



## Reviving India's R&D Funding

This editorial is based on [“India's R&D funding, breaking down the numbers”](#) which was published in The Hindu on 14/03/2024. The article explores the notable growth in India's research and development (R&D) sector, highlighted by a significant increase in Gross Expenditure on Research and Development (GERD). Despite this growth, India lags behind major developed and emerging economies due to its low investment in R&D as a percentage of GDP.

**For Prelims:** [Science and Engineering Research Board of India](#), [Climate Change](#), [GDP](#), [National Research Foundation](#), [Deep Tech Startups](#), [Deep Tech](#), [Artificial Intelligence](#), [Machine Learning](#), [Internet of Things](#), [Big Data](#), [Quantum Computing](#).

**For Mains:** Sustainable Funding for Scientific Growth, Issues of inadequate Private Sector Involvement in R & D.

The announcement in the interim Budget for 2024-25, of a corpus of Rs 1 lakh crore to bolster the research and innovation ecosystem within the country, has sparked enthusiasm within the scientific and research communities. The decision to rebrand the slogan, 'Jai Jawan Jai Kisan' to 'Jai Jawan, Jai Kisan, Jai Vigyan' to now 'Jai Jawan, Jai Kisan, Jai Vigyan, Jai Anusandhan' (by the present [Prime Minister](#)) is intended to reinforce the foundation of research and innovation for development.

### What Are the Different Positive Aspects of R&D Funding in India?

- **Powerhouse in Producing Academic Talent:**
  - Despite the comparatively lower share of GDP dedicated to R&D, India has emerged as a powerhouse in producing academic talent. Annually, India generates an impressive 40,813 PhDs and is in third place after the United States and China. This achievement reflects India's commitment to fostering intellectual capital and contributing significantly to global research endeavours.
    - Additionally, India's research output remains substantial, ranking third globally, with over 3,00,000 publications in 2022, highlighting the nation's robust research ecosystem and its commitment to advancing knowledge across diverse fields.
- **Commendable Performance in Patent Grants:**
  - India also demonstrates commendable performance in patent grants, securing the sixth position globally with 30,490 patents granted in 2022. While this figure is lower compared to the U.S. and China, it underscores India's evolving innovation landscape and its potential for further growth in intellectual property creation.
- **Emphasis on Autonomous R&D Laboratories and Institutions:**
  - A significant portion of R&D funding originates from the government, with considerable allocation directed towards autonomous R&D laboratories operated by the government. These laboratories serve a pivotal role in driving research and technology development with strategic implications.

- According to the R&D statistics (2022-23) of the Department of Science and Technology, India's total investment in R&D reached USD17.2 billion in 2020-21. Within this sum, 54% (USD 9.4 billion) is allocated to the government sector and predominantly utilised by four key scientific agencies:
- The [Defence Research and Development Organisation \(DRDO\)](#) (30.7%), the Department of Space (18.4%), the [Indian Council of Agricultural Research \(ICAR\)](#) (12.4%), and the Department of Atomic Energy (11.4%).

- **Provisions in Interim Budget 2024-25:**

- A corpus of Rs.1 lakh crore to be established with fifty-year interest free loan to provide long-term financing or refinancing with long tenors and low or nil interest rates. A new scheme to be launched for strengthening deep-tech technologies for defence purposes and expediting 'atmanirbharta' is also mooted.

## What Are the Different Concerns in R&D Funding in India?

- **Low R&D Investment as Percentage of GDP:**

- India's R&D is witnessing significant growth, with a notable increase in Gross Expenditure on Research and Development (GERD) from Rs 6,01,968 million in 2010-11 to Rs 12,73,810 million in 2020-21.
- However, with R&D investment as a percentage of [Gross Domestic Product \(GDP\)](#) standing at 0.64%, India falls behind major developed and emerging economies such as China (2.4%), Germany (3.1%), South Korea (4.8%) and the United States (3.5%).

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- **Less Contribution by Private Sector:**

- In India, GERD is primarily driven by the government sector, including the central government (43.7%), State governments (6.7%), Higher Education Institutions (HEIs) (8.8%), and the public sector industry (4.4%), **with the private sector industry contributing only 36.4%** during 2020-21.
  - The reasons for the reduction in R&D spending despite the government being cognizant of the need to increase it are not clear, but may stem from a lack of coordination between government agencies and a need for stronger political will to prioritise R&D expenses.

- **Private Sector Contribution in Developed Economies:**

- The contribution of private industries lags behind that of many other economies. At approximately USD 6.2 billion, Indian businesses represent 37% of the country's GERD, in contrast to the global trend, where business enterprises typically contribute over 65% of R&D.
- In leading innovative economies such as China, Japan, South Korea, and the U.S., a significant portion (>70%) of R&D funding is from private industries, driven by market forces and profit motives, and the actual R&D activities are conducted in the [Higher Educational Institutions \(HEIs\)](#).

- **Under-Utilisation of Allocated Funds:**

- In 2022-2023, the Department of Biotechnology (DBT), used only 72% of its estimated budget allocation on [Centrally Sponsored Schemes \(CSSs\)](#)/Projects while the DST used only 61%. The Department of Scientific and Industrial Research (DSIR), which receives the lowest allocation for CSSs, spent 69% of its allocation.
  - The reasons for under-utilisation, as with the under-allocation, are unclear and may indicate tedious bureaucratic processes for approving disbursements, lack of capacity to evaluate projects or clear utilisation certificates, lack of prioritisation for science funding by the Ministry of Finance or inadequate planning or implementation strategy for the requested funds by the Ministry of Science and Technology.

- **State Governments not Allocating Adequate Funds:**

- The RBI's report, **State Finances: A Study of Budgets of 2023-24**, had a section devoted to the r&d spending of the State governments. The study covered only 10 out of 36 States and Union Territories implying that research is not a priority for most States. The annual spending on research was also quite small in most States (0.09% of the GSDP on average), though Rajasthan emerged an outlier.



## **What are the Various Steps Needed to Enhance R&D Funding in India?**

- **Encouraging Private Sector Collaboration:**

- India's R&D ecosystem has its advantages in terms of efficiency, but could benefit more from strong private enterprises involvement and stronger industry-academia collaboration, facilitating knowledge transfer and fostering innovation.
  - The 2013 Science, Technology, and Innovation Policy noted that "Increasing Gross Expenditure on R&D (GERD) to 2% GDP has been a national goal for some time". The 2017-2018 Economic Survey reiterated this in its chapter on science and technology transformation.

- Incentives for private investment, including relaxation of **foreign direct investments (FDIs)**, tax rebates, and clear regulatory roadmaps for products will help build investor confidence.

▪ **Increasing R&D Expenditure as Percentage of GDP:**

- The significance of research and innovation cannot be overstated in fuelling economic growth, technological advancement, and global competitiveness. However, to fully realise the impact, it is crucial to assess the current R&D funding landscape in India and its resulting output.
- In 2021, member-countries of the **Organisation for Economic Co-operation and Development (OECD)** on average spent 2.7% of GDP on R&D. The U.S. and the U.K. have consistently spent more than 2% of their GDPs on R&D for the past decade.
  - **So, many experts have called for India to spend at least 1%, but ideally 3%, of its GDP every year until 2047 on R&D for science to have a meaningful impact on development.**

## Comparison of research productivity and innovation metrics in selected countries (2021-22)

Country	Researchers per million inhabitants (2021) (FTE)	PhDs produced annually (2021) (Rank)	Publication output (2022) (Rank)	Top 1% most cited articles (% share)	Patents granted (2022) (Rank)
India	262	40,813 (3)	3,06,800 (3)	0.7	30,490 (6)
The U.S.	4,452	69,525 (1)	15,06,000 (1)	1.88	3,23,410 (2)
The U.K.	4,491	27,366 (5)	2,87,200 (4)	2.35	10,578 (15)
China	1,687	53,778 (2)	9,78,100 (2)	1.12	7,98,347 (1)
S. Korea	9,082	13,882 (11)	1,09,200 (16)	1.02	1,35,180 (4)
Japan	5,638	15,804 (10)	1,71,000 (9)	0.88	2,01,420 (3)

▪ **Ensuring the Increased Role for HEIs in India:**

- HEIs in India play a comparatively minor role in the overall R&D investment, contributing 8.8% (USD 1.5 billion). It is important to recognise that increasing industry contribution to R&D is a complex issue with no single solution. A multi-pronged approach involving diverse stakeholders is necessary to address the challenges and unlock the potential of R&D for India's economic growth and competitiveness through HEIs.

▪ **Bridging the Gaps Between India's Manufacturing Reality and Aspirations:**

- India's technological and manufacturing aspirations hinge on a transformative shift in its R&D landscape. Closing the existing gap demands a dual strategy: encouraging private sector involvement and fortifying academia's research infrastructure.
  - Initiatives such as the **National Deep Tech Startup Policy (NDTSP)** signal a strong commitment to technological progress and innovation. This policy holds the potential to incentivise private sector engagement in India's R&D ecosystem.
    - Despite the substantial time and technical uncertainties involved in Deep Tech's creation, **allocating resources to safeguard intellectual property and tackle technical obstacles can unlock untapped markets.**
  - The recent enactment of the **Anusandhan National Research Foundation (ANRF) Act, 2023** underscores the government's dedication to catalyzing research and innovation as the cornerstone of development.
  - This legislative move will bolster scientific research nationwide. The Act aims to bridge India's persistent R&D investment gap while nurturing a robust research culture within HEIs.
    - **Although promising, this initiative must surmount challenges such as ensuring equitable fund distribution, fostering interdisciplinary**

## collaborations, and upholding global standards.

### ▪ Mandating Proper Utilization of Allocated Funds:

- The Union Ministry of Science and Technology has consistently under-utilised its budget, so while the calls for increased funding – through both government and private sources – are legitimate, a strengthened budget utilisation is also required to affect science outcomes.
  - Mitigating the under-spending and under-utilisation of funds earmarked for R&D stand out as obvious first steps. This, in turn, requires the political prioritisation of R&D spending and recognition of it as a core, irreplaceable element of India's growth journey.
  - Finally, India also needs the bureaucratic capacity to evaluate science projects and, after allocations, monitor utilisation. Building such capacity is a prerequisite for India becoming a science power by 2047.

### ▪ Prioritizing Expenditure Through State Governments:

- Public sector R&D expenses need to increase especially at the State level, if only to improve the quality of research facilities at State universities that are in turn tied to the freedom researchers have to work on more locally relevant problems.
- Expenditure also needs to increase to the extent that, with suitable policies, it relieves the persistent bottleneck of research graduating from the lab bench to the factory floor. Innovation is of little value without this flow, and will be restricted to low-quality advancements.

## Conclusion

Governmental efforts are poised to elevate R&D spending in India, providing strategic guidance for research, innovation, and entrepreneurship while encouraging greater private sector involvement. While India's R&D sector shows significant growth, its low investment in R&D as a percentage of GDP compared to major economies remains a concern. The interim Budget, 2024-25 combined with the NDTSP and ANRF Act, 2023 sends positive signals regarding India's commitment to incentivising private sector-led research and innovation, particularly in burgeoning industries.

### **Drishhti Mains Question:**

Examine the impact of R&D expenditure on India's scientific achievements and technological breakthroughs, assessing implications for economic growth and societal progress.

## UPSC Civil Services Examination Previous Year Question (PYQ)

### **Prelims:**

#### **Q.1 Which of the following statements is/are correct regarding National Innovation Foundation-India (NIF)? (2015)**

1. NIF is an autonomous body of the Department of Science and Technology under the Central Government.
2. NIF is an initiative to strengthen the highly advanced scientific research in India's premier scientific institutions in collaboration with highly advanced foreign scientific institutions.

**Select the correct answer using the code given below:**

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

**Ans: (a)**

#### **Q.2 For outstanding contribution to which one of the following fields is Shanti Swarup**

**Bhatnagar Prize given? (2009)**

- (a) Literature
- (b) Performing Arts
- (c) Science
- (d) Social Service

**Ans: (c)**

**Q.3 Atal Innovation Mission is set up under the (2019)**

- (a) Department of Science and Technology
- (b) Ministry of Labour and Employment
- (c) NITI Aayog
- (d) Ministry of Skill Development and Entrepreneurship

**Ans: (c)**

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