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Daily News Analysis

The Hindu Important News Articles & Editorial For UPSC CSE

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In the first half of FY 2025-26, India witnessed a striking divergence in investment patterns. While the **private sector touched a nearly 15-year high** in new project announcements, both the **government and foreign companies recorded historic lows**. This reflects structural changes in India's investment landscape, with domestic private firms increasingly driving capital formation.

Private project plans in first half of fiscal at a 15-year high

Indian firms alone account for 94% of the ₹9.95 lakh crore announced by the sector; government and foreign investment proposals slump; private sector leads in new projects, while government and foreign investments declined significantly

T.C.A. Sharad Raghavan
NEW DELHI

The value of new project announcements by the Indian private sector surged to nearly a 15-year high in the first half of the current financial year, even as new government projects and those by foreign companies slumped. The value of such announcements by the Union government and those of the States fell to at least a 15-year low during the period, while those by foreign companies were at a five-year low.

An analysis by *The Hindu* of data from the Centre for Monitoring Indian Economy (CMIE) shows that the private sector announced projects estimated at ₹9.95 lakh crore in the April-September 2025 period, up 30.4% over the first half of the previous financial year. Of this, it was the Indian private sector that did the heavy lifting. It announced projects estimated at ₹9.35 lakh crore, 94% of the value of the new project announcements in the first half and up 37.5% over the corresponding period of 2024-25. The value was the second-highest in the corresponding period of the past 15 years. The highest was in the first half of 2023-24, when it touched ₹9.54 lakh crore.

However, the data also showed that India's attractiveness as an investment destination for foreign companies might be diminishing. New project announcements by foreign companies fell to about ₹0.6 lakh crore in the April-September 2025 period, down nearly 28% from the corresponding period of last year.

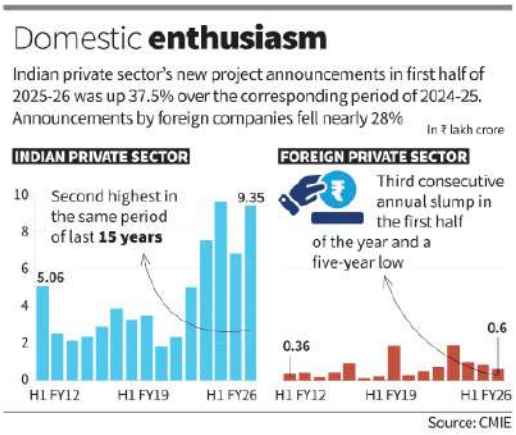
This also marks the third consecutive year where foreign announcements have slumped in the first half of the year, and a five-year low for the figure.

New project announcements by foreign companies had risen to a peak of ₹1.9 lakh crore in the first six months of 2022-23 before declining subsequently.

The slump in new project announcements in India by foreign companies is not in line with global trends. Data from the United Nations Conference on Trade and Development show that global foreign direct investment grew by 11% in 2024 over its level in 2023, which itself was 3% higher than in 2022.

New project announcements by governments slumped to ₹1.51 lakh crore in the first six months of the financial year 2025-26, down more than 71% over their level in the corresponding period of the previous year.

This level of investment intention was the lowest in at least 15 years, the period for which there is data.



Key Facts

- **Private sector project announcements** (Apr–Sep 2025): ₹9.95 lakh crore (↑30.4% YoY).
- **Indian private sector alone**: ₹9.35 lakh crore (94% share, ↑37.5% YoY).

- **Government projects**: ₹1.51 lakh crore (↓71% YoY, 15-year low).
- **Foreign projects**: ₹0.6 lakh crore (↓28%, 5-year low).
- **Peak foreign investment announcements**: ₹1.9 lakh crore (H1 of 2022-23).
- **Global trend (UNCTAD)**: FDI ↑11% in 2024 vs 2023.

Static Context

- **Investment & Growth Nexus:**
  - Higher private investment → capital formation → GDP growth.
  - Government investment often acts as a counter-cyclical driver; decline raises concerns for infra creation.
- **FDI in India:**
  - Critical for technology transfer, global integration, and balance of payments stability.
  - India traditionally competes with ASEAN economies and China to attract FDI.
- **Crowding In vs Crowding Out:**
  - Decline in government spending could reduce "crowding in" effects for private players in infrastructure-heavy sectors.

Current Affairs Context

1. **Rise of Private Sector:**
   - Reflects corporate confidence in demand recovery and policy stability.
   - Possible drivers: PLI schemes, lower corporate tax regime, push for Make in India, consumption revival.
2. **Foreign Investment Slump:**
   - Contradicts global FDI surge (UNCTAD: +11%).
   - Possible reasons:
     - Regulatory complexities and policy unpredictability.
     - Rising protectionism and tariff barriers.
     - Geopolitical risks, China+1 strategy shifting towards Vietnam, Indonesia, Mexico.
3. **Government Investment Decline:**
   - Fiscal constraints due to subsidy burden and social sector spending.
   - Delays in tendering and state-level budgetary pressures.
   - Implication: weak push to infrastructure and rural job creation.

Implications for Mains

- **Positive:** Private sector dynamism indicates maturing of Indian capitalism and reduced dependence on state-led growth.
- **Negative:** Weak FDI flows → risk of technological stagnation and global disconnect.
- **Challenge:** Balancing fiscal prudence with capital expenditure by government.
- **Broader Concern:** If foreign investment keeps declining, India's ambition of becoming a global manufacturing hub may be jeopardized.

Way Forward

1. **For Private Sector:** Ensure access to credit, stable taxation, and quick dispute resolution.
2. **For Government:** Increase capital expenditure in infrastructure to crowd-in more private investments.
3. **For FDI:** Improve ease of doing business, policy stability, and sectoral liberalisation (esp. in high-tech & renewables).
4. **Balanced Approach:** Blend private dynamism with public investment push and foreign capital inflows for inclusive growth.

Conclusion

The surge in **private sector project announcements** highlights corporate confidence in India's growth story, but the **simultaneous decline in government and foreign investments signals structural imbalances**. For India's long-term economic resilience, a **synergistic model of private, public, and foreign investment** is essential. Without foreign capital and government push, private enthusiasm alone may not sustain broad-based growth.

UPSC Prelims Practice Question

Ques: With reference to "Giffen goods" and "Veblen goods" (from your earlier query), which of the following is correct?

(A) Both always follow the law of demand.

(B) Both are exceptions to the law of demand.

(C) Only Giffen goods violate the law of demand, while Veblen goods follow it.

(D) Neither violates the law of demand.

Ans: b)

UPSC Mains Practice Question

Ques: Discuss the significance of Foreign Direct Investment (FDI) for India's economic development. In light of the recent slump in foreign project announcements despite global FDI growth, suggest measures to enhance India's investment attractiveness. **(250 Words)**

Page 07 :GS 2 & 3: Social justice& Environment / Prelims

India's rapid digital transformation has enhanced communication, education, commerce, and governance. However, the flip side of this convenience is a growing **e-waste crisis**, which poses a serious **public health and environmental challenge**. With **2.2 million tonnes of e-waste generated in 2025**, India has become the **third-largest generator globally**, after China and the U.S. Despite regulatory frameworks, most e-waste is handled informally, exposing vulnerable populations to toxic hazards.

Daily News Analysis

Cost of convenience: health hazards as a side effect of using digital tools

India generated 2.2 million tonnes of e-waste in 2025, making it the third-largest e-waste generator globally, after China and the United States; a majority of this is informally recycled, leading to the release of toxic substances into the air and water, impacting the health of both e-waste workers and communities at large

Sudheer Kumar Shukla

India's digital transformation has revolutionised communication, education, commerce, and governance. From smartphones to smart homes, convenience has become the cornerstone of contemporary urban living. Yet, beneath this technological leap lies a growing environmental and public health catastrophe: electronic waste (e-waste).

E-waste, the fastest-growing solid waste stream globally, is now one of India's most pressing yet least acknowledged urban crises. Our embrace of electronics has outpaced our ability to manage their afterlife, resulting in widespread informal recycling practices that are endangering both ecosystems and human health — especially in the country's most marginalised communities.

Escalating burden

India generated 2.2 million tonnes (MT) of e-waste in 2025, making it the third-largest e-waste generator globally, after China and the United States. This figure represents a 150% surge from the 0.71 million tonnes recorded in 2017-18. At current growth rates, India's e-waste volume is expected to nearly double by 2030.

Urban India is the epicentre of this explosion. More than 60% of e-waste originates from just 65 cities, with key hotspots including Seelampur and Mustafabad (Delhi), Moradabad (Uttar Pradesh), and Bhiwandi (Maharashtra). Despite the existence of 322 registered formal recycling units with a combined capacity to treat over 2.2 million metric tonnes annually, more than half of the country's e-waste is still processed informally or not at all.

The informal ecosystem of Jhalawalan, scrap dealers, and slum-based workshops engage in manual dismantling, open-air burning, acid leaching, and unscientific dumping, often without gloves, masks, or protective clothing. These crude methods release over 1,000 toxic substances, such as heavy metals such as lead, cadmium, mercury, and chromium, persistent organic pollutants (POPs) including dioxins, furans, and brominated flame retardants and particulate matter ($PM_{2.5}$ and PM_{10}) that is released from burning wires and circuit boards.

Scientific measurements show that $PM_{2.5}$ levels in recycling zones such as Seelampur often exceed 300 µg/m³, over 12 times higher than the World Health Organisation's 24-hour safety limit of 25µg/m³.

E-waste and human health

E-waste affects human health in a number of ways. Some of these are:

Respiratory illnesses: Informal e-waste recycling releases fine particulate matter and toxic gases that can deeply infiltrate the lungs, leading to severe respiratory issues. In Benin, West Africa, a study revealed that 33.1% of e-waste workers experienced respiratory ailments such as chest tightness, wheezing, and breathlessness, significantly higher than the 21.6% observed in a non-exposed control group.

Similarly, a 2025 study published in *MDPI Applied Sciences* reported that 76-80% of workers engaged in informal e-waste processing in India exhibited symptoms of chronic bronchitis, asthma, and persistent coughing.

Neurological damage and developmental delays: Exposure to neurotoxins such as lead, mercury, and cadmium during informal e-waste recycling poses serious risks to brain development, particularly in children. Lead, a well-known neurotoxin, affects children through contaminated air, dust, soil, and water. Even blood lead levels below 5 µg/dL are linked to cognitive impairment, reduced IQ, attention deficits, and behavioral disorders. A 2023 systematic review published in *Frontiers in Public Health*, which analysed 30 studies from e-waste recycling areas — mostly in China — found that blood lead levels at or above 5 µg/dL were common. Documented effects included neurological issues such as lower serum cortisol, inhibited haemoglobin synthesis, and delayed neurobehavioral development. According to the WHO, millions of children are exposed to hazardous levels of lead due to informal e-waste recycling. This exposure can impair brain development, damage lung function, disrupt endocrine systems, and potentially lead to DNA damage.

Skin and ocular disorders: Direct contact with hazardous substances during informal e-waste recycling leads to a spectrum of skin and systemic health issues, especially in the absence of protective equipment. Workers handling electronic devices, cathode ray tubes (CRTs), and acid baths without safety gear commonly get rashes, chemical burns, and dermatitis. A 2024 review found that skin related problems affected up to 100% of informal recyclers in several studied clusters. Those dismantling screens, CRTs, and circuit boards without protection frequently experienced skin burns, eye irritation, and chemical rashes due to direct exposure to acids, barium, phosphor compounds, and heavy metals. In Guiyu, China — one of the most extensively studied informal recycling hubs — residents reported chronic health problems such as headaches, dizziness, persistent gastritis, and skin lesions. Alarmingly, there were also higher incidence of miscarriages and preterm births, correlating with significant soil contamination by lead, chromium, and other toxic substances.

Genetic and systemic impacts: Beyond surface-level injuries, research highlights DNA damage, also termed epigenetic changes, and increased oxidative stress in those exposed to informal recycling environments. Children are especially vulnerable, presenting with more frequent immune alterations and increased markers of inflammation. Studies in recycling clusters have documented PM 2.5 exposures well above safety thresholds, establishing a direct correlation with increases in neurological and respiratory disease rates.

The health effects of e-waste do not exist in isolation. Rather, they intersect with pre-existing vulnerabilities — poverty, malnutrition, lack of healthcare, and unsafe housing. This creates a syndemic environment where multiple diseases interact and exacerbate each other, worsening health outcomes for the urban poor. According to the WHO, 18 million children and nearly 13 million women work in, or live near, informal waste-handling zones globally. In India, children are often found helping parents dismantle electronics in home-based workshops, with devastating long-term health consequences.

The digital empowerment that fuels the country's economy cannot come at the cost of public health and environmental degradation

Policy progress, gaps

India's E-Waste (Management) Rules, 2022, introduced critical provisions such as strengthened Extended Producer Responsibility (EPR) norms, mandatory registration for dismantlers and recyclers as well as incentives for formalisation and scientific handling. However, implementation remains weak. The informal sector still handles the majority of India's e-waste. As of 2021-24, only 43% of e-waste was officially processed. Further, the capping of EPR credit prices has triggered legal battles, with manufacturers arguing it creates compliance hurdles. These roadblocks risk delaying unified enforcement and undermining progress.

The way forward

To break this toxic chain, India must adopt a multi-pronged strategy that includes formalising the informal by integrating informal workers into the regulated sector through skill certification, PPE provision, safe infrastructure, and access to healthcare and social security; strengthening enforcement by empowering pollution control boards, introducing digital e-waste tracking, and mandating environmental audits to ensure compliance; expanding medical surveillance by setting up health camps and conduct long-term studies, especially focusing on children in e-waste hotspots; fostering innovation by supporting R&D for affordable, local recycling technologies and promoting decentralised treatment hubs to improve efficiency and, importantly, raising awareness through mass awareness campaigns and including e-waste education in schools to build public responsibility from an early age.

India stands at a toxic crossroads. The digital empowerment that fuels its economy cannot come at the cost of public health and environmental degradation. As the e-waste mountain grows, so does the urgency of the need for systemic reform. The country must reject the silent normalisation of informal toxicity. It must act — guided by science, informed by justice, and driven by a vision where technology uplifts, rather than undermines, human dignity and health.

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THE GIST

The embrace of electronics has outpaced the ability to manage their afterlife, resulting in widespread informal recycling practices that are endangering both ecosystems and human health — especially in the country's most marginalised communities.

The health effects of e-waste do not exist in isolation. Rather, they interact with pre-existing vulnerabilities — poverty, malnutrition, lack of healthcare, and unsafe housing. This creates a syndemic environment where multiple diseases interact and exacerbate each other, worsening health outcomes for the urban poor.

To break this toxic chain, India must adopt a multi-pronged strategy that includes formalising the informal by integrating informal workers, safe infrastructure, and access to healthcare and social security; expanding medical surveillance; fostering innovation by supporting R&D and raising awareness.

Need for systemic reform: Despite the existence of 322 registered formal recycling units with a combined capacity to treat over 2.2 million metric tonnes annually, more than half of the country's e-waste is still processed informally or not at all. REUTERS

Key Facts

- **E-waste generated (2025):** 2.2 million tonnes (↑150% from 2017–18).
- **India's rank:** 3rd largest generator after China & USA.
- **Sources:** 60% from 65 cities; hotspots include Seelampur (Delhi), Moradabad (UP), Bhiwandi (Maharashtra).
- **Formal capacity:** 322 registered units, 2.2 MT capacity, but **>50% processed informally**.
- **WHO data:** 18 million children & 13 million women exposed globally in informal recycling.
- **Air pollution levels:** $PM_{2.5}$ in hotspots >300 µg/m³ (12× WHO safe limit).

Static Context

- **E-waste definition (Basel Convention):** Electrical/electronic equipment discarded as waste without intent of re-use.
- **Hazards:** Heavy metals (lead, cadmium, mercury), POPs (dioxins, furans), toxic dust → respiratory, neurological, genetic, and developmental disorders.
- **E-waste Management Rules, 2022:** Strengthened Extended Producer Responsibility (EPR), mandatory registration of recyclers, formalisation incentives.

Current Affairs Context

1. **Public Health Dimension (GS2):**
    - Respiratory diseases (bronchitis, asthma), neurological damage in children, skin/eye disorders, reproductive issues.
    - Evidence from India & global hotspots (China, West Africa) confirms elevated health risks.
2. **Socio-Economic Angle:**
    - Informal sector dominance (kabadiwalas, slum recyclers).
    - Workers lack PPE, healthcare, and social security.
    - Poverty and malnutrition compound vulnerabilities.
3. **Governance Issues:**
    - Weak enforcement of E-waste Rules.
    - Only 43% e-waste officially processed (2023–24).
    - EPR credit disputes causing compliance hurdles.

Implications for UPSC Mains

- **Environment:** Urban pollution, soil/water contamination, biodiversity threats.
- **Health:** Silent epidemic of respiratory, neurological, and genetic disorders among marginalised communities.
- **Economy:** Informal handling leads to resource wastage; missed opportunity in circular economy.
- **Ethics (GS4):** Intergenerational equity – digital growth at the cost of children's health violates justice principles.

Way Forward

1. **Formalisation of Informal Sector:** Skill certification, PPE provision, safe workplaces, integration into formal recycling.
2. **Strict Enforcement:** Digital tracking of e-waste, environmental audits, stronger role for pollution control boards.
3. **Health Interventions:** Regular medical surveillance, child-focused health camps in hotspots.
4. **Innovation & R&D:**Localised, affordable recycling technologies; decentralised treatment hubs.
5. **Awareness & Education:** Public campaigns, e-waste education in schools, incentivised take-back programmes.

Conclusion

India's digital revolution cannot be allowed to become an environmental disaster. With **2.2 million tonnes of e-waste already generated in 2025**, and volumes expected to double by 2030, systemic reform is urgent. A **science-driven, justice-oriented approach** — combining formalisation, health safeguards, enforcement, and awareness — is essential. The goal must be to ensure that technology **uplifts human dignity and health**, rather than undermining them.

UPSC Prelims Practice Question

Ques: Consider the following statements about e-waste in India:

1. India is the second-largest e-waste generator in the world after China.

2. More than half of India's e-waste is processed informally.

3. The E-Waste (Management) Rules, 2022 introduced Extended Producer Responsibility (EPR).

Which of the statements given above is/are correct?

(A) 1 and 2 only

(B) 2 and 3 only

(C) 1 and 3 only

(D) 1, 2 and 3

Ans: (b)

UPSC Mains Practice Question

Ques: Critically examine the effectiveness of India's E-Waste (Management) Rules, 2022 in addressing the environmental and health hazards of electronic waste. Suggest reforms for sustainable e-waste management. **(150 Words)**

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Daily News Analysis

Tamil Nadu is rapidly transforming into a **hub of innovation and deep-tech startups**, under a government-led ecosystem that integrates **capital, inclusion, and infrastructure**. Over the past four years, the state has expanded from **2,032 DPIIT-registered startups to over 12,100**, with significant **women-led (50%) and socially inclusive participation**. The TN Rising Investment Conclave and upcoming Global Startup Summit 2025 highlight the state's strategic emphasis on **innovation as a driver of economic growth and social inclusion**.

A startup revolution, the goal of 'innovation capital'

M.K. Stalin
is the Chief Minister of Tamil Nadu

Tamil Nadu's strategy to facilitate startups and spark innovation is moving to the next chapter — as the Tamil Nadu Global Startup Summit 2025

At the TN Rising Investment Conclave in Hosur recently, a young founder from Torus Robotics walked up to the stage, papers in hand, ready to exchange an investment memorandum of understanding with the Government of Tamil Nadu. What set this apart from most of the other corporate majors exchanging MoUs that day was their journey so far – starting with government-backed incubation and refining a difficult problem with patient mentorship and modest seed support. That morning, they were no longer petitioners for opportunity. They became partners of the government in a significant sector with ₹100-crore investment.

Welcoming startups such as Torus Robotics and many more as investors in the State is a symbol of what we set out to build: a system where a startup nurtured by the government can mature into a collaborator of the State. This is a deliberate outcome of a strategy that marries innovation with inclusion and policy with purpose.

Exponential growth in startups

For decades, Tamil Nadu's industrial identity has been anchored in manufacturing excellence. Over the last four years, we have extended that strength into deep-tech and innovation, quietly, steadily and inclusively.

When our government assumed office, the State had 2,032 Department for Promotion of Industry and Internal Trade (DPIIT)-registered startups. Today, the number has crossed 12,100, which is roughly a six-fold rise in just four years. It is a matter of pride that 50% of them are women-led. Tamil Nadu has been recognised as 'Best Performer' in the States' Startup Ranking 2022 by the Union Government's DPIIT, which is a move up from 'Emerging State' category in 2018. Chennai was ranked 18th in Asia in the Global Startup Ecosystem Report 2024, and among Asia's top 10 for Affordable Talent. Tamil Nadu also leads the nation in the number of incubators and has been named a model State for the innovation ecosystem by the Atal Innovation Mission.

This is an outcome of a three-pillar strategy that the State has followed to facilitate startups and spark innovation. The first pillar is using State capital as a strategic catalyst. Through the Tamil Nadu Startup Seed Grant Fund (TANSEED), seed grants of ₹10 lakh are provided to startups, and ₹15 lakh to women-led, green-tech and rural-livelihood ventures. So far, 169 startups such as Ippopay, Gallabox and Dream Aerospace have received ₹18.79 crore, which have gone on to attract more than ₹537 crore in investments – a 28X multiplier on the State's seed rupee.

We are extending this capital logic to frontier sectors. For instance, the Tamil Nadu Space Tech Fund of ₹10 crore offers milestone-based assistance up to ₹50 lakh on a 1:1 match with external investors, backing both core and downstream space applications, from satellites to Artificial Intelligence (AI)-driven geospatial solutions.

Focus on inclusion, gender parity

Our second pillar is employing principles of inclusion, and not as charity but strategy. The Scheduled Castes and Scheduled Tribes (SC/ST) Startup Fund, launched in 2022-23 with an initial ₹30 crore and enhanced to ₹50 crore in 2023-24, delivers equity investments to level the playing field. Forty-three startups such as OrbitAid, Unibose and TAMS Tribal Green Fuel have received ₹60.80 crore so far. We followed it up with the Periyar Social Justice Venture Lab – an acceleration programme designed to support social enterprises and empower entrepreneurs from SCs and STs. More than 30 such startups are already engaged, and the model is already yielding appreciable results with eight companies having successfully raised the next round of funding totalling ₹16.9 crore.

We have focused on gender parity through *Thozhili* bootcamps that have equipped over 200 women in Coimbatore, Kanniyakumari, Erode and Chennai – 15 women entrepreneurs received ₹14.70 lakh for incubation expenses. For physically challenged founders and transgender founders, Special Seed Grant Funds of up to ₹5 lakh with structured mentorship and incubation access have been established. For rural innovators, the *Gramam Thorum Puthozhil* scheme (Establishing Start-ups in Villages) has been implemented. The aim is to have 100 startups in 100 villages, using equity-free TANSEED grants of ₹1 lakh and incubation via regional hubs.

Our third pillar was building a decentralised and connected ecosystem. Ten regional hubs – Chennai, Madurai, Tirunelveli, Erode, Salem, Cuddalore, Hosur, Thanjavur, Coimbatore and Tiruchi – bring infrastructure, mentors and markets closer to entrepreneurs. A Metro Hub functions in Chennai, and Thoothukudi has been announced as the next addition. We are also creating the pipeline earlier with 100 Pre-Incubation Centres being rolled out in Tier-II/III/IV institutions. The first 25 have been sanctioned at ₹7.5 lakh each (total cost of ₹1.87 crore).

Digital rails tie these hubs together. MentorTN has onboarded 320 mentors and 1,171 startups and facilitated 1,120 hours of mentoring. TANFUND connects startups to capital with 300-plus investors and 2,500-plus entrepreneurs registered, 221 Investor Connect programmes conducted, 1,417 startup-investor connections and ₹127.09 crore raised so far.

StartupTN is also a key partner in *Naan Mudhalvan's* hackathon programme '*Niral Thiruvizha*', through which we guide student projects toward becoming successful commercial startups. The collaboration connects academic and entrepreneurial ecosystems to help students develop technology-driven solutions for real-world problems.

We have complemented capital and infrastructure with tools that reduce friction and raise quality. The StartupTN Smart Card gives early-stage startups subsidised access to essential services, helping them save precious cash and scale faster. A bilingual call centre answers queries in Tamil and English, ensuring that first-time founders are not lost for want of information.

Through BrandLabs, our 'Nil-Brand-Sell' course of 250 minutes in Tamil and English helps founders turn great products into credible brands. Our Corporate Innovation Initiative, through an Open Innovation portal, connects startups with large enterprises such as Bosch, Kauvery Hospitals, Hero MotoCorp, PayU, Pierer Innovation and Daimler India Commercial Vehicles among others, to solve real-world challenges.

The results are visible, measurable and nationally acknowledged. What has changed in the last four years? The answer is systems, not slogans. We revitalised StartupTN, expanded it Statewide, and made inclusion the architecture of growth. We ensured that everyone could access the same rails of mentors, markets and money. Those who once left ideas behind now find a hand extended and a path ahead. We moved from ranking at the bottom to leading the table, from episodic initiatives to compounding institutions. We did not inherit a thriving startup engine. We built one.

Global summit in Coimbatore

The Tamil Nadu Global Startup Summit (TNGSS) 2025, taking place in Coimbatore (October 9-10, 2025) is a milestone in our efforts. Over two days, it will bring together over 30,000 visitors, 2,000 delegates, and 750 exhibitors, creating a vibrant space for collaboration and growth. To ensure meaningful connections, we are deploying a first-of-its-kind AI-enabled matchmaking app to help every participant find the right partners, investors, or resources for their specific needs. The summit is also thoughtfully designed with inclusive infrastructure, including dedicated facilities such as feeding rooms and crèches to ensure a welcoming environment for women participants. Investors, founders, students and global leaders from 35 countries will join hands to shape the next chapter of Tamil Nadu's startup story.

From masterclasses by Google, Meta, Microsoft, and Harvard Innovation Labs to insights from leading unicorns and industry pioneers, every session will open new doors. With dedicated pavilions on space-tech, corporate innovation, power brands, and government partnerships, this summit is designed to connect you with opportunities, whether you are an entrepreneur, investor, policymaker, or student.

Key Facts

- **Startup growth:** 2,032 → 12,100 startups in 4 years.
- **Recognition:** Best Performer in DPIIT States' Startup Ranking 2022; Chennai 18th in Asia (Global Startup Ecosystem Report 2024).

- **Seed Funding (TANSEED):** ₹10–15 lakh per startup; 169 startups funded → attracted ₹537 crore external investment (28X multiplier).
- **Inclusion funds:** SC/ST Startup Fund ₹50 crore; women, rural, and differently-abled focused seed grants.
- **Incubation & ecosystem:** 10 regional hubs, 100 pre-incubation centres; MentorTNonboarded 1,171 startups& 320 mentors.
- **Global Summit:** TNGSS 2025 in Coimbatore with 30,000 visitors, AI-enabled matchmaking, pavilions for space-tech, corporate innovation, and government collaboration.

Static Context

- **Startup ecosystem significance:**
  - Drives **employment generation**, **technology adoption**, and **industrial diversification**.
  - Government intervention (seed funding, incubation, mentorship) reduces risk and accelerates growth.
- **Deep-tech & innovation:**
  - Tamil Nadu's strategy emphasizes frontier sectors like AI, space tech, and green technologies.
- **Policy instruments:**
  - Extended Producer Responsibility for startups, equity-free grants, mentoring networks, and regional incubation hubs.

Current Affairs Context

1. **Economic Dimension:**
   - Startups are moving from **beneficiaries to partners** of government projects, contributing to ₹100-crore investments.
   - Public seed funding catalyses **private investments**, demonstrating a **multiplier effect** on capital infusion.
2. **Social Inclusion & Gender Parity:**
   - Special funds for SC/ST, women, rural innovators, and differently-abled founders ensure equitable access.
   - Programs like Thozhilibootcamps and GramamThorumPuthozhil encourage grassroots entrepreneurship.
3. **Infrastructure & Digital Integration:**
   - Regional hubs + MentorTN + TANFUND create a **connected, decentralised ecosystem**.
   - Early-stage startups benefit from subsidised services, mentorship, and market access, reducing entry barriers.
4. **Global Collaboration & Knowledge Exchange:**
   - TNGSS 2025 includes global investors, tech leaders, and AI-enabled networking, integrating Tamil Nadu into the **global innovation ecosystem**.

Implications for UPSC Mains

- **Economic Growth:** Catalysing **job creation**, attracting investments, and fostering a **knowledge-driven economy**.

- **Governance & Policy:** Example of **state-led intervention** for innovation and inclusion, aligning with cooperative federalism.
- **Social Equity:** Demonstrates **strategic inclusion**, empowering marginalized and women entrepreneurs.
- **Technological Advancement:** Encourages **deep-tech, AI, and space applications**, contributing to India's global competitiveness.

Way Forward

1. Scale **state incubators and pre-incubation centres** nationwide.
2. Expand **private-public partnerships** in frontier technologies.
3. Strengthen **monitoring and evaluation frameworks** to ensure funding efficacy.
4. Promote **international collaboration**, leveraging global best practices in deep-tech and startup governance.
5. Increase awareness among students and rural innovators through **education-linked hackathons and incubation programs**.

Conclusion

Tamil Nadu's startup strategy illustrates how **government policy, capital, and mentorship** can convert **early-stage innovators into economic partners**, fostering inclusive growth and global competitiveness. By integrating **equity, infrastructure, and connectivity**, Tamil Nadu is building a **model ecosystem for innovation-led development**, demonstrating a replicable blueprint for other states and India's broader startup ambitions.

UPSC Prelims Practice Question

Ques: Which of the following statements about Tamil Nadu's startup ecosystem is correct?

(a) Tamil Nadu had over 12,000 DPIIT-registered startups in 2025.

(b) 50% of startups in Tamil Nadu are women-led.

(c) Chennai ranked 18th in Asia in the Global Startup Ecosystem Report 2024.

(d) All of the above.

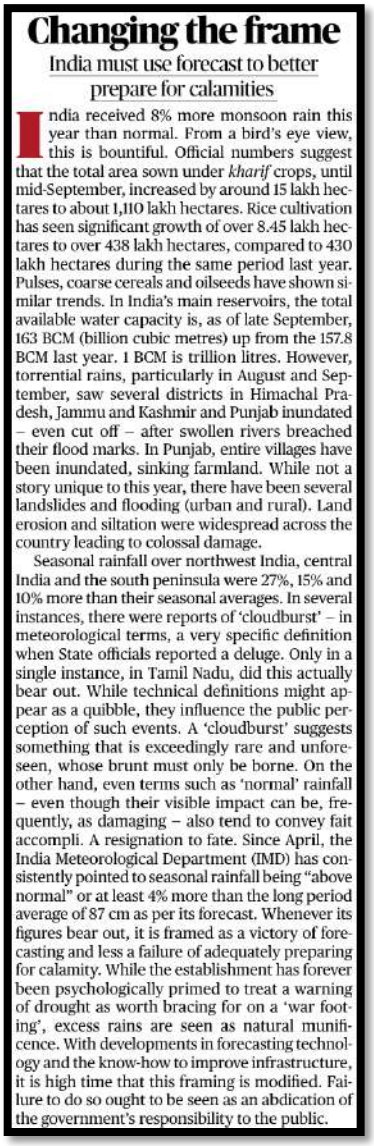
Ans: (d)

UPSC Mains Practice Question

Ques: Examine how Tamil Nadu's startup ecosystem integrates government support, capital, and mentorship to drive innovation-led economic growth. Discuss the implications for India's broader startup policy. **(150 Words)**

Page : 08: GS 3 : Envrionment and Disaster Management / Prelims

India experienced **8% above-normal monsoon rainfall in 2025**, resulting in increased kharif sowing (1,110 lakh hectares) and higher reservoir levels (163 BCM). While aggregate figures suggest a "bountiful" monsoon, **localized floods, landslides, and urban inundations** in Himachal Pradesh, Jammu & Kashmir, Punjab, and elsewhere caused severe damage, highlighting gaps in disaster preparedness. The article emphasizes the **need to shift the perception of forecasts**: from being celebratory or resigned to being actionable tools for mitigation.



Changing the frame

India must use forecast to better prepare for calamities

India received 8% more monsoon rain this year than normal. From a bird's eye view, this is bountiful. Official numbers suggest that the total area sown under *kharif* crops, until mid-September, increased by around 15 lakh hectares to about 1,110 lakh hectares. Rice cultivation has seen significant growth of over 8.45 lakh hectares to over 438 lakh hectares, compared to 430 lakh hectares during the same period last year. Pulses, coarse cereals and oilseeds have shown similar trends. In India's main reservoirs, the total available water capacity is, as of late September, 163 BCM (billion cubic metres) up from the 157.8 BCM last year. 1 BCM is trillion litres. However, torrential rains, particularly in August and September, saw several districts in Himachal Pradesh, Jammu and Kashmir and Punjab inundated – even cut off – after swollen rivers breached their flood marks. In Punjab, entire villages have been inundated, sinking farmland. While not a story unique to this year, there have been several landslides and flooding (urban and rural). Land erosion and siltation were widespread across the country leading to colossal damage.

Seasonal rainfall over northwest India, central India and the south peninsula were 27%, 15% and 10% more than their seasonal averages. In several instances, there were reports of 'cloudburst' – in meteorological terms, a very specific definition when State officials reported a deluge. Only in a single instance, in Tamil Nadu, did this actually bear out. While technical definitions might appear as a quibble, they influence the public perception of such events. A 'cloudburst' suggests something that is exceedingly rare and unforeseen, whose brunt must only be borne. On the other hand, even terms such as 'normal' rainfall – even though their visible impact can be, frequently, as damaging – also tend to convey fait accompli. A resignation to fate. Since April, the India Meteorological Department (IMD) has consistently pointed to seasonal rainfall being "above normal" or at least 4% more than the long period average of 87 cm as per its forecast. Whenever its figures bear out, it is framed as a victory of forecasting and less a failure of adequately preparing for calamity. While the establishment has forever been psychologically primed to treat a warning of drought as worth bracing for on a 'war footing', excess rains are seen as natural munificence. With developments in forecasting technology and the know-how to improve infrastructure, it is high time that this framing is modified. Failure to do so ought to be seen as an abdication of the government's responsibility to the public.

Key Facts

- **Kharif crop sown area (mid-Sep 2025):** 1,110 lakh hectares (↑15 lakh hectares YoY).
- **Rice cultivation:** 438 lakh hectares (↑8.45 lakh hectares YoY).
- **Reservoir capacity:** 163 BCM vs 157.8 BCM last year.
- **Rainfall anomalies:** NW India (+27%), Central India (+15%), South Peninsula (+10%).
- **Flood-affected states:** Himachal Pradesh, J&K, Punjab, Tamil Nadu (cloudburst).

Static Context

- **Disaster types:** Floods, cloudbursts, landslides, urban inundation.
- **Governing frameworks:**
  - **Disaster Management Act, 2005**→ National & State Disaster Management Authorities.
  - **IMD forecasts**→ Seasonal rainfall, flood alerts, and drought monitoring.
- **Hydrology context:** Reservoir management, siltation, and land erosion impact both water storage and flood risk.

Current Affairs Context

1. **Forecasting vs Action:**
   - IMD consistently predicted "above-normal rainfall," yet flood preparedness remained inadequate.
   - Excess rainfall still framed as natural bounty, leading to **complacency in infrastructure and emergency planning**.

2. **Infrastructure Gaps:**
    - River embankments breached in multiple districts.
    - Urban drainage systems failed in several cities.
    - Siltation and land erosion exacerbate flooding.
3. **Policy Implications:**
    - Forecasts must trigger **proactive measures**, not just inform public perception.
    - Need for **risk-informed planning**: dams, reservoirs, drainage, urban infrastructure.
    - Strengthen early warning systems and community-level disaster readiness.

Implications for UPSC Mains

- **Disaster Management & Governance:**
    - Treat excess rainfall with same urgency as drought.
    - Integrate forecasting, infrastructure planning, and emergency response.
- **Climate Change Adaptation:**
    - Extreme rainfall events increasing due to climate change.
    - Calls for resilient infrastructure and land-use planning.
- **Public Policy & Accountability:**
    - Failure to act on forecasts = abdication of government responsibility.
    - Need for **anticipatory governance** rather than reactive response.

Way Forward

1. **Infrastructure Preparedness:** Upgrade dams, embankments, and urban drainage.
2. **Community Awareness & Training:** Disaster drills, flood maps, evacuation plans.
3. **Integrated Use of Forecasts:** Translate meteorological predictions into actionable local plans.
4. **Climate Resilient Planning:** Incorporate rainfall extremes into agriculture, urban, and watershed management.
5. **Policy Enforcement:** Mandate that early warnings trigger **pre-emptive government action**.

Conclusion

India's above-normal monsoon in 2025 underscores that **forecasting is only useful if it prompts preparedness**. Viewing excess rainfall as a boon rather than a risk can lead to preventable calamities. For resilient development, India must **reframe forecasts as a call to action**, ensuring infrastructure, communities, and governance are ready to mitigate disasters.

UPSC Prelims Practice Question

Ques :Cloudburst is defined in meteorology as:

(A) Above-normal seasonal rainfall

(B) Localised, sudden, extremely heavy rainfall over a short period

(C) Continuous rain over 24 hours

(D) Any rainfall exceeding 100 mm in a week

Ans: b)

UPSC Mains Practice Question

Ques: Excess rainfall is often treated as a natural boon rather than a disaster. Critically examine how anticipatory governance can improve India's response to extreme weather events.**(150 Words)**

Page 11 :GS 3: Indian Economy& Science and technology/ Prelims

India's digital transformation — via affordable internet, digital banking, and e-commerce — has improved convenience, inclusion, and economic growth. However, it has also exposed vulnerabilities to **cyber frauds** such as **phishing, UPI/OTP scams, identity theft, loan scams, and digital arrests**. These crimes increasingly rely on **social engineering**, manipulating fear, greed, or urgency, rather than technical hacking skills. Protecting the digital economy requires a **shift from reactive response to proactive prevention**, leveraging technology, regulation, and citizen awareness.

Daily News Analysis

How to safeguard India's digital economy

Cyber frauds have moved far beyond the fraudulent ATM withdrawals of earlier years. Today, criminals deploy more sophisticated and targeted strategies

Rajeev Kumar

India's digital transformation – powered by affordable Internet, digital banking, and e-commerce – while enhancing convenience and inclusion has also created a fertile ground for cybercrime. Fraudsters exploit system loopholes and human psychology, using tactics such as phishing, OTP/UPI frauds, identity theft, loan scams, and increasingly, digital arrests. These frauds rely less on hacking skills and more on manipulation of fear and trust.

Perils of social engineering

The most vulnerable victims include elderly citizens, rural populations, and weaker groups such as job seekers or loan applicants. Many senior citizens remain digitally illiterate yet hold substantial savings, making them prime targets. Fraudsters often obtain leaked banking or personal data to identify such customers, tailoring scams to exploit their weaknesses. Social engineering is at the core of these crimes – manipulating fear, greed, or urgency. Even educated individuals often surrender under sustained psychological pressure, showing how deeply criminals exploit human behaviour.

Two recent digital arrest cases highlight the role of fear. In the first, a 78-year-old retired banker was duped of ₹23 crore – siphoned through 21 transactions to 16 accounts. In the second, a lawmaker's wife was defrauded of ₹14 lakh but was able to recover it as she acted swiftly. Together, these cases show a stark contrast – delay leads to irreversible losses, while swift action can save victims from ruin. These cases underline the urgent need for systemic reforms such as AI-driven monitoring to flag abnormal transactions; banks mandated to act within the 24-hour window; cyber police equipped to respond swiftly etc. Proactive detection and rapid coordination between banks and law enforcement are essential to prevent such scams from succeeding.

However, institutions have failed to keep pace. Banks, entrusted with safeguarding public money, often limit their role to issuing generic advisories, while mule accounts with weak KYCs continue to thrive. Customer data – meant to be securely protected – often circulates freely across banks and even into the hands of fraudsters. Cyber police remain severely underequipped with respect to technology, training, and workforce, leaving victims trapped in bureaucratic delays and lost opportunities for recovery. Without advanced tools, specialised skills, and adequate manpower, they risk becoming symbolic entities rather than meaningful protectors in India's fight against cybercrime.

Thousands of fraud cases are reported daily, but the actual figures are far higher, as many victims avoid reporting due to stigma or lack of faith. This systemic apathy – both from banks and cyber police – has emboldened criminals and eroded trust, threatening the credibility of India's digital economy.

Increased sophistication

Cyber frauds have moved far beyond the fraudulent ATM withdrawals of earlier years. Today, criminals deploy more sophisticated and targeted strategies. Phishing attacks lure users into revealing sensitive data through fake emails or SMS messages. Remote access scams trick victims into downloading malicious apps that give criminals control of their devices. Job and loan scams prey on the aspirations of youth and financially vulnerable populations, while OTP and UPI frauds manipulate users into unknowingly authorising transactions.

Equally damaging is identity theft, where Aadhaar, PAN, or bank details are misused to commit further crimes. Among the most alarming trends is the rise of digital arrests, where criminals impersonate police, customs, or government agencies. Victims are kept on continuous calls, shown fake warrants, and psychologically coerced into paying large sums to avoid fabricated charges. Such frauds demonstrate how criminals adapt faster than institutions. Their reliance on social engineering and technology-enabled deception shows us how they remain several steps ahead of current safeguards.

Large-scale frauds reveal recurring transaction patterns that should serve as early warning signals. First is scale. Fraudulent transfers are frequently many times larger than a customer's normal transactions. Secondly, the frequency of transactions; multiple high-value debits executed within a short span of time. In robust monitoring systems, both should trigger critical alerts. Yet banks often fail to send SMS, email, or phone verifications. Ironically, modest credit card spends and cheque clearances routinely invite confirmation calls, while multi-crore savings account debits pass without checks.

The destination of funds also exposes familiar patterns. Money is funnelled into mule accounts with incomplete or fake KYCs, often with negligible balances before suddenly receiving massive inflows. These funds are quickly dispersed across smaller or cooperative banks in a process known as layering, making recovery nearly impossible. The delay in freezing accounts compounds the problem. Victims face hurdles when reporting fraud, and the crucial 24-hour window is rarely used effectively. By the time action begins, funds are already beyond reach.

These patterns are not isolated anomalies but hallmarks of organised cyber fraud. The failure to monitor them proactively reflects systemic negligence, leaving criminals ample room to thrive.

Possible interventions

The current institutional approach is largely reactive – fraud is addressed only after complaints are filed. Artificial Intelligence (AI) and Machine Learning (ML) can shift this model to proactive prevention through the following methods:

Personalised transaction profiles: AI can map each customer's typical transaction size, frequency, timing, and risk category (for example, senior citizens, rural users, high-net-worth individuals). Customers can be grouped into clusters to generate targeted alerts for deviations from normal activity. Unusual patterns – such as abnormally large transfers or frequent debits – can trigger alerts, require confirmation, or temporarily block the transaction until verified. Clustering algorithms and anomaly detection models can flag behaviours such as unusually large one-off transfers, multiple debits within short intervals, or mule accounts receiving sudden inflows. ML systems can also identify accounts with incomplete or fake KYCs, preventing them from becoming conduits for laundering.

Cross-institutional monitoring: Banks operate in isolation without sharing information with the cyber police or telecoms. An AI-enabled fraud intelligence and early detection network could enable real-time sharing of alerts across banks, payment systems, and telecom providers. If one bank identifies a suspicious account, others could be notified instantly, preventing fraudsters from exploiting institutional gaps.

Empowering the cyber police: AI offers real-time detection and automated alerts for law enforcement, allowing swift action within the crucial 24-hour window. With global data-sharing and stronger international cooperation, AI can make cyber policing faster, more agile, and citizen-friendly.

Strengthening accountability of banks: Banks must adopt AI-driven monitoring, plug KYC gaps, and explore Blockchain for secure, tamper-proof customer data management.

Frauds today are not invisible – they are detectable with the right tools. What is missing is not technology, but institutional will. With AI-driven monitoring, fraud detection can evolve from reactive firefighting to proactive prevention.

The way forward

India must shift to a protection-first framework, where citizen safety and digital trust are central to financial stability.

For banks, reforms should tighten KYCs, audit mule accounts, and secure customer data. Blockchain promises tamper-proof record sharing, while AI-driven monitoring and shared fraud intelligence platforms are necessities. Victims must also receive swift compensation, as mandated by the RBI, without unfair blame. For the cyber police, speed, tools, and capability are key. 24/7 rapid-response units must act within the 24-hour window, supported by stronger cross-border cooperation to address globalised fraud.

If pursued sincerely, these reforms can transform India's digital economy from vulnerable to resilient, where technology and trust work together to protect every citizen.

Rajeev Kumar is a former Professor of Computer Science & Engineering at IIT Kharagpur, IIT Kanpur, BITS Pilani, and INU, and a former scientist at DRDO and DST.

GETTY IMAGES

Key Facts

- **Major targets:** Elderly citizens, rural populations, job seekers, high-net-worth individuals.
- **Recent cases:**
  - ₹23 crore lost by a 78-year-old banker through 21 transactions to 16 accounts.
  - ₹14 lakh recovered by a lawmaker's wife due to swift action.
- **Fraud patterns:** Large-scale transfers, multiple high-value debits, mule accounts with incomplete or fake KYCs, layering across multiple banks.
- **Reported vs actual cases:** Thousands daily, but underreporting due to stigma or lack of faith.

Static Context

- **Relevant laws:**
  - IT Act 2000 & amendments (cybercrime and data protection).
  - RBI guidelines for digital transactions and customer protection.
- **Cybercrime types:** Social engineering, phishing, identity theft, digital impersonation.
- **Technological safeguards:** AI/ML-based anomaly detection, Blockchain for secure data storage, inter-bank fraud intelligence networks.

Current Affairs Context

1. **Systemic gaps:**
   - Banks issue generic advisories rather than proactive monitoring.
   - Cyber police under-equipped in technology, workforce, and training.
   - Weak KYC norms allow mule accounts to proliferate.
2. **Increasing sophistication of frauds:**
   - Remote access scams, fake government/digital arrests, and psychological manipulation.
   - Fraudsters adapt faster than institutional safeguards, exploiting procedural and technological gaps.
3. **Economic impact:**
   - Erosion of public trust threatens the **credibility and growth of India's digital economy**.
   - Delayed detection results in irrecoverable losses and undermines financial stability.

Policy Implications

- **Proactive AI-driven monitoring:**
  - Personalized transaction profiling, anomaly detection, and cluster-based alerts.
  - Identify accounts with incomplete/fake KYCs.
- **Cross-institutional intelligence:**
  - Shared fraud intelligence across banks, telecoms, and cyber police.
- **Cyber police empowerment:**
  - 24/7 rapid-response units, AI-enabled monitoring, and international cooperation.
- **Bank accountability:**
  - Strengthen KYC, plug data leaks, explore Blockchain for tamper-proof customer data.

Way Forward

1. **Protection-first framework:** Citizen safety as a cornerstone of the digital economy.
2. **Technological integration:** AI, ML, Blockchain, and real-time fraud intelligence networks.
3. **Swift victim compensation:** RBI-mandated, minimizing blame on victims.
4. **Capacity building:** Cyber police equipped with tools, training, and manpower.
5. **Public awareness:** Educate users on social engineering tactics and digital hygiene.

Conclusion

India's digital economy is vulnerable not due to lack of technology but institutional inertia. By **integrating AI-driven monitoring, cross-institution collaboration, and regulatory enforcement**, India can shift from reactive firefighting to **proactive cyber protection**. A resilient digital ecosystem will safeguard citizens, reinforce trust, and sustain India's growth as a leading digital economy.

UPSC Prelims Practice Question

Ques:Which of the following technologies can be effectively used for proactive cyber fraud prevention?

A) Artificial Intelligence & Machine Learning

B) Blockchain for secure data management

C) Internet of Things (IoT) devices

D) Both A and B

Ans : d)

UPSC Mains Practice Question

Ques: Discuss the role of Artificial Intelligence, Blockchain, and cross-institutional monitoring in protecting financial transactions and customer data in India. **(150 Words)**

Page : 08 Editorial Analysis

The battlefield, change and the Indian armed forces

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With paradigm shifts in how global wars are being fought, India faces immense challenges from its adversaries in all domains. Artificial intelligence (AI), automation, drones and cheap precision weapons have lowered the cost of force yet have heightened the risks of operation. Against this backdrop of a two-front threat scenario, India is reshaping its structure, doctrine, technology, force composition, professional military education (PME) and military readiness. However, past attempts at building jointness have delivered only limited results. Reforms must now advance at a speed and scale that can match the operational needs of the armed forces.

From 'coordination' to 'command'

At the combined commanders conference last month in Kolkata, with the theme of 'Year of Reforms - Transformation for the Future', Prime Minister Narendra Modi emphasised the intention to move from service silos to integrated theatre commands. The Ministry of Defence has prioritised a review of structural, administrative, and operational matters such as the Inter-Services Organisations (Command, Control and Discipline) Rules, 2025, wherein commanders in organisations are empowered to exercise disciplinary and administrative authority for jointness in coordinated operations. However, these measures must be evaluated against real metrics. A decade after Mr. Modi emphasised jointness as a priority, it is only now that the Indian military has arrived at joint PME, underlining that the progression is not proportionate to the needs of today.

Meanwhile, the Defence Ministry has already raised tri-service agencies for cyber, space, and special operations under Headquarters Integrated Defence Staff (HQ IDS). New battle formations such as the "Rudra" and "Bhairav" units reflect this shift by combining infantry, artillery, armour, air defence, engineers, and surveillance elements into modular, mission-specific combat groups. These enable faster reaction times and more flexible operational deployment, especially along volatile borders (China and Pakistan).

Changing battlefield dynamics require an adaptive military

The recent declassification of India's Joint Doctrine for Amphibious Operations also details the framework for amphibious operations by integrating maritime, air, and land forces. However, theatrisation as understood by several militaries around the world, has yet to be contextualised in the Indian context. China has embodied integrated theatre commands for years. Indian theatrisation must be indigenous in design. This is all the more important when the jointness of all services has not been tested until now. While Operation Sindoor was a show of strength, the confrontation was largely aerial and did not require jointness for complete mobilisation.

Doctrine and tech evolution for war

The Joint Doctrine of the Indian Armed Forces (2017) and the Army's Land Warfare Doctrine (2018) set the basics for synergy and jointness. The recent Ran Samvad (the first tri-service seminar on war, warfare and warfighting) deliberated on preparing for future hybrid warriors (scholar, tech, and information warriors) who can read an adversary, code a solution, and shape the narrative. In changing times, doctrinal evolution must consider that future wars will be multi-domain from beginning, in which speed and information will decide the outcomes as much as conventional firepower.

Recent procurement has been critical and in alignment with creating seamless jointness. The MQ-9B drones deepen persistent intelligence, surveillance, and reconnaissance (ISR) and precision strike across land and sea. This deal underpins tri-service employment. The Navy's Rafale-M order stabilises carrier aviation and opens new options for maritime strike and fleet air defence. Akashteer, an AI-enabled, automated command-and-control network for Army air defence, is being integrated with the Air Force's Integrated Air Command and Control System (IACCS). This is a standard but important step in advancing jointness.

Creating a modern force

The Army's Integrated Battle Groups is emerging as an all-arms brigades ("Rudra") specifically designed to deploy within 12 to 48 hours with armour, infantry, artillery, engineers, loitering munitions and drones tailored to specific areas of confrontation. Momentum is now needed to translate into functioning brigades with joint training, logistics, and firepower. The Pralay quasi-ballistic missile completed back-to-back user trials in July 2025, strengthening land-based theatre fires. At sea, a carrier-centred maritime posture is being developed. The Rafale-M supports near-term air wings while the Navy charts a 15-year capability road map to manage air, subsurface, and unmanned growth.

India's next step is to place integration and learning at the centre of military power. This means establishing a stable and effective jointness that sets common data and interface standards. Despite inter-services differences, theatre commands should be activated, maybe with initial mandates and expanding authorities assessed over time. Professional military education must raise cadres of technologist-commanders embedded into every field exercise where failure is dealt with course correction. To make it effective, civil-military fusion is indispensable with the Defence Research and Development Organisation, defence public sector undertakings, private industry and universities for code, data, test ranges and rapid prototyping embedded in PME and exercises. A strong industrial complex management base should be tied into this cycle through rapid and repeated trials that keep what works and retire what is outdated. Where change shifts the dynamics of the battlefield, only an adaptive military moves the front.

GS. Paper 03–Science & Technology

UPSC Mains Practice Question: Discuss how India is transforming its armed forces to meet the challenges of modern warfare. Highlight structural, technological, and doctrinal reforms. **(150 Words)**

Context :

Global warfare is undergoing a **paradigm shift**, driven by AI, automation, drones, precision weapons, and hybrid threats. India, facing a **two-front scenario** with China and Pakistan, is reshaping its military structure, doctrine, technology, and professional military education (PME) to match modern operational needs. Despite past reforms,

jointness among the three services has been limited, necessitating accelerated modernization and structural adaptation.

Key Facts

- **Joint Doctrine:** Indian Armed Forces' Joint Doctrine (2017), Army Land Warfare Doctrine (2018).
- **Tri-Service Units:** "Rudra" & "Bhairav" modular formations integrating infantry, artillery, armour, engineers, air defence, and surveillance.
- **Technology Integration:**
  - MQ-9B drones → ISR & precision strike
  - Rafale-M → carrier aviation & maritime strike
  - Akashteer→ AI-enabled Army Air Defence integrated with Air Force IACCS
- **Recent Initiatives:**
  - Joint Doctrine for Amphibious Operations declassified
  - Ran Samvad→ first tri-service seminar on war, warfare, and hybrid threats
- **Operational Focus:** Fast deployment (12-48 hours), multi-domain integration, adaptive learning.

Static Context

- **Theatre Commands:** Proposed integrated commands for joint operations across land, air, and sea.
- **Professional Military Education:** Focus on technologist-commanders capable of handling AI, coding, information warfare, and multi-domain operations.
- **Procurement & Modernization:** Focused on AI-enabled systems, drones, unmanned platforms, missile systems (Pralay), carrier-centric maritime posture.
- **Civil-Military Fusion:** Integration of DRDO, DPSUs, private industry, and academia for rapid prototyping and capability development.

Current Affairs Context

1. **Global Warfare Trends:**
   - Hybrid and multi-domain wars, low-cost precision weapons, and automation lower operational cost but raise risk and complexity.
2. **India's Challenges:**
   - Two-front threat scenario (China & Pakistan).
   - Need for rapid deployment, flexibility, and seamless coordination.
3. **Strategic Reforms:**
   - Modular battle groups (Rudra/Bhairav) → flexible, fast reaction forces.
   - Tri-service cyber, space, and special operations agencies under HQ IDS.
   - Focus on joint PME to prepare technologist-commanders for modern conflict.

Policy & Operational Implications

- **Jointness& Theatre Commands:**
  - Shift from service silos to integrated commands.

  - Commands to evolve gradually with expanding authority.
- **Technology & Doctrine Evolution:**
  - Multi-domain integration → land, air, sea, cyber, space.
  - AI, ISR, automated command networks, and unmanned platforms for faster decision-making.
- **Adaptive Force Development:**
  - PME embedded with code, data, exercises, and civil-military cooperation.
  - Rapid trials → retain effective strategies, retire outdated systems.
- **Industrial & Academic Collaboration:**
  - Private sector, academia, and DRDO collaboration for R&D, prototyping, and capacity building.

Way Forward

1. **Accelerate Theatre Commands:** Implement operational mandates and gradually expand authorities.
2. **Multi-Domain Warfare Capability:** Integrate AI, automation, drones, cyber and space assets.
3. **Human Resource Development:** Train technologist-commanders and embed adaptive learning into PME.
4. **Civil-Military Fusion:** Leverage DRDO, DPSUs, private industry, and universities for rapid innovation.
5. **Continuous Assessment:** Conduct repeated field trials to evolve doctrine, force structure, and capabilities.

Conclusion

India's armed forces are at a **critical juncture of transformation**, seeking to match modern warfare's speed, technology, and multi-domain complexity. Jointness, technological integration, PME reforms, and civil-military collaboration are central to building a **flexible, adaptive, and future-ready military**, capable of operating efficiently across the two-front threat scenario.


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