighted average of sour grade (Oman/Dubai) and sweet grade (Brent) crude oils, used to track the price of crude imported into India.
- **Strait of Hormuz:** A narrow, strategically vital waterway between the Gulf of Oman and the Persian Gulf through which approximately one-fifth of the world's total petroleum consumption passes.
- **Liquefied Natural Gas (LNG):** Natural gas (predominantly methane) that has been cooled down to a liquid state (around -162°C) for ease and safety of non-pressurized storage or long-distance transport.

Volume down

Volume of India's crude oil imports fell by **4.3% in April 2026**, while the value soared by **50%** over that of the corresponding month last year





- **Net Import Bill:** The total financial expenditure incurred on importing energy commodities, minus the revenue generated from the export of refined petroleum products.

Key Economic and Strategic Frameworks

- **Petroleum Planning and Analysis Cell (PPAC):** An attached office under the Ministry of Petroleum and Natural Gas (MoPNG) that serves as the nodal state agency for data compilation, monitoring domestic demand, and evaluating international market trends.
- **Strategic Petroleum Reserves (SPR) Programme:** India's energy security initiative managed by Indian Strategic Petroleum Reserves Limited (ISPRL), designed to maintain underground rock caverns as crude stockpiles to mitigate international supply-side disruptions.
- **Current Account Deficit (CAD) Dynamics:** The macroeconomic metric heavily impacted by oil bills. Since India imports over 85% of its crude oil requirements, wild fluctuations in the international market directly weaken the Indian Rupee against the US Dollar and widen the merchandise trade deficit.

UPSC Relevance

- **GS Paper III (Indian Economy):** Mobilization of resources, infrastructure (Energy), fiscal policy, inflation management, and the direct impacts of global trade bottlenecks on India's macroeconomic stability.
- **GS Paper II (International Relations):** Effect of policies and politics of developed and developing countries on India's interests; geopolitical instability in West Asia and its implications for India's energy diplomacy.

Conclusion

The divergence between India's declining crude import volumes and its escalating import bill illustrates the country's deep-seated vulnerability to external geopolitical shocks. While lower physical consumption limits supply pressure, global price volatility driven by chokepoint closures immediately passes into the domestic economy as imported inflation. To insulate its growth trajectory, India must aggressively scale up alternative energy transitions, expand strategic fuel reserves, and diversify maritime supply lines away from conflict-heavy corridors.

4. Compulsory Singing of Vande Mataram in West Bengal Madrasas

Key Summary Points

- **Mandatory Directive:** The West Bengal government issued an official order making the singing of the national song, *Vande Mataram*, mandatory during morning assembly prayers across all categories of madrasas in the state.
- **Broad Institutional Scope:** The order applies to Government Model Madrasas (English Medium), Recognized Government-Aided Madrasas, Approved Madhyamik Shiksha Kendras (MSKs), Approved Shishu Shiksha Kendras (SSKs), and Recognized Unaided Madrasas under the Minority Affairs and Madrasah Education Department.
- **Preceding Policy Context:** This development follows a state government directive that made the singing of six stanzas of the national song compulsory in all regular schools functioning under the state's Department of Education.



- **Political and Social Debate:** The order has triggered significant political debate, with opposition parties arguing that forcing the song on minority-run institutions infringes upon cultural autonomy, while the BJP has defended the policy as a positive move for national integration.
- **National Precedent:** The discussion surrounding the national song was reignited earlier in the year following a similar directive issued by the central government, emphasizing an increasing regulatory focus on symbolic national uniformity across educational frameworks.

Definitions of Key Terms

- **Madrasa:** An educational institution, often serving the Muslim community, which can range from primary religious schools to advanced institutes offering a combined curriculum of traditional theological studies and state-approved modern subjects.
- **National Song vs. National Anthem:** *Vande Mataram* (composed by Bankim Chandra Chattopadhyay in Sanskritized Bengali) holds the status of India's National Song, which historically shares equal status with the National Anthem, *Jana Gana Mana* (composed by Rabindranath Tagore), though they have different legal and regulatory implementation frameworks.
- **Minority Educational Institutions:** Educational bodies established and administered by linguistic or religious minorities to preserve their distinct culture, script, or language, protected under specific constitutional safeguards.

Key Constitutional and Legal Provisions

- **Article 30(1) of the Constitution:** Guarantees all religious and linguistic minorities the fundamental right to establish and administer educational institutions of their choice, shielding them from arbitrary state interference in core administrative and cultural practices.
- **Article 28(3) of the Constitution:** Stipulates that no person attending an educational institution recognized by the State or receiving aid out of State funds shall be required to take part in any religious instruction or attend any religious worship without their consent.
- **Article 19(1)(a) of the Constitution:** Guarantees the right to freedom of speech and expression, which the judiciary has consistently interpreted to include the passive right to remain silent or abstain from singing if it conflicts with genuine conscientious beliefs.
- **Article 51A(a) of the Constitution:** Enshrines a Fundamental Duty for every citizen to abide by the Constitution and respect its ideals and institutions, the National Flag, and the National Anthem (notably, the literal text omits explicit mention of the National Song).

Landmark Judicial Precedents

- **Bijoe Emmanuel v. State of Kerala (1986):** A foundational Supreme Court ruling where three Jehovah's Witness students were expelled for not singing the National Anthem. The apex court reversed the expulsion, holding that compelling someone to sing against their religious convictions violates Article 19(1)(a) and Article 25, provided they show proper respect by standing.
- **Aruna Roy v. Union of India (2002):** The Supreme Court clarified that teaching or promoting national values, secularism, and historical patriotic symbols in educational institutions does not amount to imparting religious instruction under Article 28.



UPSC Relevance

- **GS Paper II (Polity and Governance):** Indian Constitution—significant provisions, fundamental rights (Articles 19, 25, 28, 29, 30), fundamental duties, and minority rights versus state-mandated secular uniformity.
- **GS Paper II (Social Justice):** Issues relating to the protection, development, and management of social sectors/services relating to Education and minorities.

Conclusion

The state directive forcing the recitation of *Vande Mataram* in minority-administered madrasas reflects a delicate constitutional conflict between promoting collective national integration and preserving individual minority rights. While the state possesses a valid interest in introducing a uniform, non-sectarian patriotic curriculum, it must balance these aims with constitutional safeguards. Moving forward, the resolution of such friction will heavily rely on strict judicial adherence to established precedents, ensuring that efforts toward national cohesion do not inadvertently dilute the pluralistic and secular ethos guaranteed by the Indian Constitution.

5. Inauguration of the Indian War Memorial in South Korea

Key Summary Points

- **Historic Dedication:** Indian Defence Minister Rajnath Singh and South Korea's Minister of Patriots and Veterans Affairs Kwon Oh-eul jointly inaugurated the newly constructed Indian War Memorial at Imjingak Park near Seoul.
- **Commemorative Milestone:** The inauguration ceremonies were timed to mark the historic 75th anniversary of the Korean War (1950–1953), providing a permanent physical site to honour the massive humanitarian contribution made by Indian personnel.
- **Honouring Medical Valour:** The monument stands as a direct tribute to the legendary 60 Para Field Ambulance of the Indian Army, a specialized airborne medical unit whose 627 deployed personnel treated over 222,000 casualties under severe frontline conditions.
- **Post-Armistice Recognition:** The memorial recognizes the role played by the 5,500- member Custodian Force of India (CFI), which managed the volatile post-war phase, maintaining custody and overseeing the humane repatriation of around 22,000 prisoners of war.
- **Bilateral Commitments:** Alongside the unveiling, India and South Korea formalized a fresh Memorandum of Understanding (MoU) focused on veteran welfare, expanded historical exchange programmes, and broader defense cooperation spanning cybersecurity and logistics.



Definitions of Key Terms

- **60 Para Field Ambulance:** A elite airborne medical unit of the Indian Army that served under the United Nations Command during the Korean War, famously dubbed the "Maroon Angels" by locals for their lifesaving battlefield interventions.



- **Neutral Nations Repatriation Commission (NNRC):** An international commission set up under the 1953 Korean Armistice Agreement to resolve the fate of prisoners who refused to return to their homelands, notably chaired by India.
- **Custodian Force of India (CFI):** The independent military contingent deployed by India to the Korean Peninsula to physically manage, guard, and process prisoners of war under the mandate of the NNRC.
- **Imjingak Park:** A highly symbolic park located near the Demilitarized Zone (DMZ) in South Korea, built to console those displaced from their homes in North Korea and now housing several monuments to wartime global solidarity.

Key Institutional and Historical Frameworks

- **Neutrality and Non-Alignment Principle:** India's foundational diplomatic posture during the Cold War. By choosing not to send a combat brigade but instead deploying medical and diplomatic missions, India preserved its independent mediator status between Western and Soviet Blocs.
- **United Nations Command (UNC):** The multinational military force established to support South Korea against aggression. India supported the initial UN Security Council resolutions condemning the invasion, aligning its subsequent medical deployment with the humanitarian umbrella of the UN.
- **India-Republic of Korea Special Strategic Partnership:** The formal diplomatic framework established in 2015, which has been expanded through recent milestones like the Joint Strategic Vision (2026–2030) to encompass defense co-production, semiconductor supply chains, and maritime safety.

Historical Leadership Figures

- **Lt. Col. (Dr.) A.G. Rangaraj:** The commanding officer of the 60 Para Field Ambulance during the war, awarded the Maha Vir Chakra (MVC) for displaying exceptional leadership and tactical courage during complex airborne operations.
- **Lt. Gen. K.S. Thimayya:** The distinguished Indian military officer who served as the Chairman of the NNRC, whose strict impartiality and diplomatic skill during the repatriation crisis earned global praise and reinforced India's reputation in international mediation.

UPSC Relevance

- **GS Paper II (International Relations):** Bilateral, regional, and global groupings involving India and affecting India's interests; evolution of India-South Korea strategic ties; and historical legacy of India's soft power and independent foreign policy.
- **GS Paper I (Modern World History):** Key events of the 20th century, including the Cold War, the structural genesis of the Korean War, and institutional efforts toward international conflict resolution.

Conclusion

The inauguration of the Indian War Memorial at Imjingak Park transitions India's historic role on the Korean Peninsula from an archival memory into a permanent diplomatic anchor. By honoring the selflessness of the 60 Para Field Ambulance and the impartiality of the Custodian Force, the memorial cements India's long-standing tradition of humanitarian diplomacy. As both nations encounter fresh geopolitical dynamics in the Indo-Pacific, this shared history of blood and compassion provides a solid baseline for deeper defense innovations, maritime security, and a robust Special Strategic Partnership.



6. Patna High Court Scrutiny on Midday Meal Safety and NGO Accountability

Key Summary Points

- **Judicial Intervention:** The Patna High Court has intervened in the Baluaha midday meal incident in Saharsa district, where over 150 government school students fell ill and required hospitalisation due to suspected food contamination.
- **Questioning Operational Status:** A Division Bench consisting of Justices Rajeev Ranjan Prasad and Mohit Kumar Shah questioned whether the involved NGO, which services 154 schools in the region, should be permitted to continue food supply operations while a formal inquiry is underway.
- **Investigation Under Scrutiny:** The High Court flagged serious delays in the ongoing investigation and raised questions regarding procedural discrepancies in the collection, seizure, and laboratory testing of the contaminated food samples.
- **Accountability Mandate:** The court directed the PM Poshan Directorate, the Saharsa Superintendent of Police, and the regional Food Safety Officer to file detailed affidavits explaining their sample-collection and forensic processes.
- **Administrative and Legal Action:** Following the contamination event, a First Information Report (FIR) was registered against the school administration, including the headmistress and teacher, alongside all nine cooks attached to the school facility.

Definitions of Key Terms

- **Pradhan Mantri Poshan Shakti Nirman (PM POSHAN):** Formally known as the Mid-Day Meal Scheme, this is a centrally sponsored school meal programme designed to improve the nutritional status of school-age children nationwide.
- **Public Interest Litigation (PIL):** A legal action initiated in a court of law for the enforcement of public interest or general welfare where the rights of a community or a vulnerable group have been adversely affected.
- **Adulteration:** The act of degrading the quality of food or essential commodities by either adding inferior substances or through negligent handling, rendering the product hazardous to human health.

Key Constitutional and Legal Provisions

- **Article 21 of the Constitution:** Guarantees the fundamental right to life and personal liberty. The Supreme Court has repeatedly interpreted this to encompass the right to health, clean food, safe drinking water, and a life with human dignity.
- **Article 47 of the Constitution (Directive Principles):** Expressly directs the State to raise the level of nutrition and the standard of living of its people, and to treat the improvement of public health as among its primary duties.
- **Food Safety and Standards Act, 2006:** The primary legislative framework regulating food safety in India. It establishes the Food Safety and Standards Authority of India (FSSAI) to formulate science-based safety standards and penalise instances of food contamination or negligence.
- **National Food Security Act (NFSA), 2013:** Provides legal entitlement to subsidized food grains and mandates the daily provision of hot cooked meals to children in classes 1 to 8 under statutory nutritional norms.



Governance and Administrative Framework

- **Three-Tier Monitoring Mechanism:** The institutional framework governing PM POSHAN includes a National level Steering-cum-Monitoring Committee (NSMC), State level Steering-cum-Monitoring Committees (SSMC), and District level committees headed by Members of Parliament to oversee safety compliance.
- **FSSAI Guidelines for Institutional Kitchens:** Statutory guidelines requiring periodic infrastructure audits, mandating the use of potable water, forcing structural separation of storage units, and enforcing mandatory food testing protocols before meals are dispatched to public schools.

UPSC Relevance

- **GS Paper II (Governance and Public Policy):** Welfare schemes for vulnerable sections of the population by the Centre and States and the performance of these schemes; mechanisms, laws, institutions, and bodies constituted for the protection and betterment of these vulnerable sections.
- **GS Paper II (Judiciary):** Role of High Courts and the Supreme Court in monitoring governance failures and executing judicial activism through Public Interest Litigations (PILs).
- **GS Paper III (Food Security):** Issues related to direct and indirect farm subsidies and minimum support prices; Public Distribution System—objectives, functioning, limitations, revamping; issues of buffer stocks and food security.

Conclusion

The Patna High Court's scrutiny emphasizes that administrative outsourcing to non-governmental organizations does not absolve the State of its structural regulatory obligations. While private-public partnerships speed up delivery logistics, they require strict regulatory oversight to prevent systemic failures in hygiene. Ensuring strict, uncompromising adherence to the Food Safety and Standards Act is critical to defending the fundamental right to health and preserving public institutional trust in child nutrition initiatives.

7. RBI Policy Interventions to Stabilize the Indian Rupee

Key Summary Points

- **Currency Depreciation Crisis:** The Reserve Bank of India (RBI) is actively evaluating aggressive monetary interventions after the Indian Rupee (INR) plunged to an all-time low of nearly 97 against the US Dollar (USD).
- **Monetary Policy Options:** Key options under consideration by Governor Sanjay Malhotra and top central bank officials include implementing a strategic repo rate hike, introducing fresh currency swap windows, and issuing offshore dollar bonds.
- **Inflationary and Capital Pressures:** The sharp depreciation is driven by sustained foreign capital outflows, a widening merchandise trade deficit, and rising global commodity prices, threatening to import inflation into the domestic economy.
- **Capital Mobilization Strategies:** To augment foreign exchange liquidity, the RBI is contemplating specialized schemes targeting Non-Resident Indians (NRIs) and overseas institutional investors to attract stable, long-term dollar inflows.
- **Liquidity Management Objectives:** These extraordinary measures aim to curb speculative trading in the onshore and offshore non-deliverable forward (NDF) currency markets while ensuring adequate domestic systemic liquidity.



Definitions of Key Terms

- **Currency Depreciation:** A decrease in the value of a currency in a floating exchange rate system relative to one or more foreign reference currencies, driven by market demand and supply dynamics.
- **Currency Swap:** A foreign exchange agreement between two parties to exchange principal and interest payments on a loan in one currency for an equivalent loan in another currency, used here by the central bank to infuse dollar liquidity into the banking system.
- **Offshore Dollar Bonds:** Debt instruments denominated in US Dollars issued by domestic entities or the sovereign in international financial markets to raise foreign capital directly.
- **Non-Deliverable Forward (NDF):** An over-the-counter currency derivative contract where parties settle the difference between the contracted NDF rate and the prevailing spot rate in a convertible currency (usually USD), outside the direct jurisdiction of the domestic central bank.

Key Institutional and Legal Provisions

- **Reserve Bank of India Act, 1934:** The statutory framework granting the RBI the explicit mandate to manage India's foreign exchange reserves and maintain domestic monetary stability. Section 45ZB outlines the constitution of the Monetary Policy Committee (MPC) to fix the policy repo rate.
- **Foreign Exchange Management Act (FEMA), 1999:** The primary legislation regulating foreign exchange transactions, cross-border trade, and capital flows, consolidating the law to facilitate external trade and maintain an orderly foreign exchange market.
- **External Commercial Borrowings (ECB) Framework:** Statutory guidelines governed by the RBI that regulate the quantum, maturity, and end-use of foreign currency loans raised by Indian corporate entities to avoid systemic external debt vulnerabilities.



Macroeconomic Stabilization Mechanisms

- **Foreign Exchange Intervention:** The direct selling of US Dollars from the country's official Forex Reserves by the RBI in the spot market to absorb excess rupee liquidity and arrest sudden, volatile depreciations.
- **Interest Rate Differential:** The gap between the domestic policy interest rate and foreign interest rates (e.g., the US Federal Reserve rate). Raising domestic interest rates widens this gap, making Indian debt instruments more attractive to foreign portfolio investors (FPIs) and reducing capital flight.

UPSC Relevance

- **GS Paper III (Indian Economy):** Monetary policy framework; role of the Reserve Bank of India; external sector dynamics including foreign exchange reserves, exchange rate management, current account balance, and the impact of capital outflows.



- **GS Paper III (Macroeconomics):** Inflation management, imported inflation, and the institutional structural adjustments required to balance external stability with domestic industrial growth.

Conclusion

The RBI's consideration of aggressive measures like rate hikes and currency swaps reflects the delicate trilemma facing emerging market economies: maintaining exchange rate stability while safeguarding domestic growth objectives. While direct market interventions provide immediate relief against speculative attacks, long-term rupee stabilization relies on strengthening India's macroeconomic fundamentals. Reducing structural dependence on imported energy, expanding merchandise exports, and maintaining fiscal discipline are critical to shielding the domestic economy from volatile global capital shifts.

8. Ecological Crisis at Sanjay Lake: Heatwave and Anthropogenic Pressures

Key Summary Points

- **Mass Mortality Event:** Hundreds of fish were found dead, floating belly-up in Sanjay Lake located in East Delhi's Trilokpuri area, following a rapid drop in water levels and severe ecological degradation.
- **Compounding Factors:** The crisis is driven by a combination of intense regional heatwave conditions and a technical failure in a critical supply pipeline, which routinely delivers treated water from the Kondli Sewage Treatment Plant (STP) but recently developed leaks.
- **Water Quality Deterioration:** Due to receding water levels and extreme temperatures, the lake has turned into shallow, stagnant green pools of slush, causing an acute drop in dissolved oxygen levels and making the aquatic habitat hostile.
- **Systemic Pollution Inflows:** The National Green Tribunal (NGT) had previously flagged that the lake, located within 3-5 km of the Ghazipur landfill, exhibits high Chemical Oxygen Demand (COD) values due to unabated solid waste dumping and local sewage inflows.
- **Broader Regional Trend:** Similar mass fish die-offs have been reported across related regional water networks, including the Sahibi river channel and the Najafgarh drain, primarily due to the sudden release of untreated effluents from stormwater drains and the Dhansa regulator.
- **Extreme Meteorological Conditions:** The incident coincided with Delhi experiencing its warmest night in 14 years with a minimum temperature of 31.9°C, alongside daytime maximums soaring to 43.6°C (3.4 notches above normal), triggering sustained orange alerts.



Definitions of Key Terms

- **Chemical Oxygen Demand (COD):** An indicative measure of the amount of oxygen required to chemically oxidize organic and inorganic matter in water. Higher COD values indicate severe chemical pollution and low health of the aquatic ecosystem.
- **Dissolved Oxygen (DO):** The amount of gaseous oxygen dissolved in a water body, which is fundamental for the respiration of aquatic organisms. High temperatures naturally reduce oxygen solubility in water.



- **Sewage Treatment Plant (STP):** An industrial facility designed to remove contaminants from municipal wastewater and domestic sewage to produce an environmentally safe effluent suitable for discharge or reclamation.
- **Heatwave:** A period of abnormally uncomfortable hot weather. In India, it is officially declared for plains when the maximum temperature reaches at least 40°C and departs by 4.5°C to 6.4°C from the normal long-term average.

Key Environmental Law and Institutional Frameworks

- **The Water (Prevention and Control of Pollution) Act, 1974:** Provides the statutory basis for maintaining and restoring the wholesomeness of water bodies and establishes Central and State Pollution Control Boards (CPCB/SPCB) to regulate effluent discharges.
- **National Green Tribunal (NGT) Act, 2010:** A specialized judicial body set up for the expeditious disposal of cases relating to environmental protection, conservation of forests, and enforcement of legal rights relating to the environment.
- **Wetlands (Conservation and Management) Rules, 2017:** Framed under the Environment (Protection) Act, 1986, these rules prohibit activities like reclamation, dumping of solid waste, and discharge of untreated effluents in notified wetland ecosystems.
- **Article 48A of the Constitution (Directive Principles):** Mandates that the State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country.
- **Article 51A(g) of the Constitution (Fundamental Duties):** Enshrines a duty upon every citizen of India to protect and improve the natural environment including forests, lakes, rivers, and wildlife.

UPSC Relevance

- **GS Paper III (Environment and Ecology):** Environmental pollution and degradation; urban wetland ecosystem management; eutrophication; impact of climate change and extreme weather events (heatwaves) on biodiversity.
- **GS Paper II (Governance and Institutions):** Role of statutory bodies like the National Green Tribunal (NGT) and Central Pollution Control Board (CPCB) in environmental monitoring and executing public accountability.

Conclusion

The ecological collapse at Sanjay Lake serves as a stark warning regarding the vulnerability of urban water bodies to climate change and inadequate municipal infrastructure. As global temperatures rise, urban lakes cannot survive as isolated ornamental features; they require consistent replenishment with treated water and absolute protection from sewage contamination. Addressing these crises demands a shift toward integrated urban wetland management, strict enforcement of the Water Pollution Act, and the climate-proofing of civic infrastructure to sustain urban biodiversity and combat the rising urban heat island effect.

9. Democratic Representation Versus Administrative Decentralization in Ladakh

Key Summary Points

- **The Core Debate:** The Union Ministry of Home Affairs argues that administrative decentralization through five new districts—Nubra, Changthang, Sham, Zaskar, and Drass—is a practical alternative for Ladakh, whereas local aspirations demand a full legislature and constitutional protections under the Sixth Schedule.



- **Flawed Official Justifications:** The Centre's reluctance to grant a legislature is based on Ladakh's sparse population, fiscal dependence on federal transfers, and strategic border sensitivity. Critics argue this logic mirrors a paternalistic, colonial-era mindset that measures democratic eligibility by profitability and demographic scale.
- **The Northeast Precedent:** Strategic sensitivity and financial dependence have historically not disqualified frontier regions from self-governance. States like Arunachal Pradesh, Nagaland, Mizoram, and Sikkim were granted full statehood and legislatures despite small populations, harsh terrains, and high reliance on central funding.
- **Administration versus Representation:** While additional districts improve localized administrative accessibility across Ladakh's 59,000 square kilometers, bureaucratic instruments cannot substitute for political agency. District magistrates implement policy upward to the bureaucracy, whereas a legislature shapes policy downward and remains directly accountable to the citizens.
- **Energy Infrastructure and Resource Negotiation:** Ladakh is central to India's clean energy goals, hosting mega projects like the 13-gigawatt renewable energy framework in the Pang region of Changthang. Without a local legislature, residents lack a statutory representative body to negotiate land rights, grazing protections for indigenous Changpa herders, and ecological safeguards against large-scale industrial intervention.



Definitions of Key Terms

- **Sixth Schedule:** A constitutional provision that allows for the creation of Autonomous District Councils (ADCs) with legislative, judicial, and administrative powers to protect tribal cultures, land, and local customs.
- **Purna Swaraj:** A concept of absolute self-governance and sovereignty championed during the Indian national movement, emphasizing that political freedom is a matter of inherent dignity and national selfhood.
- **Fiscal Solvency:** The ability of a state or region to generate enough internal revenue to meet its financial trajectories and operational expenditures without relying heavily on external subsidies or federal debt.
- **Administrative Decentralization:** The transfer of operational responsibilities and central bureaucratic functions to lower-level field offices, distinct from political decentralization which transfers decision-making power to elected representatives.

Key Constitutional and Legal Provisions

- **Article 239A of the Constitution:** The provision under which Parliament can create a legislature or a Council of Ministers for a Union Territory (as done for Puducherry and Jammu and Kashmir), which forms the core of Ladakh's political demands.
- **The Sixth Schedule (Articles 244(2) and 275(1)):** Provides special institutional safeguards for tribal-dominated areas. Extending this to Ladakh would empower local councils to frame laws regarding land use, marriage, inheritance, and forest management.



- **Article 280 of the Constitution:** Establishes the Finance Commission of India, a body designed to manage fiscal federalism by distributing tax revenues from the central pool to the states based on equity rather than a region's internal revenue-generating capacity.
- **The Jammu and Kashmir Reorganisation Act, 2019:** The parliamentary act that bifurcated the former state into two distinct Union Territories: Jammu and Kashmir (with a legislature) and Ladakh (without a legislature), altering the region's geopolitical framework.

Comparative Federalism Analysis

- **Asymmetrical Federalism:** A structural characteristic of Indian federalism where different states enjoy different relationships with the Union. This is visible in special provisions under Article 371 (A to J) granted to Northeastern states to protect their distinct cultural and tribal identities, proving that uniformity is not equity.
- **Horizontal Devolution:** The mechanism used by the Finance Commission to allocate funds among states based on fiscal capacity, demographic indicators, and geographical terrain, ensuring that resource-starved frontier states are supported by the wider national economy.

UPSC Relevance

- **GS Paper II (Polity and Governance):** Indian Constitution—historical underpinnings, evolution, features, amendments, significant provisions, and basic structure; statutory, regulatory, and various quasi-judicial bodies.
- **GS Paper II (Federalism):** Functions and responsibilities of the Union and the States, issues and challenges pertaining to the federal structure, devolution of powers and finances up to local levels and challenges therein.
- **GS Paper III (Security):** Security challenges and their management in border areas; linkages of organized crime with terrorism.

Conclusion

The political deadlock in Ladakh highlights a critical tension within Indian federalism between centralized security management and regional democratic enfranchisement. While administrative expansion through new districts resolves logistical bottlenecks in high-altitude terrains, it cannot replace the constitutional dignity of self-governance. Integrating a frontier region relies on building a deep sense of democratic belonging rather than relying solely on fiscal subsidies and military presence. Granting legislative representation and Sixth Schedule protections will align Ladakh's strategic security with its democratic aspirations, allowing its people to actively negotiate their ecological and economic future.

10. Post-Crisis Recovery of the Indian Rupee from Historic Lows

Key Summary Points

- **Market Rebound:** The Indian Rupee (INR) experienced a significant recovery of 49 paise, closing at 96.37 against the US Dollar (USD) after plumbing to an all-time intraday low near the 97 mark earlier in the week.
- **Primary Catalysts:** This financial correction was primarily driven by a sharp retreat in international crude oil prices following signs of easing geopolitical friction in West Asia, combined with timely external interventions by the Reserve Bank of India (RBI).



- **Forward Market Stress:** Despite the immediate spot market recovery, the one-year currency forward market rate breached the critical threshold of 100 per USD, revealing deep-seated structural anxieties regarding long-term domestic currency depreciation.
- **Intraday Volatility:** Trading sentiment at the interbank foreign exchange market remained volatile, with the local currency opening strong at 96.25, peaking at an early high of 96.05, and touching a low of 96.60 before stabilizing at the market close.
- **Sustained Risk Factors:** Foreign exchange market participants emphasize that while easing geopolitical tensions offer short-term relief, the Indian currency remains structurally vulnerable to international energy price shocks and capital flight risks.

Definitions of Key Terms

- **Spot Market Exchange Rate:** The current, real-time market price at which a currency pair can be bought or sold for immediate delivery and settlement in the interbank market.
- **Currency Forward Market Rate:** A financial derivative contract that locks in an exchange rate today for a transaction that will occur on a specific future date, reflecting market expectations and interest rate differentials over that period.
- **Central Bank Intervention:** The deliberate operational practice where a central bank buys or sells foreign currency in the open market to stabilize the domestic currency or curb erratic, speculative volatility.
- **Interbank Foreign Exchange Market:** The global, over-the-counter financial network where commercial banks and large financial institutions trade currencies directly with one another.



Key Economic and Statutory Provisions

- **Foreign Exchange Management Act (FEMA), 1999:** The overarching legal framework that empowers the Government of India and the RBI to regulate foreign exchange transactions, capital flows, and maintain an orderly domestic currency market.
- **Section 40 of the RBI Act, 1934:** The statutory provision that guides the central bank's operations concerning the purchase and sale of foreign currencies to meet international obligations and preserve macroeconomic equilibrium.
- **Managed Float Exchange Rate Regime:** India's institutional exchange rate framework under which the rupee's value is primarily determined by open market supply and demand forces, but the RBI actively intervenes if the currency experiences extreme, destabilizing fluctuations.

Dynamics of Forward Premium and Depreciation

- **Forward Premium:** The situation where the future expected exchange rate of a currency is higher than its current spot rate. A one-year forward rate touching 100/USD implies that international traders are pricing in an institutional weakening bias for the INR, demanding a premium to hedge against long-term depreciation risks.
- **Interest Rate Parity (IRP):** The fundamental economic theory governing forward markets, dictating that the difference between the spot and forward exchange rates of two currencies should equal the difference in interest rates between the two respective countries.



UPSC Relevance

- **GS Paper III (Indian Economy):** External sector dynamics, management of the exchange rate, foreign exchange reserves, impact of imported inflation, and the structural correlation between global crude oil volatility and domestic macroeconomic indicators.
- **GS Paper III (Banking and Monetary Policy):** Role and statutory powers of the Reserve Bank of India (RBI) in managing systemic liquidity and defending the domestic financial system from external shocks.

Conclusion

The rupee's sudden rebound highlights the intrinsic link between India's domestic economic stability and global geopolitical corridors. While tactical interventions by the central bank and softening crude prices can arrest immediate speculative runs, the breach of the 100/USD mark in the one-year forward market indicates that structural vulnerabilities remain. To insulate the domestic currency from persistent long-term depreciation, India must look beyond short-term monetary defenses and actively focus on narrowing its merchandise trade deficit, scaling up domestic energy security, and attracting sticky, long-term Foreign Direct Investment (FDI).

11. Debating Central Bank Intervention Versus Free-Market Depreciation of the Indian Rupee

Key Summary Points

- **The Policy Dilemma:** As the Indian Rupee (INR) faces sustained downward pressure near 97 against the US Dollar (USD), a major macroeconomic debate has emerged regarding whether the Reserve Bank of India (RBI) should aggressively intervene or allow the currency to find its own market-determined equilibrium.
- **The Non-Interventionist Argument:** Mainstream economic models, supported by global economists like Gita Gopinath, argue that a depreciating currency acts as an automatic stabilizer. By making imports more expensive and exports more competitive, it naturally curtails a Current Account Deficit (CAD) without draining foreign exchange reserves.
- **Conflation of Weak vs. Falling Rupee:** Critics of non-intervention point out that a "weak rupee" and a "falling rupee" are fundamentally different. A rapidly falling rupee fails to boost exports if foreign buyers delay purchases anticipating further depreciation; conversely, it causes import front-loading as domestic buyers rush to secure essential commodities like crude oil before prices rise further.
- **Speculative Capital Dynamics:** Unlike textbook trade models driven by consumer demand, the ongoing currency slide is heavily driven by speculative outflows from Foreign Institutional Investors (FIIs) capitalising on rising interest rates in developed markets. This implies that the rupee's current valuation reflects volatile market sentiment rather than core economic fundamentals.
- **The Threat of Imported Inflation:** Allowing unchecked, speculative depreciation presents severe domestic risks. The escalating import bill for inelastic commodities passes directly into the domestic economy,





causing structural inflation that disproportionately impacts a population already coping with stagnant real wages and pandemic-induced reverse migration.

- **Global Precedents of Intervention:** Currency defense is not confined to emerging economies; even developed nations actively manage extreme volatility. For instance, during a sharp slide of the Yen against the Dollar, Japanese Finance Minister Satsuki Katayama signaled decisive market interventions, demonstrating that major economies routinely disrupt pure speculation to preserve financial stability.

Definitions of Key Terms

- **Current Account Deficit (CAD):** A macroeconomic metric that occurs when the total value of goods, services, and transfers imported by a country exceeds the total value of those it exports.
- **Imported Inflation:** A sustained rise in domestic prices attributable to an increase in the costs of imported raw materials or finished products, frequently exacerbated by a depreciating domestic currency.
- **Automatic Stabilizer (Exchange Rate):** The theoretical mechanism by which a floating exchange rate automatically adjusts to trade imbalances, where currency depreciation corrects a deficit by altering relative import-export pricing.
- **Front-Loading (Imports):** The behavioral tendency of market importers to advance or accelerate their purchase timelines to buy goods immediately, driven by the expectation that the domestic currency will lose value in the near future.

Key Constitutional and Legal Provisions

- **Article 246 read with Seventh Schedule (Union List):** Places all matters concerning foreign loans, foreign exchange, and the regulation of international trade exclusively under the legislative domain of the Parliament of India.
- **Reserve Bank of India Act, 1934:** Grants statutory power to the central bank to maintain monetary stability and regulate the country's credit and currency systems. The RBI utilizes its foreign exchange reserves under this mandate to smooth out erratic currency fluctuations.
- **Foreign Exchange Management Act (FEMA), 1999:** Enacted to consolidate and amend the laws relating to foreign exchange, with the explicit objective of facilitating external trade and payments and promoting the orderly development and maintenance of the foreign exchange market in India.

Macroeconomic Trilemma Analysis

- **The Impossible Trinity:** A foundational macroeconomic concept stating that an economy cannot simultaneously maintain three conditions: a fixed foreign exchange rate, free capital flow (absence of capital controls), and an independent monetary policy.
- **India's Policy Choice:** India operates on a managed float, meaning it permits capital mobility and maintains monetary independence, choosing to intervene in the exchange rate market only to check extreme, non-fundamental volatility.

UPSC Relevance

- **GS Paper III (Indian Economy):** External sector dynamics, balance of payments, components of current and capital accounts, exchange rate determination systems (floating vs. managed float), and the macroeconomic implications of currency depreciation.



- **GS Paper III (Economic Growth & Policy):** Issues relating to planning, mobilization of resources, growth, development, and employment; management of imported inflation and its structural impact on real wages and poverty.

Conclusion

The debate over rupee stabilization highlights that pure reliance on free-market adjustments can be deeply problematic when a currency's trajectory is dictated by speculative capital rather than trade fundamentals. While letting the rupee find its level aligns with theoretical economic frameworks, the real-world consequence involves severe imported inflation and structural stress on the domestic populace. In an era of volatile global capital flows and tightening interest rates by foreign central banks, targeted interventions by the RBI remain an essential tactical shield. Ultimately, safeguarding India's long-term economic sovereignty requires a deeper structural evaluation of the role of speculative foreign capital within the national growth narrative.

12. Technical Overview of the Environmental Control and Life Support System (ECLSS) for Gaganyaan

Key Summary Points

- **Core Functionality:** The Environmental Control and Life Support System (ECLSS) artificially replicates Earth's atmospheric conditions in orbit by precisely managing air revitalisation, water supply, ambient temperature, pressure, humidity, and metabolic waste within the spacecraft cabin.
- **Air Revitalisation Mechanism:** To prevent hypercapnia, the ECLSS removes the roughly 1 kg of carbon dioxide exhaled daily per astronaut using replaceable lithium hydroxide canisters equipped with activated charcoal filters, while maintaining metabolic oxygen levels via high-pressure gas bottles supplying 0.84 kg of oxygen per person daily.
- **Microgravity Fluid and Circulation Challenges:** In the absence of natural convection and gravity, small internal fans are used to prevent lethal carbon dioxide or oxygen pockets from forming. Additionally, water storage relies on pressurized bladders to force liquid forward mechanically, preventing floating water globules from causing electrical short-circuits or choking hazards.
- **Environmental Matrix Optimization:** The system maintains an Earth-like sea-level pressure of 101.3 kPa, keeps cabin temperatures tightly regulated between 20°C and 26°C using active heat exchangers that expel electronic and metabolic heat into space, and stabilizes relative humidity between 30% and 70% via condensing units.
- **Waste and Fire Safety Management:** Due to microgravity conditions, the module utilizes suction-based airflow systems to collect human waste into specialized fecal collection bags and urine funnels, chemically treating them to suppress ammonia and microbial growth; meanwhile, specialized fire extinguishers deploying a fine water mist are integrated to cool spherical zero-gravity flames and scrub toxic smoke particles.

Definitions of Key Terms

- **Hypercapnia:** A medical condition marked by abnormally elevated carbon dioxide levels in the blood, leading to headaches, dizziness, respiratory distress, and cognitive impairment in closed space environments.
- **Microgravity:** An environment in which the pull of gravity is greatly reduced, causing objects and fluids to appear weightless and rendering natural thermal convection and traditional fluid pouring impossible.



- **Relative Humidity:** The ratio of the current absolute humidity to the highest possible absolute humidity at a given temperature, expressed as a percentage; its control in space prevents skin irritation at low levels and electronic short-circuits or microbial growth at high levels.
- **Active Cooling System:** A thermal management network that utilizes mechanical heat exchangers and circulated fluids or air to collect waste heat from internal electronics and metabolic processes, discharging it externally into deep space.

Key Institutional and Programmatic Frameworks

- **Gaganyaan Programme:** India's maiden human spaceflight mission undertaken by the Indian Space Research Organisation (ISRO), aimed at demonstrating indigenous capability to launch a three-member crew to a 400 km low Earth orbit (LEO) and safely return them to Earth.
- **Space Technology Cells (STCs):** Collaborative institutional frameworks established between ISRO and premier academic laboratories (such as the IITs and IISc) to indigenize complex aerospace subsystems like the ECLSS, minimizing dependence on foreign space agencies.
- **Space Liability Convention, 1972:** An international treaty defining the rules of strict liability for damage caused by space objects, emphasizing why complex structural life support technologies must be perfectly designed to prevent catastrophic orbital failures.



System Architecture of Closed versus Open-Loop ECLSS

- **Open-Loop Life Support:** A system architecture where all metabolic consumables (oxygen, water) are launched directly from Earth and all metabolic waste products (carbon dioxide, urine, graywater) are stored in specialized containment units for post-mission disposal; this is the configuration optimized for short-duration missions like Gaganyaan.
- **Closed-Loop Life Support:** An advanced regenerative architecture utilized in long-duration missions (such as the International Space Station) where metabolic waste is actively recycled back into breathable oxygen and potable water using Sabatier reactors and advanced filtration assemblies, reducing cargo resupply requirements.

UPSC Relevance

- **GS Paper III (Science and Technology):** Achievements of Indians in science and technology; indigenization of technology and developing new technology; awareness in the fields of Space, computers, and robotics.
- **GS Paper III (Security and Disaster Management):** Safety protocols, biological risks in confined spaces, and risk mitigation strategies in high-risk technological endeavors.



Conclusion

The successful indigenization of the Environmental Control and Life Support System (ECLSS) represents a critical milestone in India's space journey, transitioning ISRO from launching unmanned satellites to sustaining human life in extreme orbital environments. By resolving the complex physics of microgravity fluid dynamics and air chemistry, the system guarantees astronaut safety while laying the technical foundation for future long-duration operations, such as the proposed Bharatiya Antariksha Station. Ultimately, achieving self-reliance in life-support engineering elevates India's status within the global space economy and secures its position as a primary stakeholder in future interplanetary exploration.



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