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# MAINS TOPIC

DEEP ANALYSIS

*for*

**IAS MAINS  
EXAMINATION**

From

**23<sup>rd</sup> to 28<sup>th</sup> Mar 2026**



# INDEX

|                                                            |           |
|------------------------------------------------------------|-----------|
| <b>1. GENERAL STUDIES 2</b>                                | <b>01</b> |
| 1.1. POLITY & GOVERNANCE                                   | 01        |
| 1.1.1. The North-South Socio-Economic and Political Divide | 01        |
| 1.2. SOCIAL JUSTICE                                        | 04        |
| 1.2.1. TUBERCULOSIS                                        | 04        |
| <b>2. GENERAL STUDIES 3</b>                                | <b>08</b> |
| 2.1. ECONOMY                                               | 08        |
| 2.1.1. Corporate Social Responsibility (CSR) in India      | 08        |
| 2.1.2. National Gas Grid                                   | 11        |
| 2.1.3. World Trade Organization (WTO)                      | 15        |
| 2.2. SCIENCE & TECHNOLOGY                                  | 18        |
| 2.2.1. India's Multi-Domain Deterrence                     | 18        |

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# GENERAL STUDIES 2

## 1.1. POLITY & GOVERNANCE

### 1.1.1. THE NORTH-SOUTH SOCIO-ECONOMIC AND POLITICAL DIVIDE

#### Context:

The looming **Census** and subsequent **Delimitation exercise** have brought the "existential fault-line" between the **Peninsular States** (South) and the **Great Indian Plain** (North/Hindi Heartland) into sharp focus.

#### Nature of the Asymmetry (North–South Divide)

- **Economic–Political Mismatch**
  - South generates higher **GDP & tax revenues** and contributes a disproportionately high share to the divisible tax pool.
  - North holds greater **political representation (population-based seats)**
- **Demographic Asymmetry**
  - North: High fertility, population growth
  - South: Low fertility, ageing. It has reached a "Replacement Level" of fertility, leading to a stabilizing (and eventually shrinking) population.
- **Human Development Gap**
  - South: Better **education, health, HDI** in states like Kerala and Tamil Nadu are on par with **upper-middle-income European or South American nations**.
  - North: Persistent deficits in **literacy, healthcare** in Bihar and Uttar Pradesh remain comparable to **sub-Saharan Africa**
- **Structural Divergence**
  - South: Diversified economy → **manufacturing + services + global integration**
  - North: Dominated by **low-productivity agriculture, Slower industrialisation and job creation**
- **Internal Inequality (Within South)**
  - Wealth is **concentrated in urban clusters** (e.g., Bengaluru, Hyderabad, Chennai)
  - A **"middle-income trap" tendency** — growth without deep social transformation. Issues of patriarchy, casteism, and weak rule of law persist.
  - High per capita income hasn't translated to high daily wages for laborers. (e.g., **TN per capita is 3x Bihar's, but agricultural wages aren't even 2x**).



## About Delimitation

### About:

Delimitation refers to the process of **redrawing or fixing the boundaries of electoral constituencies** for the Lok Sabha and State Legislative Assemblies so that each constituency represents an approximately equal population.

### Objective:

Its aim is to uphold the democratic principle of **“one person, one vote, one value”** by adjusting constituency boundaries in line with changing population patterns.

### Constitutional Mandate:

- **Article 82:** Requires Parliament to pass a Delimitation Act after every Census for **reallocation of Lok Sabha seats among States and readjustment of constituencies**.
- **Article 170:** Provides for similar **readjustment in State Legislative Assemblies**.

### Delimitation Commission:

- An **independent, high-powered body** constituted by the Central Government.
- Composition:
  - Chairperson: Sitting or retired Supreme Court judge
  - Chief Election Commissioner (or nominee)
  - State Election Commissioners of concerned States
- Key features:
  - Its decisions carry **legal force**
  - **Not subject to judicial challenge** (with limited exceptions)
  - Orders are placed before Parliament and State Legislatures but **cannot be altered**
- Constituted **four times**: 1952, 1963, 1973, and 2002.

### Freeze on Delimitation:

- **42nd Constitutional Amendment Act, 1976:**
  - Froze Lok Sabha seat allocation based on the **1971 Census**
  - Intended to avoid penalising States that implemented **population control measures**
- **84th Amendment Act, 2001:**
  - Extended this freeze until the **first Census after 2026**
- Although the **2002 Delimitation Commission** revised **internal constituency boundaries** (using 2001 Census),
  - **Inter-state seat distribution still relies on 1971 population data**

### Judicial Review:

- In the **Kishorchandra Chhanganlal Rathod Case (2024)**, the Supreme Court clarified that:
  - Delimitation Commission's orders can be **judicially reviewed only in exceptional cases**, Specifically when they are **arbitrary or violate constitutional principles**.

## The Delimitation Dilemma (Political Risk)

The core of India's existential crisis lies in the upcoming **redistribution of Lok Sabha seats** based on the next Census.

### 1. The Demographic Penalty

- **Success Punished:** Southern states proactively implemented population control. If seats are redistributed purely by current population, their parliamentary share will **fall dramatically**.
- **Reward for Failure:** Northern states with higher fertility rates will gain a **political windfall**, effectively increasing their dominance in the Union.

### 2. Wealth vs. Voice

- **Decoupling:** The region generating the most tax revenue (the South) will have its voice "muted" by the sheer demographic weight of the region that consumes it (the North).
- **The "Extractive" Friction:** This creates a perception of the South being an **extractive colony**—contributing wealth but losing the agency to influence national policy.

### 3. Historical Precedent of Failure

- **The USSR/Yugoslavia Warning:** The text notes these are the only historical examples where an **economically prosperous minority** was forced to subsidize a **politically dominant but impoverished majority**. Both entities eventually fractured.

### 4. Structural Integrity at Stake

- **From Squabble to Rupture:** Unlike routine debates over tax shares, this is an **existential fault-line**. Without a "grand bargain" or a fairer system like **Digressive Proportionality**, the trajectory suggests a potential rupture in the structural integrity of the Indian Union.

## Way Forward: A New Social Contract

To bridge the North-South fault-line, the discourse must move from regional rhetoric to a **structural "Grand Bargain."**

### 1. Political Reimagining

- **Adopt Digressive Proportionality:** Shift from "Strict Proportionality" (population-only) to a system that balances state equality. This prevents any single region from achieving hegemonic control.
- **Sober Dialogue:** Move beyond reactive regionalism to an intellectual, federal dialogue between New Delhi and State capitals.

### 2. Internal Reform in the South

- **Break the "Middle-Income Trap":** Focus on internal inclusivity rather than just aggregate GDP or "Unicorn" counts.
- **Social Transformation:** Address persistent "great unifiers" of the Indian experience—casteism, patriarchy, and misogyny—to translate economic wealth into social progress.
- **Human Capital:** Prioritize the literacy rates of the poorest districts (e.g., Dharmapuri) and the daily wages of agricultural laborers over elite-centric growth.

### 3. National Convergence Strategy

- **Beyond "Extractive" Growth:** Move from an extractive economic model to a social contract where prosperity is shared by the many, not just a narrow elite.
- **Migrant Integration:** Address the "internal outsider" status of North-to-South migrants. Create a cohesive social fabric where mobility leads to shared political and social stakes.
- **Institutional Strengthening:** Southern states must improve the rule of law and institutional quality to truly "pull" the rest of the country upward.

#### Conclusion

India's stability hinges on a **New Social Contract** that reconciles the Peninsula's economic dynamism with the Heartland's demographic weight. Through **digestive proportionality** and internal social reform, India can transform this existential fault-line into a resilient, decentralized, and truly unified power.

*Q. The proposed delimitation exercise after 2026 has the potential to reshape India's federal balance. Critically examine its implications for political representation, federalism, and regional equity.*

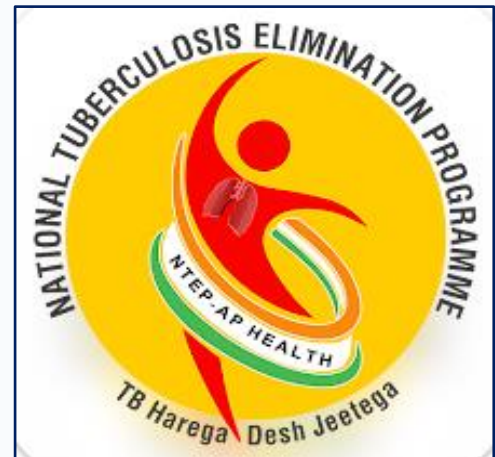
## 1.2. SOCIAL JUSTICE

### 1.2.1. TUBERCULOSIS

#### Context:

India aimed to eliminate TB by **2025**, five years ahead of the Sustainable Development Goal (SDG 3.3) target of 2030. While India recorded the **fastest global decline** in TB incidence (21% reduction since 2015), it missed the 2025 elimination target.

- **Current Burden:** India still accounts for **25% of global TB cases** and **32% of global Multi-Drug Resistant TB (MDR-TB)** cases.
- **Latest Theme (World TB Day 2026):** "Yes! We Can End TB!"



#### Tuberculosis (TB): Clinical Overview

- **Pathogen:** Mycobacterium tuberculosis (Bacterium).
- **Transmission:** Airborne (droplets from coughing/sneezing).
- **Classification:**
  - **Pulmonary TB:** Affects lungs (most common and contagious).
  - **Extrapulmonary TB:** Affects lymph nodes, bones, kidneys, or the brain (Meningitis).
  - **Latent TB:** Infected but not ill; cannot spread the disease (25% of the global population has latent TB).

## Key Government Initiatives for TB Elimination

1. **National Strategic Plan (NSP) 2017-2025:** A multi-pronged framework aiming to eliminate TB by **2025** (5 years ahead of the SDG 2030 target) through the pillars of **Detect, Treat, Prevent, and Build (DTPB)**.
2. **Nikshay Poshan Yojana (NPY):** A flagship **Direct Benefit Transfer (DBT)** scheme that provides **₹500–₹1,000 per month** to every notified TB patient for nutritional support throughout the duration of their treatment.
3. **Pradhan Mantri TB Mukh Bharat Abhiyaan:** A community-driven initiative that introduced **Nikshay Mitras**. It allows individuals, NGOs, and corporates to "adopt" TB patients and provide them with additional diagnostic, nutritional, and vocational support.
4. **Universal Drug Susceptibility Testing (U-DST):** A policy shift ensuring that every diagnosed TB patient is screened for drug resistance (using molecular tests like **CB-NAAT** or **TrueNat**) at the very start of treatment, rather than waiting for treatment failure.
5. **Introduction of BPALM Regimen:** As of 2024-2025, India has rolled out the **BPALM regimen** (Bedaquiline, Pretomanid, Linezolid, and Moxifloxacin), which reduces the treatment time for Multi-Drug Resistant TB (MDR-TB) from 20 months to just **6 months**.
6. **TB Mukh Panchayat Abhiyaan:** A decentralized "Jan Andolan" (People's Movement) that empowers **Panchayati Raj Institutions** to track cases, reduce stigma, and achieve "TB-Free" status at the village level through a certification and award system.

## Major Challenges in TB Elimination

- **Drug Resistance (MDR/XDR-TB):** India has the world's highest burden of Multi-Drug Resistant TB. Treatment is long, expensive, and often has severe side effects, leading to **patient non-compliance**.
- **The "Social Determinants" Gap: Undernutrition** remains the leading risk factor, responsible for nearly 40% of TB cases. Coupled with overcrowded housing and poor ventilation in urban slums, these socio-economic factors sustain the transmission cycle despite medical interventions.
- **Private Sector Fragmentation:** A significant portion of patients first seek care from private practitioners. Gaps in **mandatory notification**, inconsistent treatment protocols, and delayed referrals to the government system often lead to "missing cases" and improper treatment.
- **Latent TB Pool:** An estimated **350–400 million Indians** have Latent TB Infection (LTBI). These individuals are not sick but carry the bacteria; without massive scaling of **TB Preventive Treatment (TPT)**, this pool remains a "ticking time bomb" for future active cases.
- **Stigma and Delayed Diagnosis:** Deep-rooted social stigma leads to the concealment of symptoms, particularly among women and marginalized groups. This results in **delayed diagnosis**, increased community transmission, and higher mortality rates before treatment even begins.

## Global Achievements in TB Control: Comparative Analysis

| Region/<br>Country     | Key Achievement<br>(2015–2024)                                           | Primary Drivers & Strategies                                                                                                                                                                                                                                                                                |
|------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>African Region</b>  | <b>-46% Mortality</b> (Fastest global decline) & <b>-28% Incidence</b> . | <ul style="list-style-type: none"> <li>→ <b>HIV-TB Integration:</b> 90% co-infected patients on Antiretroviral Therapy (ART).</li> <li>→ <b>Fiscal Shift:</b> Transitioned from donor aid to national funding.</li> <li>→ <b>Community Outreach:</b> Massive deployment of rural health workers.</li> </ul> |
| <b>European Region</b> | <b>-39% Incidence</b> (Global leader in rate reduction).                 | <ul style="list-style-type: none"> <li>→ <b>Digital Health:</b> Whole Genome Sequencing &amp; video-based adherence tools.</li> <li>→ <b>Modern Regimens:</b> All-oral 6-month treatments.</li> <li>→ <b>Targeted Screening:</b> Focus on migrants, prisoners, and elderly.</li> </ul>                      |
| <b>China</b>           | <b>"Moderate-to-Low" Prevalence</b> status (WHO 2025).                   | <ul style="list-style-type: none"> <li>→ <b>Zero-TB Communities:</b> Mass screening + preventive treatment (TPT).</li> <li>→ <b>AI-Smart Screening:</b> 40% faster diagnosis using AI-chest X-rays.</li> <li>→ <b>Governance:</b> Three-tier network linking CDC, hospitals, and clinics.</li> </ul>        |

### Way Forward for TB Elimination

- **Scaling TB Preventive Treatment (TPT):** Transition from just treating active cases to aggressively managing **Latent TB**. Expanding TPT to all household contacts of pulmonary TB patients is critical to exhausting the reservoir of future cases.
- **Integrating "One Health" Approach:** Addressing TB not just as a respiratory disease but as a **comorbidity-linked crisis**. This involves mandatory screening for Diabetes, HIV, and tobacco use, which significantly increase the risk of treatment failure.
- **Strengthening Nutritional Security:** Moving beyond the ₹1,000 DBT to direct **food fortification** and high-protein ration kits for vulnerable families. Addressing undernutrition is the most effective "social vaccine" against TB.
- **Private-Public Mix (PPM) Optimization:** Universalizing the **"Patient Provider Support Agencies" (PPSA)** model to ensure that every patient treated in the private sector is notified, tracked, and provided with free government-funded molecular diagnostics and drugs.
- **R&D for an Adult Vaccine:** Since the 100-year-old BCG vaccine loses efficacy in adults, India must fast-track indigenous clinical trials for candidates like **VPM1002** or **MTBVAC** to provide long-term community immunity.
- **Community-Led Advocacy (Jan Andolan):** Leveraging the **Panchayati Raj Institutions** and "Nikshay Mitras" to de-stigmatize the disease. Transforming TB elimination from a medical program into a social movement is the only way to reach the "missing millions."

## Conclusion

To end TB by 2030, India must shift from a clinical approach to a **socio-technological movement**, leveraging **adult vaccines**, **AI-driven diagnostics**, and **nutritional sovereignty** to ensure a "TB-Mukt Bharat."

**Q.** "Evaluate the shift from 'Symptom-based' to 'Molecular-based' diagnostics in India's National TB Elimination Programme. How does this technological leap address the challenge of Multi-Drug Resistant TB (MDR-TB)?"

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## 2.1. ECONOMY

### 2.1.1. CORPORATE SOCIAL RESPONSIBILITY (CSR) IN INDIA

#### Introduction

Corporate Social Responsibility (CSR) refers to the idea that businesses should balance their profit-making activities with activities that benefit society. In India, CSR is not just a philanthropic act but a **legal mandate** under the Companies Act, 2013.



#### Statutory Framework: Section 135 of Companies Act, 2013

India was the first country in the world to make CSR mandatory for certain classes of companies.

- **Threshold for Applicability:** A company must spend on CSR if it meets any of these criteria in the preceding financial year:
  - **Net Worth:** ₹500 crore or more.
  - **Turnover:** ₹1,000 crore or more.
  - **Net Profit:** ₹5 crore or more.
- **Spending Requirement:** Eligible companies must spend at least **2% of their average net profits** made during the three immediately preceding financial years.
- **Governance:** Companies must constitute a **CSR Committee** of the Board (with at least one independent director) to formulate and monitor the CSR policy.

#### Key Areas of Corporate Social Responsibility (CSR) Activity

The diverse activities listed under **Schedule VII** of the Companies Act, 2013, can be strategically grouped into these **6 key pillars**:

##### 1. Human Capital & Social Welfare

- **Health & Nutrition:** Eradicating hunger, poverty, and malnutrition; promoting preventive healthcare and sanitation (including contribution to the *Swachh Bharat Kosh*).
- **Vulnerable Groups:** Setting up old age homes, day care centers, and hostels for women/orphans; measures for reducing inequalities faced by SCs, STs, OBCs, and minorities.

##### 2. Education & Skill Empowerment

- **Education:** Promoting literacy and special education.
- **Livelihood:** Employment-enhancing vocational skills, especially among children, women and the differently-abled to ensure economic self-reliance.

##### 3. Environmental Stewardship & Sustainability

- **Ecological Balance:** Protection of flora and fauna, animal welfare and agroforestry.
- **Resource Conservation:** Maintaining the quality of soil, air and water (including contributions to the *Clean Ganga Fund*).

#### 4. Heritage, Culture & National Identity

- **Cultural Preservation:** Protection and restoration of historical buildings, sites and works of art.
- **Promotion of Arts:** Development of traditional handicrafts and setting up public libraries.

#### 5. Research, Innovation & Sports

- **R&D:** Contributions to public-funded universities, IITs and national laboratories (DRDO, ICAR, CSIR) for research in science, technology and medicine.
- **Sports:** Training to promote rural, nationally recognized, Paralympic and Olympic sports.

#### 6. National Resilience & Relief Funds

- **Armed Forces:** Measures for the benefit of veterans, war widows and their dependents (including CAPF and CPMF families).
- **Disaster Management:** Relief, rehabilitation, and reconstruction activities; contributions to the **PM CARES Fund** or the PM National Relief Fund.

### Significance of Corporate Social Responsibility (CSR) in India

#### 1. Supplementing State Capacity

CSR acts as a vital bridge between public policy and private efficiency. It allows corporate capital, technology, and managerial expertise to reach developmental sectors (like health and education) that the state alone may struggle to fully fund or implement.

#### 2. Localization of SDGs

CSR activities are a primary vehicle for achieving the **UN Sustainable Development Goals (SDGs)** at the grassroots level. By investing in local sanitation, gender equality, and renewable energy, companies localize global targets into tangible Indian outcomes.

#### 3. Promoting Ethical Corporate Governance

The mandate pushes companies beyond a "profit-only" motive toward a "**Triple Bottom Line**" approach (People, Planet, Profit). It fosters transparency, accountability and a culture of social responsibility within the Indian corporate ecosystem.

#### 4. Human Capital Development

Through massive investments in vocational training and skill development, CSR helps address India's "**Skill Gap**." This creates a more employable workforce, directly supporting national initiatives like *Skill India* and *Atmanirbhar Bharat*.

#### 5. Strengthening Social Infrastructure

CSR funding has led to the creation of durable community assets such as schools, clinics and solar-powered irrigation particularly in rural areas, improving the overall quality of life and social stability.

#### 6. Environmental Stewardship

By mandating spending on ecological balance and resource conservation, CSR encourages industries to mitigate their carbon footprints. It promotes green technologies and helps India meet its **Nationally Determined Contributions (NDCs)** under the Paris Agreement.

## Challenges of Corporate Social Responsibility (CSR) in India

### 1. Geographic & Regional Imbalance

There is a severe concentration of CSR funds in industrialized states like **Maharashtra, Gujarat, and Karnataka**, while developmentally backward regions (including the North-East and several **Aspirational Districts**) remain neglected. This defeats the goal of "inclusive growth."

### 2. Sectoral Skewness

Corporate spending is heavily tilted toward **Education and Healthcare** (the "easy" sectors), while critical areas under Schedule VII such as the protection of national heritage, promotion of rural sports, and slum area development receive negligible funding.

### 3. Issues with Implementing Agencies (NGOs)

Many companies lack the internal expertise to execute projects and rely on NGOs. However, many local NGOs lack **professionalism, transparency, and the capacity** to handle large-scale corporate funds or provide the rigorous "Impact Assessment" now required by law.

### 4. "Greenwashing" & Superficial Compliance

Some companies treat CSR as a mere **compliance burden** or a PR exercise ("Greenwashing"). Instead of long-term sustainable transformation, they focus on "cheque book philanthropy" or one-off events that provide visibility without substantial social impact.

### 5. Lack of Community Participation

CSR projects are often designed using a **"Top-Down" approach** by corporate boards without adequately consulting the local communities. This leads to a lack of "local ownership," where the assets created (like toilets or libraries) often fall into disuse due to a lack of community involvement.

## Way Forward

### 1. Focus on Aspirational Districts

To correct the **geographic imbalance**, the government and corporates should prioritize projects in the **112 Aspirational Districts**. Incentivizing spending in North-Eastern and tribal states through tax benefits or "CSR credits" can ensure more inclusive regional development.

### 2. Transition from "Outlays" to "Outcomes"

Companies must move beyond merely reporting "money spent" to measuring **"social impact."** Mandatory **Third-Party Impact Assessments** and Social Audits should be standardized to ensure that assets created (like schools or clinics) are functional and delivering long-term benefits.

### 3. Promoting "Collective CSR"

Encouraging a **Consortium Model** where multiple companies pool their 2% funds for large-scale, high-impact infrastructure projects (e.g., massive water desalination plants or regional waste management units). This prevents "fragmented spending" on small, ineffective programs.

### 4. Convergence with Government Schemes

CSR initiatives should be strategically aligned with flagship national missions like **Gati Shakti (Infrastructure)**, **Poshan 2.0 (Nutrition)**, and the **Lighthouse Tourism** initiative. This creates a "Multiplier Effect," where private funds complement the scale of government machinery.

## 5. Strengthening NGO Capacity & Transparency

The government should develop a **National CSR Exchange Portal**—a digital marketplace that connects verified, high-performing NGOs with corporate donors. This would reduce "middleman" issues, improve transparency, and help smaller NGOs in rural areas access professional funding.

### Conclusion

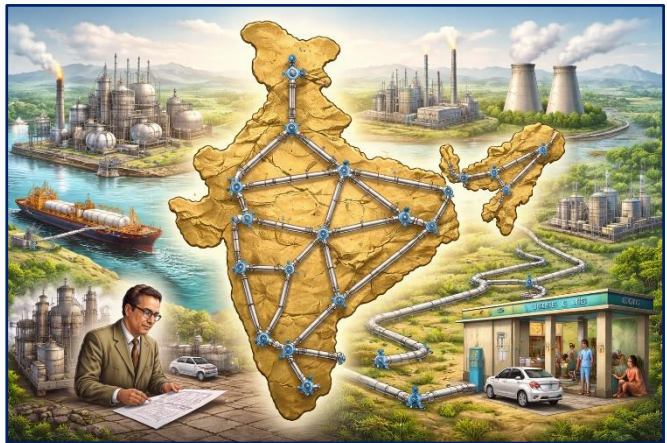
Corporate Social Responsibility (CSR) funds bridge the gap between profit and purpose. By investing in sustainable development, businesses drive measurable social impact, enhance brand reputation, and ensure long-term ethical growth.

*Q. With a consideration towards the strategy of inclusive growth, the new Companies Bill, 2013 has indirectly made CSR a mandatory obligation. Discuss the challenges expected in its implementation in right earnest. Also discuss other provisions in the Bill and their implications.*

## 2.1.2. NATIONAL GAS GRID

### Context:

West Asia conflict involving the **U.S., Israel, and Iran** effectively closed the **Strait of Hormuz**, disrupting 90% of India's LPG imports. Consequently, the government issued the **Natural Gas (Supply Regulation) Order, 2026**, prioritizing **PNG** and **fertilizers** to mitigate the severe national energy shortage.



### Background of National Gas Grid (NGG)

#### 1. Early Conceptual Origins (1950s–1970s)

The idea of a **National Gas Grid** in India dates back to **1955**, when Syed Husain Zaheer proposed a **nationwide gas pipeline network** based on **coal gasification**.

- He envisioned a **"Town Gas Supply Scheme"**:
  - Gas produced from coal
  - Transported through pipelines to cities and industries

#### 2. Vision & Goals

- **"One Nation, One Gas Grid"**: Integrating regional networks into a single national unit for equitable gas distribution.
- **Objective**: Increase the share of natural gas in the energy mix from **~6.7% to 15% by 2030**.

#### 3. Regulatory Framework

- **PNGRB Act, 2006**: Established the statutory board to regulate the downstream sector (transport, storage, and distribution).
- **Common Carrier Principle**: Mandates "open access" to pipelines, preventing infrastructure monopolies.

- **Unified Tariff (2023):** Replaced multiple additive fees with a single "One Nation, One Tariff" model, drastically lowering costs for consumers far from gas sources (e.g., NE India).

#### 4. Structural Evolution

- **Initial Phase:** Centered on the **HBJ (Hazira-Vijaipur-Jagdishpur)** pipeline, primarily serving Northern India's fertilizer and power sectors.
- **Regional Integration:**
  - **South:** Connection via the **Kochi-Mangaluru** pipeline.
  - **East: Pradhan Mantri Urja Ganga (JHBDPL)** connecting Bihar, Jharkhand, West Bengal, and Odisha.
  - **Northeast: Indradhanush Gas Grid (IGGL)** linking all eight NE states to the national network.

#### Need for the National Gas Grid

##### 1. Transition to a Gas-Based Economy

- **Target Alignment:** Essential to increase natural gas share in the energy mix from **~6.7% to 15% by 2030**.
- **Bridge Fuel:** Necessary to move away from "dirtier" fossil fuels (coal/oil) toward **Net Zero 2070** goals.

##### 2. Ending "Energy Poverty" (Regional Balance)

- **Geographical Equity:** Connects the "gas-starved" Eastern and North-Eastern regions to the supply-rich Western and Southern coasts.
- **Uniform Growth:** Ensures that industrial development is not restricted to coastal states with LNG terminals.

##### 3. Strategic Energy Security

- **Import Diversification:** Allows India to move gas from any port (West or East coast) to any inland demand center, crucial during maritime disruptions (e.g., **2026 West Asia crisis**).
- **Strategic Storage:** Required to link future **strategic gas reserves** to industrial and domestic hubs.

##### 4. Industrial & Agricultural Productivity

- **Fertilizer Subsidy Control:** Reliable gas supply to urea plants via the grid reduces the high cost of production and the government's subsidy burden.
- **Industrial Feedstock:** Vital for "Hard-to-Abate" sectors like Steel and Cement that require high-heat energy.

##### 5. Clean Urban Mobility & Cooking

- **Pollution Control:** Necessary to expand **City Gas Distribution (CGD)** networks, reducing urban smog by replacing diesel/petrol with CNG.
- **LPG Substitution:** Reduces the logistics and foreign exchange drain associated with importing and transporting LPG cylinders.

## 6. Future-Proofing (Hydrogen & Biogas)

- **Blending Hub:** The grid is the only viable infrastructure for the large-scale transport of **Green Hydrogen** and **Compressed Biogas (CBG)** from rural production centers to urban markets.

### Significance of the National Gas Grid

#### 1. Energy Security & Stability

- **Buffer Against Volatility:** Reduces reliance on a single fuel source (like coal or oil).
- **Supply Resilience:** Enables rapid diversion of gas to deficit regions during geopolitical crises (e.g., the **2026 West Asia supply crunch**).

#### 2. Economic Growth

- **Industrial Competitiveness:** Provides reliable, cheaper fuel to fertilizer, steel, and glass industries.
- **Cost Reduction:** The **Unified Tariff** makes gas affordable for industries far from coastal LNG terminals.

#### 3. Environmental Impact

- **"Bridge Fuel":** Emits **40% less CO<sub>2</sub>** than coal and nearly zero Particulate Matter (PM), aiding India's **Net Zero 2070** goal.
- **Decarbonization:** Facilitates the transition of heavy transport (trucks/buses) from diesel to **CNG**.

#### 4. Social & Infrastructure Benefits

- **Consumer Convenience:** Direct-to-kitchen **PNG** eliminates the logistics and safety risks of LPG cylinders.
- **Regional Development:** Connects under-developed regions (East and Northeast India) to the mainstream industrial economy.

#### 5. Strategic Integration

- **Multi-fuel Synergy:** Essential for injecting **Compressed Biogas (CBG)** and **Green Hydrogen** into existing pipelines, future-proofing India's energy infrastructure.

### Challenges to the National Gas Grid

#### 1. High Import Dependency

- India imports nearly **50% of its natural gas** as LNG. Global price volatility (spiked by the **2026 West Asia crisis**) makes gas expensive compared to domestic coal, leading to underutilization of gas-based power plants.

#### 2. Exclusion from GST

- Natural Gas remains outside the **Goods and Services Tax (GST)**. This leads to a cascading effect of taxes (VAT and Central Excise) across state borders, increasing the final cost for industries by **10-15%** compared to other fuels.

### 3. Land Acquisition & RoW Issues

- Securing the **Right of Way (RoW)** for laying pipelines is a major bottleneck. Legal disputes and compensation delays in densely populated states (like West Bengal and Kerala) often lead to significant project cost overruns.

### 4. Underutilized "Stranded" Assets

- Approximately **14.3 GW of gas-based power capacity** remains "stranded" or underutilized because the high cost of imported gas makes the electricity produced commercially unviable for Discoms.

### 5. Last-Mile Connectivity

- While the "trunk" pipelines (main arteries) are expanding, the **City Gas Distribution (CGD)** networks face "last-mile" hurdles in old, congested cities, delaying the transition of households to PNG.

### 6. Technical & Safety Risks

- Integrating **Green Hydrogen** and **Compressed Biogas (CBG)** into existing steel pipelines poses technical challenges like "hydrogen embrittlement" (weakening of metal), requiring expensive infrastructure upgrades.

## Government Initiatives

### 1. Infrastructure Projects

- **Pradhan Mantri Urja Ganga (PMUG):** Connecting the "gas-starved" East (UP, Bihar, Jharkhand, WB, Odisha). It revitalizes defunct fertilizer plants and supports the **Matix Fertilizer** plant in West Bengal.
- **North East Gas Grid (NEGG):** Implemented by **IGGL**, this 1,656 km pipeline aims for full commissioning by **March 31, 2026**, linking all eight North-Eastern states to the national grid.

### 2. Pricing & Tariff Reforms

- **Unified Pipeline Tariff (2023-2026):** A "One Nation, One Grid, One Tariff" model. It eliminates multiple transit fees, ensuring that a consumer in a remote area (like Agartala) pays a transport rate similar to one near a coastal terminal (like Dahej).
- **Kirit Parikh Committee Implementation:** Moving toward a market-linked pricing regime with a "floor" and "ceiling" price for domestic gas to protect both producers and consumers.

### 3. Bio-Fuel Integration

- **SATAT Initiative:** Promoting **Compressed Biogas (CBG)**. As of **2026**, the government has mandated a **CBG Blending Obligation (CBO)** for all City Gas Distribution (CGD) entities to reduce LNG imports.
- **National Green Hydrogen Mission:** Upgrading the grid to be "hydrogen-ready" for blending green hydrogen into existing natural gas pipelines.

### 4. Expanding Access

- **City Gas Distribution (CGD) Bidding:** The **12th CGD Bidding Round (2024-25)** has brought nearly **100% of India's map** under authorized gas coverage.

- **PM Ujjwala Yojana 2.0:** While focused on LPG, it acts as a precursor to PNG by building the "clean cooking" habit in rural India, with over **10.4 crore beneficiaries** by early 2026.

### Way Forward

1. **Fiscal Integration (GST):** Include natural gas under the **GST regime** to eliminate the cascading effect of varied state taxes (VAT/Entry tax). This will reduce industrial fuel costs by **10–15%** and create a truly unified national market.
2. **Creation of Strategic Gas Reserves:** Establish **Strategic Natural Gas Reserves** (similar to Strategic Petroleum Reserves) in salt caverns or depleted wells. This is critical to buffer against 30–60 day supply shocks caused by maritime chokepoints (e.g., **2026 Strait of Hormuz crisis**).
3. **Infrastructure "Teeth" (Legal Reform):** Enact a "**National Transmission Corridor Act**" to grant gas pipelines the same legal status as Highways or Railways. This would streamline **Right of Way (RoW)**, reduce land acquisition litigation, and prevent "project-stretch" in states like West Bengal.
4. **Independent Transmission System Operator (TSO):** Establish an **Independent TSO** to manage the grid. This ensures "neutral" third-party access to pipelines, separating the *transport* of gas from the *marketing* of gas, which encourages private investment and prevents monopolies.
5. **Future-Proofing with "Green Blending":** Mandate and subsidize the blending of **Compressed Biogas (CBG)** and **Green Hydrogen** into the existing grid. This reduces LNG import dependency and leverages the National Gas Grid as a "decarbonization highway."
6. **Demand Aggregation & Digital Twins:** Deploy **Real-time Data Monitoring (under the 2026 Information Order)** and "Digital Twins" of the grid. This allows for predictive maintenance and "Demand Aggregation" to negotiate better long-term LNG contracts with non-Gulf suppliers like the U.S. and Australia.

### Conclusion

The National Gas Grid is the strategic backbone of India's **Net Zero 2070** journey, evolving into a multi-fuel "Energy Highway" that seamlessly integrates natural gas, green hydrogen, and biogas.

*Q. "Examine the role of the National Gas Grid in enhancing India's energy security and regional equity. What are the major bottlenecks in its effective implementation?"*

### 2.1.3. WORLD TRADE ORGANIZATION (WTO)

#### Context:

The **14th Ministerial Conference (MC14)** of the WTO scheduled for **March 2026 in Yaoundé, Cameroon** is a critical focal point. It occurs at a time when the "rules-based" global order is being tested by "power-based" geopolitical rivalries (U.S. vs. China).



Established on **January 1, 1995**, via the **Marrakesh Agreement**, the WTO is the only international organization dealing with the global rules of trade between nations.

## Core Objectives of World Trade Organization (WTO)

- **Liberalization:** Reducing tariffs and non-tariff barriers.
- **Predictability:** Ensuring trade rules are stable and transparent.
- **Development:** Providing **Special & Differential Treatment (S&DT)** to developing and Least Developed Countries (LDCs).

## Foundational Principles

- **Most Favoured Nation (MFN):** Treating all members equally. A trade favor given to one must be given to all.
- **National Treatment:** Imported goods must be treated no less favorably than domestic goods once they enter the market.
- **Consensus-based Decision Making:** Every member has a "veto"; no decision is taken if any member present formally objects.

## Structure of the World Trade Organization (WTO)

The WTO is a member-driven organization with a hierarchical structure:

1. **Ministerial Conference (MC):** The supreme body; meets every 2 years. **MC14** is the 2026 session.
2. **General Council:** Handles day-to-day functions. It also convenes as the:
  - a. **Dispute Settlement Body (DSB):** To settle trade conflicts.
  - b. **Trade Policy Review Body (TPRB):** To audit members' trade policies.
3. **Specialized Councils:** Council for Trade in Goods (GATT), Services (GATS), and Intellectual Property (TRIPS).
4. **The Secretariat:** Headed by the **Director-General (DG)**

## Key Agreements of World Trade Organization (WTO) & Subsidy Boxes

### Major Agreements

- **GATT 1994:** Governance of trade in **goods**.
- **GATS:** Governance of trade in **services** (e.g., IT, banking, tourism).
- **TRIPS:** Standards for IP protection (Patents, Copyrights, GIs).
- **Agreement on Agriculture (AoA):** Aims to reform trade in the sector by cutting subsidies.

### The Subsidy "Boxes" (Agreement on Agriculture)

Subsidies are classified like traffic lights to denote their level of trade distortion:

| Box              | Nature                     | Impact & WTO Status                                                          | Examples                                                  |
|------------------|----------------------------|------------------------------------------------------------------------------|-----------------------------------------------------------|
| <b>Green Box</b> | Non-distorting             | <b>Permitted</b> without limits.                                             | Research, Environment protection, Food aid.               |
| <b>Amber Box</b> | Trade-distorting           | <b>Restricted.</b> De Minimis limits (5% for developed, 10% for developing). | <b>MSP (India)</b> , Input subsidies (Power, Fertilizer). |
| <b>Blue Box</b>  | Distorting with conditions | <b>Permitted.</b> Amber Box subsidies but with production limits.            | Direct payments based on fixed area/yield.                |

|                        |            |                                                   |                                                 |
|------------------------|------------|---------------------------------------------------|-------------------------------------------------|
| <b>Development Box</b> | S&DT focus | <b>Permitted.</b> Specific to developing nations. | Subsidies for low-income/resource-poor farmers. |
|------------------------|------------|---------------------------------------------------|-------------------------------------------------|

### MC14 Yaoundé: Key Issues of World Trade Organization (WTO)

MC14 is being labeled the "**Digital & Dispute**" conference.

- **Dispute Settlement Reform:** The U.S. continues to block appointments to the **Appellate Body**. Developing nations are pushing for a two-tier binding system to prevent "trade bullying."
- **E-commerce Moratorium:** The 1998 ban on customs duties for digital transmissions expires **March 31, 2026**. India and South Africa oppose a permanent extension to protect fiscal revenue.
- **Plurilateral vs. Multilateral:** The rise of **Joint Statement Initiatives (JSIs)** like the China-led **Investment Facilitation for Development (IFD)**. India argues these bypass the consensus rule and undermine the WTO's multilateral character.
- **Fisheries Subsidies:** Negotiations to ban subsidies that lead to overcapacity/overfishing. India demands a **25-year transition period** for its small-scale fishers.

### World Trade Organization (WTO) and India: Strategic Challenges

India's relationship with the WTO in 2026 is defined by a "defensive yet assertive" stance:

1. **Food Security:** India's breach of the 10% Amber Box cap for rice necessitates a **Permanent Solution for Public Stockholding (PSH)**. The temporary "Peace Clause" (2013) is insufficient due to strict notification norms.
2. **Digital Sovereignty:** India's refusal to join plurilateral digital trade deals to maintain its right to tax "Big Tech" and regulate data.
3. **Green Protectionism:** Opposing the EU's **CBAM (Carbon Border Adjustment Mechanism)** as a "disguised trade barrier" that penalizes Indian exports like steel.
4. **TRIPS Waiver:** Pushing for permanent waivers on COVID-19/Pandemic-related diagnostics and therapeutics to ensure global health equity.

### Way Forward

1. **Restoring the "Crown Jewel":** Prioritize the immediate **reinstatement of a two-tier binding Dispute Settlement Body**. Without a functional Appellate Body, the WTO risks becoming a "power-based" rather than a "rules-based" organization, leaving developing nations vulnerable to unilateral trade sanctions.
2. **Permanent Solution for Food Security:** Transition from the temporary "Peace Clause" to a **permanent legal solution for Public Stockholding (PSH)**. This is essential to provide India the policy space to run its MSP-based food procurement programs (like PMGKAY) without the constant threat of international litigation.
3. **Integrating Development into "Green Trade":** Address the rise of "Green Protectionism" (like the EU's **CBAM**) by ensuring that climate-related trade measures adhere to the principle of **Common But Differentiated Responsibilities (CBDR)**. Environmental goals should not become disguised barriers to exports from the Global South.

4. **Calibrated Digital Trade Governance:** Negotiate a "middle path" on the **E-commerce Moratorium**. While ensuring digital stability, the WTO must allow developing nations the flexibility to generate revenue through digital customs duties to fund their own domestic digital infrastructure and bridge the digital divide.
5. **Inclusive Multilateralism over Plurilateralism:** While **Joint Statement Initiatives (JSIs)** offer speed, they must not bypass the core **Consensus-based** model. Any new trade rules (on Investment or AI) must be inclusive and transparent, ensuring that the interests of Least Developed Countries (LDCs) are not sidelined by "club-based" agreements.

### Conclusion

The WTO must balance **reformed multilateralism** with **developmental equity**. Restoring the dispute body and finalizing a permanent solution for **food security** are vital to ensuring a fair, rules-based global order.

**Q.** *What are the key areas of reform if the WTO has to survive in the present context of 'Trade War', especially keeping in mind the interest of India? 15 Marks*

## 2.2. SCIENCE & TECHNOLOGY

### 2.2.1. INDIA'S MULTI-DOMAIN DETERRENCE

#### Context

The evolving security architecture in the Indo-Pacific, characterized by China's military "intelligentization," necessitates a paradigm shift in India's defense strategy. To deter the People's Liberation Army (PLA), India is transitioning from a platform-centric approach to a **Multi-Domain Operations (MDO)** framework.



#### What Is India's Multi-Domain Deterrence

##### 1. The Conceptual Core: "MITRA" & "ARADO"

India has adopted the **MITRA** framework (Multi-domain Integrated Technologically-empowered Resilient Armed Forces).

- **From MDO to ARADO:** The strategy is evolving from Multi-Domain Operations to **All Realm All Domain Operations (ARADO)**, focusing on "Intelligent Warfare."
- **Non-Nuclear Strategic Deterrence:** A key goal is to win at every level of escalation without necessarily crossing the nuclear threshold, using precision strikes and non-kinetic (cyber/electronic) vectors.

##### 2. The Structural Pillar: Integrated Theatre Commands (ITC)

The roadmap for **ITC India** is the most significant reform since independence, consolidating 17 single-service commands into three adversary-based theatres:

- **Northern Theatre Command (Lucknow):** Focused on the 3,488 km LAC with China.

- **Western Theatre Command (Jaipur):** Focused on Pakistan.
- **Maritime Theatre Command (Thiruvananthapuram):** Focused on the Indian Ocean and countering the "String of Pearls."

### 3. The Five Functional Domains

| Domain          | Strategic Focus                                     | Key Asset/Initiative                                              |
|-----------------|-----------------------------------------------------|-------------------------------------------------------------------|
| Space           | Persistent surveillance and satellite resilience.   | <b>Defence Space Agency (DSA)</b> and LEO constellations.         |
| Cyber           | Protecting C4ISR networks and offensive disruption. | <b>Defence Cyber Agency (DCA)</b> ; Tri-Service Common Data Link. |
| Electromagnetic | Deceiving and degrading adversary sensors.          | Indigenous <b>Electronic Warfare (EW)</b> suites like Sudarshan.  |
| Cognitive       | Information warfare and psychological operations.   | AI-driven battlefield analytics to counter "Grey Zone" tactics.   |
| Physical        | Precision long-range strikes and infrastructure.    | <b>Agni-V (Mission Divyastra)</b> and <b>BrahMos</b> integration. |

## India's Multi-Domain Deterrence: Strategy & Industrial Reform

### 1. Strategic Pillar: The Transition to ARADO

India has officially transitioned from Multi-Domain Operations (MDO) to **All Realm All Domain Operations (ARADO)**.

- **The "MITRA" Framework:** Standing for Multi-domain Integrated Technologically empowered Resilient Armed Forces, this doctrine focuses on **Intelligent Warfare**.
- **Six-Domain Integration:** Operations now synchronize across **Land, Sea, Air, Space, Cyber, and Cognitive** (Information/Psychological) realms.
- **Non-Nuclear Strategic Deterrence:** A focus on winning at every level of the escalation ladder using precision strikes and cyber vectors to avoid early nuclear triggers.

### 2. Structural Reform: Integrated Theatre Commands (ITC)

The roadmap to collapse 17 single-service commands into **3 Adversary-Based Theatres** is in its final implementation phase:

- **Northern Theatre (Lucknow):** Unified command for the entire 3,488 km LAC with China.
- **Western Theatre (Jaipur):** Integrated response for the Pakistan front.
- **Maritime Theatre (Thiruvananthapuram):** Securing the IOR and countering the "String of Pearls."

### 3. Industrial Reform: From "Make" to "Design"

The **Defence Acquisition Procedure (DAP)** and the "Year of Reforms" have fundamentally restructured the industrial base:

- **IP Ownership:** Under the new "Indian-IDDm" (Indigenously Designed, Developed and Manufactured) category, companies must own the **source code and circuit layouts** to qualify.

- **Civil-Military Fusion (CMF):** Deep integration of dual-use technologies (AI, 6G, Semiconductors) from the private sector into military C4ISR.
- **Budgetary Muscle:** The 2026-27 Defense Budget reached an all-time high of **₹7.85 lakh crore**, with a 20% increase in capital expenditure for modernization.
- **The "3 Lakh Crore" Goal:** India aims for ₹3 lakh crore in domestic production and ₹50,000 crore in exports by 2029.

#### 4. Tech-Enabling Layers

- **Tri-Service Common Data Link:** It creates a "Common Operating Picture" (COP) by fusing data from MQ-9B drones, GSAT-series satellites, and ground sensors.
- **Asymmetric Persistence:** Investing in "attritable" (cheap/disposable) ISR drone swarms to maintain visibility over the LAC despite Chinese electronic jamming.

#### The Core Challenge: Asymmetric Capabilities

1. **C4ISR Transparency:** China's "Intelligentized" warfare uses a dense network of satellites and AI to create a transparent battlefield. They can "see" Indian movements in real-time, while India struggles with intermittent surveillance gaps along the LAC.
2. **Missile & Rocket Elasticity:** The PLA Rocket Force (PLARF) possesses a massive inventory of short and medium-range precision missiles. China's industrial surge capacity allows it to replace these munitions faster than India can intercept them.
3. **The "Kill Web" vs. "Kill Chain":** China has moved to a decentralized "**Kill Web**" where any sensor can talk to any shooter. India is still transitioning from linear, service-specific "Kill Chains" that are slower and easier to disrupt.
4. **Non-Kinetic Dominance:** China leads in **Electronic Warfare (EW)** and **Cyber-capabilities**, aimed at "blinding and deafening" Indian command centers before a single bullet is fired, neutralizing India's legacy platforms (tanks/jets).
5. **Infrastructure & Logistics:** China's dual-use infrastructure (high-speed rail, airbases, and fiber-optics) on the Tibetan plateau allows for rapid troop mobilization, forcing India into a "reactive" rather than "proactive" posture.
6. **Grey Zone Superiority:** Using "Salami Slicing" and civilian militias (Little Blue Men), China creates territorial "faits accomplis" that stay below the threshold of full-scale war, making traditional Indian military deterrence less effective.
7. **Industrial Scale & Speed:** China's defense-industrial base functions at a "civil-military fusion" level, churning out advanced drones, Type 055 destroyers, and J-20 stealth jets at a pace India's current public-private setup cannot yet match.

#### Three Strategic Pathways for India

##### 1. The Bold Approach (High-Tech Leapfrog):

- **Focus:** Betting entirely on "disruptive" technologies (AI, autonomous drone swarms, quantum encryption).
- **Risk:** If implementation fails or the tech isn't battle-ready, it creates "capability holes" where legacy systems were abandoned too soon.
- **Goal:** To neutralize China's numerical advantage through technological superiority.

## 2. The Conservative Strategy (Incremental Integration):

- **Focus:** Enhancing existing "legacy" platforms (tanks, Su-30 jets) with modern sensors, cyber, and electronic warfare suites.
- **Risk:** While "doable," it likely won't alter the balance of power; it is better suited for short conflicts (e.g., Pakistan) than a protracted war with China.
- **Goal:** To make the current force more effective and "digitized" without radical structural overhaul.

## 3. The Middle Path (Syncretic Multi-Domain):

- **Focus:** Maintaining reliable legacy platforms while investing heavily in "Enabling Layers" (C4ISR, deep-strike missiles, and robust logistics).
- **Risk:** Requires high-level political will and "doctrinal convergence" across all three military services to work as one.
- **Goal:** To evolve into a multi-domain force where the *system* is stronger than the individual platforms.

## Way Forward

1. **Theatre Commands (Final Implementation):** Collapsing 17 legacy commands into **3 Integrated Theatres** (Northern, Western, Maritime) by May 2026. This shifts India from "Service-Specific" silos to a unified, "All-Realm" command for faster decision-making.
2. **DAP 2026 & IP Ownership:** Transitioning from "Make in India" to "**Design in India.**" The *Indian-IDDM* category now mandates Intellectual Property (IP) ownership, allowing India to modify and "patch" weapon systems without foreign OEM dependence.
3. **Integrated Rocket Force (IRF):** Rapidly operationalizing a conventional deep-strike layer using **Pralay** (ballistic) and **Nirbhay** (cruise) missiles. This creates a non-nuclear deterrent to offset China's massive missile inventory.
4. **Startup-to-Soldier (iDEX/ADITI):** Leveraging the private sector to build "attributable" (low-cost/disposable) tech. The focus is on **AI-driven drone swarms** and **AUVs** for persistent surveillance and asymmetric response.
5. **Space & Cyber Resilience:** Implementing the **2026 Space Cyber Security Guidelines** to harden satellite communications (SATCOM) and C4ISR networks. This ensures the "nervous system" of the military remains functional even under heavy electronic or cyber-attack.

## Conclusion

India's Multi-Domain Deterrence necessitates a shift from platform-centric to **data-driven warfare**. Success requires synchronizing Integrated Theatre Commands with a robust, private-sector-led industrial base to offset China's technological advantage effectively.

*Q. In light of the growing structural security challenges posed by China, **discuss** the role of a robust domestic defence-industrial base in ensuring strategic autonomy. To what extent can the integration of 'enabling layers' strengthen India's 'Deterrence-by-Denial' strategy along the LAC?*

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