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Chance to 'turn over a new leaf' with Iran, says Vance

Associated Press
OBBUERGEN

U.S. Vice-President J.D. Vance said on Sunday that there was an opportunity to "turn over a new leaf" with Iran as the two sides launched talks aimed at building out the interim deal to end the war in Iran reached by the two sides last week.

Mr. Vance is holding talks with Iran's parliamentary Speaker, Mohammad Bagher Ghalibaf, and Foreign Minister Abbas Araghchi, at a Swiss mountainside resort near Lake Lucerne. Mediators from Pakistan and Qatar were in the room for the direct engagement.

The U.S. is looking to get Iran locked into negotiations over its nuclear programme amid concerns it



Iranian delegation, including Foreign Minister Abbas Araghchi and Speaker Mohammed Bagher Ghalibaf, in Switzerland on Sunday. AP

may be used for military purposes, which Iran denies. Mr. Vance also wants to push Tehran to commit to keeping open the Strait of Hormuz. But the ongoing conflict in Lebanon between Israel and Hezbollah continues to threaten to derail the peace efforts.

"The question before us now is how much more can we accomplish together? Can we turn over a new leaf?" Mr. Vance said as the

talks, dubbed the "Lake Lucerne Summit", got under way.

While Iran's President Masoud Pezeshkian said before the meeting that the Islamic Republic will maintain its right to a nuclear programme, the country's state broadcaster said that nuclear programme was not discussed on Sunday.

'TROOPS FREE TO ACT'

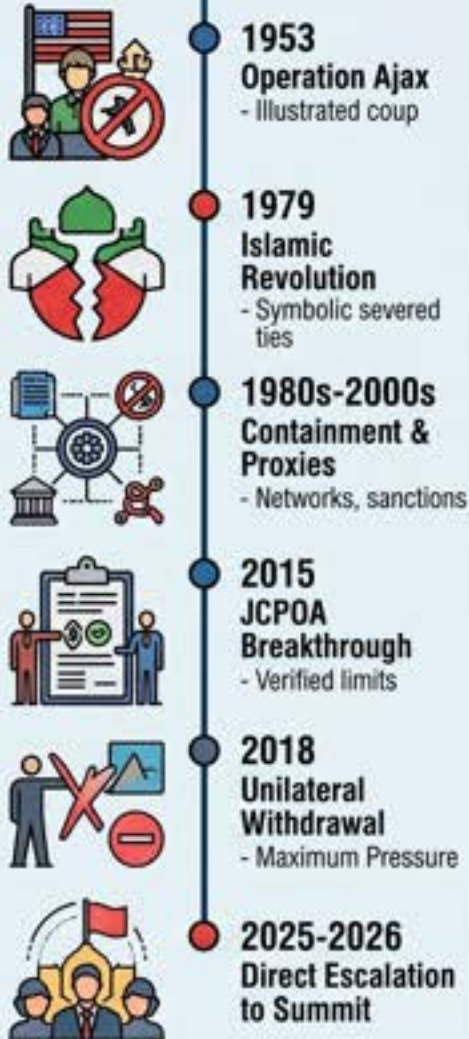
» PAGE 14

- **Key Terms and Explanations**
- **The Lake Lucerne Summit (2026):** A high-stakes diplomatic conference held at a Swiss resort, representing the first direct, face-to-face negotiations between senior executive leadership from the United States and the Islamic Republic of Iran in decades. It functions as a critical platform to de-escalate acute military friction and establish a structured roadmap for long-term regional stability.
- **Interim Agreement / Memorandum of Understanding (MoU):** A provisional diplomatic framework signed by heads of state to immediately halt active hostilities, provide reciprocal early-stage relief, and institute a time-bound window (such as a 60-day period) to negotiate intricate technicalities before a comprehensive, legally binding treaty is finalized.
- **The Strait of Hormuz:** A hyper-strategic maritime chokepoint separating the Persian Gulf and the Gulf of Oman. It serves as the primary energy artery of the global economy, facilitating the transit of approximately 20% of the world's petroleum supply. Any disruptions or threats of closure here trigger severe supply shocks across international commodity markets.
- **Uranium Enrichment and Stockpile Dilution:** Uranium enrichment is the highly sensitive technological process of increasing the concentration of the fissile uranium-235 isotope to produce nuclear fuel or weapons-grade material. Stockpile dilution involves the verified chemical or physical downgrading of highly enriched uranium (HEU) to lower concentration levels to permanently eliminate its weaponization potential under global oversight.
- **Proxy and Hybrid Warfare:** A conflict dynamic where major sovereign states avoid direct conventional warfare, choosing instead to fund, train, and strategically deploy non-state armed groups to hit rivals and project power. A primary example is the strategic synergy between Iran and its regional network, such as Hezbollah in Lebanon, which serves as a powerful geopolitical lever.
- **Frozen Assets and Sanctions Waivers:** Punitive economic tools where a state's sovereign foreign exchange reserves held in international banks are legally locked. Conversely, a sanctions waiver is a temporary legal exemption that restores a state's ability to freely trade commodities (like crude oil) and access frozen funds as an incentive for diplomatic compliance.
- **Main Arguments and Substantive Parts**
- **The Core Thesis of Engagement**
- The overriding argument is that a durable structural reset in West Asian security cannot be achieved through unilateral military coercion alone. Instead, it requires a synchronized, step-by-step diplomatic framework. The current diplomatic push shows that face-to-face engagement can prevent a full-scale regional conflict, provided both sides agree to immediate, verified concessions.
- **The United States' Strategic Imperatives**
- Washington's core arguments focus on locking Tehran into permanent, verifiable caps on its nuclear fuel cycle and securing unhindered freedom of navigation through the Strait of Hormuz. The US administration asserts that offering immediate economic relief—such as unfreezing billions in sovereign assets—is a necessary trade-off to secure immediate Iranian compromises on nuclear dilution and regional ceasefires.
- **The Iranian Sovereign Stance**
- Tehran maintains that its sovereign right to a peaceful civilian nuclear program under international law is non-negotiable. Its primary argument is that the concrete implementation of sanctions relief and the unfreezing of assets must precede any final, permanent concessions. Furthermore, Iran emphasizes that stabilizing the region requires an immediate halt to external military operations against its regional partners, particularly in Lebanon.
- **Domestic and Strategic Counterarguments**
- A massive challenge to this diplomatic effort comes from intense internal political opposition within both nations. Critics in the United States argue that an interim agreement acts as an "abject surrender," providing a hostile regime with billions of dollars without permanently eliminating its ballistic missile capabilities or proxy networks. Concurrently, hardline rhetoric from top political leaders frequently threatens to derail the fragile trust built by negotiators on the ground.

- **Historical Evolution of the Issue**
- **The Pre-1979 Era and the Genesis of Mistrust**
 - The roots of modern geopolitical friction trace back to the 1953 Anglo-American backed coup (Operation Ajax) that overthrew Iran's democratically elected Prime Minister, Mohammad Mossadegh, reinstating the autocratic pro-Western Shah. This historical intervention generated deep-seated anti-Western sentiment, culminating in the 1979 Islamic Revolution led by Ayatollah Khomeini, which transformed Iran into a theocratic republic and completely severed formal diplomatic ties with Washington.
- **The Era of Containment and Proxy Networks (1980s–2000s)**
 - During the devastating Iran-Iraq War (1980–1988), Western powers tilted heavily toward Iraq, cementing Tehran's perception of existential encirclement. In response, Iran developed its "Axis of Resistance," cultivating regional non-state allies to offset its conventional military weaknesses. This period turned into a prolonged phase of containment, with the US designating Iran a state sponsor of terrorism and building a comprehensive web of economic sanctions.
- **The Multilateral Breakthrough of the JCPOA (2015)**
 - Following decades of clandestine nuclear enrichment and intensifying international sanctions, diplomacy peaked with the signing of the Joint Comprehensive Plan of Action (JCPOA) in 2015 between Iran and the P5+1 nations. The deal offered sweeping economic integration and sanctions relief in exchange for strict, internationally verified limits on Iran's nuclear program, proving that multilateral diplomacy could resolve complex non-proliferation deadlocks.
- **Unilateral Withdrawal and the 2025–2026 Escalation**
 - The unilateral withdrawal of the US from the JCPOA in 2018 completely shattered bilateral trust. Washington initiated a "Maximum Pressure" campaign, prompting Iran to systematically roll back its nuclear commitments and ramp up regional proxy operations. This escalatory cycle reached a critical point between late 2025 and early 2026 with direct military strikes on Iranian assets, ultimately exhausting both sides and forcing them to sit down for talks in Switzerland.
- **Way Forward**
 - **Institutionalizing Multilateral Legal Safeguards:** To ensure the interim understanding survives domestic political transitions in the West, its technical parameters must be anchored within a robust international framework. The International Atomic Energy Agency (IAEA) must be granted continuous, unhindered access to verify the dilution of highly enriched uranium, transforming a fragile bilateral deal into a rules-based international commitment.
 - **Constructing Phased, Performance-Linked Escrow Systems:** Economic relief and the unfreezing of assets should be structurally isolated from day-to-day political rhetoric. The financial flows should be placed into verified, phased escrow accounts tied directly to specific nuclear dilution milestones, ensuring that the unlocked capital is used primarily for humanitarian and civilian economic recovery.
 - **Formulating an Inclusive Regional Security Architecture:** Long-term stability cannot be achieved in a vacuum. The international community must encourage a gradual transition where Iran shifts its regional strategy from backing armed proxy networks to pursuing formal, institutionalized diplomatic ties. This requires building an inclusive West Asian security dialogue that includes both Tehran and its regional competitors.
 - **Calibrating India's Strategic Autonomy:** For Indian foreign policy, this diplomatic window offers an optimal opportunity to accelerate infrastructure expansion at the Chabahar Port and revitalize diversified energy partnerships. New Delhi should leverage its strong ties with both Washington and Tehran to champion the freedom of navigation in the Indian Ocean region, securing its critical commercial sea lanes.

STRATEGIC RESET? U.S.-IRAN RELATIONS & THE LAKE LUCERNE SUMMIT (2026): A GEOPOLITICAL ANALYSIS FOR CIVIL SERVICES ASPIRANTS

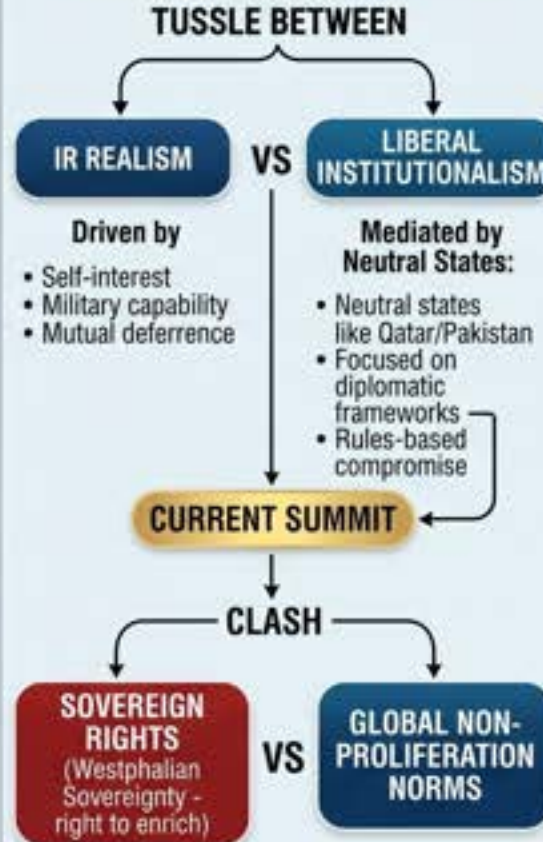
HISTORICAL EVOLUTION



CORE CONCEPTS & TERMINOLOGY



BILATERAL STRATEGIC DRIVERS & IR THEORY



VISUAL CONTEXT NOTE

Note: Lake Lucerne Summit context available via Geopolitical Briefing video.



EXAM RELEVANCE & UPSC CSE PREVIOUS YEARS QUESTIONS (PYQs)

UPSC CSE SYLLABUS LINKAGES

- GS Papers 2, 3, 4, Essay, Hattopics
- GS Papers 2, 3, 4, Essay
- PSIR:
 - International Relations
 - Regional Groupings
 - Economic Development
 - Ethics in IR

SAMPLE PREVIOUS YEARS QUESTIONS

- GS Paper 2 (2020) on US-Iran friction fraction impact on India's strategic autonomy
- GS Paper 4 (2019) on ethical dimensions of economic warfare

Why India's largest power trader can't trade on the exchange it helped create

Pratyush Deep
New Delhi, June 21

INDIA'S LARGEST power trader, PTC India, finds itself in a Catch-22 situation.

The country's top electricity regulator on June 17 rejected a plea by a power exchange — a platform for generators, distribution companies, traders and large consumers to buy and sell electricity — that sought an exemption for PTC India.

Hindustan Power Exchange Ltd (HPX) asked for a three-year transitional exemption for the company to trade on the exchange while it gradually dilutes its stake to meet the regulatory threshold. Under the Central Electricity Regulatory Commission (CERC) (Power Market) Regulations, 2021, a trader-member cannot hold more than 5% equity in the power exchange on which it trades. PTC India currently owns 22.62% of HPX.

This comes as the CERC plans to overhaul India's power market architecture through market coupling. Under this mechanism, power prices across exchanges would be discovered through a centralised mechanism operated by Grid Controller of India, replacing the current system where each exchange independently determines prices based on its own demand-supply dynamics.

Hurdles for PTC India

The regulatory framework has left PTC in a difficult position. The company cannot trade on the HPX, which it helped create, unless it first dilutes its stake. Yet, selling that stake may prove difficult because HPX has struggled to gain market share and attract sufficient trading volumes. India

MARKET STRUGGLE

PTC cannot trade on the HPX, which it helped create, unless it first dilutes its stake. PTC India currently owns 22.62% of HPX.

Yet, selling that stake may prove difficult because HPX has struggled to gain market share and attract sufficient trading volumes.

currently has three power exchanges regulated by the CERC. The Indian Energy Exchange (IEX) dominates the market with over 80% share, while Power Exchange India Ltd (PXIL) and HPX account for the remainder. Established in 1999, PTC India is the country's pioneering power trader and accounted for nearly 31.8% of the total bilateral electricity volume transacted through licensed traders in FY25, making the regulatory imposition significant for both the company and HPX.

HPX's struggle for market share

In HPX's submissions before the regulator, the exchange said that it has struggled to gain meaningful market share "due to the dominant position of one of the Power Exchanges", in an indirect reference to IEX.

It contended that allowing PTC India to participate as a trading member would bring liquidity and trading volumes to the platform, benefiting all stakeholders.

This is exactly what the HPX first projected as a business plan when the process of its formation began.

In that business plan, the exchange presented three business scenarios that were ana-

lysed for market size estimation. In all three scenarios, it was assumed that PTC would be able to bring business to the exchange platform. Even the conservative scenario in the business plan assumed that HPX would start with only the volume that PTC was trading through other exchanges. Other investors had invested a large amount in HPX based on this projection, the regulator noted in its order.

However, since the commencement of the exchange in 2022, PTC India has not reduced its stake and continued to trade through the other two power exchanges — IEX and PXIL. In its order, CERC noted that PTC India has not submitted documents showing efforts to dilute its shareholding. "Therefore, we find no merit in such submissions of the Petitioner, as these are purely commercial considerations," the regulator said.

PTC India seeks removal of curbs

PTC India's unease with this regulatory restriction prominently featured in its latest submission to the regulator on draft CERC (Power Market) (Second Amendment) Regulations, 2026. It proposed norms on market coupling — a process that seeks to discover a uniform electricity price across exchanges. In its submission to the regulator on June 5, PTC India argued that the proposed regulations mark a shift from an "exchange-centric" structure towards a more "member-centric" one. Here, market-clearing prices would be determined by the Market Coupling Operator, based on aggregated anonymous bids received across power exchanges.

FULL REPORT ON

WWW.INDIANEXPRESS.COM

- **Key Terms and Explanations**
 - **Power Trader:** An entity licensed to buy electricity from generating companies (GenCos) and sell it to distribution companies (DisComs), large industrial consumers, or other traders. They act as financial and logistical intermediaries, absorbing counterparty risks.
 - **Power Exchange:** An institutionalized digital platform that facilitates the automated, transparent, and anonymous trading of electricity contracts (such as spot markets, term-ahead markets, and green energy contracts).
 - **Trader-Member Equity Cap:** A structural regulatory barrier established under the Central Electricity Regulatory Commission (CERC) Power Market Regulations, 2021. It mandates that no power trader can hold more than a **5% equity stake** in a power exchange where it actively executes trades. This rule is designed to prevent insider trading, market manipulation, and conflicts of interest.
 - **Market Coupling:** A regulatory mechanism where buy and sell bids from all independent power exchanges are aggregated into a single national pool. A designated central agency—the **Grid Controller of India**—then runs a centralized algorithm to discover a single, uniform electricity clearing price across the entire country, overriding the independent price discovery of individual exchanges.
 - **Catch-22 Scenario in Market Liquidity:** A structural paradox where a new trading platform cannot attract trading volumes because it lacks market depth, but it cannot develop market depth because institutional volume-creators are legally barred from participating due to legacy shareholding patterns that cannot be liquidated in a low-volume market.
- **Main Arguments and Substantive Parts**
 - The structural debate within India's power sector revolves around balancing strict corporate governance with the practical economic realities of fostering competition in a highly concentrated market.
 - **The Core Regulatory Mandate vs. Commercial Deadlock**
 - The central conflict arises from the enforcement of the **CERC Power Market Regulations, 2021**. The regulator maintains that structural separation between platform owners and platform users is non-negotiable.
 - When a dominant power trader holds a substantial stake (such as **22.62%**) in an exchange it helped create, it faces an absolute barrier: it cannot trade on that platform without diluting its equity to 5%. However, divesting a massive equity stake in a newly established exchange is commercially unviable when that exchange struggles to attract trading volume, creating an operational stalemate.
 - **Arguments for Regulatory Flexibility and Market Depth**
 - Proponents of transitional relief argue that rigid legalism inadvertently reinforces existing monopolies. Currently, the Indian Energy Exchange (IEX) commands a dominant market share of **over 80%**.
 - Allowing a major institutional power trader to participate as a trading member during a transitional phase would instantly inject much-needed liquidity and trading volume into newer platforms like HPX. This injection of volume is seen as a necessary precursor to driving up the exchange's valuation, which would ultimately make equity divestment feasible for the promoter.

- **Historical Evolution of the Issue**
 - **1999–2003: The Era of Bilateral Genesis:** Prior to structural reforms, power distribution was entirely dominated by State Electricity Boards (SEBs) locked into rigid, long-term Power Purchase Agreements (PPAs). PTC India was established in 1999 as a public-private initiative to pioneer interstate power trading, acting as a buffer to minimize payment default risks between cash-strapped SEBs and generating companies.
 - **2003–2008: The Legislative Breakthrough:** The enactment of the **Electricity Act, 2003** completely transformed the sector. It legally unbundled generation, transmission, and distribution, recognized "power trading" as a distinct, licensed activity, and introduced the concept of **Open Access**. This legislative shift laid the groundwork for competitive marketplace platforms.
 - **2008–2021: Platform Proliferation and Monopolization:** The launch of IEX and PXIL in 2008 introduced spot trading and day-ahead markets to India. Over the next decade, IEX captured more than 80% of the transaction volume due to first-mover advantages and self-reinforcing liquidity networks. Recognizing the systemic risks of a single platform dominating price discovery, the CERC introduced the **Power Market Regulations, 2021**, which established the 5% ownership limit for trader-members to curb vertical integration.
 - **2022–2026: The Liquidity Stagnation and Structural Shift:** The Hindustan Power Exchange (HPX) entered the market in 2022 but immediately ran into structural entry barriers. Unable to leverage its founding institutional traders due to the 2021 equity cap, HPX remained volume-starved. By 2026, the regulatory discourse has shifted toward **Market Coupling** under the draft CERC Second Amendment Regulations, aiming to dismantle the exchange-centric price discovery model in favor of a centralized architecture run by the Grid Controller of India.
 - **Way Forward**
 - **Implementing an Independent Blind Trust Mechanism:** To resolve the immediate equity deadlock, the regulator could permit promoter-traders to transfer their excess equity stakes (above the 5% threshold) into an independent, third-party financial blind trust or escrow account. This structure would strip the trader of voting rights and board representation during the transition, preventing conflicts of interest while allowing them to trade on the platform and inject critical market liquidity.
 - **Executing a Phased and Transparent Market Coupling Pilot:** The Grid Controller of India should accelerate a phased rollout of the centralized market coupling model. By initiating time-bound pilots in specific market segments—such as the Real-Time Market (RTM) or Day-Ahead Market (DAM)—the state can verify the uniform price discovery algorithm without disrupting the wider financial ecosystem, ensuring a smooth transition away from exchange-centric monopolies.
 - **Adopting a Dynamic Regulatory Sandbox Framework:** The CERC could introduce a specialized "Regulatory Sandbox" for newly established infrastructure platforms. Under this framework, new exchanges could receive temporary, conditional exemptions from ownership caps for their first few years, provided they adhere to strict real-time data disclosures and independent transaction audits. This balances basic systemic security with the commercial runway needed to scale up.
-



INDIA'S POWER TRADING REFORMS: COMPREHENSIVE ANALYSIS & FUTURE ARCHITECTURE

THE PTC INDIA DILEMMA



- **Trader-Member Equity Cap** (CERC 2021 Regulations)
Cannot hold >5% in exchange it trades on
- **Dominant Trader** (22.62% holding)
- Struggle to dilute in low-liquidity market
- Needs volume to increase valuation



CASE STUDY & CONCEPTS

REGULATORY IMPASSE & MANDATE



- **Conflict of Interest Prevention** (Ethical Basis)
- **Structural Separation** necessary for fairness
- **Uniform application of rules** (Regulatory Formalism)



CURRENT MARKET STRUCTURE



EVOLUTION & ANALYSIS

MULTIDIMENSIONAL ANALYSIS

Social
Affordability/Access
- Power lines



Political
State utility health -
DisComs & Subsidies

Legal
Administrative law
- Balance scales



Ethical
Corporate Governance
- Conflict of Interest

Economic
Regional Grid/Standards
- SAARC map



International
Monopoly breakdown
- Capital flow

ECONOMIC & PHILOSOPHICAL BASES

Regulatory Formalism
vs
Economic Pragmatism



Network Effects
vs
Centralized Optimization



HISTORICAL EVOLUTION



LINKAGES & SOLUTIONS

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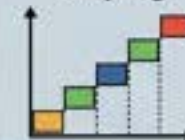


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RISE ABOVE THE REST

• DEFENCE

Three distinct strategic roles of the three ships inducted into Navy

Sushant Kulkarni

Pune, June 21

THE NAVY inducted three ships on Sunday — one that can fight far out at sea, one that can map the sea, and one that can hunt submarines close to the coast.

The three vessels — the Brahmos-armed stealth frigate INS Dunagiri, the deep-water survey vessel INS Sanshodhak, and the Anti-Submarine Warfare Shallow Water Craft (ASW SWC) INS Agray — have been built by Garden Reach Shipbuilders & Engineers (GRSE) in Kolkata. According to the Ministry of Defence, the three together have more than 75 per cent indigenous content, and involve over 200 MSMEs.

What are these three ships?

INS DUNAGIRI: The largest and most heavily armed of the three is INS Dunagiri. It is a frigate, smaller than a destroyer but large enough to operate far from the coast.

It is part of the Navy's Project 17A, under which a new generation of stealth guided-missile frigates are being built in India. Dunagiri carries weapons such as BrahMos surface-to-surface missiles, sensors including Multi-Function Surveillance, Track



PM Modi presided over the commissioning ceremony in Kolkata on Sunday. PTI

And Guidance Radar (MFSTAR), electronic warfare systems and anti-submarine weapons. "At the strategic level, these multi-mission frigates are capable of operating in a 'blue water' environment — deep sea far from shore — dealing with both conventional and non-conventional threats," a serving Navy officer said. Other vessels in the class are INS Nigiri, Himgiri, Taragiri, Udaygiri and Vindhyagiri.

INS SANSHODHAK: This is a Survey Vessel

— Large (SVL). Its job is to measure and map the sea: the depth of waters, seabed features, approach channels to ports, navigational routes, and oceanographic data. It is equipped with systems such as autonomous underwater vehicles, remotely operated vehicles and multi-beam echo sounders. These help the ship collect data from the surface and underwater.

"Warships and submarines do not operate in an empty blue space. They move through waters shaped by depth, seabed features, currents, reefs, channels, ports, underwater slopes and coastal clutter. Knowing this environment helps ships move safely, submarines plan routes, ports update charts, and forces prepare for operations. It also supports civilian needs such as safe shipping, disaster relief, ocean research and coastal development," said a Navy officer who has served on survey ships.

INS AGRAY: The smallest vessel of the three, it has a highly specialised role. Agray belongs to the Arnala-class of smaller warships built specifically to detect and attack submarines in shallow waters near the coast, ports, naval bases and important sea approaches. Agray carries lightweight torpedoes, indigenous anti-submarine rocket

launchers and sonar systems.

"Coastal waters are difficult places to find submarines. They are noisy, busy and cluttered. Fishing boats, merchant ships, seabed features and coastal activity can make submarine detection harder than in the open ocean. That is where ASW-SWCs such as Agray come in," said an officer.

What is the larger message behind commissioning them together?

The importance of Sunday's ceremony is that the three ships add three different capabilities at once.

As the Indian Ocean becomes more contested, the triple-commissioning "is a sign of how the Navy is building capability in layers: big warships for distant operations, survey ships to understand the sea, and smaller submarine-hunters to guard coastal waters," said an officer.

It is also an industrial signal. That three different kinds of ships, with different missions and technologies, can be built domestically and commissioned together shows the growing maturity of India's naval shipbuilding ecosystem.

FULL REPORT ON

WWW.INDIANEXPRESS.COM/EXPLAINED

- **Key Terms and Explanations**
- **Blue-Water Navy:** A maritime force capable of operating across the deep, open oceans globally, far from its home country's coastline. Unlike a "Green-Water Navy" (which operates in regional seas) or a "Brown-Water Navy" (focused on riverine and coastal areas), a blue-water navy can sustain long-range power projection.
- **Stealth Frigate:** A medium-sized, highly maneuverable warship designed using radar-absorbent materials, specialized hull geometries, and suppressed infrared signatures to drastically reduce its radar cross-section. This makes the ship difficult for enemy radars and sensors to detect at long ranges.
- **Anti-Submarine Warfare Shallow Water Craft (ASW SWC):** Specialized, smaller warships optimized to hunt, track, and neutralize enemy submarines operating in shallow coastal areas, ports, and choke points. Coastal waters are acoustics-heavy, busy, and cluttered with civilian shipping traffic, making standard sonar less effective and requiring specialized detection frequencies.
- **Survey Vessel Large (SVL):** Hydrographic survey ships equipped with advanced oceanographic tools like multi-beam echo sounders, autonomous underwater vehicles (AUVs), and remotely operated vehicles (ROVs). Their primary job is to map the topography of the seabed, track underwater currents, and chart safe navigation paths.
- **Defense Indigenization:** The capability of a nation to design, develop, and manufacture defense equipment within its own borders, reducing reliance on foreign imports and securing its sovereign supply chains.
- **Main Arguments and Substantive Parts**
- The contemporary focus on naval modernization centers around a fundamental shift toward holistic, layered maritime security. Rather than focusing on a single class of massive warships, strategic dominance in contested waters requires a synchronized architecture of diverse capabilities.
- **The Doctrine of Layered Naval Capability**
- The core thesis of modern naval induction is that maritime security cannot be achieved via a one-dimensional surface fleet. A robust naval strategy requires building capability in distinct, overlapping layers:
- **Deep-Water Strategic Projection:** Large, heavily armed stealth frigates act as the long-range shield, dealing with both conventional missile threats and non-conventional asymmetric challenges far out at sea.
- **Hydrographic and Oceanographic Dominance:** Warships do not operate in a vacuum; they navigate a highly complex underwater terrain. Hydrographic survey vessels provide the foundational data—mapping seabed features and currents—that enables safe deployment, strategic positioning, and invisible submarine routing.
- **Littoral and Coastal Submarine Hunting:** The shallow, noisy waters near coastlines and ports present a distinct tactical vulnerability. Specialized, agile shallow-water craft ensure that localized choke points and naval bases are actively insulated from underwater infiltration.
- **The Industrial and Supply Chain Ecosystem**
- Beyond pure military tactics, the current paradigm underscores a major industrial transformation. The simultaneously coordinated commissioning of diverse naval platforms serves as a direct indicator of a mature domestic shipbuilding ecosystem.
- **MSME Integration as a Strategic Pillar:** Integrating over 200 MSMEs into the construction pipeline demonstrates that defense self-reliance is no longer confined to massive state-run public sector undertakings. It creates a distributed, resilient industrial network.
- **Economic Capital Retention:** Achieving indigenous content thresholds above **75%** ensures that national security expenditures act as domestic economic multipliers, keeping capital within the country and fostering high-tech engineering skills locally.

- **Historical Evolution of the Issue**
- **The Post-Independence Phase (1947–1960s): The Brown-Water Era** At independence, the navy was largely structured as a coastal defense force, heavily reliant on decommissioned, legacy British vessels. Due to pressing land-border conflicts in the north and west, national defense budgets overwhelmingly prioritized the army, leaving the maritime domain underfunded and strictly focused on immediate shoreline protection.
- **The Cold War Expansion (1960s–1980s): Shifting to Green-Water** The geopolitical shocks of the 1962 and 1971 wars highlighted the vulnerability of long coastlines and vital sea ports. This era saw a major pivot toward the Soviet Union for technology transfers, acquiring diesel-electric submarines and missile boats. The navy began expanding into a regional "green-water" force, though core design philosophies remained deeply dependent on foreign blueprints.
- **The Strategic Awakening (1990s–2010s): The Blue-Water Blueprint** The post-Cold War economic liberalization combined with the rise of non-traditional maritime threats (such as piracy in the Gulf of Aden and the 2008 Mumbai sea-borne terror attacks) forced a radical rethink. The Indian Navy regularized its Maritime Security Strategy, formally identifying the wider Indian Ocean Region (IOR) as its primary area of strategic interest. Long-term domestic design initiatives, such as the initial Project 15 (destroyers) and Project 17 (frigates), were operationalized.
- **The Atmanirbhar Paradigm (2020s–Present Day 2026): Layered Independence** The current era represents a shift from merely assembling foreign components to complete indigenous conceptualization. Driven by aggressive regional anti-access/area-denial (A2/AD) strategies by revisionist powers in the Indian Ocean, India's naval expansion has transitioned into a highly synchronized, multi-layered approach—simultaneously deploying deep-sea stealth platforms, advanced hydrographic mapping, and localized coastal submarine hunters built on a foundation of local MSME participation.
- **Way Forward**
- **Deepening Public-Private Partnerships (PPP):** While state-run shipyards have demonstrated strong capability, accelerating future build timelines requires transitioning more design and construction responsibilities to private defense manufacturers. This will expand overall national shipbuilding capacity and shorten delivery pipelines.
- **Accelerating R&D in Critical Sub-Systems:** While achieving **75%** indigenization is a major milestone, the remaining **25%** often consists of specialized high-end components, such as advanced gas turbine engines, specialized semiconductor chips, and complex sensor arrays. Focused funding should be directed toward domestic defense research entities to master these core technologies.
- **Expanding Underwater Domain Awareness (UDA):** Deploying physical ships must be coupled with an expansive, permanent underwater monitoring framework. India needs to scale up its networks of seabed acoustic sensors, underwater drones, and satellite-linked tracking systems to maximize the effectiveness of its shallow-water anti-submarine assets.
- **Leveraging Defense Exports for Regional Diplomacy:** The ability to build diverse, high-quality naval platforms domestically opens up opportunities for defense exports. Offering locally made coastal patrol crafts, survey vessels, and anti-submarine systems to friendly littoral nations across East Africa, West Asia, and Southeast Asia can strengthen bilateral ties and solidify India's role as a reliable security partner.



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INDIAN NAVY'S LAYERED STRATEGY: COMPREHENSIVE ANALYSIS FOR UPSC CSE PREP

THE LAYERED MARITIME CAPABILITY APPROACH

INS Dunagiri (Frigate)



- PROJECT 17A STEALTH GUIDED-MISSILE FRIGATE
- BRAHMOS SURFACE-TO-SURFACE MISSILES
- DEEP-SEA WARFARE AND POWER PROJECTION



INS Agray



- ANTI-SUBMARINE WARFARE SHALLOW WATER CRAFT (ASW SWC)
- AGILE & SPECIALIZED ACOUSTICS
- WEAPONS: TORPEDOES, ASW ROCKETS



DEEP-WATER
(BLUE-WATER)
POWER PROJECTION

ENVIRONMENTAL
DOMAIN
AWARENESS

COASTAL
DEFENSE
(SHALLOW-WATER
ASW)

INS Sanshodhak (Survey Vessel Large)



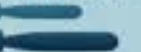
- SURVEY VESSEL LARGE (SVL)
- SEABED AND HYDROGRAPHIC MAPPING
- NAVIGATIONAL ROUTES FOR SHIPS & SUBMARINES
- SUPPORTS WARFARE PLANNING & CIVILIAN NEEDS



INS Agray (ASW Shallow Water Craft)



- ANTI-SUBMARINE WARFARE SHALLOW WATER CRAFT (ASW SWC)
- HUNTING SUBMARINES IN COASTAL WATERS & PORTS
- WEAPONS: TORPEDOES, ASW ROCKETS



MULTIDIMENSIONAL IMPACT FOR UPSC

- **GS2 (International Relations & Geopolitics)**
 - Controlling IOR Choke Points
 - Responding to Regional Contest
 - Future P17A Ships: P17A ships (Nilgiri, Himgiri, etc.)
- **GS3 (Economy & Technology)**
 - Indigenization of Critical Systems, MSME Job Creation
 - Technological Advancement in Radar/ASW
- **GS4 (Ethics)**
 - Balanced Development vs. Defense Spending (conceptual link)

THE INDUSTRIAL & ECONOMIC MESSAGE

GRSE
(Kolkata)
Build

75%+
Indigenous
Content

200+
MSME
INVOLVEMENT

MATURING
NAVAL
SHIPBUILDING
ECOSYSTEM

ECONOMIC
GROWTH &
SELF-RELIANCE



Guardrails in AI growth to protect developing nations



EXPERT EXPLAINS
B RAVINDRAN

HEAD, CENTRE FOR RESPONSIBLE AI,
IIT MADRAS

THE TRANSFORMATIVE potential of artificial intelligence (AI) is becoming increasingly evident, and its impacts are already being felt, touching everything from daily life to broader industries. Consequently, efforts have begun to create global institutions and frameworks to regulate the development and deployment of AI systems.

Some preliminary institutional structures have already been set up. Last year, the United Nations General Assembly established a Global Dialogue on AI in which every country has been invited to participate. An Independent International Scientific Panel on AI is tasked with making periodic scientific assessments to enrich the Global Dialogue discussions.

Professor B Ravindran, head of the Centre for Responsible AI at IIT Madras, is the only Indian among the 40 people appointed to the Panel for a three-year term. He spoke to **Amitabh Sinha** about the need for a system of global AI governance, why it matters for developing countries like India, and what a commons system for AI tools and resources could look like.

What is the International Scientific Panel on AI supposed to do?

This is the first time a global scientific body on AI has been set up. It is supposed to take a periodic view of the state of science around AI and inform the Global Dialogue on AI.

Our primary responsibility would be to produce reports on the scientific aspects of AI. This body would not get into the politics or policy side of AI discussions. That is the responsibility of the Global Dialogue, in which governments would participate.

Why is a global governance structure on AI needed? Are we moving in that direction?



Visitors at the AI Impact Summit in New Delhi this year. **ANURAG CHAND**

Personally, I feel that having some kind of international agreement on how AI is to be deployed in the applications we want to use might be useful. As of now, countries are developing their own frameworks to deal with this technology, but that might not be the most effective way forward.

There are two ways of looking at it. One is from the perspective of the development of AI systems. If the regulation is too fragmented, meaning every country has its own set of differing regulations, then the development of AI would also become fragmented. Companies will have to ensure that their systems can adhere to differing sets of requirements in different geographies.

What might happen, as a result, is a possible slowdown in innovation. AI companies might prefer to roll out their services or support innovations only in countries seen as more friendly in terms of their regulations.

At the same time, if some countries begin invoking issues of data sovereignty (seeking control over data originating within their borders) and insist that all AI development and its infrastructure must



A weekly column decoding AI's new frontiers, how they shape the world and why you need it

Safety and access

AI Commons is being built as a repository of accessible tools, datasets and other resources to test AI systems.

be within national boundaries, it can lead to significant concentration of power. Already, a few countries have the infrastructure and resources to support the entire AI ecosystem.

The other perspective is of deployment. Many countries in Asia or Africa might not have the resources or capacities to frame robust regulations to protect their interests. There would always be a danger of them being reduced to digital colonies.

In this context, having a globally agreed-upon set of minimum regulations would be useful.

AI is a very transformative technology, with a capability of the order of the steam engine. It would be useful if, owing to a lack of regulatory capacities, certain developing countries were denied the benefits of AI. It will be a disservice to humanity at large.

This is why international agreements and arrangements are important. We need to ensure that the interests of countries that are not AI developers themselves are also protected, and they continue to benefit from advancements in this technology.

• Where AI regulation stands

• Several parallel attempts are being made to regulate the development and deployment of artificial intelligence. Most of these structures have voluntary participation, varying degrees of legal force, and focus on specific aspects like standards, safety and ethics.

• The most comprehensive legal framework for AI is the European Union's AI Act of 2024. It prioritised safe, transparent, non-discriminatory and environmentally friendly AI systems.

• Annual global AI summits, whose most recent edition was held in New Delhi in February, have also resulted in mechanisms that could feed into the development of global governance models on AI.

Global regulation can help with technology innovation while ensuring that the benefits of AI are widespread and equitable

Would international regulation also control the risks from AI?

There are definite risks, no doubt. People talk about AI's capabilities in building the next generation of biological weapons or the next most powerful chemical weapons. We have international agreements and treaties that control biological or chemical weapons. Now, people might also want to bring about international frameworks that control AI models and the tools that enable these weapons to be built.

While that is logical, the fear and worry are that it might take the shape of some prohibition language. There might be attempts to propose that only certain countries or companies can develop safe and responsible AI, and therefore, they should be the only ones allowed unrestricted development and use of AI systems. That would lead to something similar to the global nuclear regime.

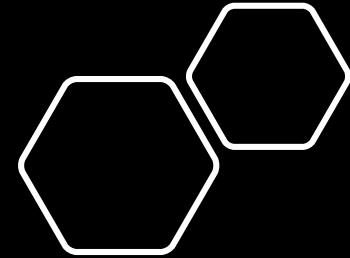
I am worried about the dialogue on AI moving in that direction. Hopefully, it will not happen, but I think we have to be on constant vigil against it.

You were personally involved in developing the framework for Trusted AI Commons, which was one of the main outcomes of the New Delhi AI Impact Summit in February. What is that, and how would it help?

It can be seen as another part of the global governance structure. The Trusted AI Commons is a repository of various tools needed to develop and deploy AI systems in a safe and responsible manner.

Suppose someone wants to test an AI system meant for agriculture. Trusted AI Commons would be like a one-stop shop to figure out what tools are available to test AI deployment, what the benchmarks, datasets, and even protocols are. Several resources will be housed in the Trusted AI Commons.

To begin with, this Commons will be hosted and managed by India. The India AI mission has to identify a suitable vehicle to do that. Trusted AI Commons will not commission building these tools right away, but many organisations are already working on it. This includes the Centre for Responsible AI at IIT Madras. Companies like Google have also created their own tools. It is called Commons because it will be open, accessible, and with very liberal licensing requirements.



- **Key Terms and Explanations**

- **Global Governance of AI:** This refers to the creation of harmonized, transnational institutional frameworks, agreements, and bodies designed to regulate the development, testing, and deployment of artificial intelligence. It aims to prevent cross-border risks—such as algorithmic bias or autonomous security threats—without stalling technological progress.
- **Data Sovereignty:** This is the principle that digital data generated within a country's borders is subject to the laws and governance of that specific nation. For example, when a state mandates that its citizens' financial or personal data must be stored on domestic servers rather than transferred abroad, it is actively asserting data sovereignty.
- **Digital Colonialism:** This dynamic occurs when technologically advanced nations or massive transnational corporations extract raw data from developing countries, process it using proprietary AI models, and then lease the finished technology back to those same nations. This leaves the developing world as mere consumers and data exporters, locked out of high-value innovation.
- **AI Non-Proliferation Risk:** Borrowed from nuclear diplomacy, this concept highlights the danger of global regulations being weaponized to create a restrictive cartel. It occurs when a select group of advanced nations or tech monopolies seek to restrict the development of sophisticated AI models exclusively to themselves under the guise of security, thereby widening the global technology gap.
- **Trusted AI Commons:** A democratized, open-access repository housing verified datasets, evaluation benchmarks, safety protocols, and software tools. It serves as a one-stop shop allowing resource-constrained nations and small enterprises to test and deploy AI systems safely and responsibly under liberal licensing agreements.
- **EU AI Act (2024):** Widely recognized as the world's first comprehensive, risk-based legal framework for artificial intelligence. It categorizes AI applications into distinct risk tiers (unacceptable, high, medium, and low) and enforces strict safety, transparency, and non-discriminatory compliance measures before technologies can enter the market.

- **Main Arguments and Substantive Parts**

- The contemporary dialogue surrounding technology governance centers on balancing systemic risk mitigation with equitable access. The core arguments can be broken down into several substantive pillars:
- **The Paradox of Regulatory Fragmentation:** A major challenge is the rise of divergent, siloed national regulations. If every country implements vastly different compliance structures, global innovation risks a severe slowdown. Technology firms may suffer from compliance fatigue or choose to roll out life-changing AI tools only in jurisdictions with the most permissive frameworks.
- **The Vulnerability of the Global South:** Developing nations across Asia and Africa face a distinct disadvantage. Lacking the institutional capacity, capital, and compute infrastructure to draft complex regulations or build sovereign models, they run the risk of becoming entirely dependent on foreign digital ecosystems, exposing them to modern forms of economic exploitation.
- **The Threat of Institutional Gatekeeping:** There is a justified concern that international safety agreements could mirror the discriminatory nature of historic nuclear non-proliferation treaties. If global frameworks dictate that only a handful of certified states possess the maturity to develop advanced AI, it will institutionalize an insurmountable tech monopoly.
- **Separating Science from Geopolitics:** To ensure fair governance, technical assessment must be decoupled from political posturing. The establishment of independent international scientific panels—tasked purely with analyzing the state of AI capabilities, risks, and environmental impacts—is crucial to keeping global policy debates grounded in objective evidence.
- **Democratization via Open-Source Infrastructure:** True safety cannot exist without accessibility. Initiatives like a shared AI Commons, managed transparently and offered with flexible licensing, ensure that developing states can actively verify and safely implement AI solutions tailored to their specific socio-economic needs, such as agriculture or public healthcare.

- **Historical Evolution of the Issue**

- The path toward global technology governance is not a sudden phenomenon; it is the culmination of shifting geopolitical power dynamics and rapid industrial transitions over several decades:
- **The Pre-Digital and Industrial Era (Pre-2000s):** International technology debates were primarily viewed through the lens of the North-South divide. Developing nations argued for a New International Economic Order (NIEO) to ensure fairer technology transfers in manufacturing and hardware, while advanced economies strictly guarded their intellectual property.
- **The Data Explosion and Unregulated Expansion (2000s–2010s):** The meteoric rise of the internet and smartphone penetration led to an unprecedented boom in big data extraction. During this phase, AI and machine learning models were developed in a virtual regulatory vacuum, treated as proprietary corporate assets with very little state oversight regarding privacy or societal impacts.
- **The Rise of Tech-Nationalism and Splinternet (2018–2022):** Revelations regarding algorithmic manipulation and data privacy breaches prompted a sharp shift toward localization. The European Union pioneered this with the General Data Protection Regulation (GDPR), which inspired developing nations like India to articulate their own data localization and digital sovereignty policies to curb the unregulated flow of citizen data outward.
- **The Generative AI Breakthrough and Institutionalization (2023–Present):** The exponential leap in generative models transformed AI from a specialized tool into a foundational, general-purpose technology. This sparked urgent multilateral interventions, leading to the UN General Assembly establishing global dialogues, the codification of the EU AI Act, and international summits aimed at creating cooperative frameworks like the Trusted AI Commons to prevent global technological exclusion.
- **Way Forward**
- **Codifying Global Minimum Standards:** Instead of chasing a hyper-fragmented regulatory regime, international bodies should focus on establishing a foundational baseline of safety, non-discrimination, and transparency. This allows individual nations the policy space to customize local regulations without creating friction that stalls global innovation.
- **Scaling and Institutionalizing the AI Commons:** Open-source safety repositories must be aggressively supported. India, utilizing its experience with Digital Public Infrastructure (DPI), can spearhead this effort by hosting and co-managing public datasets, testing protocols, and benchmarks under liberal licensing, ensuring that smaller enterprises can build safe, localized applications.
- **Ensuring Geopolitical Diversity in Oversight Panels:** International scientific and advisory bodies must remain fiercely independent and representative. Representation on these panels must be balanced so that immediate, localized vulnerabilities of developing nations receive the same scientific attention and resource allocation as long-term existential security risks.
- **Investing heavily in Sovereign Compute Infrastructure:** Developing nations cannot rely solely on international goodwill; they must build domestic capacity. Expanding initiatives like the IndiaAI Mission to establish public data centers, clean vernacular datasets, and targeted tech-talent pipelines is essential to maintaining true strategic and digital autonomy.



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GLOBAL GUARDRAILS IN AI GROWTH: PROTECTING DEVELOPING NATIONS - A UPSC COMPREHENSIVE ANALYSIS PLATE

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INTERNATIONAL SCIENTIFIC PANEL ON AI



Periodic State
of Science
Assessments



Detailed Analysis
of Capabilities
& Risks



Non-Political
Reports
Global Dialogue

NEEDS OF DEVELOPING NATIONS



Equal Access to
Tools & Datasets



Data Sovereignty



Robust, Customized
Domestic Regulations



Capacity Building

AI INNOVATION POTENTIAL
(e.g., Agriculture, Healthcare, etc.)



A DEEP DIVE: TRUSTED AI COMMONS (New Delhi Outcome)



WHERE AI REGULATION STANDS



EU AI ACT (2024):
Risk-based,
Transparent,
Environmentally
Friendly



Global AI
Summits
(e.g., New
Delhi)



Current
Voluntary
Frameworks
(Current State)

RISKS OF THE CURRENT PATH

Fragmentation
DIFFERING NATIONAL
REGULATIONS



Innovation
Slowdown
Companies Avoid
complex Regions

Exclusionary Access
NON-PROLIFERATION
RISK / DIGITAL
COLONIALISM



Leaseback of Tools
(Dependency)

TIE-UP WITH HOLTEC INT'L ON THE CARDS, FOLLOWS PACTS WITH EDF, CLEAN CORE AND ROSATOM

Global nuclear players turn to NTPC for N-tech partnerships

It is the only state-owned company involved in construction of a nuclear power project, apart from NPCIL

Pratyush Deep & Anil Sasi
New Delhi, June 21

NTPC LTD, the country's largest integrated power generator, is emerging as a key pivot in India's nuclear landscape after the sector was opened up through an overarching legislation late last year.

For decades, the Nuclear Power Corporation of India Ltd (NPCIL) has been the vanguard of India's traditional nuclear establishment. With the passage of the SHANTI Act, 2005, which eased the liability framework and paved the way for greater private and foreign participation, NTPC is emerging as a second pillar of sorts and a partner of choice for global nuclear technology providers seeking a foothold in the Indian market.

Notably, an NTPC functionary is also seen as a possible contender for a top energy advisory role in the government.

The latest collaboration in the works is with New Jersey-based nuclear technology firm

Holtec International known for its flagship small modular reactor, the SMR-300. The company is understood to be in advanced discussions with NTPC and could formalise a partnership as early as next month. The *Indian Express* has learned.

This comes after NTPC signed a non-binding Memorandum of Understanding (MoU) in April with Electricité de France (EDF) to explore co-operation in developing new nuclear power projects in India. The company has also inked an agreement with Russia's state-owned nuclear company Rosatom for its VVER series of reactors — a type of reactors called light water reactors, or pressurised water reactor (PWR).

NTPC is also in talks to buy a minority stake in US-based nuclear fuel technology company Clean Core Thorium Energy (CCTE), the company had informed the stock exchange in January. Both the companies are exploring the "development and deployment of a thorium-based fuel" for

• DEEPENING NUCLEAR PUSH

NTPC'S LATEST collaboration is with New Jersey-based nuclear tech firm Holtec International known for its flagship small modular reactor, the SMR-300

THE COMPANY is in advanced discussions with NTPC and could formalise a partnership as early as next month

THE THERMAL major is also in talks to buy a minority stake in US-based nuclear fuel tech firm Clean Core Thorium Energy (CCTE)

existing nuclear stations in India, subject to regulatory clearances. Department of Atomic Energy told the parliament earlier this year.

Both Holtec and Clean Core are among the handful of American nuclear companies which have begged "specific authorisations" from the US government with respect to a restrictive American regulation referred to as "10CFR810" — (Part 810 of Title 10, Code of Federal Regulations of the US Atomic Energy Act of 1954).

The authorisation permits these firms, subject to certain



CCTE AND NTPC are exploring the "development and deployment of a thorium-based fuel" for existing nuclear stations in India

conditions, to transfer technology to Indian entities, which is otherwise barred under 810 regulations.

NTPC's unique role, NPCIL's hold on PHWRs

NTPC's growing appeal among foreign nuclear technology providers stems from its unique position within India's nuclear ecosystem. Apart from NPCIL, it is the only state-owned power company currently involved in the construction of a nuclear power project. NTPC is developing the Mahi Banswara Rajasthan Atomic

Power Project through ASH-VINI, its joint venture with NPCIL.

In its latest earnings call, NTPC said it has secured capacity consent for 2,770 megawatt-electric (MWe) of the proposed 2,800 MWe Mahi Banswara Rajasthan Atomic Power Project from the customers in Rajasthan, Gujarat, Chhattisgarh, and Andhra Pradesh.

The first concrete pour for the project is expected by August 2027, while synchronisation of the first unit with the grid is targeted for November 2032, the company added.

Another factor working in favour of the state-owned thermal power major, as many in the policy circle point out, is NPCIL's monopoly over the pressurised heavy water reactors (PHWR) technology which has long formed the backbone of India's nuclear power programme.

While PHWRs are a technology India's nuclear establishment has mastered, it is increasingly out of sync with the light water reactors (LWRs), or pressurised water reactors, that are now the most dominant type worldwide. The Americans, Russians and French are among the leaders in LWR technology.

FULL REPORT ON
WWW.INDIANEXPRESS.COM

- **Key Terms and Explanations**
 - **Small Modular Reactors (SMRs):** These are next-generation nuclear reactors with a power generation capacity of up to 300 MWe per module. They are "modular" because their components can be factory-fabricated, transported by truck or rail, and assembled on-site.
 - **Pressurized Heavy Water Reactors (PHWRs):** A class of nuclear reactors that use unenriched natural uranium as fuel and heavy water (deuterium oxide) as both the coolant and the neutron moderator. This technology forms the traditional backbone of India's indigenous nuclear fleet managed by public entities.
 - **Light Water Reactors (LWRs) / Pressurized Water Reactors (PWRs):** The most dominant nuclear reactor design globally. Unlike PHWRs, they use ordinary water as a coolant and moderator, which necessitates the use of enriched uranium rather than natural uranium. Global giants from Russia, France, and the United States primarily utilize this technology.
 - **Thorium-Based Advanced Fuels:** Nuclear fuels designed to utilize Thorium-232, a fertile material that must be converted into a fissile isotope to generate power. Innovative fuel designs blend thorium with High-Assay Low-Enriched Uranium (HALEU) to bypass the traditional, decade-long reprocessing cycles normally required to unlock thorium's energy.
 - **10CFR810 (US Federal Regulation):** This refers to Part 810 of Title 10 in the United States Code of Federal Regulations. It is a strict export control framework managed by the US Department of Energy that regulates the transfer of unclassified nuclear technology, assistance, and technical data to foreign nations to prevent unauthorized proliferation.
- **Main Arguments and Substantive Parts**
 - The core narrative surrounding India's civil nuclear expansion revolves around a structural paradigm shift: the diversification of the nuclear ecosystem away from a single-entity state monopoly toward a collaborative, multi-utility framework.
- **The Core Thesis**
 - India's ambitious net-zero targets cannot be met by solar and wind alone due to their intermittent nature. Therefore, the country is rapidly positioning its largest integrated conventional power producer, NTPC, to act as a second major pillar alongside the Nuclear Power Corporation of India Limited (NPCIL). This evolution allows India to actively absorb foreign technology, capture global supply chains, and build flexible nuclear baseload capacity.
- **Key Supporting Arguments**
 - **Breaking the Monolithic Structure:** For decades, NPCIL was the sole custodian of nuclear power construction. Introducing a commercial giant like NTPC brings massive balance-sheet strength, project management expertise from the thermal sector, and the agility needed to execute multi-billion-dollar energy transitions.
 - **Technological Re-alignment:** While India has mastered indigenous PHWR technology, the global market has moved decisively toward Light Water Reactors (LWRs) and Small Modular Reactors (SMRs). Partnering with international technology vendors allows India to integrate into mainstream global supply chains.
 - **Overcoming Regulatory Barriers:** Strategic international diplomatic efforts have begun yielding results, evidenced by foreign tech firms securing specialized authorizations (such as the US 10CFR810 clearances). This opens the door for direct technology transfers and advanced fuel testing on Indian soil.
- **Counterarguments and Structural Challenges**
 - **The Liability Dilemma:** Civil nuclear liability frameworks remain a delicate issue for foreign suppliers who fear financial exposure in the event of industrial accidents, necessitating highly complex joint-venture risk-sharing models.
 - **Capital Intensity and Tariffs:** Nuclear power demands immense upfront capital expenditure compared to solar or natural gas. Balancing high initial construction costs with the need to provide affordable electricity to state distribution companies (DISCOMs) poses a significant commercial challenge.

- **Historical Evolution of the Issue**
- **The Dawn of the Three-Stage Programme (1940s–1950s):** Formulated by Dr. Homi J. Bhabha, India's nuclear strategy was built on a closed fuel cycle designed to achieve long-term self-reliance. Stage 1 utilized Pressurized Heavy Water Reactors (PHWRs) fueled by natural uranium; Stage 2 focused on Fast Breeder Reactors (FBRs); and Stage 3 aimed to utilize India's vast thorium reserves.
- **The Era of Isolation and Sanctions (1974–2008):** Following the "Smiling Buddha" peaceful nuclear explosion in 1974 and the Pokhran-II tests in 1998, India was placed under strict international technology embargoes by the Nuclear Suppliers Group (NSG). During this period, domestic policy focused strictly on indigenizing PHWR designs under the exclusive control of NPCIL.
- **The Great Institutional Breakout (2008–2015):** The signing of the historic Indo-US Civil Nuclear Agreement and the subsequent NSG waiver in 2008 reintegrated India into global nuclear commerce. This allowed India to import foreign fuel and reactors, legally separating its civilian and military nuclear installations.
- **Legislative Liberalization (2015–Present):** A major legislative turning point occurred when the government amended the Atomic Energy Act of 1962. This critical change allowed NPCIL to form joint ventures with other cash-rich public sector undertakings (PSUs), laying the institutional groundwork for NTPC to enter nuclear power generation and co-develop large-scale projects like the Mahi Banswara project in Rajasthan.
- **Way Forward**
- **Empower the Regulator:** Grant full statutory independence and expand the technical workforce of the Atomic Energy Regulatory Board (AERB). Ensuring the regulator remains independent from commercial operators like NPCIL and NTPC is vital for maintaining high public trust and world-class safety standards.
- **Establish a Dedicated SMR Policy Framework:** Create a customized regulatory pathway tailored specifically for Small Modular Reactors. Standardizing safety reviews for factory-built designs will accelerate approvals and make it easier to replace retiring coal-fired plants with SMR units.
- **Pool Financial and Project Capital:** Use NTPC's strong financial position to absorb upfront capital risks, while relying on NPCIL's deep operational experience to manage core nuclear safety. This division of labor keeps projects commercially viable while ensuring strict safety standards.
- **Expand Technical Skill Development:** Establish specialized nuclear engineering and safety training centers through collaborations between the Department of Atomic Energy (DAE), state utilities, and leading universities to build a robust domestic talent pipeline for next-generation reactor technologies.



ANALYSIS: THE NEW AGE OF INDIA'S CIVIL NUCLEAR ENERGY ECOSYSTEM

SHIFTING PARADIGM: FROM MONOPOLY TO DIVERSIFICATION

PRE-2015:
NPCIL MONOPOLY



PHWR,
limited partners



NPCIL -
traditional fleet

NOW: MULTI-PILLAR
& COLLABORATIVE



SECOND MAJOR PILLAR
NTPC -
new commercial
scaling

NEW
LEGISLATIVE ERA



LEGISLATIVE ERA
Atomic Energy Act 2015
amendment of India
for existing nuclear stations
in India.

GLOBAL N-TECH PARTNERSHIPS & PROJECTS

USA
(Holtec - SMR-300)



SMR

FRANCE
(EDF - Nuclear
Projects)



USA (Clean Core -
Thorium-Based Fuel)



RUSSIA
(Rosatom - VVER
reactors)



KEY CONCEPTS & TECHNOLOGIES

PHWR
(Indian Backbone)



Natural Uranium,
Heavy Water,
Indigenous.

LWR
(Global Standard)



Enriched Uranium,
Light Water,
Imported.

SMR
(Future Scaling)



Factory-fabricated,
Transportable,
Scalable, Like
SMR-300.



Thorium-Based Fuels



CCTE partnership
for immediate
deployment.

Regulatory Era
10CFR810



specific authorizations for
technology transfer,
bypassing complex
standard procedures.

PYQ & SYLLABUS RELEVANCY



GS2
International
relations,
treaties



GS3
Energy,
Science & Tech,
Climate Change



NCERT
Physics,
Geography,
Pol Sci

MULTIDIMENSIONAL ANALYSIS Matrix

International



Elevated global strategic
status, technology
acquisition.

Legal



Managing liability
frameworks (e.g.,
supplier liability,
regulatory compliance).

Economic



Massive initial capital
expenditure vs. long-term
low running costs. SMR
mitigation of financial risk.

Social



High-skill employment
in rural areas, managing
public radiophobia.

Ethical



Climate justice transition
vs. intergenerational
waste management.

Political



Central planning and
Federal coordination for
site allocation.

What is Google's Project Nimbus, and why are students protesting against it?

Amazon and Google's Project Nimbus cloud contract with Israel has sparked protests over U.S. Big Tech enabling the Israeli military's violence against Palestinians; the row has intensified internal unrest within companies, with employees raising ethical concerns over how their work is being used

Sahana Venugopal

The story so far:

 In June 14, Google CEO Sundar Pichai's speech at Stanford was disrupted as more than 100 students walked out in protest. Some carried Palestinian flags, others draped black-and-white patterned keffiyeh as scarves, and they shouted, "Free, free Palestine!"

The students were protesting against Google's Project Nimbus, a tech contract between the search giant and the Israeli government that is linked with violence against Palestinian civilians.

What is Project Nimbus?

Project Nimbus is a technology contract between the Israeli government and Google and Amazon. It is worth over \$1 billion. In May 2023, Google said the agreement would deliver cloud services to Israeli government entities, including ministries, authorities, and government-owned companies. The project was scheduled to run for an initial period of seven years, and the Israeli government could extend it for up to 23 years. A month later, Amazon said the Israeli government had selected Amazon Web Services (AWS) as its primary cloud provider, under the Nimbus contract for government ministries and its subsidiaries.

In 2024, an investigation by Israeli media outlets *972 Magazine* and *Local Gali* found that the country's army stored

information on servers managed by AWS. That data came from the surveillance of Palestinians, as per the investigation. Sources quoted by the media outlets alleged such information could be used to help plan airstrikes.

Furthermore, the outlets reported an increase in Israeli service demands from Google Cloud, AWS, and Microsoft Azure since October 2023, as army units sought data storage and AI services.

Why are protesters against Project Nimbus?

Project Nimbus has been facing backlash since it was first announced. In 2021, an anonymous letter signed internally by 90 Google workers and over 300 Amazon workers criticised the partnership, per *The Guardian*. They condemned Project Nimbus and the Israeli military's killings of Palestinian civilians, claiming that their employers would be "selling dangerous technology to the Israeli military and government."

The workers claimed that cloud service technology would help expand the surveillance of Palestinians, as well as illegal Israeli settlements on Palestinian land.

Opposition to Project Nimbus has grown since the Hamas attacks against Israeli civilians on October 7, 2023, followed by Israel's airstrikes and blockades in Gaza. In 2024, protesting Google employees even carried out sit-ins at Google locations in the U.S. Later, 28 employees were fired.

Pro-Palestinian protests by employees have also taken place at Big Tech company events, such as during Microsoft's 50th anniversary celebrations in 2025.

Last year, *The Guardian*, *972 Magazine*, and *Local Gali* cited leaked documents revealing that under the Project Nimbus contract, Israel mandated that Google and Amazon would not restrict how its governmental units used the tech companies' cloud services – even if Israel violated their terms of service.

However, Google has in the past stressed that Project Nimbus workloads are not related to the military, weapons, or classified intelligence. Amazon too highlighted its privacy commitments to its customers.

Which other tech companies have links to Israel?

A Palestinian-led movement, called Boycott, Divestment and Sanctions (BDS), has identified large technology companies that have formal contracts with Israel and its military sector.

The BDS website alleges these companies "technologically equip the Israeli military with computing systems as well as surveillance and communications technologies to accelerate the genocide in Gaza and automate apartheid in the West Bank, including East Jerusalem."

In September, Microsoft Vice-Chair & President Brad Smith said the company had "ceased and disabled a set of services to a unit within the Israel Ministry of

Defense (IMOD)." This announcement came after media outlets *The Guardian*, *972 Magazine*, and *Local Gali* reported that the Israel Defense Forces (IDF) was using Microsoft's Azure to store Palestinians' recorded phone calls data that could be leveraged for mass surveillance or even military action.

Did Microsoft truly sever its ties with Israel's defense surveillance systems?

While Mr. Smith said that Microsoft does not provide technology to facilitate the mass surveillance of civilians, he affirmed the company's "important work" to protect the cybersecurity of Israel and other West Asian countries.

In a conclusion to the external investigation that Microsoft commissioned after the Azure surveillance allegations, the tech giant said it would implement better review processes, provide more guidance to employees, and let employees anonymously report potential policy violations.

The No Azure for Apartheid group, which is made up of Microsoft workers, claimed on June 6 that Microsoft still allowed the Israeli military and government to host other surveillance projects on Azure. "Nothing short of cutting all ties with the genocidal Israeli military and government will be enough. We will show up to escalate, confront, and disrupt in every place, at every moment, announced and unannounced," said the group.

- **Key Terms and Explanations**
 - **Sovereign Cloud Infrastructure:** This refers to a cloud computing environment designed to store, manage, and process a nation-state's data within its own legal jurisdiction, adhering strictly to its national data security and privacy laws. Unlike standard commercial clouds, it ensures that foreign entities cannot access or manipulate critical governance data.
 - **Dual-Use Technology:** Software, hardware, or cloud services originally developed for benign commercial applications (like data analytics, logistics, or customer service) that can also be easily repurposed for military, intelligence, or surveillance operations.
 - **Sovereign Immunity/No-Lockout Clauses:** Contractual stipulations in high-stakes technology agreements that prevent the vendor (the tech company) from unilaterally terminating, restricting, or pausing cloud services, even if the purchasing state uses that infrastructure in ways that violate international human rights norms or the company's own terms of service.
 - **Boycott, Divestment, and Sanctions (BDS) Framework:** A global socio-political campaign that utilizes economic pressure—such as withdrawing consumer support, selling off corporate shares, or imposing trade restrictions—against a state or corporate entity to compel compliance with international law and human rights standards.
- **Main Arguments and Substantive Parts**
 - The geopolitical friction surrounding large-scale state technology contracts centers on the moral accountability of transnational tech giants providing infrastructure to states involved in active conflicts.
- **The Core Thesis**
 - The expanding reliance of sovereign states on transnational tech conglomerates for core administrative and security operations blurs the line between private commercial enterprise and state-sponsored warfare. This creates an acute ethical friction between the corporate leadership seeking financial returns and the workforce driving technical innovation.
- **Key Supporting Arguments**
 - **Enabling Asymmetric Surveillance:** Detractors argue that providing advanced cloud computing architectures (such as Amazon AWS, Google Cloud, or Microsoft Azure) to defense wings essentially subsidizes mass surveillance. By handling immense volumes of data, these platforms automate the monitoring of marginalized or occupied populations, transforming commercial tools into weapons of state control.
 - **The Loss of Corporate Leverage:** Leaked contractual details reveal that governments are actively insulating themselves against corporate moral shifts. By binding companies to "no-restriction" clauses, states ensure that even if a tech firm's board or employees object to how the technology is deployed during wartime, the infrastructure cannot be legally turned off.
 - **The Employee-Led Moral Rebellion:** A significant shift is occurring where the tech workforce is rejecting the traditional "neutrality" of engineering. Through internal walkouts, sit-ins, and public whistleblowing, workers are demanding a say in the geopolitical destination of the code they write, challenging top-down corporate governance.

- **Historical Evolution of the Issue**

- **Pre-2000s: The Classic Military-Industrial Complex:** Historically, state defense departments built their own monolithic mainframes or relied on dedicated, private defense contractors whose explicit purpose was the creation of weaponry and intelligence tools. Technology firms operated purely within clear, segregated parameters set by the state.
- **2000s–2010s: The Commercial Cloud Boom and State Outsourcing:** As commercial cloud technologies outpaced government-built IT architectures, global intelligence and defense wings realized that maintaining private, insular servers was economically unviable and technologically limiting. This era saw the birth of massive intelligence cloud deals (such as the CIA's historic contract with Amazon AWS), setting a precedent for state reliance on public commercial tech infrastructure.
- **Late 2010s: The Genesis of Tech-Worker Activism:** The friction exploded globally around 2018 with internal rebellions like Google's *Project Maven* (where employees protested AI tools analyzing drone footage). This forced corporate leadership to temporarily withdraw from specific defense bids and write ethical AI principles, proving that the tech workforce could influence corporate foreign policy.
- **2021–Present: The Era of Sovereign Megadeals and Structural Lockouts:** Modern tech contracts, exemplifying initiatives like Project Nimbus, have institutionalized absolute resilience against public or internal pushback. Governments now mandate multi-billion dollar, multi-decade cloud frameworks that legally prevent tech companies from altering service delivery, setting up a permanent, structural collision between corporate accountability and state power.

- **Way Forward**

- **Mandatory Human Rights Impact Assessments (HRIAs):** International regulatory bodies, in conjunction with tech consortiums, should institutionalize mandatory, independent HRIAs before any sovereign cloud or AI contract is finalized. These assessments must explicitly evaluate whether the technology will be deployed to automate civil liberties violations or scale up asymmetric surveillance.
 - **Standardizing Independent "Ethical Exit Clauses":** Global trade and legal frameworks should require that "no-lockout" clauses be balanced by international humanitarian provisions. Tech companies must retain the legal right to pause or throttle advanced data processing services if independent United Nations monitoring bodies confirm that the platform is actively facilitating war crimes or systemic violations of international law.
 - **Fostering Digital Sovereignty through Open-Source Public Clouds:** To avoid complete dependency on foreign tech monopolies, developing nations like India must expand their indigenous public options (such as the *MeghRaj* cloud initiative). By building state-backed, open-source cloud architectures and local AI repositories, states can protect their strategic autonomy without sacrificing technical modernization.
 - **Establishing Internal Co-Governance Tech Councils:** Technology conglomerates should shift away from top-down executive decision-making on defense deals by instituting democratically elected internal tech councils. Comprising software engineers, legal experts, ethicists, and civil society representatives, these councils should possess the institutional mandate to audit high-stakes government contracts, ensuring code alignment with universal ethical principles.
-

DECODING THE BIG TECH & STATE SOVEREIGNTY DILEMMA: A COMPREHENSIVE UPSC ANALYSIS

Multi-dimensional Impact Grid

SOCIAL  Global Polarization, Workforce Alienation	POLITICAL  Reduced Strategic Autonomy, State Dependence	LEGAL  Lack of Global Accountability, Contractual Lock-ins
ETHICAL  Ethical Complicity, Conscience vs. Profits	INTERNATIONAL  Asymmetric Warfare, Informational Dominance	ECONOMIC  Monopolistic Dependencies, Rising Migration Costs

Syllabus Linkages



GS 2



GS 3

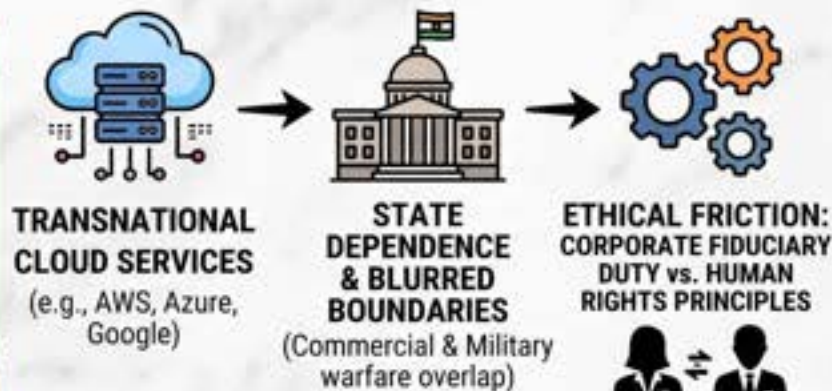


GS 4



Essay

Core Issues Flow



Historical Evolution Timeline



Academic Foundations & PYQs

NCERT FOUNDATIONS



CLASS 12 POL
SCI (Security)



CLASS 12
SOCIOLOGY
(Globalisation)



CLASS 11 POL
SCI (Rights & Citizenship)

UPSC CSE PYQs at a Glance

BRIEF

GS 2
(2023)

BIG TECH IN
CONFLICTS

GS 3
(2022)

CLOUD COMPUTING
& SOVEREIGNTY

GS 4
(2019)

ETHICAL AI
DILEMMAS

PRELIMS

CLOUD
COMPUTING
MODELS

The Way Forward

- ✓ **MANDATORY HUMAN RIGHTS IMPACT ASSESSMENTS (HRIAs)**
- ✓ **INDEPENDENT 'ETHICAL EXIT CLAUSES' for Tech Firms**
- ✓ **FOSTER INDIGENOUS SOVEREIGN PUBLIC CLOUDS** (e.g., India's MeghRaj)
- ✓ **INTERNAL CO-GOVERNANCE TECH COUNCILS** for Defense Contracts

Can police re-open probe without court approval?

Does Section 173(8) of CrPC permit filing of a supplementary report without Magistrate's permission?

EXPLAINER

R.K. Vij

The story so far:

The Supreme Court recently in *Paliniswamy Veeraraja & Ors. versus The State of Karnataka & Anr.* reiterated that the investigating authorities were required to obtain permission from the Magistrate to initiate further investigation after filing the closure report. In this case, the court quashed the First Information Report (FIR) and subsequent chargesheet noting that such permission had not been obtained.

Although an application seeking further investigation had been filed before the concerned Magistrate for a third time, no order granting permission was placed on record, the court said.

The investigating agency had earlier filed closure reports twice, stating that the dispute appeared to be entirely civil in nature. The court also relied on the principles laid down in *State of Haryana v. Bhajan Lal* (1992), holding that the civil nature of the dispute was an additional ground for quashing the FIR and subsequent proceedings.

Can supplementary report be filed without Magistrate's approval?

The sub-section (2) of Section 173 of the Criminal Procedure Code (CrPC) provides for forwarding a report to the Magistrate after completing investigation in the prescribed form. The Section 173(8) CrPC says that in case the in-charge of a police station finds additional evidence after sending final report to the Magistrate, he may send supplementary report to the Magistrate. It is silent on obtaining permission from a Magistrate for filing

supplementary report under sub-section (8). Section 193(9) of the BNSS is *pari materia* (dealing with the same subject matter) to Section 173(8) of the CrPC.

What has been held by the Supreme Court with regard to further investigation after filing a final report?

The Supreme Court in *Vinay Tyagi versus Irshad Ali* (2013) held that "though there is no specific requirement in the provisions of Section 173(8) of the code to conduct further investigation or file supplementary report with the leave of the court, the investigating agencies have not only understood but also adopted it as a legal practice to seek permission of the courts to conduct further investigation and file supplementary report with the leave of the court".

The court held that the requirement of seeking prior leave of the court to

conduct further probe will have to read into, and is necessary implication of the provisions of Section 173(8) of the code. The court held that the doctrine of *contemporanea expositio* supports such an interpretation, as a practice that has been consistently understood and implemented over time, and is backed by law, should be recognised as an integral part of the interpretative process. This proposition has been approved by the Supreme Court in subsequent cases also.

While the newly added proviso to Section 193(9) of the BNSS (which is *pari materia* to Section 173(8) of the CrPC) mandates that the permission of the court is necessary if the trial has begun, the top court, in *Rama Chaudhary versus State of Bihar* (2024) reiterated that even though the statute does not require express permission, the law has developed and seeking permission from the concerned magistrate is essential. The Supreme Court, in *Robert Lalchungnunga Chongthu v. State of Bihar* (2025), reaffirmed the ratio in *Vinay Tyagi* (supra), holding that obtaining the court's leave to file a supplementary chargesheet forms an integral part of the law.

Therefore, despite the new provision of the BNSS, once a chargesheet or closure report has been filed, further probe based on new evidence may be undertaken only with the permission of the court.

R.K. Vij is a former IPS officer.

THE GIST

▼
The Section 173(8) CrPC says that in case the in-charge of a police station finds additional evidence after sending final report to the Magistrate, he may send supplementary report to the Magistrate.

▼
The court held that the doctrine of *contemporanea expositio* supports such an interpretation, as a practice that has been consistently understood and implemented over time, and is backed by law, should be recognised as an integral part of the interpretative process.

- **Key Terms and Explanations**

- To master this legal and constitutional domain for the UPSC Civil Services Examination, one must grasp the core terminology governing criminal procedure and statutory interpretation. The following concepts form the bedrock of judicial oversight in criminal investigations:
- **Final Report / Chargesheet (Section 173(2) CrPC / Section 193 BNSS):** This is the concluding report compiled by the investigating officer after a criminal probe is completed. It is submitted directly to the competent Magistrate. If the police find sufficient evidence against the accused, it is termed a **Chargesheet**. If they find no actionable evidence, or if the matter is deemed non-criminal, it is submitted as a **Closure Report**.
- **Further Investigation (Section 173(8) CrPC / Section 193(9) BNSS):** This refers to the continuation of an existing investigation to unearth additional, fresh evidence. Crucially, it does not mean wiping the slate clean; it means building upon the investigation already conducted. It results in a **Supplementary Report** or Supplementary Chargesheet. This is legally distinct from a "*Fresh/De Novo Investigation*," which can only be ordered by higher constitutional courts (High Courts or the Supreme Court) and involves scraping the old probe entirely.
- **Pari Materia:** A foundational Latin legal principle meaning "**on the same matter**" or "**relating to the same subject**." When courts interpret a new law, they look at older laws dealing with the exact same subject to maintain continuity and clarity. For instance, Section 193(9) of the newly enacted Bharatiya Nagarik Suraksha Sanhita (BNSS) is *pari materia* to Section 173(8) of the old Code of Criminal Procedure (CrPC).
- **Doctrine of Contemporanea Expositio:** This is a doctrine of statutory interpretation. It dictates that the meaning of a law or legal provision should be understood based on how it has been continuously and consistently interpreted, applied, and practiced by legal authorities and practitioners over a long duration of time. Even if a statute is textually silent on an issue, decades of uniform legal practice integrate that practice directly into the body of the law.

- **Main Arguments and Substantive Parts**

- The intersection of police powers and judicial supervision highlights a profound institutional debate: Can the police unilaterally reopen a case once they have declared it closed or concluded before a court?

- **The Core Thesis**

- While the literal text of the Code of Criminal Procedure may appear silent on whether an investigating agency needs explicit judicial permission to carry out a further probe, established judicial jurisprudence—reinforced across decades—firmly mandates that **prior leave of the**

- **Key Substantive Points and Jurisprudential Evolution**

- **The Constraint of Judicial Oversight:** Based on landmark rulings such as *Palinismwamy Veeraraja & Ors. v. The State of Karnataka*, courts have firmly established that if the police file a closure report or chargesheet and subsequently initiate a further investigation *without* a Magistrate's nod, the subsequent proceedings, including any new chargesheets, are legally unsustainable and liable to be quashed.

- **Reading Between the Statutory Lines:** In the seminal *Vinay Tyagi v. Irshad Ali (2013)* case, the Supreme Court addressed the statutory silence of Section 173(8) of the CrPC. The court ruled that the requirement for seeking prior leave must be read into the law using the doctrine of *contemporanea expositio*. Investigating agencies have historically sought such permission, transforming this practice into a binding legal custom.

- **Recent Validations:** This legal principle has been consistently upheld in contemporary jurisprudence. In *Rama Chaudhary v. State of Bihar (2024)* and *Robert Lalchungnunga Chongthu v. State of Bihar (2025)*, the apex court reaffirmed that even if a statute does not explicitly type out the words "express permission," the organic growth of criminal law dictates that seeking permission from the concerned Magistrate is a non-negotiable step to maintain procedural integrity.

- **The Impact of the New Criminal Laws (BNSS):** With the transition to the Bharatiya Nagarik Suraksha Sanhita (BNSS), a specific proviso has been added to Section 193(9), making court permission statutory and mandatory **if the trial has already commenced**. However, combining this with recent judgments, the legal rule of thumb remains that judicial permission is vital *regardless* of whether the trial has started, once the final report is already in the custody of the court.

- **Historical Evolution of the Issue**
- **The Colonial Era (The Code of Criminal Procedure, 1898)**
 - Under the British Raj, the criminal justice machinery was heavily skewed toward executive dominance. The police were viewed primarily as instruments of state control rather than public service. Once an investigation was launched, the police possessed wide, unfettered powers. The concept of an independent judicial officer constantly monitoring or limiting the reopening of a probe was largely absent, leaving citizens vulnerable to continuous colonial state scrutiny.
- **The Post-Independence Transition (The CrPC of 1973)**
 - When the old code was overhauled to create the CrPC of 1973, lawmakers recognized that a rigid system where an investigation could never be updated would defeat the cause of justice if new evidence surfaced. Thus, Section 173(8) was explicitly introduced, empowering police to conduct "further investigation." However, the legislature left a critical vacuum—it omitted any explicit text indicating whether the police needed a Magistrate's permission to exercise this power, setting the stage for institutional friction.
- **The Era of Judicial Activism and Interpretation (1990s–2013)**
 - As instances of police overreach and the weaponization of FIRs grew, the judiciary stepped in to fill the statutory gaps. In landmark rulings like *State of Haryana v. Bhajan Lal (1992)*, the Supreme Court laid down strict parameters to prevent civil disputes from being maliciously twisted into criminal cases. This culminated in the *Vinay Tyagi (2013)* judgment, where the Court recognized that allowing the executive to reopen cases unilaterally would breed systemic instability, thereby reading judicial permission into the law.
- **The Contemporary Era of Codification (2024–2026)**
 - We are currently witnessing the codification of these judicial lessons. The transition from the CrPC to the Bharatiya Nagarik Suraksha Sanhita (BNSS) marks a legislative acknowledgment of past judicial rulings. By inserting an explicit proviso in Section 193(9) of the BNSS, the legislature has institutionalized the requirement of court permission once a trial begins, while recent 2025 judgments ensure that this protective judicial shield applies right from the moment a final report is submitted.
- **Way Forward**
- **Explicit Legislative Amendment in BNSS:** While Section 193(9) of the BNSS represents a positive step by explicitly requiring court permission *after the trial begins*, a slight legislative ambiguity still remains regarding the period *before* the trial begins. The Parliament should explicitly amend the provision to clarify that judicial leave is mandatory at **any stage** once a final report has been submitted, thereby fully codifying recent judicial updates.
- **Drafting Standard Operating Procedures (SOPs):** The Ministry of Home Affairs, in collaboration with the National Crime Records Bureau (NCRB) and State Police Academies, should issue a clear, standardized SOP for investigating officers. This SOP should mandate that whenever credible, additional evidence is discovered post-final report, the officer must first document the relevance of the evidence and formally petition the Magistrate before taking active investigative steps.
- **Strengthening the Directorate of Prosecution:** The internal accountability of the police must be enhanced. Before an investigating officer approaches a Magistrate for permission to conduct a further probe, the evidence should be vetted by an independent **Directorate of Prosecution**. This ensures that only legally sound, merit-based applications reach the court, filtering out frivolous or politically motivated requests.
- **Time-Bound Judicial Disposal:** To ensure that the search for truth is not delayed, the judiciary should establish strict timelines for Magistrates to decide on applications for further investigation. A decision should ideally be rendered within 15 to 30 days of filing, preventing prolonged uncertainty for both the victims and the accused.



KEY CONTEXT & TERMINOLOGY

FINAL REPORT / CHARGESHEET
(CrPC 173(2) / BNSS 193(1))
Concluding police investigation, submitted to Magistrate.

FURTHER INVESTIGATION
(CrPC 173(8) / BNSS 193(9))
Continuing a probe for **NEW EVIDENCE**, NOT a fresh start.

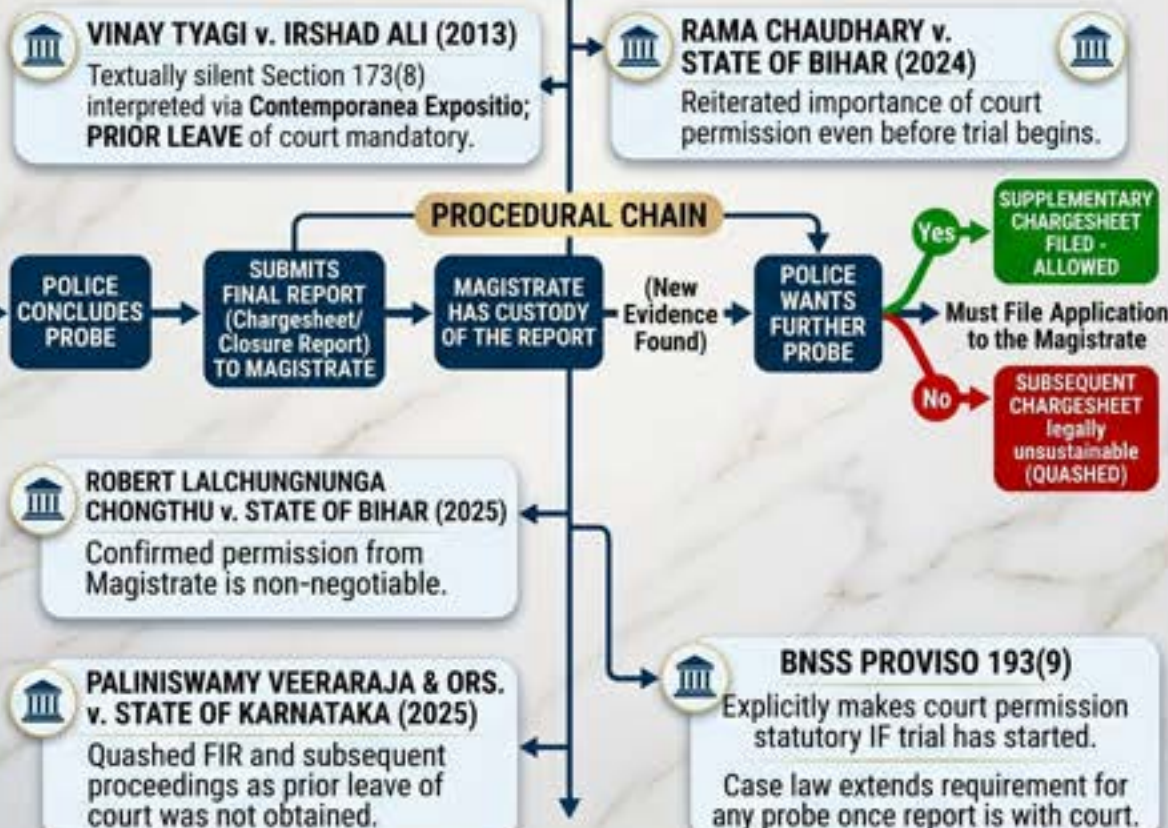
SUPPLEMENTARY REPORT
Submitted after Further Investigation.

PARI MATERIA
New law (BNSS) is read together with old law (CrPC) on same subject.

DOCTRINE OF CONTEMPORANEA EXPOSITIO
Interpretation based on consistent, established legal practice over time. **Reading court permission into the statute.**

CAN POLICE RE-OPEN PROBE WITHOUT COURT APPROVAL? - Comprehensive Analysis for UPSC CSE.

EVOLUTION & JUDICIAL PRECEDENT



CRITICAL ANALYSIS FOR UPSC CSE

LOGICAL & PHILOSOPHICAL BASE



SEPARATION OF POWERS
(Police investigate, court oversees report custody) & **ARTICLE 21** (Protection of Personal Liberty from arbitrary state action).

BALANCING ACT



Ensures search for truth is regulated by neutral judicial mind.

WAY FORWARD & RECOMMENDATIONS



Codification of all relevant case laws in BNSS.



Strict Standard Operating Procedures (SOPs) for police.



Vetting of applications by Independent Directorate of Prosecution.



Time-bound judicial disposal of applications.

Are footpaths more than safe spaces?

Are footpaths, as a material resource, facing a situation akin to the 'tragedy of commons'? Have laws favoured vehicles over pedestrians? Does footpath promote equality in urban spaces? Does walking still hold significance in India? Who are responsible for protecting footpaths? Why does the court want a regulator?

EXPLAINER

Krishnadas Rajagopal

The story so far:

A Bench of Justices P.S. Narasimha and Abul S. Chaudhkar has, in its judgment (*Mariyath Bheegathu Riazat versus P. Ayyappan*), said a footpath's relevance is more than that of a narrow strip of land where the 'less-fortunate' ones take cover from being knocked down by vehicles speeding on multi-lane motorways.

Does the ruling disconnect the footpath from the theme of accidents?

Justice Narasimha's judgment divorces the footpath from the theme of motor accidents. The sole aim of a footpath is not to avoid accidents. The pathways have an identity and a purpose of their own.

The footpath caters to the most essential, the most fundamental of rights – the pleasure of walking. The court said the presence of a broad footpath is a reflection of civilisational advancement and respect for the freedom to walk. The tracks offer the public access to urban spaces through movement by walking.

The judgment declared that the right to walk on a comfortable and safe footpath held 'priority over movement by motor vehicles'. In a way, reasoning of the judgment suggests that footpaths suffer from a situation described in environmental law as the 'tragedy of the commons' or the degradation of a precious resource when many individuals use it. Safe and broad footpaths have become a scarce resource, riddled by encroachments, garbage and pavement trade. Secondly, the court has reasoned that broad footpaths, besides amplifying the beauty of cities, must also enable equitable access to all. Nothing should be done to thwart the public's free access to common spaces.



Sidelining safety: A row of police vehicles parked on the footpath in Cabbot Park forced the pedestrians to walk on the road during IPL match in Bengaluru in April, 2022 (to remain)

Justice Narasimha has observed that access to common spaces, in both urban areas and rural areas, should be distributed in such a way that it was "not a monopoly of the motorised class alone". Article 39(b) of the Constitution mandates that material resources of a community must be distributed so as to sub-serve the common good. Authorities must consider the "common good" of both pedestrians and motor vehicle owner while designing a material resource like land to build roadways. A wide, well-demarcated and uninterrupted footpath could "change the beauty of and equitable access to our cities and towns".

Does walking still hold significance in the Indian imagination?

The court said that the act of walking have had diverse roles in the Indian imagination. Walking was a struggle for the not-so-unfortunate, a meditation in motion for many, resistance for others, discovery for the inquisitive, a cohesive strategy for sharp socio-political minds.

From the first sparks which ignited the national struggle for freedom to the complexities of modern politics, the idea of walking as a means of expressing an opinion or drawing public attention remains a constant. Walking was not just motion, but embodied the fundamental freedoms of speech and expression, of peaceful protest and the right to form associations and unions for gaining the just rights of workers.

Have the 'duty-bearers' neglected their duty to protect footpaths?

However, laws like the Motor Vehicles Act of 1988 paid homage to movement by wheels. They even "undermined the precious rights of walkers". Justice Narasimha said the tendency to subjugate safe and comfortable footpaths to motor transport was a civilisational problem.

The primary "duty-bearers" responsible for effectively managing footpaths are urban development authorities, municipal corporations, municipalities, and panchayats. Footpaths

are held in trust by these bodies for the public's benefit. They are the material resources of the community.

Is there a need for statutory law and regulator?

The judgment is not satisfied by merely declaring the right to walk safely on a wide and clearly demarcated footpath as a basic right, but recommends to the government to implement the fundamental right through a statutory law, and moreover, establish a regulator to hear aggrieved pedestrians.

The court recalled the positive role played by Parliament and State legislatures in the past in enabling the effective exercise and enjoyment of fundamental rights on the ground.

It also noted that modern statutes have shaped a new framework of institutional governance by creating regulatory bodies. These bodies institutionalise continuity through perpetual succession and seal, embed expertise through specialisation, promote diversity through their composition, and ensure integrity through mechanisms of accountability.

One of the examples the court drew in this context was the Right to Education Act, which had declared the fundamental right to free and compulsory elementary education under Article 21A in Section 3 to Section 5. The National Commission for Protection of Child Rights was recognised as the regulator.

Justice Narasimha said a similar Act and a regulatory body must be devised by the legislature to protect the fundamental right to walk on demarcated footpaths. The statutory framework would not only ensure the working of the fundamental right on the ground but also identify the duty-bearers. The court said such an Act must also establish a full-time regulator to plan, enforce, and implement this precious right. The apex court has directed its Registry to send a copy of the judgment to the Central Ministries and the Law Commission of India to "reflect on the compelling necessity for initiating the necessary legal framework".

THE GIST

▼ The court said the presence of a broad footpath is a reflection of civilisational advancement and respect for the freedom to walk.

▼ The court has reasoned that broad footpaths, besides amplifying the beauty of cities, must also enable equitable access to all.

▼ The judgment is not satisfied by merely declaring the right to walk safely on a wide and clearly demarcated footpath as a basic right, but recommends to the government to implement the fundamental right through a statutory law.

- **Key Terms and Explanations**
- **Tragedy of the Commons**
 - This economic concept describes a situation where individual users, acting independently according to their own self-interest, deplete or spoil a shared resource through collective uncoordinated action. In urban landscapes, footpaths act as this shared resource. When shopkeepers extend their displays, motorists use them for parking, and authorities install poorly placed utility boxes, the common walking space is destroyed for everyone.
- **Public Trust Doctrine**
 - This legal principle establishes that certain natural and material resources are preserved for public use, and that the government holds them in a permanent trust for the benefit of the general community. Under this doctrine, local municipal bodies cannot treat footpaths as residual commercial land to be leased out or ignored; they are legally bound to protect them as essential community infrastructure.
- **Article 39(b) of the Constitution**
 - A vital Directive Principle of State Policy (DPSP) which mandates that the ownership and control of the material resources of the community must be distributed in a way that best subserves the common good. Urban land and walkways are classic examples of these material resources. This constitutional mandate dictates that public spaces cannot be monopolized by private vehicular interests at the cost of the pedestrian majority.
- **Motorized Class Monopoly**
 - This term highlights the systemic urban design bias where public infrastructure spending and spatial allocation are overwhelmingly skewed in favor of personal motor vehicles (cars and bikes). An example of this is when municipal corporations narrow existing pavements to add extra driving lanes, effectively pricing out and endangering non-motorized transport users.
- **Non-Motorized Transport (NMT)**
 - A comprehensive category encompassing all forms of human-powered mobility, primarily walking and cycling. In the hierarchy of sustainable urban transit, NMT sits at the very apex, acting as the greenest, most equitable, and healthiest mode of short-distance commuting.
- **Main Arguments and Substantive Parts**
- **Beyond Accident Prevention: An Independent Identity**
 - The judicial discourse surrounding urban infrastructure has long suffered from a narrow focus on safety. Walkways are not mere safety buffers designed to prevent the marginalized segments of society from being run over by speeding vehicular traffic. Instead, broad and well-demarcated footpaths possess an independent civilizational identity. They serve as a primary indicator of a society's advancement and its structural respect for the basic freedom of human movement.
- **The Right to Walk as a Priority**
 - A key argument centers on the established legal hierarchy of public spaces: the fundamental right of a citizen to walk on a comfortable, uninterrupted, and safe footpath holds absolute priority over the movement of motor vehicles.
- **The Failure of Existing Frameworks**
 - The statutory landscape has historically been tilted against the pedestrian. Legislations such as the Motor Vehicles Act of 1988 have structurally prioritized speed and vehicular throughput, inadvertently undermining the rights of non-motorized commuters. This systemic neglect has turned the degradation of footpaths into a profound civilizational problem, transforming what should be a safe public resource into a scarce commodity riddled with garbage, structural encroachments, and unmonitored commercial trade.
- **The Case for a Statutory Law and a Dedicated Regulator**
 - Declaring the "Right to Walk" as a fundamental right under Article 21 is meaningless without institutional implementation. There is a compelling structural necessity for a dedicated statutory law coupled with an independent regulatory body, similar to how the Right to Education (RTE) Act utilizes the National Commission for Protection of Child Rights (NCPCR). A specialized pedestrian regulator is vital to plan infrastructure, enforce standards, and provide an accessible grievance redressal mechanism for the public.

- **Historical Evolution of the Issue**
- **Pre-Independence: Walking as Democratic Expression**
 - During the anti-colonial struggle, the act of walking was transformed into a powerful instrument of political resistance and democratic expression. Iconic milestones like Mahatma Gandhi's Dandi March in 1930 and various regional padayatras established walking not just as a mode of travel, but as a profound equalizer that bridged deep-seated socio-economic divides. Public paths were the literal and figurative arenas of political reclamation.
- **Post-Independence to the 1980s: The Car-Centric Shift**
 - As India entered the era of planned industrialization and urbanization, cities began expanding rapidly. However, urban planning models were heavily influenced by Western, car-centric ideals. The passage of the Motor Vehicles Act in 1988 formalized this paradigm, dedicating legislative energy and public funds toward smoothing the path for wheels, while systematically ignoring the basic spatial requirements of feet.
- **The 1990s to 2010s: Municipal Indifference and Judicial Interventions**
 - With the post-liberalization boom, the explosion of private vehicular ownership triggered severe urban congestion. Footpaths became the first casualties, routinely sliced away to widen roads or overrun by chaotic commercial operations. While various High Courts occasionally stepped in during the 2000s to address hawker evictions and pavement safety, these interventions were treated as isolated civic management or law-and-order issues rather than systemic rights violations.
- **The Present Era: Evolution of Rights-Based Urbanism**
 - The contemporary legal paradigm marks a shift toward rights-based urbanism. In line with rulings like *Maniyar Iliyaz @ Shaik Riyaz versus P. Ayyappan*, the judiciary has elevated pedestrian rights from basic municipal duties to core constitutional entitlements. The modern evolution recognizes that the preservation of the urban commons requires a structured legal framework, pushing the state to shift its focus from building vehicle-friendly smart cities to human-centric, walkable urban centers.
- **Way Forward**
- **Enactment of a Comprehensive Pedestrian Rights Act**
 - The Union and State legislatures should draft a dedicated "Right to Walk and Pedestrian Infrastructure Act." This statutory framework must clearly outline the minimum mandatory dimensions, safety standards, and continuity requirements for footpaths across all urban categories, transforming a constitutional ideal into enforceable law.
- **Establishment of an Independent Pedestrian Regulatory Authority**
 - Mirroring successful regulatory frameworks like the RTE's connection to the NCPCR, states should establish an independent urban transit and pedestrian ombudsman. This body must be equipped with the statutory teeth to penalize municipal corporations for maintenance failures, audit urban spaces, and directly address pedestrian grievances.
- **Institutionalizing Pedestrian-First Design Guidelines**
 - Urban renewal missions, such as AMRUT and the Smart Cities Mission, must make funding conditional on the adoption of non-motorized transport metrics. Footpaths must be designed as continuous, obstruction-free corridors with mandatory features like subterranean utility ducts, tactile paving for the visually impaired, and physical barriers that prevent vehicular parking while maintaining accessibility.
- **Participatory Spatial Planning and Street Vendor Integration**
 - Rather than pursuing counterproductive eviction drives that harm the informal economy, municipal bodies should adopt participatory urban design. By actively involving resident welfare associations, urban planners, and street vendor unions, cities can map and allocate specific multi-use zones on wide pavements. This approach preserves pedestrian flow while avoiding the chaotic degradation seen in unregulated urban commons.

DECODING THE 'RIGHT TO WALK' & THE FATE OF URBAN FOOTPATHS

A Comprehensive UPSC/PSC CSE Preparation Note

PANEL 1: THE CHALLENGE: 'TRAGEDY OF THE COMMONS' IN CITIES



MOTORIZED CLASS MONOPOLY

Cars monopolizing space and not they normally transgress to of road



SYSTEMIC NEGLECT: FOOTPATHS AS residual spaces

Footpaths is police motorcycles (<IMAGE 1>)



DUTY-BEARER FAILURES

- Failures to duty mized space monopoly.
- Duty-bearers monopolizing space and unions
- Duty-bearer failures to father and langer or vast road



PANEL 2: THE NEW LEGAL DOCTRINE: FOOTPATHS AS CIVIC IDENTITY



PRIORITY OVER VEHICLES

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IDENTITY BEYOND SAFETY

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PUBLIC TRUST DOCTRINE & ARTICLE 39(b)

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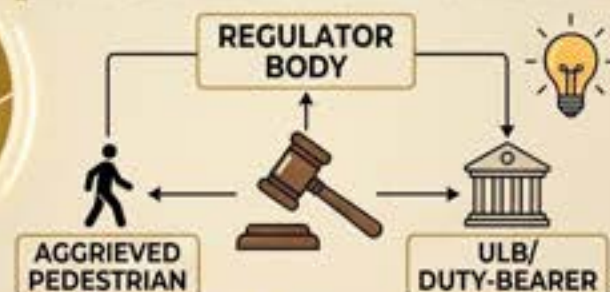
PANEL 3: THE WAY FORWARD: STATUTORY LAW & REGULATOR



NEED FOR A STATUTE (LIKE RTE ACT)

Law had its a law dutcomso law book, and like RTE ACT

[PROPOSED REGULATORY ARCHITECTURE]



[PLAN, ENFORCE, REDRESS GRIEVANCES]

EQUITABLE ACCESS

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CIVIL ADVANCEMENT

Footpaths are ncoverlained proessment evilability and cilivaful advancement



Biochar offers a way to turn India's farm smoke into 'black gold'

When added to poor, degraded soils, biochar can increase their ability to store water and stimulate the growth of beneficial microbes, studies have indicated that it can improve crop productivity by 30% to 30% and water-holding capacity by 30% to 25%, particularly in soils low in nutrients

Vinaya Kumar R.M.,
Vikram Paul

India's agriculture faces a serious paradox: a large amount of biomass that could improve soil health is instead being burned. This threatens soil health and food security. Punjab and Haryana alone burn more than 20 million tonnes of paddy straw in their open fields every year. This is due to the short post-harvest periods and a lack of practical alternatives.

Burning these residues creates large quantities of greenhouse gases and fine particles into the air and soil, causing serious air pollution in the region as well as a major loss of organic matter that could otherwise be returned to the increasingly depleted soils.

At the same time, large tracts of agricultural land, from the black soils of Maharashtra to the red soils of Kerala, suffer from very low soil organic carbon, poor water-holding capacity, and rapid loss of nutrients, reducing crop productivity even with better seeds and irrigation.

Both these problems are symptoms of the same larger failure to recycle natural resources efficiently.

Value to agriculture

This is where biochar emerges as a carbon-negative solution. Biochar is made by heating agricultural waste in low-oxygen conditions. What remains is a carbon-rich material that breaks down very slowly in the soil, helping to keep carbon locked away for long periods of time. The benefits extend well beyond carbon capture. Biochar is highly porous and contributes to aggregating soil particles, holding water, and creating a suitable environment for microorganisms.

Given these properties, the value of biochar to agriculture should be obvious. When added to poor, degraded soils, it can increase their ability to store water and stimulate the growth of beneficial microbes.

Studies have indicated that it can improve crop productivity by 30% to 30% and water-holding capacity by 30% to 25%, particularly in soils low in nutrients.

Biochar derived from waste stalks and applied to black soils in Akola district of Maharashtra has improved soil organic carbon content and overall soil fertility in field trials. Research from Kerala has shown that biochar made from coconut leaf stalks increased soil quality in different cropping systems, emphasising the need to use local resources effectively. Perhaps most significantly, long-term studies have shown that biochar has the benefit of reducing soil health and maintaining higher crop output over time.

Water retention

This approach also supports India's wider vision of sustainable agriculture and climate resilience. As droughts,



Biochar remains ready to be applied to soil. Biochar is made by heating agricultural waste in low oxygen conditions. What remains is a carbon-rich material that breaks down very slowly in the soil, sequestering CO₂.

floodwaters, and erratic rainfall become more frequent and more intense, improving soil health will be crucial to sustaining agricultural production.

By increasing the water holding capacity and the ability to use nutrients efficiently, then, biochar can help crops withstand seasonal stress while reducing dependency on external inputs. This is particularly important for small and marginal farmers, who are often the most exposed to the climate's vagaries.

Integrating biochar into the existing practices on natural farming, soil health management, and carbon farming can deliver environmental and economic benefits at scale. Yet in India, biochar remains largely confined to research trials and pilot projects, and is very much alien to many farmers.

In fact, agricultural residues are generally seen only as a problem of disposal. But they are an important resource that can generate additional income, create jobs, can deliver environmental benefits, and could even support payments for ecosystem services.

Carbon credits

As one way forward, the government could package the activities of burning agricultural waste into biochar and putting it on soil into carbon credit markets, creating a strong economic incentive for mass adoption.

Biochar carbon already passes rigorous stability criteria for long-term sequestration, and it can be classified as a permanent carbon dioxide removal technology under international accepted accounting standards. For

Biochar is highly porous and contributes to aggregating soil particles, holding water, and creating a suitable environment for microorganisms

instance, VMOG agricultural land management methodology quantifies both avoided emissions from residue burning and long-term carbon sequestration in soils. In this protocol, each tonne of certified biochar can generate 2.2 t of carbon dioxide equivalent in carbon credits. Depending on carbon market prices, certified biochar can thus provide an additional source of income for project developers, farmers, and cooperatives.

This approach is already being tested in projects such as those using the USAN lab from IIT Kharagpur, which allows smallholders to monetise farm waste.

Several international examples also illustrate the scalability of biochar systems. In Kenya, turning rice husks into biochar has produced thousands of certified carbon credits and improved soil pH and phosphorus content. Thailand has pushed biochar use through national initiatives on soil rehabilitation and carbon management, and soil certification to access to the national carbon-trading system, providing a policy-to-market pipeline. High carbon retention and large yield gains have also been reported from Kenya's Endropia Initiative after using on-farm biochar generated from sugarcane bagasse. These examples also show that success

depends on integrated strategies that combine the most robust, appropriately scaled production technology with strong measurement, reporting, and verification systems.

Urban organic waste

The feedstock for biochar is also not limited to agricultural waste and can encompass urban organic waste as well. India generates around 12 million tonnes of municipal solid garbage per year and more than 50% of that is biodegradable sewage sludge and crop residues can also be converted into biochar.

Given its fit with the principles of the circular economy, as organic waste is diverted from landfills that produce methane and is converted to a useful product for agriculture, by systematically implementing these measures, India can turn its large waste streams into 'black gold', thus ensuring a more resilient agricultural future while making a meaningful contribution to global climate mitigation efforts.

Overall, the value of biomass can only be realised through an integrated ecosystem that catalyses innovation, entrepreneurship, market linkages, investment, and cost-effective access to biochar for farmers.

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THE GIST

Biochar is made by heating agricultural waste in low oxygen conditions.

Integrating biochar into the existing initiatives on natural farming, soil health management, and carbon farming can deliver environmental and economic benefits at scale.

As droughts, floodwaters, and erratic rainfall become more frequent and more intense, improving soil health will be crucial to sustaining agricultural productivity.

In India, however, biochar remains largely confined to research trials and pilot projects, and is very much alien to many farmers.

- **Key Terms and Explanations**

- **Biochar:** A stable, carbon-rich, charcoal-like substance obtained from the thermochemical conversion of biomass in an oxygen-depleted environment. Unlike raw organic matter that decomposes rapidly, it remains stable in the soil for centuries. **Pyrolysis:** The thermal decomposition of organic materials at elevated temperatures (typically between 300°C and 700°C) in the complete or near-complete absence of oxygen. This chemical process prevents combustion, ensuring that the carbon is retained in a solid form rather than escaping as greenhouse gases.
- **Soil Organic Carbon (SOC):** The measurable carbon component of soil organic matter, comprising decomposing plant and animal residues. It is the bedrock of soil fertility, dictating structure, moisture retention, and biological activity. High SOC means healthy, resilient soil.
- **Carbon Farming:** An agricultural framework that utilizes specific land management practices to increase the rate at which atmospheric carbon dioxide is captured and stored in the soil and vegetation. It treats carbon sequestration as a measurable crop or output that can be monetized.
- **Decentralized Pyrolysis Units:** Small-scale, localized thermochemical conversion systems installed close to the source of biomass generation (such as the KISAN kiln developed by IIT-Kharagpur mentioned in image.png). This model eliminates the prohibitive logistics and transport costs associated with moving bulky crop residues to a central factory.
- **Measurement, Reporting, and Verification (MRV):** A rigorous multi-step framework used to quantify greenhouse gas mitigation effects accurately. In carbon markets, an MRV protocol (such as the VM0042 methodology) proves that a specific amount of carbon has been permanently removed from the atmosphere, turning ecological actions into certified financial assets.
- **Circular Economy:** An economic model designed to eliminate waste through the continual use, recycling, and upcycling of resources. Converting urban municipal solid waste or rural stubble into agricultural inputs epitomizes this approach.

- **Main Arguments and Substantive Parts**

- The core discourse addresses a systemic paradox within Indian agriculture while presenting a technologically viable and market-incentivized path forward.

- **The Great Indian Agrarian Paradox**

- India's agricultural landscape is currently caught in a damaging contradiction. On one hand, northern states like Punjab and Haryana burn more than 20 million tonnes of paddy straw annually in open fields due to narrow post-harvest windows and a lack of viable alternatives, triggering severe regional air pollution. On the other hand, massive tracts of agricultural land across the nation—ranging from the black soils of Maharashtra to the red soils of Kerala—suffer from severely depleted Soil Organic Carbon, poor water retention, and accelerating nutrient exhaustion. The natural resources that could restore dying soils are literally going up in smoke.

- **The Multifunctional Intervention of Biochar**

- Pyrolyzing agricultural residues breaks this destructive cycle. When applied to degraded soils, biochar serves as a permanent physical matrix that improves crop productivity by 10% to 30% and enhances water-holding capacity by 10% to 25%, showing particular efficacy in nutrient-deficient regions. Field trials substantiate these claims: maize stalk biochar has demonstrably upgraded soil quality in Akola (Maharashtra), while coconut leaf stalk biochar has optimized diverse cropping systems in Kerala.

- **Monetization via Global Carbon Credit Frameworks**

- The transition from crop residue to soil amendment passes strict international carbon accounting standards. Biochar offers a highly persistent carbon dioxide removal technology. Under recognized frameworks like the VM0042 methodology, every single tonne of certified biochar can generate between 2 and 2.8 tonnes of carbon dioxide-equivalent (\$CO₂e\$) in carbon credits. This mechanism converts an environmental hazard into a direct, alternative stream of income for smallholders and rural cooperatives.

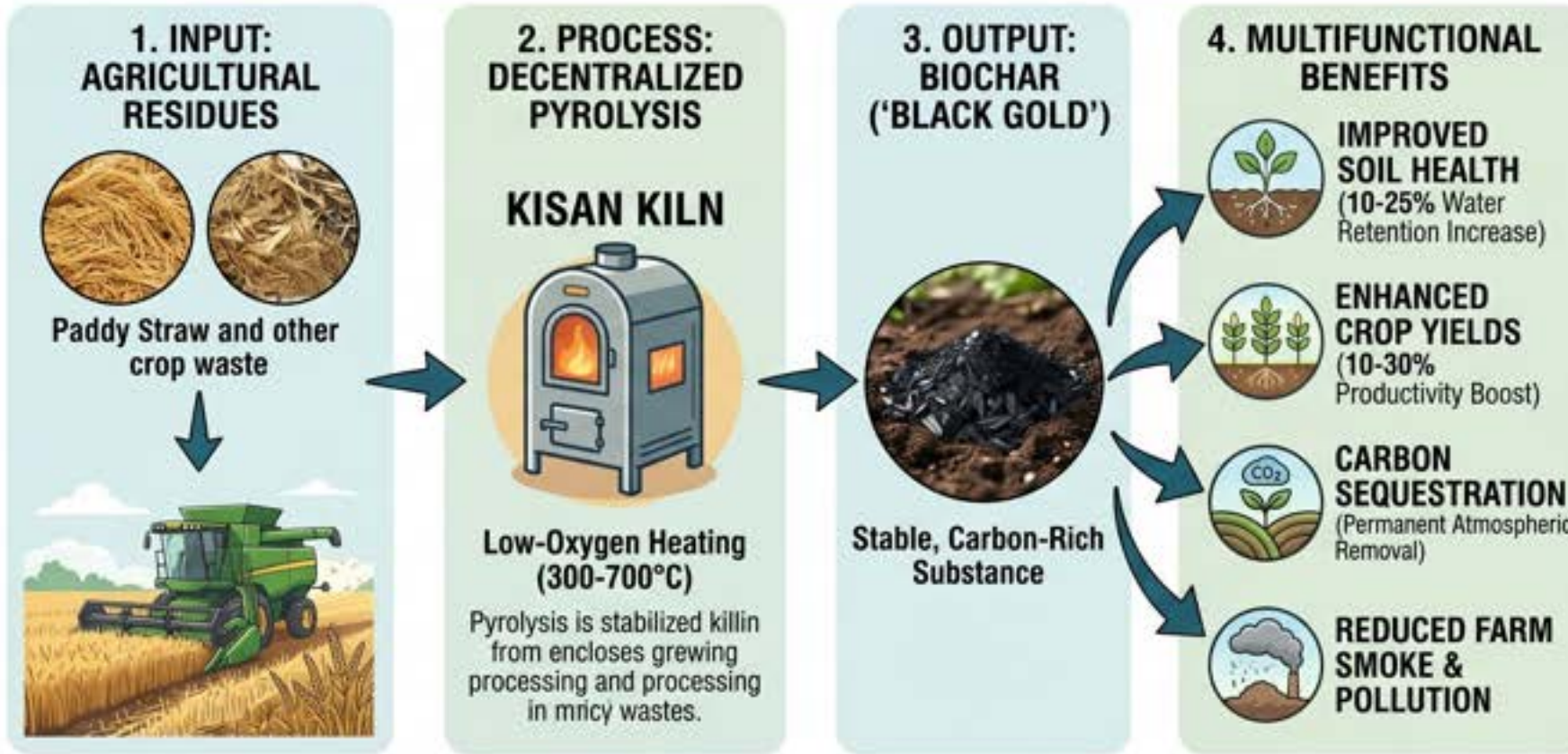
- **Scaling Bottlenecks and Structural Realities**

- Despite compelling evidence from pilot initiatives, the widespread adoption of biochar remains confined to isolated research trials. The strategy is still largely unfamiliar to the average Indian farmer. Overcoming this barrier requires an integrated approach that pairs decentralized, cost-effective pyrolysis hardware with accessible local supply chains and simplified, low-cost MRV systems tailored for smallholder farmers.

- **Historical Evolution of the Issue**
- **Pre-Independence & Traditional Eras (Pre-1960s):** Traditional Indian agriculture relied heavily on localized closed-loop systems. Crop residues were recycled as cattle fodder, thatch, or organic compost. Biomass burning was limited because low-intensity, diversified farming systems naturally returned organic matter to the soil, maintaining a baseline equilibrium of soil organic carbon.
- **The Green Revolution and Intensification (1960s–1980s):** The introduction of high-yielding crop varieties, combine harvesters, and intensive rice-wheat rotations altered the landscape. Combine harvesters leave behind tall stubble that is difficult to plow back manually. Combined with the short window between harvesting paddy and sowing wheat, open field burning became the fastest, cheapest option for farmers, while heavy chemical fertilizer subsidies masked falling natural soil fertility.
- **The Air Quality Crisis and Policy Interventions (2000s–2010s):** Dense winter smog over northern India turned stubble burning into a major public health and political issue. The government responded with regulatory bans, the establishment of the Commission for Air Quality Management (CAQM), and subsidies for in-situ machines (like Happy Seeders) and ex-situ biomass power generation. Concurrently, programs like the Soil Health Card Scheme (2015) highlighted the widespread depletion of organic carbon in Indian soils.
- **The Carbon Market and Circular Economy Phase (2020s–Present):** The conversation has expanded from simple pollution control to carbon sequestration and circular resource use. India's target of achieving Net Zero by 2070, along with the growth of global voluntary carbon markets, has brought biochar forward as a scalable solution. Efforts are now focused on processing both farm waste and urban organic refuse into biochar to meet climate and agricultural goals.
- **Way Forward**
- **Scaling Up Decentralized Pyrolysis Technology:** The government should support the production of low-cost, portable pyrolysis kilns (like the IIT-Kharagpur KISAN kiln) through schemes like the Mission for Integrated Development of Horticulture (MIDH) or Rashtriya Krishi Vikas Yojana (RKVY). Distributing these units to village clusters and Farmer Producer Organizations (FPOs) eliminates the need for expensive biomass transportation.
- **Building a Streamlined National Carbon Credit Framework:** The National Carbon Market (NCM) should establish a simplified, digital Measurement, Reporting, and Verification (MRV) process tailored for smallholders. This will allow small-scale farmers to easily aggregate their carbon savings and sell certified credits without getting bogged down in complex international administration.
- **Integrating Biochar into Existing Agricultural Programs:** Biochar should be formally included as an approved input under the Soil Health Card Scheme, the Paramparagat Krishi Vikas Yojana (PKVY), and the National Mission on Natural Farming. Providing initial subsidies or incentives for biochar application can help jumpstart adoption among traditional farmers.
- **Creating Urban-Rural Waste Links:** Municipal corporations and agricultural departments should collaborate to build urban organic waste processing hubs. Converting the biodegradable portion of India's annual 62 million tonnes of urban waste into biochar creates a reliable supply of soil amendments for nearby farming regions, fulfilling the goals of the circular economy.



THE BIOCHAR CYCLE: CROP WASTE TO RESOURCE



GLOBAL CARBON CREDIT FRAMEWORK (VM0042)



2 to 2.8 t CO2e Credits Generated Per Tonne of Biochar

Monetization for Farmers & Cooperatives

MULTIDIMENSIONAL IMPACT ANALYSIS

- Social:** Public Health Improvement
- Economic:** Doubling Farmer's Income, Rural Micro-Enterprises
- Political:** Reducing Inter-State Conflicts over Smoke
- Legal:** Compliance with Air Quality & Waste Rules, like in APSC examples
- Ethical:** Intergenerational Climate Justice
- International:** Fulfilling NDCs, Global Capital Inflow

UPSC CSE / APSC CCE SYLLABUS MAPPING

- GS-2:** Govt Policies, Welfare Schemes
- GS-3:** Agriculture, Technology, Pollution, Disaster Management
- Essay:** Sustainable Development
- Ethics:** Public Value, Intergenerational Equity
- Optionals:** Geography, Agriculture

WAY FORWARD

1. DECENTRALIZED TECHNOLOGY ROLLOUT
2. STREAMLINED NATIONAL CARBON MARKET & MRV
3. INTEGRATION WITH NATIONAL NATURAL FARMING PROGRAMS
4. URBAN-RURAL WASTE LINKS for Circular Economy



Police begin collecting DNA records under 2022 law; over one lakh profiles generated

Vijaita Singh
NEW DELHI

The police in several States have started collecting DNA records, primarily from blood samples, of suspects arrested for heinous crimes. Along with DNA profiles, photographs, fingerprints, and iris scans, the government is creating a unique identification record of arrested persons and convicts that can be retained for up to 75 years.

Over the past five months, the DNA records of more than one lakh suspects have been stored in a central database operated by the National Crime Records Bureau (NCRB) under the Union Home Ministry.

The samples are being collected under the Criminal Procedure (Identification) Act (CrPI), a law passed in Parliament in 2022. More than 2,600 measurement collection units have been esta-



The biological samples can be matched with records to identify habitual offenders.

blished across the country, and the CrPI system is now available in police districts and prisons. It is also accessible to Central agencies such as the Central Bureau of Investigation, the National Investigation Agency, and the Narcotics Control Bureau.

The contours of the CrPI system were showcased on June 19 at an NCRB event presided over by Home Minister Amit Shah.

"The samples are at pre-

sent being collected by police in cases punishable by seven years. The DNA, mostly drawn from blood and in some cases saliva too, is then sent to a forensic laboratory, which generates a unique number. The NCRB preserves the code in its records. The sanctity of the samples depends on the police," an NCRB official said.

NAFIS

"CrPI Act, 2022 allows police and prison officers to take physical and biological samples of arrested and convicted individuals. To make these provisions effective, there was a need for a national platform that could integrate and make identification-related data useful across the country. In this direction, the NCRB launched the National Automated Fingerprint Identification System (NAFIS) in the year 2022, which fully automated the fingerprint matching process. Today, with more than 1.27 crore

fingerprint records, NAFIS has played a significant role in solving many old inter-State criminal cases," a presentation on the CrPI system said.

"Through CrPI, now all information related to identification, including face, iris, and biological samples is available in a national-level searchable database, making accurate and scientific identification possible within moments. Now, a photo obtained from a crime scene can be instantly matched with records across the country. CrPI functions as a unified system across the country, where every identification-based measurement is securely stored in a standardised system. As per standards, while taking photos, clarity of the eyes is ensured so that identification is not hindered despite any disguise or changes. CrPI ensures enrolment of face and iris measurements of arrested and convicted persons, and in special cas-

es, registration of biological samples as well. There is a provision to retain all these measurements securely for 75 years," it said.

According to the NCRB presentation, biological samples recovered from crime scenes can be directly matched with existing records, enabling the identification of habitual offenders through scientific methods.

Video analytics feature

The NCRB said the CrPI system also has an advanced video analytics feature through which investigating officers can upload CCTV footage to identify faces of suspicious persons and match them with the national database. "What earlier took hours of manual investigation is now possible in just a few minutes. This feature also simplifies and speeds up identification of interstate criminals, as their records can be matched instantly across the country," it said.

- **Key Terms and Explanations**
- **Criminal Procedure (Identification) Act, 2022 (CrPI):** This is the governing legislative framework that replaced the century-old Identification of Prisoners Act, 1920. It authorizes law enforcement agencies to collect modern biometric, biological, and behavioral measurements from convicts, arrested individuals, and detainees to enhance investigative efficiency.
- **National Crime Records Bureau (NCRB):** Operating under the Union Ministry of Home Affairs, this nodal agency is responsible for collecting, storing, processing, and analyzing crime data across India. In the context of biometric collection, it acts as the centralized repository and standard-setting authority for all criminal identification records.
- **National Automated Fingerprint Identification System (NAFIS):** A centralized, web-based database managed by the NCRB that assigns a unique National Fingerprint Number (NFN) to arrested individuals. It allows real-time, cross-jurisdictional fingerprint matching across police stations nationwide to track habitual and interstate offenders.
- **DNA Profiling:** A forensic technique that analyzes specific regions of an individual's DNA—often extracted from blood, saliva, or hair roots—to create a unique genetic identifier. Unlike medical DNA testing, forensic DNA profiling focuses on non-coding regions to establish identity rather than revealing predisposition to medical conditions.
- **Biometric vs. Biological Measurements:**
 - *Biometric measurements* refer to physical or behavioral characteristics used for automated recognition, such as iris scans, facial geometry, and fingerprints.
 - *Biological measurements* involve actual physical samples collected from the body, such as blood, semen, or saliva, which require laboratory analysis to generate data profiles.
- **Core Concepts and Systemic Arguments**
- The modern transition toward data-driven policing centers on a fundamental objective: replacing traditional, error-prone investigation methods with scientific, irrefutable forensic evidence. This evolution aims to optimize judicial processing and elevate conviction rates.
- **The Thesis of Scientific Modernization**
- The primary justification for expanding biometric databases is the optimization of the criminal justice system. By establishing standardized measurement collection units across police districts and prisons, investigators can bypass the delays associated with manual identification. The integration of centralized platforms allows central investigative agencies like the CBI, NIA, and NCB to share intelligence seamlessly, turning localized arrests into nationwide investigative breakthroughs.
- **Arguments Favoring the System**
- **Deterrence of Interstate Recidivism:** Habitual criminals frequently exploit jurisdictional blind spots by changing names or crossing state lines. A unified national database instantly links a suspect's biometric profile to their entire criminal history, regardless of geographic location.
- **Efficiency in Investigation:** Advanced capabilities, such as the video analytics features that match crime scene CCTV footage with central records, reduce the investigation timeline from months to minutes. This swift processing prevents the flight of suspects and optimizes police resources.
- **Objective Judicial Evidentiary Value:** Scientific evidence like DNA and iris scans significantly reduces reliance on eyewitness testimonies, which are notoriously susceptible to coercion, memory lapse, or systemic bias.

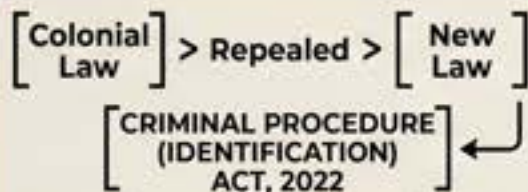
- **Historical Evolution of Forensic Identification in India**
- **The Colonial Foundation**
 - The journey began with the **Identification of Prisoners Act, 1920**, enacted by the British regime. This law was strictly limited in scope, permitting only the collection of fingerprints and footprint impressions from a narrow category of convicted or arrested persons. The underlying philosophy was rooted in colonial policing, which prioritized maintaining order over protecting individual privacy.
- **Post-Independence Stagnation and Judicial Prompts**
 - For decades, the 1920 framework remained unchanged despite rapid advancements in forensic science. In 1980, the **87th Report of the Law Commission of India** highlighted this widening gap, noting that the definition of "measurements" needed urgent expansion to include modern forensic tools. Throughout the 2000s, various iterations of a specialized DNA Profiling Bill were drafted, but they repeatedly stalled in Parliament due to growing concerns regarding biological privacy and potential misuse.
- **The Constitutional Turning Point and Contemporary Realignment**
 - The legal landscape changed completely with the landmark **K.S. Puttaswamy v. Union of India (2017)** judgment, which declared the Right to Privacy a fundamental right under Article 21. Any state intrusion was now bound by a strict three-pronged test: legality, necessity, and proportionality.
 - To address the limitations of the century-old law within this new constitutional reality, Parliament passed the **Criminal Procedure (Identification) Act, 2022**. This statute expanded the definition of measurements to include biological samples, iris scans, and behavioral traits, establishing the current operational framework for modern forensic data collection.
- **The Way Forward**
- **Refining the Legal and Proportionality Frameworks**
 - The state should adopt a tiered approach to data collection rather than a blanket model. True proportionality means that extensive biological samples, such as DNA profiling, should be reserved for individuals accused of serious or heinous crimes (e.g., offenses carrying punishments exceeding seven years, or crimes against women and children). For minor offenses or preventative detentions during civil demonstrations, data collection should be restricted to basic, non-intrusive biometrics.
- **Automated Expungement and Data Deletion Protocols**
 - To prevent the lifelong stigmatization of innocent citizens, the central database must include automated, algorithmic deletion systems. If an individual is fully acquitted by a court, or if a suspect is released without charge, the system should automatically purge their biometric and biological profiles. The burden of applying for data removal should not fall on the citizen; instead, the state's database should update automatically based on judicial records.
- **Strengthening Cybersecurity Infrastructure**
 - As shown by the systemic rollout of over one lakh profiles across multiple states, the database managed by the NCRB requires advanced security measures. The infrastructure should use a **Zero-Trust Architecture** featuring end-to-end encryption, strict access logs, and multi-factor authentication for logging into the database. Independent, third-party cyber audits should be conducted regularly to identify and patch system vulnerabilities before breaches occur.
- **Independent Oversight and Capacity Building**
 - An independent regulatory authority, led by a retired judicial officer and forensic experts, should be established to oversee the operations of NAFIS and NCRB data collection units. This body would review complaints regarding unauthorized data collection. Concurrently, regular training programs must be conducted for local police personnel to standardize collection methods. This ensures the physical "sanctity of samples" is maintained, preventing contamination and ensuring evidence remains valid in court.

COMPREHENSIVE ANALYSIS: POLICE DNA PROFILING UNDER THE CRIMINAL PROCEDURE (IDENTIFICATION) ACT, 2022



AXIA
IAS ACADEMY
RISE ABOVE THE REST

LEGISLATION & CONTEXT.



- Authorizes modern biometrics and biological sample collection (DNA, Iris, Face) from suspects & convicts.
- Changes as man connotation to biological sample collection & convicts.

2,600+
MEASUREMENT
COLLECTION
UNITS
established.

CORE SAMPLE PROCESS



SAMPLE
COLLECTION



ANALYSIS



UNIQUE DNA
PROFILE GENERATED



SENT TO NCRB
CENTRAL DATABASE

2,600+
MEASUREMENT
COLLECTION
UNITS
established.

KEY SYSTEMS & SCALE

NCRB



UNION HOME
MINISTRY
(MHA)

NAFIS

National Automated Fingerprint



1.27+ CR
FINGERPRINT
RECORDS

UNIQUE NATIONAL
FINGERPRINT
NUMBER (NFN)



OVER 1 LAKH
DNA PROFILES
GENERATED

FEATURES & TECHNOLOGIES.



FINGERPRINT



DNA



IRIS SCANS



FACIAL
MEASUREMENTS



PHOTOGRAPHS

RECORDS
RETAINED
FOR
75
YEARS

VIDEO ANALYTICS FEATURE

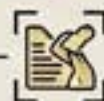


- Instant CCTV match to National Database
- Faster Inter-State identification

IMPACT & PURPOSE.



HABITUAL OFFENDERS
IDENTIFIED THROUGH
SCIENTIFIC METHODS



DIRECT MATCHING
OF CRIME SCENE
SAMPLES

KEY CONCERNS & REFORMS (Balanced View)

PRIVACY
CONCERNS &
DATA SECURITY

LONG RETENTION
PERIOD vs.
RIGHT TO BE
FORGOTTEN

UPSC CSE RELEVANCE.

GS 2

POLITY &
CONSTITUTION
(Right to Privacy -
Puttaswamy
Federalism)

GS 3

SCIENCE & TECHNOLOGY
(Forensic applications)
INTERNAL SECURITY
(Modern policing)

GS 4

ETHICS
(Bodily integrity
vs.
Public safety)



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'Maritime sector a major engine of economic growth'

Shiv Sahay Singh

KOLKATA

Prime Minister Narendra Modi on Sunday said no nation could emerge as a major power without strong maritime capabilities.

He was speaking at an event here after commissioning three indigenously-built naval ships – *INS Durgam*, an advanced stealth frigate; *INS Sanjivini*, a survey vessel (large); and the *INS Agra*, an anti-submarine warfare shallow watercraft.

Describing the event as a milestone in the journey towards "an *Aatmanirbhar Bharat*, a secure India, and a developed India", Mr. Modi said the government viewed the maritime sector not as an isolated industry but as a major engine of employment and economic growth. "The country whose maritime strength is robust, its economic and strategic influence will be equally ro-

bust. India is preparing itself for this," he said, asserting that India did not wish to be merely a buyer in the defence sector.

"The strength of the nation's military cannot be measured by its dependence on global markets but by its ability to become self-reliant. India seeks to become a producer and a manufacturer, because nations that manufacture become decisive players on the global stage," he said.

Highlighting recent achievements in indigenous shipbuilding capabilities of the country, the Prime Minister noted that more than 40 indigenously built warships and submarines have been inducted into the Indian Navy over the past few years.

Defence Minister Rajnath Singh said that the tri-commissioning of *INS Durgam*, *INS Agra*, and *INS Sanjivini* was going to be a "defining moment in India's maritime capability development".

- **Key Terms and Explanations**
- **Maritime Capabilities:** The collective strength of a nation's naval assets, coast guard, commercial shipping fleet, port infrastructure, and maritime surveillance systems. It determines a country's capacity to protect its trade routes and project power.
- **Atmanirbhar Bharat (Self-Reliant India):** A strategic macro-economic vision aimed at reducing import dependencies in critical sectors. In defense, this translates to designing, developing, and manufacturing military hardware domestically rather than relying on foreign suppliers.
- **Stealth Frigate:** A medium-sized, fast warship designed with advanced radar-evading technology. By shaping the ship's hull at specific angles and using radar-absorbent materials, its radar cross-section is minimized, making it difficult for enemies to detect.
- **Anti-Submarine Warfare (ASW) Shallow Watercraft:** Specialized naval vessels optimized to detect, track, and neutralize enemy submarines operating closer to the coast in shallow waters.
- **Survey Vessel (Large):** Advanced hydrographic platforms equipped with sonar and oceanographic tools to map the ocean floor, study underwater topography, and gather data essential for safe navigation and naval operations.
- **Blue Economy:** The sustainable utilization of ocean resources for economic growth, improved livelihoods, and jobs, while preserving the health of the ocean ecosystem. It encompasses shipping, fisheries, marine biotechnology, and deep-sea mining.

- **Main Arguments and Substantive Parts**
- The core thesis driving modern maritime discourse is that true global leadership is unattainable without structural dominance over the seas. Economic prosperity and strategic influence are directly proportional to a nation's naval self-reliance.
- **The Strategic Shift from Buyer to Producer**
- A nation's military strength cannot be measured by its access to international markets, but by its capacity to invent and manufacture domestically. Relying on global defense imports introduces strategic vulnerabilities during geopolitical crises. By transitioning into a manufacturer, a state establishes itself as a decisive player on the global stage.
- **The Maritime Sector as an Economic Multiplier**
- The maritime domain should never be viewed as an isolated security or defense industry. Instead, it functions as a primary engine of employment and industrial growth.
- **Industrial Linkages:** A single domestic shipbuilding contract feeds a vast ecosystem of MSMEs, steel manufacturers, electronics design firms, and heavy engineering sectors.
- **Job Creation:** Shipyards generate high-skilled engineering jobs and extensive blue-collar employment, translating defense capital expenditure into structural economic development.
- **Multifaceted Naval Modernization**
- The simultaneous development of distinct naval platforms—ranging from stealth combatants (*INS Dunagiri*) and coastal defenders (*INS Agray*) to scientific mapping vessels (*INS Sanshodhak*)—proves that a balanced navy requires multi-dimensional capabilities. Over 40 indigenously built warships and submarines inducted in recent years demonstrate a scalable, sustainable domestic manufacturing trajectory.

- **Historical Evolution of the Issue**
- **The Pre-Independence and Ancient Era:** India possessed a rich maritime tradition, exemplified by the Indus Valley maritime trade and the Chola Empire's naval expeditions across Southeast Asia. However, the subsequent neglect of naval defense allowed European colonial powers to exploit the seas, leading to subjugation.
- **Post-Independence Caution (1947–1960s):** Following independence, India's security focus was heavily land-centric, driven by immediate border conflicts with Pakistan and China. The Royal Indian Navy/Indian Navy received minimal budgetary allocations and was often perceived as a secondary coastal defense force.
- **The 1971 Watershed Moment:** The decisive success of the Indian Navy during the 1971 War—particularly the missile boat attacks on Karachi port (Operation Trident) and the deployment of *INS Vikrant*—shifted strategic thinking. It highlighted that sea control is vital to absolute victory.
- **The Geopolitical Re-awakening (1990s–2010s):** The rise of extra-regional powers in the Indian Ocean Region (IOR) and the emergence of non-traditional threats (like the 2008 Mumbai maritime terror attacks and piracy) forced a major doctrine shift. India transitioned from a "Brown Water Navy" (coastal) to a "Green and Blue Water Navy" (open ocean power projection).
- **The Present Era of Strategic Autonomy:** Today, the focus has completely converged on comprehensive indigenization. Milestones like the commissioning of the indigenous aircraft carrier *INS Vikrant*, alongside the induction of dozens of indigenously constructed advanced frigates and corvettes, mark India's transition into a self-reliant producer and a recognized "Net Security Provider" in the Indian Ocean Region.
- **Way Forward**
- **1. Fostering a Triple-Helix Innovation Model**
- India must strengthen collaboration between the Indian Navy, academia, and domestic private industries (especially tech start-ups and MSMEs). Moving from basic hull manufacturing to designing advanced onboard technology—such as specialized semiconductors, marine propulsion systems, and quantum communication tools—is essential.
- **2. Civil-Military Convergence in Maritime Infrastructure**
- The development of commercial shipyards should be synced with naval requirements under integrated frameworks like the **Sagarmala Project**. Dual-use port infrastructure ensures that civilian commercial ports can quickly adapt to provide logistics, repairs, and support to naval fleets during contingencies.
- **3. Scaling Defense Exports and Maritime Diplomacy**
- Transitioning from an importer to a manufacturer allows India to become a key exporter of security assets. Offering indigenously built patrol vessels, hydrographic survey ships, and anti-submarine systems to friendly littoral nations in East Africa, the Middle East, and Southeast Asia will strengthen partnerships under the **SAGAR (Security and Growth for All in the Region)** vision.
- **4. Streamlining Defense Procurement and Funding**
- Implementing long-term, non-lapsable defense modernization funds will protect capital-intensive shipbuilding programs from annual budget fluctuations. Streamlining the "Make in India" procurement process by cutting red tape will encourage greater private sector investment in heavy defense manufacturing.

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1. KEY TERMS & CONCEPTS



2. MAIN ARGUMENTS



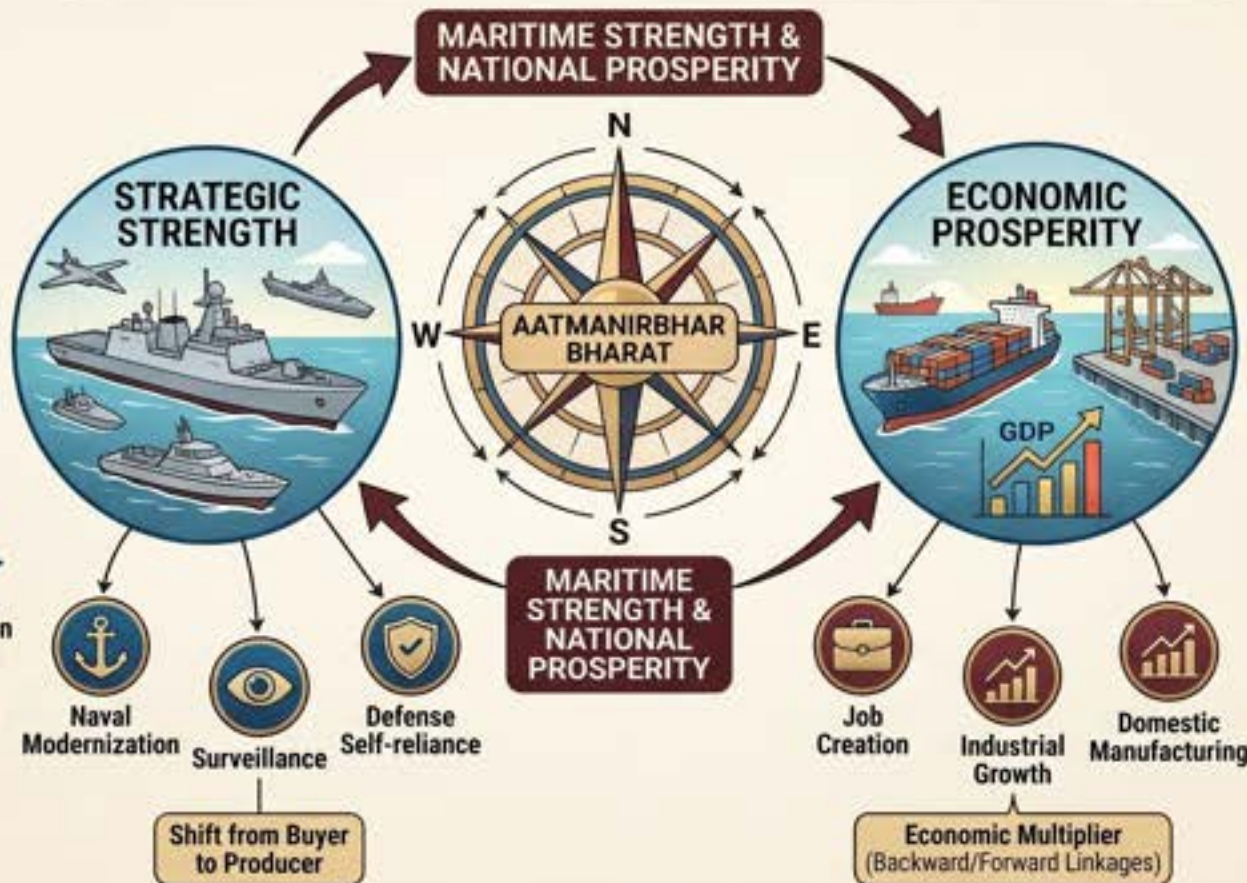
3. HISTORICAL EVOLUTION



4. LOGICAL & PHILOSOPHICAL BASE



MARITIME SECTOR: A MAJOR ENGINE OF ECONOMIC GROWTH



5. MULTIDIMENSIONAL ANALYSIS



6. LINKAGES WITH NCERTs



7. UPSC CSE SYLLABUS



8. WAY FORWARD





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