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Mains Marathon

2nd Week November, 2025

HISTORY
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SCIENCE AND TECHNOLOGY
GEOGRAPHY AND ENVIRONMENT

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Examine the need for India's nutritional transformation leveraging smart proteins and functional foods. Critically analyze the policy and public perception challenges in expanding this ecosystem.

Introduction

According to NFHS-5, **35.5% of children are stunted** and **57% of women are anaemic**, signalling a shift from mere food security to nutritional security. Functional foods and smart proteins offer sustainable nutrition aligned with SDG-2.

Why does India need a nutritional transformation?

1.   The existing food system is cereal-centric due to MSP support for wheat and rice, leading to **hidden hunger**, low-quality diets, and high lifestyle disorders (obesity, diabetes).

2.   Thus, India needs a **nutritional paradigm shift**, not in calories, but in quality of diet.

3.   Despite being the world's largest producer of milk, pulses, and coarse grains, India is a **"protein-deficient" and micronutrient deficient nation**:

Indicator	Data
Child stunting (NFHS-5)	**35.5%**
Anaemia among women (NFHS-5)	**57%**
Average Indian protein intake (ICMR-NIN, 2020)	**<60% of recommended daily intake**

What are functional foods and smart proteins?

Category	Key features	Examples
Functional foods	Foods enriched with micronutrients to enhance health and reduce disease risk	Zinc-rich rice (IIRR), Iron-rich pearl millet (ICRISAT), Vitamin-fortified salt
Smart proteins	Protein alternatives produced via biotechnology, reducing reliance on livestock	Plant-based meat (GoodDot), Fermentation-based proteins, Cultivated chicken

1.   Functional foods use **biofortification, 3D printing, nutrigenomics**, and **bioprocessing**.

2.   Smart proteins are aligned with **climate-smart agriculture**, addressing UN-FAO estimates that livestock contributes **14.5% of global emissions**.

3.   **Singapore (2020)** was the **first country to approve commercial sale of cultivated chicken**.

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India's ecosystem: Progress and opportunities

1. Functional foods and smart proteins are recognized under the **BioE3 (Biotechnology for Economy, Environment and Employment) policy**.
2. Government push through **DBT & BIRAC** funding.
3. In India (as of 2023): **377 alternative protein products** from **70 companies**, Startups: GoodDot, Blue Tribe Foods, Evo Foods, Zydus Lifesciences investing in precision fermentation and CCMB funded ₹ **4.5 crore** for cultivated meat R&D.

4. **Economic Opportunities** as global plant-based protein market value by 2030: **$85 billion — UBS** and **$240 billion — Credit Suisse.**

5. India can become a **global smart protein manufacturing hub**.

Policy and regulatory challenges (critical analysis)

Challenge	Consequence
No FSSAI regulatory clarity for cultivated meat / fermentation proteins	Delays innovation, lowers investor confidence
Lack of infrastructure for precision fermentation	Import dependency
Regulatory overlap: DBT–FSSAI–MoFPI	Slows approvals

Food systems scholars warn of a potential "**corporate capture of food biotechnology**", concentrating profits in few companies. To avoid this, policies must ensure:

1. Standards for **labelling, traceability, allergen risk**
2. Farmer inclusion in **value chains** (e.g., legumes supply for plant protein)

Approaches to address skepticism:

1. **Managing public perception challenges like** "Lab-grown" nature creates **consumer distrust**, cultural/religious hesitations. Low awareness about environmental footprint of conventional livestock.
2. **Transparent communication** like Singapore's Food Agency did.
3. **Public trials, school nutritional programmes** featuring fortified foods.
4. Clear **front-of-pack labelling.**
5. Behavioral science shows that **taste, price, and familiarity** drive adoption more than environmental concerns.

Conclusion

As **Amartya Sen emphasizes in "Development as Freedom,"** true development expands choices. Functional foods and smart proteins expand India's dietary freedom, ensuring nutrition, sustainability, and food justice.

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Examine the institutional factors hindering India's scientific output of Nobel-calibre work. Critically analyze the necessity of systemic reforms in academic hiring and funding for genuine discovery.

Introduction

No Indian scientist working in India has won a science Nobel since **C.V. Raman in 1930**. India invests only **0.65% of GDP in R&D (UNESCO 2023)**, and systemic institutional flaws—not talent scarcity—limit breakthrough research.

Institutional barriers restricting breakthrough science

Barrier	Evidence / Impact
Opaque and patronage-based hiring	Faculty selection often prioritises connections, regional networks, conformity rather than merit. Young researchers struggle to secure positions despite strong global credentials.
Bureaucratic and hierarchical research culture	Scientists spend time on administrative permissions, procurement delays, and internal politics rather than ideation. ("temples of science turned into bureaucratic fortresses").
Output measured by quantity, not quality	Academia rewards number of papers → "publish or perish". Nobel laureates like **Peter Higgs** published few papers but challenged paradigms. Indian ecosystem punishes such risk-taking.
Lack of high-risk, long-term funding	Funding cycles are short-term and grant decisions depend on committees → discourages fundamental, curiosity-driven research. Nobel science often requires 15–30 years of uninterrupted pursuit.
Senior-dominated leadership structure	Director/Vice-Chancellor positions dominated by academic elites resistant to new ideas. No space for young visionary leadership.
Fragmented industry–academia collaboration	Countries like the U.S. and Israel have strong university-startup ecosystems (Stanford–Google; Technion–Intel), while India's linkage remains weak.

Result: **Incremental research, not disruptive discovery**.

Why money alone is not the solution?

1.   While increased funding is necessary, even a tenfold rise will fail unless **systems reward big ideas, not bureaucratic compliance**.

2.   Countries that produced recent Nobel laureates (Japan, South Korea, Israel) focused on:

- o   Meritocratic hiring
- o   Scientist-led institutions
- o   Competitive grants

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○ Academic freedom

3. India lacks in these all four metric.

Need for reforms in hiring and funding

1. **Transparent, merit-based hiring**: Open, global recruitment like **Max Planck Institutes (Germany)** and **Howard Hughes Medical Institute (HHMI)**. Evaluation based on originality and research vision, not number of publications.

2. **Shift from bureaucratic to scientist-led administration**: Devolving autonomy from ministries to institutions. Reduce administrative approvals via digital procurement systems.

3. **Long-term, high-risk funding**: Set up a **"Nobel Challenge Grant"** or **Frontier Science Fund**, similar to the U.S. DARPA or EU's ERC grants. Encourage "blue-sky research".

4. **Leadership rejuvenation — Let younger scientists lead**: Promote globally accomplished scientists aged 40–50 to Directorship (parallel to Sarabhai/Bhabha era). Term limits for leadership positions.

5. **Performance linked to disruptive outcomes**: Incentivise patents, breakthrough impact, and global citations rather than award collection.

Case Studies

Country	Success Practice
Israel	17% R&D private participation; strong startup–university linkages.
China	Tenure-track reforms + global talent recruitment program ("Thousand Talents Program").
Japan (Nobel wave post-2000)	Long-term funding for basic research + academic freedom.

India can emulate these.

Conclusion

As Richard Feynman wrote, "**Science requires freedom to doubt."** Only transparent hiring, merit-based funding, and young visionary leadership can convert India from **potential to discovery**, from **talent-rich to Nobel-worthy**.

Examine the India-Bhutan relationship as a model for regional cooperation despite asymmetry. Justify how this partnership successfully avoids mistrust and antagonism in a challenging neighbourhood.

Introduction

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Despite asymmetry—India's economy nearly **250 times larger than Bhutan's (World Bank 2023)**—their ties remain conflict-free. The **2007 Treaty revision** upheld sovereignty, showing how sensitivity, development partnership, and mutual trust shape durable regional diplomacy.

India-Bhutan: A Relationship Built on Trust, Not Dominance

Unlike India's relations with some neighbours (Nepal, Maldives, Sri Lanka) that often oscillate between engagement and suspicion, India-Bhutan ties exemplify **respectful asymmetry**.

Key pillars:

1. **Sovereign equality and non-interference**: 1949 Treaty clause requiring Bhutan to be **"guided by India"** was removed in 2007. The revised treaty affirms **"mutual respect for independence, sovereignty, and territorial integrity."**
2. **Security cooperation without coercion**: India assists Bhutan in defence training and border management. In **Doklam 2017**, India intervened to protect Bhutanese sovereignty and its own strategic interests **after Bhutan sought support**.
3. **Development partnership rooted in Bhutan's priorities**: India finances major **hydropower projects (Tala, Chukha, Punatsangchhu)**. Hydropower contributes **17% to Bhutan's GDP and 30% to government revenues (Royal Monetary Authority 2022)**. Power import from Bhutan helps India meet clean energy targets (SDG-7).
4. **Soft power and cultural connect**: Shared Buddhist heritage, scholars' exchanges, student scholarships. Exposition of Buddha relics from India in Bhutan (2024) reinforces civilizational diplomacy.

This aligns with India's neighbourhood policy pillars: **"Security and Growth for All in the Region (SAGAR)" and "Neighbourhood First."**

Why this partnership avoids mistrust? Lessons for South Asia

1. **Transparency and demand-driven development:** Projects are implemented based on Bhutan's priorities—not Indian conditionalities—reducing suspicion of exploitation.

2. **No interference in domestic politics:** Unlike in Nepal or Maldives, India refrains from overt involvement in Bhutanese internal decisions.

3. **Managing asymmetry with emotional intelligence:** India practices what scholars call "asymmetry with sensitivity"—avoiding the temptation of big-power assertiveness.

4. **Mutually beneficial interdependence:** Bhutan earns revenue through power exports. India receives clean renewable energy.

5. **Shared strategic perspective:** Both remain cautious of China's assertiveness in the Himalayas and prioritise territorial sovereignty.

Comparison with India's relations with other neighbours

Parameter	Bhutan (success case)	Nepal / Sri Lanka / Maldives (challenges)

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Perception of India	Partner	Big brother
Development cooperation	Demand-driven	Viewed as politically motivated
Border disputes	Sensibly managed (Doklam)	Often politicised
Strategic trust	High	Volatile

Bhutan shows that **trust grows when power is exercised with restraint**.

Way Forward

1. Diversify connectivity: **rail links, digital payments integration, trade corridors**.
2. Expand cooperation on **climate and hydropower**, making Bhutan a green energy hub.
3. Encourage **people-centric diplomacy** through education and tourism.

Conclusion

As **Joseph Nye notes, "Power with others is better than power over others."** India-Bhutan ties illustrate respectful asymmetry, where trust, sovereignty, and shared values produce lasting regional harmony.

Critically analyze how Beijing's WAICO initiative could reshape the global AI order, particularly for the Global South. Examine the strategic need for India to engage without endorsing.

Introduction

The proposed **World Artificial Intelligence Cooperation Organization (WAICO)** by China signals a shift from Western-dominated tech governance to Beijing-led AI multilateralism, challenging existing frameworks like the **UN's Global AI Governance Track (2024)** and OECD AI principles.

WAICO: Beijing's Strategic Bid for Algorithmic Multilateralism

China's WAICO proposal, announced by **President Xi Jinping (2024 APEC Summit, Busan)**, aims to **institutionalise global AI norms under Chinese leadership** — the **"Bretton Woods of algorithms."**

Key features:

1. **Headquarters:** Shanghai — signalling geographic centralisation.
2. **Objectives:** Establish a **technology-sharing platform**, **AI governance standards**, and an **Algorithmic Compensation Fund** financed by AI revenues.
3. **Design:** Formally multilateral, but functionally China-centric — echoing earlier initiatives like the **Global Development Initiative (GDI)** and **Global Security Initiative (GSI)**.

4. **Strategic intent:** To move from being **a rule-taker to a rule-maker**, giving Beijing an edge in **data standards, surveillance norms, and AI trade regulation** — the soft power equivalent of setting global operating systems.

Implications for the Global South

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For developing nations, **WAICO appears attractive**:

1. Promises **AI access, funding, and capacity-building**, bridging the digital divide.
2. Reflects frustration with **Western techno-nationalism** and export controls on semiconductors (e.g., U.S. CHIPS Act 2022).
3. Offers inclusion and voice where **OECD and EU AI Acts** remain restrictive.

However, **hidden asymmetries persist**:

1. Control over standards may reinforce **digital dependency** rather than autonomy.
2. "Algorithmic colonisation" could replace old economic hierarchies with new **data-driven hierarchies**.
3. Surveillance-based governance models could erode **privacy and democratic accountability**.

Thus, WAICO risks turning **AI multilateralism into a techno-political monopoly**, shaping norms on ethics, bias, and data localisation to align with Chinese interests.

India's Strategic Dilemma: Engage Without Endorsing

India sits at the intersection of **technological sovereignty** and **global cooperation**. As **Chair of the Global Partnership on AI (GPAI)** and leader in **Digital Public Infrastructure (DPI)**, its choices will shape Global South's stance.

Why India must engage:

1. **Access:** To influence governance and prevent exclusion from AI resource pools (chips, compute, cloud).
2. **Voice:** To represent **Global South perspectives** on ethical AI, fairness, and affordability.
3. **Leverage:** Participation provides visibility and early insight into **standard-setting mechanisms**.

Why India must not endorse blindly:

1. WAICO may compromise **data sovereignty** and **open-source ethics**.
2. Could undercut **UN-based AI frameworks** (UNGA 2024 resolution on Global AI Governance).
3. Centralisation in Shanghai risks a **China-centric digital order**, undermining pluralism.

India's prudent approach:

1. **Transparency over geography:** Advocate for open budgeting, rotating leadership, and third-party audits.
2. **Interoperability over ideology:** Promote **DPI model**—combining openness and sovereignty.
3. **Access over allegiance:** Demand **compute quotas** and equitable algorithmic access.
4. **Parallel coalitions:** Build **South-South AI hubs** (e.g., with Brazil, UAE, South Africa) for balanced innovation networks.

Broader Geopolitical Context

1. The **AI governance race** mirrors the 20th-century battles over trade and finance rules.
2. Just as the **IMF and World Bank** institutionalised Western dominance, **WAICO could become Beijing's "Digital Bretton Woods."**

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3. Hence, India's strategy must blend **strategic autonomy** with **principled multilateralism**, ensuring no bloc monopolises AI ethics or infrastructure.

Conclusion

As **Yuval Noah Harari cautions in Homo Deus, "Those who own the data own the future."** India must shape AI's global grammar—engaging strategically, yet preserving ethical and sovereign autonomy.

Examine how the proposed Shram Shakti Niti 2025 exposes gaps in India's labour landscape. Critically analyze its failure to address the plight of exploited workers.

Introduction

India has **11 million people in modern slavery (Global Slavery Index 2023)** and nearly **90% workforce informal (ILO 2024)**. Amid rising exploitation, the proposed **Shram Shakti Niti 2025** promises reforms but reveals deep systemic gaps.

Labour Landscape: Informalization, Precarity, and Structural Exploitation

1. Field studies and media investigations show widespread **wage theft, absence of contracts, forced labour** and denial of **EPF/ESI** benefits. **Example:** Women in seafood export units were downgraded from registered workers to "daily wagers" to deny provident fund benefits.

2. Despite constitutional guarantees under **Articles 14, 21, 23 and 42**, India's labour market is characterised by:

Indicator	Status
Informal workforce	~90% (ILO, 2024)
Gig/platform workers	~12 million (NITI Aayog, 2022)
Forced labour victims	11 million (Global Slavery Index, 2023)
Female labour participation	33.7% (PLFS 2024)

Shram Shakti Niti 2025: What It Aims to Do

The draft policy claims to be **"rights-driven and future-ready"**. The policy invokes **Directive Principles: Art. 41 (right to work), Art. 42 (humane work conditions), Art. 43 (living wage)**.

Promised Measures:

1. **Universal Social Security Account** integrating EPFO, ESIC, PM-JAY, e-SHRAM.
2. Use of **AI-driven National Career Service (NCS)** for job matching.
3. Targets **35% female labour force participation by 2030**.
4. Enforces safety under **Occupational Safety, Health and Working Conditions Code, 2020**.

How the Policy Exposes Gaps and Contradictions

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1.   **Social security without funding:** No mandate for employer contributions. Risk of becoming another e-SHRAM: registered **28 crore workers**, but benefit delivery remains negligible. Outcome will be **digital registration without material protection**.

2.   **Digital optimism → digital exclusion:** 38% households have **functional digital literacy (NFHS-5).** Women, older workers, and migrants are excluded. **Constitutional implication such as it v**iolates **Article 15: non-discrimination**.

3.   **Weak enforcement = empty promises:** Inspector vacancies and absence of penalties make the **"near-zero fatality by 2047"** target aspirational. **Example:** In construction and mining belts, workers die without compensation due to lack of monitoring under the **OSH Code, 2020**.

4.   **Gig and platform workers: flexibility masking exploitation:** No recognition of minimum wages under the **Code on Wages, 2019**. Platform companies **evade accountability—"algorithmic management"** replaces humane management. Case study: Rajasthan's Gig Workers Act (2023) provides **welfare fund**; Centre's policy lacks such provisions.

5.   **Workers Lose Dignity and Bargaining Power: Union weakening**, absence of collective bargaining → loss of voice. Moves MoLE towards being an "employment facilitator", not rights protector. ILO Convention 29 on forced labour remains breached.

Conclusion

As Amartya Sen notes **in Development as Freedom**, growth without dignity is injustice. Shram Shakti Niti's success depends not on digital dashboards but on **funding, enforcement and worker rights**.

Critically analyze the proposition that the Supreme Court's order on stray dogs is inhumane and anti-science. Examine its potential to exacerbate the human-animal conflict instead of resolving it.

Introduction

India records **~1.6 crore dog bites annually (MoHFW 2023)** and is home to the world's largest stray dog population. The Supreme Court's recent order on relocating stray dogs raises ethical, scientific, and legal concerns.

Supreme Court's Order and Its Rationale

The Supreme Court (2024–25) directed:

1. Removal of stray dogs from public spaces such as schools, hospitals, railway stations.
2. Housing them permanently in shelters.
3. Preventing their re-release.
4. Purpose was to reduce dog attacks and ensure public safety.

Why the Order is Considered Inhumane and Anti-Science

Dimension	Why the order is problematic

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Scientific	Violates established scientific model of **CNVR (Catch-Neuter-Vaccinate-Release)** endorsed by **WHO, World Organisation for Animal Health (OIE)**, and **UN FAO**. Forced confinement **creates a vacuum effect—new unsterilised dogs** migrate into vacated territories.
Legal	Contradicts **Prevention of Cruelty to Animals Act, 1960**, and **Animal Birth Control Rules, 2023**, which **legally mandate sterilisation + release**, not confinement. "Removal without release" indirectly encourages killing, violating **Bharatiya Nyaya Sanhita's anti-cruelty provisions**.
Practicality	India has **780 districts** but less than **10% have functional ABC centres (MoHFW 2024)**. No capacity to house lakhs of stray dogs—no shelters, funds, or trained veterinary manpower.
Humaneness	**Permanent confinement = psychological trauma** for an animal evolved to live in territorial social groups. Equivalent to mass imprisonment of sentient beings.

Example: Bhutan adopted **nationwide CNVR (2009–2023)** and achieved near-total sterilisation, leading to sharp decline in dog bite and rabies cases.

3. How the Order Can Exacerbate Human–Animal Conflict

1. **Increase in new, unvaccinated dogs (Vacuum Effect)**: Removing territorial vaccinated **dogs → vacant niche → unvaccinated dogs move in → higher rabies risk.**
2. **Illegal and panic-driven killing or relocation**: Municipalities lacking shelters may resort to: poisoning, dumping dogs on highways and illegal relocations. Such practices worsen aggression and disperse rabies.
3. **Loss of community cooperation**: Community dog feeders assist in CNVR monitoring. Criminalising feeding breaks this cooperation, delaying sterilisation campaigns.
4. **Rabies management setback**: India already accounts for **36% of global rabies deaths (WHO, 2024)**. Removing vaccinated stray dogs will reverse progress toward **"Rabies Free India by 2030" (National Rabies Control Programme)**.

Constitutional Dimensions

1. **Article 21** protects the right to life—not just human, but interpreted by courts to extend to animal dignity (A. Nagaraja Judgment, 2014).
2. **Fundamental Duties (Art. 51A(g))** impose responsibility to show compassion to animals. Thus, the order conflicts with India's constitutional morality and animal welfare jurisprudence.

The Humane and Effective Path: CNVR + Public Health

1. Global best practices show: CNVR + vaccination + community participation is the **only sustainable method**.

2. Need to invest in infrastructure: one **ABC centre per district**, trained vets, funding to urban local bodies.

Conclusion

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As Justice H.R. Khanna noted, "**Compassion is a higher law.**" Effective policy must be **science-based and humane**—dogs need sterilisation, not confinement; conflict reduces only when dignity guides governance.

Examine the emergence of 'white-collar' terrorists as a new security red flag. Analyze the implications of middle-aged radicalization and the need to adapt India's counter-terrorism strategy.

Introduction

According to the **NCRB (2023)** and **UNODC reports**, terror recruitment patterns in India are shifting—from vulnerable unemployed youth to educated professionals, signalling a dangerous new phase of **"white-collar radicalization"** demanding strategic recalibration.

The Emerging Trend of White-Collar Terrorism

The **Delhi Red Fort blast (2025)** and the **Faridabad module case** revealed sleeper cells comprising **medical professionals and women doctors** linked to **Jaish-e-Mohammad (JeM)** — marking the rise of **"white-collar terrorists."**

Characteristics:

1. Educated, middle-class, professionally stable individuals (doctors, engineers, IT professionals).
2. Radicalized through ideological indoctrination, not economic desperation.
3. Operate inconspicuously — **"below the intelligence radar."**

Examples:

1. **2016 ISIS module (Hyderabad):** Software engineers radicalized online.
2. **Sri Lanka Easter bombings (2019):** Carried out by affluent businessmen and educated elites.
3. **UK physician Bilal Abdullah (2007 Glasgow attack)**: A doctor turned extremist. This pattern challenges traditional security assumptions that poverty breeds extremism.

Drivers of Middle-Aged and White-Collar Radicalization

Driver	Explanation
Ideological Alienation	Online extremist narratives exploit identity crises and perceived religious or political injustices.
Cognitive Radicalization	Professionals often encounter ideological material through encrypted apps and closed digital communities.
Emotional Triggers	Grievance-based propaganda (e.g., global conflicts like Gaza or Syria) taps into moral outrage.
Technological Access	Dark web forums, Telegram, and encrypted channels bypass traditional monitoring.

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Social Insulation	Urban anonymity and lack of community engagement allow undetected radical drift.

Case Study: A 2022 NIA investigation revealed a Bengaluru-based tech engineer financing online jihadist propaganda under false digital identities.

Implications for India's Security Architecture

1. **Shift from Peripheral to Insider Threats**: Radicalization among educated professionals erodes institutional trust, especially when individuals are embedded within medical, academic, or IT ecosystems.
2. **Blurring of "Hard" and "Soft" Terror Spaces**: White-collar extremists often engage in **cyber-terrorism, financial transfers, or propaganda operations**, reducing visibility in **traditional kinetic warfare.**
3. **Psychological Complexity**: Radicalization becomes **ideational rather than material**, making de-radicalization harder since it is rooted in beliefs, not deprivation.
4. **Operational Adaptability of Terror Outfits**: Pakistan-based groups like **Lashkar-e-Taiba and JeM** increasingly exploit educated recruits for **cyber operations, logistics, and recruitment**, not merely field attacks.
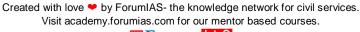
Adapting India's Counter-Terrorism Strategy

1. **Intelligence Reorientation**: Develop **Behavioral Threat Analysis Units** integrating **psychological profiling and AI-based pattern mapping**. Expand **NIA–IB–NTRO** coordination through **real-time digital forensics**.

2. **Cyber and Cognitive Warfare Preparedness**: Strengthen **Cyber Crime Coordination Centre (I4C)** to monitor radicalization trends on encrypted platforms. Employ **AI-driven predictive policing** and **OSINT (Open Source Intelligence)**.

3. **Counter-Radicalization and Community Engagement**: Launch programmes akin to **UK's "Prevent Strategy"** and **Singapore's Religious Rehabilitation Group (RRG)**. Partner with universities, hospitals, and professional bodies to flag behavioural shifts.

4. **Legal and Institutional Reform**: Update **UAPA 2019** to include "digital radicalization" clauses. Invest in **rehabilitation and psychological counselling centres** under the Ministry of Home Affairs.

Conclusion

Extremism evolves with society. Combating white-collar radicalization demands not only stronger intelligence but also empathetic governance that safeguards minds before borders.

Examine the role of inter-State rivalry in accelerating India's growth. Critically analyze how State-led investor campaigns are altering the traditional dynamics of Centre-State relations.

Introduction

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According to **NITI Aayog's India Competitiveness Report (2023)**, the rise of **competitive federalism**—where States rival each other to attract investment—has emerged as a key driver of India's post-liberalization economic dynamism and policy innovation.

From Centralised Planning to Competitive Federalism

1.   Historically, India's growth trajectory was shaped by **cooperative federalism**—a Centre-led, plan-based system under the **Planning Commission**.

2.   Post-1991 reforms dismantled the "license-permit raj," devolving economic decision-making and unleashing **market-based competition among States**.

   3.   Pre-1991: States sought **Delhi's patronage** for industrial licenses.
   4.   Post-1991: States began **competing for investors** through infrastructure, governance, and policy credibility. **Example:** The transition from centrally allocated steel plants to State-driven industrial corridors like **DMIC** and **Chennai–Bengaluru Industrial Corridor** reflects this transformation.

Inter-State Rivalry as a Growth Accelerator

1.   **Investment and Industrialization**: **Andhra Pradesh–Tamil Nadu–Karnataka** competition over Google's AI Data Centre and Foxconn's facility demonstrates healthy industrial rivalry. **Gujarat's semiconductor win** over Maharashtra (Vedanta-Foxconn JV) showcases policy agility and investor confidence.

2.   **Policy Innovation and Governance Reforms**: States emulate best practices—**Telangana's TS-iPASS**, **Tamil Nadu's EV policy**, and **Uttar Pradesh's Defence Corridor**—creating a virtuous cycle of reform diffusion.
 This fosters **policy benchmarking** and **inter-State learning**, hallmarks of a dynamic federation.

3.   **Regional Economic Convergence**: World Bank's **Ease of Doing Business (EoDB) rankings** and **Export Preparedness Index (2022)** have pushed lagging States (Odisha, Jharkhand) to adopt reforms, narrowing regional disparities.

4.   **Global Integration**: With **China+1 diversification**, global firms now evaluate Indian States individually, "Invest in Bengaluru, not India in abstract." States thus act as **subnational diplomatic actors**, marketing themselves globally.

How State-led Investor Campaigns Are Redefining Centre-State Relations

Traditional Dynamic	Evolving Dynamic
Centre dispensed fiscal & industrial patronage	States autonomously compete for FDI & domestic capital
Policy uniformity across India	**Asymmetric federalism**—policy diversity reflecting local strengths
Cooperative federalism	**Competitive federalism** within a cooperative framework

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Centralized funding via Planning Commission	Outcome-based grants via **NITI Aayog**, performance-linked incentives

Examples:

1. **Vibrant Gujarat**, **Magnetic Maharashtra**, **Happening Haryana**, **Global Investors Summit (UP)**—reflect the decentralization of investor diplomacy.
2. **Chief Ministers as "CEOs" of States** — e.g., **CM's of Tamil Nadu, Andhra Pradesh, Uttar Pradesh** leading international roadshows.

Critical Concerns and Cautions

1. **Risk of "Race to the Bottom"**: Excessive tax breaks, land subsidies, or environmental leniency may hurt fiscal health and sustainability**. Example: Amazon HQ2 bidding war** in the US triggered debates on subsidy overreach.

2. **Fiscal Federalism Strain**: States demanding greater fiscal autonomy under **GST compensation lapses** may cause vertical imbalances.

3. **Inequality and Regional Disparity**: High-performing States attract more capital, while poorer States struggle despite reforms—risking **"club convergence."**

4. **Need for Regulatory Coherence**: Investor competition must not lead to fragmented standards; **NITI Aayog**, **GST Council**, and **Inter-State Council** should harmonize policies.
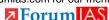
Way Forward: Towards "Collaborative Competition"

1. **Balanced Federalism:** Combine **cooperative and competitive** fedralism principles — **"Team India" approach.**
2. **Institutional Reforms:** Strengthen **Finance Commission**, **NITI Aayog's ranking mechanisms**, and fiscal performance indicators.
3. **Knowledge Sharing Platforms:** Encourage cross-State learning through best-practice summits.
4. **Inclusive Growth Focus:** Promote capacity building for eastern and northeastern States.
5. **Green Competitiveness:** Align investment races with **SDG-linked development indicators**.

Conclusion

As **Raghuram Rajan's "Federalism and India's Growth"** argues, balanced competition among States catalyzes innovation. Inter-State rivalry, when guided by fairness and sustainability, transforms India's diversity into a collective economic strength.

Examine why Antimicrobial Resistance (AMR) is an escalating threat in India. Justify a comprehensive strategy encompassing GLASS surveillance, rational use, and public stewardship to tackle it.

Introduction

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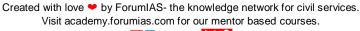**Forum IAS**

WHO's **GLASS 2025** reports that **one in three infections in India is antibiotic-resistant**, reflecting the world's highest AMR levels driven by antibiotic misuse, weak surveillance, environmental contamination, and limited antimicrobial stewardship across health, agriculture, and community settings.

Why AMR is an Escalating Threat in India

1.   **Extremely High Clinical Resistance Rates:** GLASS 2025 shows **E. coli, Klebsiella, Staphylococcus aureus** exhibit **carbapenem resistance exceeding global averages**. ICU settings show alarming MDR and XDR patterns, raising surgical and hospital mortality.

2.   **Overuse and Misuse of Antibiotics:** India is the **world's largest consumer of antibiotics** (Lancet, 2022). OTC access, self-medication, incomplete treatment courses fuel resistance. Veterinary overuse before the **2019 colistin ban** worsened resistance in zoonotic pathways.

3.   **Environmental Drivers: Pharmaceutical effluents**, hospital waste, and sewage containing antibiotic residues create hotspots of resistant bacteria—documented in **Hyderabad, Patancheru, and Delhi drains**.

4.   **Uneven Surveillance and Data Gaps:** Current systems—**ICMR's AMRSN, iAMRSS, NCDC's NARS-Net**—capture mostly **tertiary hospital data**, overestimating severity but missing **community resistance** patterns. Rural, primary, and secondary centres remain largely outside the network.

5.   **Weak Implementation of NAP-AMR (2017–2021):** Only **Kerala** has effectively operationalised a **State AMR plan**. Most States lack funding, coordination, intersectoral mechanisms, or enforcement capacity.

6.   **High Infectious Disease Burden:** India's dual burden of **TB, diarrhoeal diseases, respiratory infections** increases antibiotic consumption and accelerates resistance.

Justifying a Comprehensive Strategy

1.   **Strengthening GLASS-aligned Surveillance:** Why it is essential; **GLASS requires nationwide representative data,** not sentinel tertiary-hospital snapshots. Accurate resistance maps enable evidence-based antibiotic guidelines and procurement. Measures must be, expanding **500+ NABL-certified labs**, integrate private sector data. Build microbiology capacity in **district hospitals**, CHCs, PHCs. Real-time digital platforms like **i-AMRSS** must be universalised.

2.   **Rational Antibiotic Use and Stewardship: Clinical stewardship** like mandatory **hospital AMSPs**, **infection prevention and control (IPC)** standards. Restrict last-line antibiotics; strengthen prescription audits. Promote narrow-spectrum antibiotic usage guided by updated antibiograms. **Regulatory stewardship,** enforcing **Schedule H1**, end OTC sales—Kerala's **AMRITH** model shows measurable reduction in misuse. Regulate agricultural and aquaculture antibiotic use.

3.   **Community and Public Stewardship:** Its essential because AMR is invisible to the public; literacy levels remain very low. Experts stress the need **to "humanise AMR"** so people relate to it. The approach should be mass AMR literacy programmes **(Kerala targets "Antibiotic-Literate State by 2025").** School curricula integration, campaigns by ASHAs, NGOs, large non-profits. Behavioural nudges: Red-label antibiotics, mobile reminders for adherence.

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4.   Promoting Innovation and Access to New Antibiotics: Support Indian R&D efforts like **Bugworks** developing novel broad-spectrum agents. Respond to WHO's warning that only **12 of 32 antibiotics** in pipeline meet innovation criteria. Incentivise industry via **push and pull funding mechanisms**, PPPs, and tax credits.

5.   One Health Approach: Integrate human, animal, and environmental sectors. Learn from **COVID-19's cross-sectoral collaboration** and apply to AMR preparedness.

Conclusion

As highlighted in the **Global Research on AMR (GRAM) Study**, unchecked resistance threatens decades of medical progress. India must institutionalise GLASS surveillance, stewardship, and multi-sectoral One Health action to avert a looming public-health catastrophe.

Critically examine the proposition that the actions of a US President could be the catalyst for the demise of the global nuclear order. Analyze its implications for multilateral security."

Introduction

Despite nuclear arsenals reducing from **65,000 in the 1970s to 12,500 today (SIPRI 2024)**, recent U.S. signals of resuming nuclear testing threaten to erode long-standing norms, rekindling uncertainties in global nuclear governance.

Why Presidential Decisions in the U.S. Matter for the Global Nuclear Order

1.   The U.S. as an Architect of the Nuclear Regime: The United States shaped the **NPT (1968)**, led the push for the **CTBT (1996)**, and negotiated major arms-control treaties such as **INF (1987)** and **New START (2010)**. Because the U.S. is a nuclear superpower and norm-setter, any deviation from restraint signals a systemic shift.

2.   Resumption of Nuclear Testing: A Normative Shock: Donald Trump's 2025 announcement to "start testing our nuclear weapons" risks: **Breaking the moratorium since 1992,** Undermining the global taboo on nuclear explosive tests **and** Encouraging Russia, China, India, Pakistan, and North Korea to follow suit. The **CTBT**, although not in force, functions as a de facto global norm. Its collapse would dismantle verification structures like the **International Monitoring System (IMS)**.

3.   Acceleration of a New Arms Race: Presidential encouragement of testing or arms development heightens instability by incentivising states to pursue new warhead designs, hypersonic glide vehicles, and MIRV capabilities. Even before Trump's announcement, an incipient arms race existed: **Russia** tested the nuclear-powered Burevestnik cruise missile and Poseidon underwater drone, **China** is rapidly expanding warheads (projected 1,000 by 2030) and **U.S.** began deploying low-yield warheads (W76-2) and new B61-13 bombs

·   **Collapse of Arms-Control Architecture:** Trump's stance threatens the last remaining pillar of U.S.–Russia nuclear stability. The absence of arms-control transparency increases risks of **miscalculation**, **first-strike anxieties**, and **accidental escalation.** U.S. actions since 2018 already weakened the system: Withdrawal from **INF Treaty,** Uncertainty over **Open Skies Treaty and** Minimal progress on **New START extension**, expiring February 2026

Implications for Multilateral Security

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1. Erosion of Non-Proliferation Norms: A U.S. return to nuclear tests could trigger: Indian and Pakistani renewed testing (India has tested thermonuclear designs only once) Middle Eastern states revisiting latent nuclear programmes (Iran, Saudi Arabia). Growing disenchantment with NPT inequities, pushing states toward hedging.

2. Rise of Regional Nuclear Instabilities

- **East Asia:** Japan and South Korea may reconsider nuclear latency as China expands arsenal
- **West Asia:** An already fragile Iran nuclear situation may worsen
- **South Asia:** India-Pakistan deterrence stability becomes more volatile

3. Undermining UN-based Collective Security: The UN Secretary-General warns that nuclear risks are at "**alarmingly high levels**." If U.S. leadership recedes, multilateral forums like the **UNSC**, **IAEA**, and **NPT Review Conferences** lose coherence.

4. Weakening of the "Nuclear Taboo": Political signalling by a U.S. President that normalises nuclear usability (low-yield warheads, dual-use hypersonics) erodes the moral restraint described by scholars like **Nina Tannenwald**.

Conclusion

Nuclear stability hinges on credible restraint. U.S. destabilisation risks unraveling global norms, making multilateral security arrangements dangerously fragile amid emerging geopolitical fractures.

Examine the concept of 'deep-tech democracy' in India. Critically analyze how shared compute and open data can ensure inclusive Artificial Intelligence (AI) for all citizens.
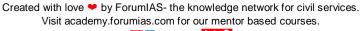
Introduction

AI's **global concentration—where 90%** of advanced compute lies in a few nations **(OECD 2023)—**risks widening digital inequality. India's emerging "deep-tech democracy" seeks to democratise compute, data, and talent, enabling inclusive, citizen-centric AI.

Understanding 'Deep-Tech Democracy' in India

1. 'Deep-tech democracy' refers to India's model of **state-led, public-good-oriented technological development** that treats AI as a **shared societal resource rather than proprietary capital.**

2. Through the **IndiaAI Mission (2024)**, India aims to decentralise access to computation, datasets, and skilling so that innovation is not confined to elite institutions or global corporations.

3. It is anchored in the **Samaj–Sarkar–Bazaar framework,** integrating society, government, and markets to ensure **ethical, accountable, and inclusive technological progress.**

Role of Shared Compute in Democratizing AI

1. Reducing the Compute Divide: India's deployment of **38,000+ GPUs** under the national AI compute grid provides affordable high-performance compute to start-ups, students, and researchers. This contrasts sharply with global monopolies where a few firms—OpenAI, Google, Amazon—control frontier compute, restricting innovation in the Global South.

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2. Enabling Grassroots Innovation: The compute grid allows: AI-based crop advisory models for small farmers. Local-language applications for governance and citizen services. Affordable R&D for deep-tech start-ups such as in healthcare diagnostics, climate modelling, and precision agriculture. This mirrors the success of DPI systems such as **UPI**, where **shared infrastructure led to innovation at scale.**

3. AI as a Public Utility: By socialising compute costs, India reduces entry barriers. Start-ups no longer require millions of dollars for GPU access, promoting **equitable participation** rather than algorithmic dependency on global tech giants.

Critical Perspective

While transformative, challenges remain:

1.   Public compute infrastructure must avoid bureaucratic bottlenecks

2.   Ensuring fair access across states and institutions is essential

3.   Power shortages and cloud dependence could create operational vulnerabilities

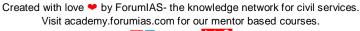**Open Data as the Second Pillar of Inclusion**

1. AI Kosh and Local Contextual Datasets: Over **360 curated datasets** across agriculture, health, climate, and governance are being made available through AI Kosh. This tackles a major gap identified by **UNESCO's 2023 AI Readiness Report**—the Global South's dependence on Western datasets that fail to represent local realities.

2. Linguistic Inclusion through Bhashini: Digital India Bhashini, backed by **Project Vaani's 150,000 hours of speech data**, enables AI systems in 22 Indian languages—critical in a country where only **11%** are English proficient.

3. Governance Use Cases: Open datasets enable AI applications in: Precision agriculture (e.g., crop disease prediction), public health surveillance (e.g., TB and maternal health analytics), urban mobility and disaster forecasting. This strengthens **evidence-driven policymaking**, fulfilling **NITI Aayog's vision of "AI for All" (2018).**

Critical Concerns

1.   Ensuring **privacy-by-design** is essential to avoid data misuse

2.   Need strong data anonymisation standards under DPDP Act

3.   Avoiding dataset centralisation that could marginalise smaller states

Conclusion

As Amartya Sen argues in Development as Freedom, true progress expands people's capabilities. India's deep-tech democracy advances this ideal, ensuring AI becomes an empowering public good rather than an exclusionary privilege.

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Evaluate Flexible Inflation Targeting (FIT) as a balanced monetary policy framework. Justify the necessity of deriving acceptable inflation rates consistent with India's growth prospects and macro conditions.

Introduction

India's 2016 adoption of Flexible Inflation Targeting (FIT) stabilised inflation despite global shocks, with CPI inflation averaging near 4.5%. As RBI reviews the framework for 2026, recalibrating acceptable inflation consistent with growth becomes crucial.
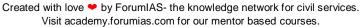
What is Flexible Inflation Targeting (FIT)?

1. Flexible Inflation Targeting (FIT) represents a calibrated approach to price stability, giving the Reserve Bank of India autonomy to anchor inflation expectations while accommodating growth impulses.

2. The current 4% ±2% target, introduced through the Monetary Policy Framework Agreement (2016), has helped India maintain macroeconomic stability even amid supply shocks, COVID-19 disruptions, and global geopolitical volatility.

FIT as a balanced monetary policy framework

1. **Anchoring inflation expectations:** Studies by the RBI and IMF show that post-2016, household inflation expectations became less volatile. A credible anchor reduces the "inflation tax" on the poor—aligning with the article's point that high inflation is regressive.
2. **Accommodating growth (flexibility component):** Unlike strict inflation targeting regimes (e.g., New Zealand in early 1990s), FIT allows Indian monetary policy to consider output gaps, supply shocks, and financial stability. The **MPC's accommodative stance** during 2020-22 prevented a deeper recession despite inflation temporarily breaching the 6% upper band.
3. **Institutional autonomy & policy discipline:** FIT complements FRBM legislation by preventing fiscal dominance. The end of automatic monetisation in 1994 and the FIT regime together reduce risks of "fiscal inflation" characteristic of the 1970s-80s.
4. **Clarity on headline vs core inflation:** As the article notes, targeting **headline inflation** is logical because food inflation often triggers second-round effects on wages and core CPI in India. Technical tools like **output gap analysis** and **Phillips Curve estimations** strengthen decision-making.
5. **Performance during shocks:** Despite global commodity shocks, India's inflation largely stayed within or near the band. World Bank's 2023 report recognised India as one of the few large economies avoiding double-digit inflation.

Why deriving acceptable inflation rates is essential now

1. **Threshold inflation for growth:** Empirical studies (RBI 2023, Sarel 1996) indicate that above **4–6%** inflation, growth begins to deteriorate. The article's analysis shows an inflection point at **3.98%**, making the current target economically justified.
2. **Forward-looking calibration (2026–2031):** Deriving an acceptable inflation rate must consider expected fiscal consolidation, global supply chain realignments, climate change-related food shocks, and energy transitions over the next decade.
3. **Macroeconomic compatibility:** Acceptable inflation must be consistent with:
    o **External stability:** To avoid currency depreciation and imported inflation.
    o **Financial stability:** Preventing excessive credit cycles.

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- - **Investment climate:** Predictable prices encourage long-term capital formation.
4. **Avoiding target drift:** A higher target (e.g., 5–6%) may weaken RBI's credibility and allow prolonged inflation close to the upper band, risking stagflation. The article rightly notes that **staying near 6% undermines FIT's spirit**.
5. **Alignment with global best practices:** Most credible inflation-targeting economies (UK, Canada, Australia) maintain targets between **2–3%**. India, as a supply-shock-prone emerging economy, may justify a slightly higher threshold, but evidence still favours the 4% benchmark.

Needed refinements

1. Clear communication on tolerance duration near upper/lower bands.

2. Stronger monetary–fiscal coordination to avoid policy slippages.

3. Improved high-frequency inflation data, especially for rural markets.

4. Enhanced modelling for climate-sensitive food inflation.

Conclusion

Credible inflation targeting sustains growth. India must refine FIT by deriving realistic, evidence-backed targets aligned with future macroeconomic conditions.

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