FINDER
29th December 2025
FORTUNE IAS NEWS DAILY EXPLAINER
FORTUNE IAS ACADEMY
More than just an academy

A grand vision and the great Indian research deficit

Prelims: General Studies Paper - 1
Economic and Social Development-Sustainable Development, Poverty, Inclusion, Demographics, Social Sector Initiatives, etc.

Mains: General Studies - 3
Achievements of Indians in science & technology; indigenization of technology and developing new technology.

1. Background

- India aspires to become a **global economic and technological power** but suffers from a **chronic Research and Development (R&D) deficit.**
- Despite **17.5% of the world's population,** India contributes only **3% of global research output**, reflecting poor conversion of demographic strength into knowledge creation.
- India's **Gross Expenditure on R&D (GERD)** remains stagnant at **0.6 - 0.7% of GDP**, far below **China (2.4%), U.S. (3.5%), and Israel (5.4%+)**.
- In 2023, India ranked **6th globally in patent filings** (**64,480 applications, 15.7% growth**), yet formed only **~1.8% of 3.55 million global filings** and ranked **47th** in resident patents per million..
- **Huawei's $23.4 billion R&D spend (2023)** exceeds India's total national R&D expenditure, exposing **weak innovation intensity.**

2. Challenges

- **Persistent underinvestment** keeps India technologically dependent and slows high-value innovation..
- **Weak private sector participation**: Government funds **63.6%** of R&D, while industry contributes only **36.4%**, unlike mature innovation economies.
- **Risk-averse industry:** Firms prioritise **incremental gains** and technology licensing over indigenous, disruptive R&D.
- **Academia-industry disconnect:** Siloed, theoretical research and weak technology transfer limit industry collaboration.
- **Commercialisation failure**: Research struggles to cross the **"valley of death"** from lab to market.
- **Brain drain:** Talent migrates due to weak infrastructure, funding constraints, and low remuneration.
- **Bureaucratic delays**: Slow approvals and uncertain fund flows disrupt long-term research..

3. Way Forward

- **Raise R&D spending to at least 2% of GDP** within 5-7 years with higher public outlay and private incentives.
- **Increase private sector share** to at least 50% of total R&D spending through tax incentives and targeted grants.
- **Efficiently deploy** the ₹1 lakh crore **Research, Development and Innovation (RDI) Fund** for frontier and strategic technologies..
- **Mission-mode focus**: Prioritise **semiconductors, AI, quantum, advanced materials, and green energy** with long-term funding and clear outcomes.
- **Reform higher education** by transforming universities into **research-intensive institutions** with strong PhD funding, competitive faculty positions, and world-class infrastructure.
- **Institutionalise academia-industry collaboration** through industry-sponsored research chairs and joint incubation centres.
- **Strengthen intellectual property culture** by simplifying patent processes, improving enforcement, and financially rewarding commercially successful innovations.

Linked civilisations, a modern strategic partnership

Prelims: General Studies Paper - 1
Current events of national and international importance

Mains: General Studies - 2
Effect of policies and politics of developed and developing countries on India's interests, Indian diaspora.

1. Background

- **India-Iran relations** are rooted in **shared civilisational origins, with linguistic, cultural,** and **philosophical links** dating back to early **Indo-Iranian history**.
- Similarities between the **Avesta and the Rigveda** and centuries-long use of Persian in India as a language of administration, art, and poetry created enduring cultural trust.
- The **Indo-Persian literary tradition**, especially **Sabk-e-Hendi**, symbolised deep cultural integration, sustaining ties despite political disruptions.

2. Drivers of the Modern Partnership

- The multipolar world order has increased the **strategic relevance** of closer India-Iran cooperation.
- **Energy security:** Iran's vast oil and gas reserves align with India's growing energy needs.
- **Connectivity and trade:**
  - **Chabahar Port** enhances India's access to Afghanistan and Central Asia.
  - Iran is central to the **International North-South Transport Corridor (INSTC)**, which is **40% shorter** and **30% more cost-efficient** than the Suez route.
- **Regional security concerns**: Shared threats from extremism and terrorism encourage intelligence and security cooperation.

3. Challenges

- **Third-party pressures** have intermittently constrained bilateral ties.
- **Financial vulnerabilities** due to external sanctions highlight the need for alternative trade mechanisms.
- **Overdependence on traditional oil trade** limits the partnership's long-term potential.

4. Way Forward

- **Strengthen strategic autonomy** through flexible financial arrangements, including local-currency trade.
- **Diversify cooperation** into information technology, knowledge-based industries, nanotechnology, and medical sciences, leveraging complementary strengths.
- **Deepen connectivity,** energy, and counterterrorism cooperation to anchor regional stability.
- **Transform historical goodwill into an innovation-driven partnership** as both countries mark **75 years of diplomatic relations,** aligning **civilisational trust** with contemporary strategic interests.

Gaps in regulating digital campaigns

Prelims: General Studies Paper - 1
Indian Polity and Governance-Constitution, Political System, Panchayati Raj, Public Policy, Rights Issues, etc.

Mains: General Studies - 2
Appointment to various Constitutional posts, powers, functions and responsibilities of various Constitutional Bodies. Statutory, regulatory and various quasi-judicial bodies.

1. Outdated Election Regulation

- India's **election rules** still focus mainly on **political parties and candidates**.
- However, modern campaigns are increasingly driven by **digital platforms**, **influencers**, and **third-party intermediaries**.
- This creates a **mismatch** between how elections are regulated and how voters are actually influenced.

2. Limited Scope of EC Directives

- The **Election Commission (EC)** mandated **pre-certification** of political ads and disclosure of **social media expenditure**.
- Later rules extended restrictions to **organisations and individuals**, but only for **print media** and only during the **immediate pre-poll period**.
- These measures fail to address the **continuous and early nature of digital campaigning**.

3. Rise of Third-Party Campaigners

- In the Bihar Assembly election, **third-party actors** outnumbered official parties and candidates in **digital ad spending**.
- Though spending amounts were similar, **third-party campaigns achieved far higher visibility and reach**.
- They were also **more cost-efficient**, generating significantly more **impressions per rupee spent**.

4. Unaccounted Financial Influence

- Some **official party advertisements** were funded by **external entities**, blurring accountability.
- Such spending may not appear in **official expenditure statements**, leading to **under-reporting**.
- This reveals a **bi-directional relationship**, where third parties both **amplify and finance** political messaging.

5. Accountability and Timing Gaps

- Existing legal principles prohibit **unauthorised political advertising**, but **third-party actors remain largely unchecked**.
- **Digital spending disclosures** are vague, often listing platforms instead of actual funders.
- Regulation is also **delayed**, activating too close to polling day, while **digital influence builds over months**.
- Without expanding regulation to **all real stakeholders**, transparency and **electoral fairness** remain compromised.

What are rare-earth elements and why is everyone looking for them?

Prelims: General Studies Paper - 1
Indian and World Geography-Physical, Social, Economic Geography of India and the World.

Mains: General Studies - 1
Distribution of key natural resources across the world (including South Asia and the Indian subcontinent); factors responsible for the location of primary, secondary, and tertiary sector industries in various parts of the world (including India).

1. What Are Rare-Earth Elements

- **Rare-earth elements (REEs)** are a group of **17 metallic elements in the periodic table**.
- They include **15 lanthanides** (lanthanum to lutetium) plus **scandium** and **yttrium**.
- They are **not truly rare**, but are found in **low concentrations** and mixed together, making them **hard and costly to separate**.

2. Why Rare-Earths Are Important

- REEs are essential for **modern technologies** and **green energy**.
- Key uses include **high-performance magnets**, **electronics**, **lighting**, **optics**, **catalysts**, and **renewable energy systems**.
- **Neodymium-iron-boron magnets** are widely used in **motors and generators**.

3. Unique Magnetic and Optical Properties

- Rare-earth atoms have **4f electrons** that create **strong and stable magnetism**.
- These magnets work efficiently even at **high speeds and temperatures**.
- REEs are also used as **phosphors**, producing **sharp and stable colours**.

4. Mining and Processing Challenges

- Rare-earth ores are mined from minerals like **bastnäsite** and **monazite**.
- Processing involves **beneficiation, chemical cracking, leaching**, and complex **solvent extraction**.
- Separation is **energy-intensive**, **polluting**, and may produce **radioactive waste** due to **thorium or uranium** content.

5. China's Dominance and Strategic Importance

- Rare-earth processing, not mining, is the **strategic bottleneck**.
- **China dominates global refining and separation**, controlling over **90%** of these stages.

- Many countries now focus on building **refining and magnet-manufacturing capacity**, not just new mines.
- REEs are increasingly viewed as **strategic resources**, similar to **oil**, due to their role in **energy transition and geopolitics**.

KEYWORDS

Monazite

- **Monazite** is the **principal rare earth bearing mineral in India**, and the country holds **significant global reserves** of this mineral.
- In **Odisha**, monazite occurs mainly along the **coastal tracts of Cuttack and Ganjam districts**.
- In **Andhra Pradesh**, substantial **placer deposits of ilmenite and monazite** are found around **Visakhapatnam and Bhimunipatnam**.
- The **beach sands of Kerala and Tamil Nadu** are also particularly **rich in monazite**.
- Although the **monazite content in placer deposits** is generally **less than 3%**, the mineral is important because it contains **radioactive elements**.
- The mineral contains radioactive **uranium and thorium with maximum concentrations varying between 70 and 3000 ppm** respectively.

International North–South Transport Corridor (INSTC)

- The INSTC is a **multimodal transport network** launched through an Inter-Governmental Agreement on **12 September 2000** by **India, Iran, and Russia** to enhance trade and connectivity.
- It links the **Indian Ocean and Persian Gulf to the Caspian Sea** via Iran, and further connects Russia to Northern Europe through **St. Petersburg.**
- Membership has expanded to **13 countries**:
- India, Iran, Russia, Azerbaijan, Armenia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkey, Ukraine, Belarus, Oman, and Syria, with **Bulgaria as an Observer State**.
- Progress remained slow due to geopolitical constraints, but renewed global disruptions have revived its relevance.
- **US-led sanctions** on Russia, **Red Sea shipping attacks**, and the **2021 Suez Canal blockage** exposed vulnerabilities of existing routes.
- For India, INSTC offers a **strategic alternative to the Suez route** and a platform to tap export potential in Central Asia, strengthening regional trade resilience.

Kaleshwaram Lift Irrigation Project (KLIP)

- The Kaleshwaram Lift Irrigation Project is a multi-purpose irrigation project on the **Godavari River** in Telangana
- It is recognised as the world's largest multi-stage lift irrigation project.
- Its upstream reach extends to the **Pranahita-Godavari confluence,** with the Pranahita formed by the **Wardha, Painganga and Wainganga rivers**,
- The project is designed to irrigate new areas, stabilise existing irrigation, and supply water for drinking and industrial purposes, including to **Hyderabad.**
- It covers multiple districts of Telangana and is supported by an **extensive canal** and **lift-based pumping network.**
- The project was **inaugurated on 21 June 2019**