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DAILY EDITORIAL ANALYSIS

TOPIC

A GRAND VISION AND THE GREAT INDIAN RESEARCH DEFICIT

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Context

- India's ambitions to become a global innovation powerhouse remain constrained by limited R&D spending, despite possessing one of the world's largest pools of human capital and a rapidly growing economy.

Scale of the R&D Deficit

- **Mismatch Between Population & Research Output:** India houses **17.5% of the world's population** but contributes only **3% of global research output**.
  - It reflects a chronic underutilization of intellectual potential and systemic underinvestment in high-value research.
- **Patent Activity (Growth Without Depth):** India ranked **6th globally in 2023** for total patent filings **(WIPO)** with an impressive **15.7% growth rate**.
  - However, India's **global share remains a mere 1.8%**, and when **adjusted for population** (resident applications per million), it ranks **47th**, exposing weak grassroots innovation intensity.
- **Investment Crisis:** India spends **only 0.6 – 0.7% of its GDP** on R&D **(Gross Expenditure on R&D)**, one of the lowest among major economies.
    - However, **China, the United States, South Korea, and Israel** spend about 2.4%, 3.5%, 4.2% and 5.4% respectively.
    - In contrast, **Huawei** alone spent **$23.4 billion** on R&D in 2023, exceeding **India's total combined public and private R&D expenditure**.
- **Structural Barriers to Innovation:**
  - **Government-dominated R&D:** The **government sector still drives 63.6%** of total funds unlike innovation-driven economies where the **private sector contributes over two-thirds** of R&D spending.
    - The **private sector's 36.4% share** reveals a business culture focused on incremental gains rather than disruptive breakthroughs.
    - A study commissioned by the **Office of the Principal Scientific Adviser** found that **only about 25% of public-funded R&D institutions support startup incubation**, and just 15% support deep-tech ventures.
  - **Academia-industry Disconnect:** India's universities often produce theoretical research with **limited industrial relevance.**
    - Mechanisms for **technology transfer, commercialization, and joint research** remain weak.
  - **Brain Drain & Weak Research Infrastructure:** A significant proportion of India's brightest researchers and engineers **continue to migrate abroad** for better funding and facilities.
    - Domestically, **limited high-end research infrastructure**, **lower salaries**, and **bureaucratic hurdles** deter both talent retention and high-impact research.
  - **Bureaucratic Bottlenecks:** Public R&D funding is plagued by **slow approvals** and **staggered disbursements**, making long-term, ambitious research projects difficult to sustain.
- **Institutional and Structural Challenges:**
  - Collaboration with international industry and academia remains limited, with only 15% of institutions engaging in such partnerships.

Related Initiatives & Efforts

- **Anusandhan National Research Foundation (ANRF):** A flagship initiative under the **National Education Policy (NEP) 2020.**
  - Aims to fund peer-reviewed research across disciplines, especially in underfunded universities and colleges.
  - Designed to bridge gaps between academia, industry, and government research bodies.

- **Vigyan Dhara Scheme:** A unified scheme launched to promote scientific research, innovation, and technology development.
  - Focuses on capacity building, translational research, and innovation for societal challenges.
- **Research, Development and Innovation (RDI) Fund (₹1 Lakh Crore):** Offers low-interest loans to private sector entities investing in deep-tech and basic research.
  - Aims to shift India's R&D model from government-dominated to a more balanced public-private partnership.
- **National Access Initiatives:** The **One Nation One Subscription (ONOS)** initiative aims to democratize access to scientific journals and databases for all Indian researchers, reducing barriers to high-quality research.

Way Forward: Building a Culture of Innovation

- **Raise R&D Spending to 2% of GDP:** India needs to aim to **double its R&D - to - GDP ratio** to **2% within 5 – 7 years**, with the private sector contributing **at least 50%** of total R&D spending.
  - The newly announced **₹1 lakh crore RDI Fund** is a promising start, but its impact will depend on **efficient targeting** toward frontier technologies.
- **Launch National Missions in Strategic Domains:** India needs to prioritize sustained, mission-mode research in **semiconductors; Artificial Intelligence (AI); Quantum Computing; Advanced Materials; and Green Energy.**
  - Each mission needs to have **long-term funding**, **clear milestones**, and **strong links to economic and national security goals**.
- **Reforming Higher Education and Research:** Universities need to evolve from teaching-focused institutions into **centres of excellence for research**. It requires:
  - Enhanced **PhD funding;**
  - Competitive **faculty research positions;**
  - Development of **state-of-the-art research infrastructure;**
  - Establishment of **industry-sponsored research chairs** and **joint incubation centres**
- **Strengthening Intellectual Property Ecosystem:** A strong innovation culture demands:
  - **Simplified patent processes;**
  - **Faster approvals;**
  - **Stronger IP enforcement;**
  - **Financial incentives** for successful commercialization;

Conclusion

- India has the talent and the ambition to emerge as a global innovation leader, but it lacks the **structural, financial, and cultural foundation** required to harness that potential.
- It needs to be devoted to creating an ecosystem that rewards risk-taking, nurtures research, and values intellectual property to become a **'Viksit Bharat' by 2047**.

Source: TH

Daily Mains Practice Question

[Q] Examine the factors contributing to India's research and development deficit. What strategic reforms are necessary to align India's innovation ambitions with its research capabilities?

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