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FOR UPSC CIVIL SERVICE EXAMINATION

DATE: 22/09/2026 (TUESDAY)



9972258970 & 9740702455

#317/A SKB Arcade, D. Subbaiah Road,
Ramaswamy Circle, Mysuru-570004

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VIDHVATH IAS ACADEMY

1. Supreme Court Directives on Re-Arrests and Safeguards Under Article 22

Key Highlights & Summary

- A Supreme Court bench comprising Justices Ujjal Bhuyan and Atul S. Chandurkar established strict guidelines for re-arresting individuals released due to procedural violations under Article 22 of the Constitution.
- The Court ruled that an individual released due to non-furnishing of grounds of arrest is freed from "illegal and unconstitutional detention" rather than being "enlarged on bail".
- Investigating agencies cannot re-arrest an individual at their own discretion; they must first furnish written grounds of arrest and obtain prior sanction from the concerned Judicial Magistrate.
- The application for re-arrest must be endorsed by the investigating officer's immediate superior and contain a clear explanation of why grounds were not provided during the initial arrest.
- To prevent institutional bias, the superior officer must transfer the case investigation to a new officer and initiate a departmental inquiry against the erring official responsible for the initial breach.
- The apex court emphasized that safeguards under Article 22(1) and Article 22(2) are non-negotiable fundamental rights that apply universally across all criminal and special statutes, regardless of the gravity of the offense.

Essential Definitions

- **Article 22(1) Protection:** A fundamental constitutional right guaranteeing that no arrested person shall be detained without being informed of the grounds of arrest in writing as soon as may be, along with the right to consult a legal practitioner.
- **Article 22(2) Mandate:** The constitutional requirement that every person arrested and detained in custody must be produced before the nearest magistrate within 24 hours, excluding journey time.
- **Judicial Imprimatur:** Official sanction or authorization granted by a judicial authority (Magistrate) ensuring executive actions comply with statutory and constitutional standards.
- **Unconstitutional Detention:** Custody executed without complying with mandatory constitutional or statutory procedures, rendering the confinement void *ab initio*.



Legal and Constitutional Framework

- **Article 22:** Provides protection against arbitrary arrest and detention, forming a crucial pillar of personal liberty under Part III of the Constitution.
- **Article 21:** Guarantees the Right to Life and Personal Liberty, establishing that no person shall be deprived of liberty except according to procedure established by law.
- **Section 47 of Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023:** Statutory duty on police officers to inform arrested persons of the grounds of arrest and right to bail.

- **Public Law Remedy:** Judicial power of Constitutional Courts to award monetary compensation for state violation of fundamental rights under Articles 21 and 22.

Conclusion

By requiring judicial approval and internal police accountability for re-arrests following constitutional breaches, the Supreme Court has reinforced the rule of law over administrative convenience. This ruling ensures that state power is exercised strictly within procedural boundaries, preserving personal liberty against arbitrary arrest.

UPSC Relevance

- **GS Paper II:** Indian Constitution—Historical Underpinnings, Evolution, Features, Fundamental Rights, Judiciary, and Statutory/Regulatory Oversight.
- **GS Paper III:** Internal Security, Police Reforms, Governance Frameworks, and Criminal Justice Adjudication.
- **Prelims Focus:** Article 22(1) and 22(2) provisions, difference between bail and release from unconstitutional detention, procedural rules under BNSS 2023, and judicial remedies for unlawful custody.

2. India-New Zealand Free Trade Agreement Set to Take Effect

Key Highlights & Summary

- The bilateral Free Trade Agreement (FTA) between India and New Zealand will officially enter into force on October 20, 2026, coinciding with the festival of Vijayadashami.
- The pact provides duty-free market access for 100% of Indian exports to New Zealand from day one, targeting a doubling of bilateral trade to ₹35,000 crore ($7 billion) by 2030.
- India has protected its sensitive domestic sectors by keeping dairy products, onions, chickpeas, peas, corn, almonds, and sugar entirely on the exclusion list.
- New Zealand has committed to facilitating $20 billion in Foreign Direct Investment (FDI) into India over a 15-year period to strengthen manufacturing, technology, and infrastructure.
- Calibrated market access via Tariff Rate Quotas (TRQs) and seasonal import windows has been granted for specific New Zealand produce, including kiwifruit, apples, and Manuka honey.



- Mobility provisions include a dedicated quota of 5,000 Temporary Employment Entry visas for skilled Indian workers and post-study work rights of up to 3 to 4 years for STEM graduates and doctoral scholars.

Essential Definitions

- **Free Trade Agreement (FTA):** A pact between two or more nations to reduce or eliminate tariffs, quotas, and non-tariff barriers on goods and services, fostering cross-border commerce.
- **Exclusion List (Negative List):** A designated list of sensitive items and commodities explicitly exempted from tariff reductions or concessions to shield domestic industries.

- **Tariff Rate Quota (TRQ):** A trade policy mechanism that allows a specified quantity of a product to be imported at a lower or zero customs duty, while imports exceeding the limit face higher tariffs.
- **Strategic Partnership:** A formal framework between sovereign states to deepen economic, political, security, and technological cooperation toward long-term shared objectives.

Legal and Constitutional Framework

- **Article 253:** Grants Parliament exclusive authority to enact legislation for implementing international treaties, agreements, or conventions with foreign nations.
- **Article 73:** Extends executive power of the Union to all matters with respect to which Parliament has power to make laws, including negotiating and ratifying international treaties.
- **Seventh Schedule (List I, Entry 41 & 42):** Vests absolute jurisdiction over "Trade and Commerce with foreign countries" and "Import and export across customs frontiers" in the Union Government.
- **Customs Tariff Act, 1975:** Governs the statutory levy, exemption, and administrative restructuring of import and export duties resulting from preferential trade agreements.

Conclusion

The India-New Zealand FTA establishes a balanced economic partnership that expands market access for Indian manufacturing and skilled service professionals while safeguarding domestic agrarian livelihoods. Securing long-term foreign investment and technology transfer reinforces India's broader vision of sustainable economic self-reliance.

UPSC Relevance

- **GS Paper II:** Bilateral, Regional, and Global Groupings involving India, Effect of Foreign Trade Policies on India's Interests, and Treaty-making Powers under Article 253.
- **GS Paper III:** Indian Economy, Foreign Direct Investment (FDI), Agricultural Trade Protections, and Industrial Sector Growth.
- **Prelims Focus:** Entry into force date (October 20, 2026), key Indian exclusions (dairy, pulses, sugar), TRQ mechanisms, and constitutional provisions under Article 253 and Union List Entries 41 and 42.

3. Controversies Surrounding the Implementation of the Kasturirangan Report on the Western Ghats

Key Highlights & Summary

- Karnataka Chief Minister D.K. Shivakumar stated in the Legislative Assembly that implementing the Kasturirangan Committee report threatens the livelihoods of people across 10 districts in the state.
- The High-Level Working Group report identifies 20,668 sq. km of Karnataka's Western Ghats region, encompassing 1,449 villages, as ecologically sensitive.
- Public anxiety and widespread opposition among agricultural communities stem from the inclusion of agricultural and plantation lands within proposed Ecologically Sensitive Area (ESA) boundaries.
- State leaders have highlighted that over six major rivers originate in the Western Ghats, emphasizing that unscientific boundaries create fear among local agrarian populations.

- Suggestions raised by state stakeholders include conducting a ground-level physical survey based on the Kerala model, seeking legal amendments, or requesting special status under Article 371.
- The Union Government set a deadline of September 27 for Karnataka to convey its final legislative stand and decision on the seventh draft ESA notification.

Essential Definitions

- **Ecologically Sensitive Area (ESA):** A biologically diverse area notified under the Environment (Protection) Act, 1986, where specific commercial, industrial, and developmental activities are restricted to prevent environmental degradation.
- **Natural Landscape vs. Cultural Landscape:** A classification framework dividing the Western Ghats into contiguous pristine natural ecosystems (37% proposed for ESA) and human-modified areas containing settlements and agriculture (63% cultural landscape).
- **Kasturirangan Committee (HLWG):** A High-Level Working Group appointed by the Ministry of Environment, Forest and Climate Change to suggest a balanced, practical model for conserving the Western Ghats.
- **Malnad Region:** The mountainous belt along the eastern and western slopes of the Western Ghats in Karnataka, characterized by heavy rainfall, dense forest cover, and extensive plantation farming.



Legal and Constitutional Framework

- **Environment (Protection) Act, 1986 (Section 3):** Empowers the Central Government to take measures to protect and improve the environment, including declaring Ecologically Sensitive Zones and restricting industrial operations.
- **Article 48A:** Directive Principle of State Policy obligating the State to protect and improve the environment and safeguard the nation's forests and wildlife.
- **Article 51A(g):** Fundamental Duty requiring every Indian citizen to protect and improve the natural environment, including forests, lakes, rivers, and wildlife.
- **Seventh Schedule (List II, Entry 14 & 18):** Places Agriculture and Land tenure/rights under the exclusive legislative domain of State Governments, creating federal overlap with Union environmental mandates.

Conclusion

Harmonizing ecologically sensitive zone notifications with local socioeconomic realities requires transitioning from satellite-based mapping to participatory, ground-level physical surveys. Balancing

environmental protection under statutory laws with rural livelihood safeguards is crucial to achieving sustainable ecological governance in the Western Ghats.

UPSC Relevance

- **GS Paper III:** Environment Conservation, Environmental Impact Assessment (EIA), Biodiversity Loss, and Sustainable Development.
- **GS Paper II:** Center-State Relations, Cooperative Federalism, Issues and Challenges Pertaining to the Federal Structure, and Statutory Bodies.
- **Prelims Focus:** Recommendations of the Gadgil vs. Kasturirangan Committees, provisions of the Environment (Protection) Act 1986, geographical extent of the Western Ghats, and DPSP Article 48A.

4. Severe Dry Spell and Impending 100% Drought Declaration in Maharashtra

Key Highlights & Summary

- Maharashtra Cooperation Minister Babasaheb Patil indicated an impending declaration of 100% drought across the state by late September due to an unprecedented and severe prolonged dry spell.
- Extended dry spells exceeding 20 days across 83 talukas in 20 districts have severely damaged major Kharif crops, including soybean, cotton, and sugarcane.
- State departments have initiated immediate mitigation measures, including student fee waivers, electricity bill exemptions, and water tanker deployments in affected rural areas.
- The Groundwater Surveys and Development Agency (GSDA) and district administrations were directed to conduct village-level drinking water audits and draft phased contingency plans through mid-2027.
- Formal ground verification and crop damage assessments will commence after October 5, adhering strictly to the Union Government's Manual for Drought Management norms.
- Chief Minister Devendra Fadnavis emphasized that the state government will provide immediate relief measures to distressed farmers without waiting for central assistance from the National Disaster Response Fund (NDRF).

Essential Definitions

- **Hydrological Drought:** A condition occurring when surface and subsurface water supplies (reservoirs, lakes, and groundwater) drop below normal levels due to prolonged precipitation deficits.
- **Manual for Drought Management (2016):** The statutory guideline issued by the Ministry of Agriculture and Farmers Welfare establishing scientific parameters (rainfall deviation, soil moisture, satellite vegetation index, and hydrological levels) for formal drought declarations.
- **National Disaster Response Fund (NDRF):** A central fund constituted under Section 46 of the Disaster Management Act, 2005, to meet expenses for emergency response, relief, and rehabilitation during severe natural calamities.
- **Groundwater Surveys and Development Agency (GSDA):** A specialized state agency responsible for monitoring groundwater levels, evaluating aquifer recharge, and planning sustainable rural water supply frameworks.

Legal and Constitutional Framework

- **Disaster Management Act, 2005:** Provides the legal framework for disaster declaration, institutional response, and financial assistance through SDRF and NDRF mechanisms.
- **Article 21:** Includes the right to basic sustenance, clean drinking water, and livelihood security as integral parts of the Fundamental Right to Life.
- **Article 39(b) & (c):** Directive Principles of State Policy requiring the State to direct its policy toward securing material resources of the community to serve the common good and prevent concentration of wealth.
- **Seventh Schedule (List II, Entry 14 & 17):** Vests absolute jurisdiction over "Agriculture" and "Water supplies, irrigation, and canals" in State Governments, making primary drought mitigation a state responsibility.

Conclusion

Navigating severe climatic disruptions requires shifting from emergency relief operations to long-term climate-resilient agriculture and groundwater management. Science-based drought assessments combined with prompt financial aid protect agrarian livelihoods while reinforcing state capacity against recurring environmental shocks.

UPSC Relevance

- **GS Paper III:** Disaster Management, Floods and Droughts, Impact of Climate Change on Agriculture, Cropping Patterns, and Water Resource Governance.
- **GS Paper II:** Centre-State Relations in Disaster Management, Role of Statutory Bodies under the Disaster Management Act 2005, and Constitutional DPSPs.
- **Prelims Focus:** Indicators under the Manual for Drought Management 2016 (SPI, NDVI, MAI), NDRF vs. SDRF funding mechanisms, role of GSDA, and Seventh Schedule entries related to agriculture and water.

5. Death of Namibian Cheetah Gaurav at Kuno National Park Highlights Conservation Challenges

Key Highlights & Summary

- Gaurav (originally named Elton), a 10-year-old Namibian male cheetah brought to India in September 2022 under Project Cheetah, died at Kuno National Park during medical treatment.
- Rescued from the wild on September 12 after exhibiting severe weakness and dehydration, veterinary teams suspected an underlying chronic condition before his death.
- Gaurav and his coalition partner Shaurya recorded the first successful cheetah hunt in India in over 70 years after being released into the free-ranging area in March 2023.
- The male cheetah contributed significantly to the genetic diversification of the reintroduction initiative by fathering five cubs with Nirva, a female imported from South Africa.
- Following Gaurav's demise, India's total cheetah population stands at 55, including 51 individuals at Kuno National Park and 4 at the Gandhi Sagar Sanctuary.
- Field authorities have sent samples for a detailed post-mortem examination to ascertain the precise cause of death and assess chronic health risks in translocated wildlife.

Essential Definitions

- **Project Cheetah:** World's first intercontinental translocation project aimed at reintroducing large carnivores to re-establish the ecological role of cheetahs in Indian grasslands.
- **Coalition:** A social group formed primarily by male cheetahs (often brothers or non-related males) to defend larger territories and improve hunting success against competitors.
- **Soft Release (Quarantine Boma):** A controlled acclimation method where translocated animals are kept in large fenced enclosures before full release into free-ranging wilderness habitats.
- **In-situ vs. Ex-situ Conservation:** In-situ refers to conserving species in their natural habitats, whereas ex-situ involves protection outside natural environments, such as zoos or captive breeding enclosures.

Legal and Constitutional Framework

- **Wildlife Protection Act, 1972 (Schedule I):** Grants the highest level of legal protection to the Asiatic and African cheetahs in India, prohibiting hunting and commercial trade with severe penalties.
- **National Tiger Conservation Authority (NTCA):** Statutory body under MoEFCC functioning as the nodal executing agency for managing and funding Project Cheetah interventions.
- **CITES (Appendix I):** International agreement categorizing cheetahs (*Acinonyx jubatus*) under Appendix I, strictly regulating cross-border movement and international trade of specimen individuals.
- **Article 48A:** Directive Principle mandating the State to protect and improve the environment and safeguard forest ecosystems and national wildlife heritage.

Conclusion

The death of founder cheetahs underscores the physiological and environmental stresses involved in intercontinental wildlife translocations. Sustaining long-term success requires shifting focus toward soft management, genetic monitoring, and expanding contiguous grassland corridors across landscapes.

UPSC Relevance

- **GS Paper III:** Biodiversity Conservation, Project Cheetah Dynamics, Human-Wildlife Conflict, and Wildlife Protection Legislation.
- **GS Paper II:** Role of Statutory Bodies (NTCA) and International Environmental Frameworks (CITES).
- **Prelims Focus:** Extinction timeline of cheetahs in India (1952), CITES Appendix I status, Wildlife Protection Act (1972) schedules, and ecological features of Kuno and Gandhi Sagar sanctuaries.

6. The Arithmetic of Tamil Nadu's Growth Ambition

Key Highlights & Summary

- Tamil Nadu announced a target at the NITI Aayog meeting to expand its Gross State Domestic Product (GSDP) into a $1.5 trillion economy by 2035-36.
- Expanding the current GSDP of ₹35.29 lakh crore (2025-26) to ₹172.56 lakh crore by 2035-36 requires a 4.9-fold increase, assuming an annual rupee depreciation of 2%.

- Reaching the $1.5 trillion target in ten years necessitates a continuous nominal growth rate of 17.2% and a real growth rate of 12.2% annually, assuming 5% inflation.
- At a 17.2% nominal growth rate, the state's per capita income would rise to $19,157 by 2035-36, surpassing the projected global threshold ($16,383) for a developed economy.
- Under a more plausible 14% nominal (9.1% real) growth scenario, Tamil Nadu will achieve the $1.5 trillion target by 2038-39, and the $1 trillion mark by 2034-35.
- Sustaining a 10% real growth rate requires an investment rate of 40% of GSDP at an Incremental Capital Output Ratio (ICOR) of 4, alongside keeping the fiscal deficit below 3%.

Essential Definitions

- **Gross State Domestic Product (GSDP):** The aggregate monetary value of all final goods and services produced within the geographical boundaries of a state during a specific time period.
- **Incremental Capital Output Ratio (ICOR):** An economic metric assessing the efficiency of capital, representing the additional capital investment required to produce one additional unit of economic output.

Estimated per capita income and other related indicators till 2037-38

Year	Nominal growth (%)*	Nominal GSDP (₹ trillion)	Exchange rate (₹/U.S.$)	Nominal GSDP (U.S. $ trillion)	Per Capita Income (PCI) in U.S. $	World Bank's PCI norm for developed country (U.S. $) (estimated)
2025-26	15	35.3	94.65	0.37	4,808	14,558
2026-27	15	40.6	96.55	0.42	5,413	14,740
2027-28	15	46.7	98.48	0.47	6,095	14,923
2028-29	15	53.7	100.45	0.53	6,862	15,105
2029-30	15	61.7	102.46	0.60	7,726	15,288
2030-31	15	71	104.51	0.68	8,699	15,470
2031-32	15	81.6	106.60	0.77	9,808	15,653
2032-33	15	93.9	108.73	0.86	11,058	15,835
2033-34	15	108	110.90	0.97	12,468	16,018
2034-35	15	124.1	113.12	1.10	14,058	16,200
2035-36	15	142.8	115.38	1.24	15,850	16,383
2036-37	15	164.2	117.69	1.40	17,850	16,565
2037-38	15	188.8	120.04	1.57	20,120	16,748

* Required Real Growth = 15%-5%=10%

- **Nominal vs. Real Growth Rate:** Nominal growth measures economic output at current market prices without adjusting for inflation, whereas real growth reflects economic expansion adjusted for price fluctuations.
- **Fiscal Deficit & Debt-GSDP Ratio:** Fiscal deficit measures the gap between total government expenditure and non-borrowed receipts, while the Debt-GSDP ratio evaluates state debt sustainability relative to overall economic size.

Legal and Constitutional Framework

- **Article 293:** Regulates the borrowing powers of State Governments, requiring central consent if a state has outstanding loans extended by the Union Government.
- **Fiscal Responsibility and Budget Management (FRBM) Act Framework:** Mandates state governments to maintain fiscal discipline by targeting a fiscal deficit cap of 3% of GSDP to ensure long-term debt sustainability.
- **Seventh Schedule (List II, Entry 20):** Places Economic and Social Planning under the Concurrent List (List III, Entry 20), fostering collaborative economic policymaking between the Union and States.
- **NITI Aayog Governing Council:** Serves as the premier national platform for cooperative federalism, enabling Chief Ministers to align state development goals with national economic vision.

Conclusion

Achieving Tamil Nadu's $1.5 trillion growth aspiration requires balancing ambitious growth targets with structural fiscal discipline. Enhancing capital efficiency, attracting private domestic and foreign investments, and maintaining price stability will remain crucial to transitioning toward a developed economy status.

UPSC Relevance

- **GS Paper III:** Indian Economy, GSDP Growth Dynamics, Investment Models, Capital Efficiency (ICOR), and Fiscal Consolidation.
- **GS Paper II:** Federal Structure, Cooperative Federalism, Role of NITI Aayog, and Statutory Limits under Fiscal Responsibility Frameworks.
- **Prelims Focus:** Concepts of ICOR, Real vs. Nominal GSDP, Article 293 borrowing limitations, World Bank per capita income classifications, and FRBM deficit thresholds.

7. A Malacca-Singapore Model for Resolving the Hormuz Impasse

Key Highlights & Summary

- Ongoing maritime disruptions in the Strait of Hormuz draw attention to the historical resolution of territorial claims in the Straits of Malacca and Singapore.
- In 1971, Malaysia, Indonesia, and Singapore challenged the "international high seas" status by asserting 12-nautical-mile territorial sea claims that met in the middle, creating overlapping territorial waters.



- To balance state sovereignty with international trade, UNCLOS codified the legal regime of "transit passage," allowing continuous, expeditious navigation for commercial and naval vessels.
- The 2007 Cooperative Mechanism established an Aids to Navigation Fund for safety projects, funded voluntarily by user states and industry without imposing tolls or transit fees.
- Similar to Malacca, the Strait of Hormuz features intersecting territorial waters of Iran and Oman, but resolving its blockade is complicated by primary security disputes and US non-acceptance.
- While regional stakeholders point to the Malacca model, Iran's 1993 domestic law requiring authorization for foreign warships remains a core point of contention under global maritime law.

Essential Definitions

- **Strait Used for International Navigation:** A narrow natural maritime passage connecting one part of the high seas or an exclusive economic zone (EEZ) to another.
- **Transit Passage:** A legal regime under UNCLOS granting all ships and aircraft the right of freedom of navigation solely for continuous and expeditious transit through international straits.
- **Innocent Passage:** Navigation through a coastal state's territorial sea that is not prejudicial to peace, good order, or security, subject to suspension by the coastal state.

- **Cooperative Mechanism:** An institutional framework enabling littoral states, user nations, and maritime industries to co-fund safety and environmental initiatives without levying compulsory transit tolls.

Legal and Constitutional Framework

- **UNCLOS (Part III, Articles 37–44):** Defines the legal regime of transit passage through straits used for international navigation and limits coastal states' rights to impede passage.
- **UNCLOS (Article 3):** Authorizes coastal sovereign states to establish the breadth of their territorial sea up to a limit not exceeding 12 nautical miles.
- **Article 51(c):** Directive Principle of State Policy encouraging respect for international law and treaty obligations in the dealings of organized peoples with one another.
- **Article 253:** Empowers Indian Parliament to make laws for implementing international conventions and treaty commitments governing freedom of navigation.

Conclusion

The Malacca-Singapore Cooperative Mechanism demonstrates how littoral nations can reconcile sovereign security with international freedom of navigation. Replicating this framework in the Strait of Hormuz demands diplomatic consensus between regional actors and global powers to ensure global energy supply stability.

UPSC Relevance

- **GS Paper II:** India and its Neighborhood- Relations, Effect of Policies and Politics of Developed and Developing Countries on India's Interests, Important International Institutions and Conventions (UNCLOS).
- **GS Paper III:** Security Challenges and Management in Strategic Maritime Corridors, Energy Security, and Global Trade Bottlenecks.
- **Prelims Focus:** Geography of key maritime choke points (Strait of Malacca, Strait of Singapore, Strait of Hormuz), UNCLOS provisions (Transit vs Innocent Passage), and DPSP Article 51(c).

8. Decoding the Transition to Alternative Fuels in India's Mobility Sector

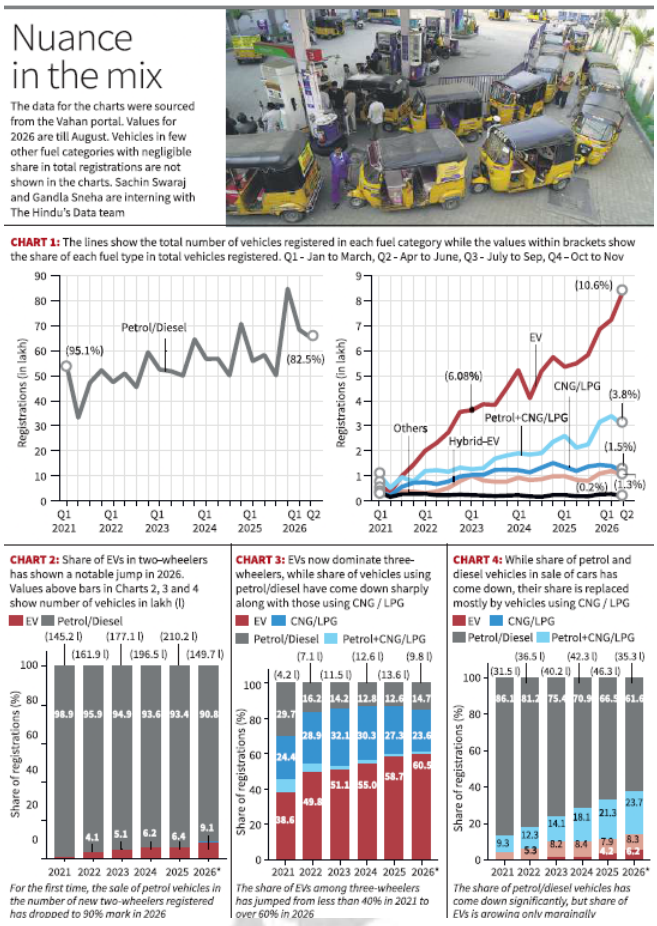
Key Highlights & Summary

- Electric vehicle (EV) penetration in India is driven predominantly by the two-wheeler (2W) and three-wheeler (3W) segments, outstripping adoption rates in four-wheeler passenger cars.
- Favorable Total Cost of Ownership (TCO) parity, lower operational expenses per kilometer, and fast commercial payback periods have accelerated 2W and 3W electrification.
- Commercial fleet operators and last-mile delivery logistics service providers serve as primary demand catalysts for low-speed and mid-speed electric three-wheelers.
- High upfront purchase costs, limited public fast-charging infrastructure, and range anxiety continue to slow down mass adoption in the private passenger car category.
- Alternative fuels such as Compressed Natural Gas (CNG), Flex-Fuels (E20 ethanol blends), and Green Hydrogen are emerging as viable parallel decarbonization pathways for commercial heavy transport.

- Targeted government demand incentives like the PM E-DRIVE scheme focus on subsidizing public transport, charging infrastructure, and commercial electric fleets.

Essential Definitions

- **Total Cost of Ownership (TCO):** An economic assessment calculated by combining an asset's initial purchase price with all subsequent operational, fuel, and maintenance costs over its lifespan.
- **Range Anxiety:** The driver's concern that an electric vehicle's battery power will deplete before reaching a destination or available charging station.
- **Flex-Fuel Vehicle (FFV):** An internal combustion engine vehicle equipped to run on a blend of gasoline and ethanol up to higher concentrations such as E85 or E100.
- **PM E-DRIVE Scheme:** The central government flagship initiative designed to accelerate EV adoption through direct demand incentives and charging infrastructure development across India.



Legal and Constitutional Framework

- **Article 48A:** Directive Principle of State Policy directing the State to protect and improve the natural environment and reduce industrial carbon emissions.
- **Article 21:** The Right to Life includes the right to a clean, pollution-free environment and healthy air quality, as affirmed by the Supreme Court of India.
- **Motor Vehicles Act, 1988 (Section 110):** Vests authority in the Central Government to establish construction, equipment, and emission standards for motor vehicles.
- **Seventh Schedule (List III, Entry 35):** Categorizes "Mechanically propelled vehicles including the principles on which taxes on such vehicles are to be levied" under the Concurrent List.

Conclusion

Accelerating India's transition to clean mobility requires maintaining momentum in two and three-wheelers while deploying robust fast-charging networks for passenger cars. Integrating alternative fuel technologies alongside battery electric vehicles ensures a diversified, resilient, and sustainable transport ecosystem.

UPSC Relevance

- **GS Paper III:** Environment and Pollution Control, Electric Vehicle Manufacturing, Renewable Energy Integration, and Industrial Policy.
- **GS Paper II:** Public Policies and Interventions for Sectoral Development, Centre-State Coordination under National Clean Air Programme (NCAP).

- **Prelims Focus:** Objectives of PM E-DRIVE, National Biofuel Policy target (E20 ethanol blending), battery chemistry fundamentals, and DPSP Article 48A.

9. Supreme Court Strikes Down Unreasonable Methanol Denaturing Rules

Key Highlights & Summary

- The Supreme Court struck down Rules 18A and 18B of the Maharashtra Poisons Rules, 1972, which mandated adding colourants and bitterants to industrial methanol before sale to non-drug manufacturers.
- A Bench of Justices J.B. Pardiwala and K. Vinod Chandran held that the impugned rules were disproportionate, arbitrary, and violated Fundamental Rights under Articles 14 and 19(1)(g).



- The court observed that compulsory chemical additives failed to establish a rational, proximate nexus with preventing the diversion of methanol into illicit hooch production.
- The judgement noted that the regulations imposed continuous production hurdles on legitimate paint, resin, and pharmaceutical industries without solving unregulated black-market misuse.
- Applying the four-prong proportionality test from *K.S. Puttaswamy (2017)*, the court ruled that while preventing hooch deaths is a legitimate state aim, the restrictions were neither suitable nor necessary.
- The apex court issued comprehensive national guidelines directing strict licensing, GPS-tracked transportation in dedicated tankers, inter-departmental enforcement, and rehabilitation support.

Essential Definitions

- **Denaturing:** The process of adding chemical substances, colourants, or bitterants to industrial alcohols to render them unpalatable or unfit for human consumption.
- **Proportionality Test:** A judicial review standard evaluating whether a state measure limiting fundamental rights has a legitimate goal, a rational nexus, no less restrictive alternatives, and a balanced impact.
- **Hooch Tragedy:** Mass poisoning incidents resulting from the illegal consumption of illicitly distilled liquor adulterated with lethal industrial chemicals like methanol.
- **Methanol (Methyl Alcohol):** A highly toxic, flammable industrial solvent extensively utilized as a precursor in chemical manufacturing, paints, resins, and laboratory applications.

Legal and Constitutional Framework

- **Article 14:** Guarantees equality before the law and protection against arbitrary, irrational, or disproportionate state actions.
- **Article 19(1)(g):** Protects the fundamental right to practice any profession or carry on any lawful occupation, trade, or business, subject to reasonable restrictions under Article 19(6).
- **Poisons Act, 1919:** Empowers state governments to formulate rules regulating the possession, stocking, and sale of designated poisonous substances.

- **Seventh Schedule (List II, Entry 8):** Vests jurisdiction over "Intoxicating liquors, that is to say, the production, manufacture, possession, transport, purchase, and sale of intoxicating liquors" in State Legislatures.

Conclusion

Balancing industrial economic needs with public safety requires targeted regulatory enforcement rather than blanket, unscientific chemical mandates. The Supreme Court's ruling reinforces that administrative regulations must satisfy constitutional tests of non-arbitrariness while curbing illegal chemical diversions through robust tracking systems.

UPSC Relevance

- **GS Paper II:** Judiciary and Executive Interactions, Judicial Review, Fundamental Rights (Articles 14 and 19), and Statutory Frameworks.
- **GS Paper III:** Industrial Growth Barriers, Governance of Hazardous Chemicals, and Public Safety Standards.
- **Prelims Focus:** Applications of the Proportionality Framework, Provisions of the Poisons Act 1919, Seventh Schedule Entry 8 (List II), and chemical properties of Methanol.

10. Mechanics and Deployment of Parachute Recovery Systems in ISRO's Gaganyaan Mission

Key Highlights & Summary

- The Gaganyaan crew module relies on atmospheric drag and a multi-staged parachute cluster developed by the Aerial Delivery Research and Development Establishment (ADRDE) for safe re-entry and touchdown.





- The deceleration system comprises ten parachutes in total, including two apex covers, two pilot, two drogue, and three main parachutes, ensuring critical structural redundancy.
- Sequenced deployment prevents extreme opening shock loads: small pilot chutes extract the drogue chutes for initial velocity reduction, followed by mortar-deployed main chutes.
- Multi-staging utilizes timed reefing cutters that progressively sever restraint cords on the main canopy, allowing controlled expansion while regulating dynamic pressure.
- Advanced synthetic polymers are deployed for specific stresses: high-tensile Kevlar for load-bearing suspension lines, heat-resistant Nomex near mortar discharges, and elastic Nylon for canopy shock absorption.
- System reliability is verified through Ground Rail Track Rocket Sled (RTRS) testing, drop tests from aircraft, and integrated pyro-cutter mechanisms that detach canopies post-landing to prevent drag or capsizing.

Essential Definitions

- **Drogue Parachute:** A high-drag, small-canopy parachute deployed at high velocities to stabilize an entry capsule and reduce its speed before main canopy extraction.

- **Reefing Mechanism:** A temporary physical constraint applied around a parachute canopy using cords to restrict initial expansion, reducing peak deceleration forces on astronauts.
- **Dynamic Pressure:** The kinetic energy per unit volume of fluid flow, representing the aerodynamic force exerted on a re-entering spacecraft and its recovery gear.
- **Pyrotechnic Cutters:** Explosively actuated mechanical cutting devices used to sever reefing lines during canopy inflation and release main parachutes immediately upon touchdown.

Legal and Constitutional Framework

- **Article 51A(h):** Fundamental Duty obligating every citizen and state institution to develop scientific temper, humanism, and the spirit of inquiry and reform.
- **National Space Policy, 2023:** Regulates the institutional domain of ISRO, IN-SPACe, and private entities in advancing human spaceflight technologies and indigenous research.
- **Rules for Safe Operations under ISRO Safety Council:** Statutory safety norms governing high-energy pyrotechnic handling, crew safety thresholds, and recovery testing protocols.
- **Defense Research and Development Organisation (DRDO) Charter:** Legal framework under MoD empowering laboratories like ADRDE to co-develop strategic aerospace recovery systems.

Conclusion

Mastering multi-stage parachute deceleration represents a vital technological hurdle for India's human spaceflight program. Indigenous design and rigorous ground and aerial testing ensure crew survivability, laying a solid foundation for future orbital and deep-space missions.

UPSC Relevance

- **GS Paper III:** Achievements of Indians in Science & Technology, Indigenization of Technology, ISRO's Space Missions, and Human Spaceflight (Gaganyaan).
- **GS Paper II:** Institutional Framework of R&D Bodies (ISRO, DRDO) and Policy Directions under National Space Policy.
- **Prelims Focus:** Parachute sequence (Pilot, Drogue, Main), functions of materials (Kevlar, Nomex, Nylon), roles of ADRDE/DRDO, and concepts of dynamic pressure and reefing.

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