Demand for Grants 2021-22 Analysis
Science and Technology

The Ministry of Science and Technology has three departments: (i) Department of Science and Technology (DST), (ii) Department of Scientific and Industrial Research (DSIR), and (iii) Department of Biotechnology (DBT). DST is responsible for promoting new areas of science and technology, coordinating, and integrating areas of science and technology having cross-sectoral linkages. It formulates and implements policies for the promotion of science, technology, research, and innovation in the country. DSIR is responsible for promotion, development, and transfer of indigenous technology. The Council for Scientific and Industrial Research (CSIR) is an autonomous body under DSIR which undertakes research and development in diverse areas. DBT is entrusted with the promotion and development of biotechnology. This note examines the expenditure by the three Departments and discusses key issues in the sector.

As 2020-21 had extra-ordinary expenditure on account of COVID-19, we have used annualised increase (CAGR) over the 2019-20 figures for comparison across all our Tables.

Overview of Finances[1,2,3]

Expenditure

In 2021-22, the Ministry of Science and Technology has been allocated Rs 14,794 crore. This comprises: (i) Rs 6,067 crore to DST (41%), (ii) Rs 5,224 crore to DSIR (35%), and (iii) Rs 3,502 crore to DBT (24%). This is an annual increase of 8% over 2019-20. Allocation to DBT (22% annual increase over 2019-20) has increased at a higher rate as compared to DST (6%) and DSIR (4%).

Table 1: Overview of Allocation (in Rs crore)

Dept	2019-20	2020-21 BE	2020-21 RE	% change in 20-21 (BE to RE)	2021-22 BE	CAGR (19-20 to 21-22)
DST	5,407	6,302	5,000	-21%	6,067	6%
DSIR	4,872	5,385	4,252	-21%	5,224	4%
DBT	2,359	2,787	2,300	-17%	3,502	22%
Total	**12,637**	**14,473**	**11,552**	**-20%**	**14,794**	**8%**

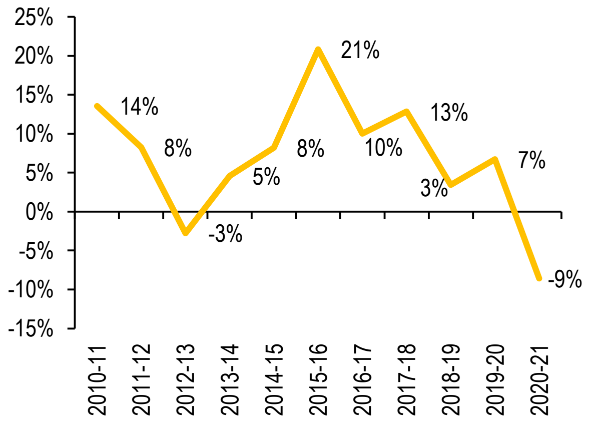
Note: BE: Budget Estimates; RE: Revised Estimates. CAGR: Compounded Annual Growth Rate.
Source: Expenditure Budget; PRS.

Almost all the expenditure under the Ministry is revenue expenditure (99.7% on average). In 2020-21, all three departments have seen a notable cut in the allocation at the revised stage as compared to the budget estimate (20% on aggregate). In comparison, the overall revenue expenditure of the central government in 2020-21 increased by 14.5% from the budget stage to the revised stage. However, note that there have been significant variations in the allocation to individual ministries in 2020-21 at the revised stage. This may be due to a change in expenditure priorities during the year due to COVID-19 and national lockdown. In 2020-21, the amount allocated at the budget stage to the DSIR was about Rs 1,000 crore less than the initial demand by the department.[4] While examining this allocation, the Standing Committee on Science and Technology (2020) had suggested that an additional amount of Rs 440 crore should be allocated to the DSIR at the revised stage.[4] This was to be utilised for meeting its bare minimum expenses on the fellowship to researchers and salary to the staffs of the department, and certain schemes.[4] However, as mentioned earlier, in 2020-21, allocation to DSIR has further reduced by Rs 1,133 crore at the revised stage.

Growth in Expenditure

The growth in the expenditure of the Ministry has been variable during the last decade (Figure 1 and 2). The year-on-year growth in expenditure was relatively higher during the 2015-18 period. During the 2018-21 period, the growth has slowed down. In 2018-19, the expenditure by the Ministry was only 3% higher than the previous year. In 2018-19, actual expenditure by DSIR registered a negative growth as compared to the previous year (-2%). Similarly, expenditure by DBT in 2019-20 was 1% less than the previous year. In 2020-21, all three departments are estimated to register a decline in expenditure as compared to the previous year. During the 2015-20 period, the compounded annual growth rate in expenditure is: (i) 9% for DST, (ii) 5% for DSIR, and (iii) 11% for DBT.

Figure 1: Year-on-year growth in expenditure-Ministry of Science and Technology



Note: Expenditure for 2020-21 is as per revised estimates.
Source: Expenditure Budget; PRS.

Regarding the expenditure of DST, the Standing Committee on Science and Technology (2020) had observed that there is a need for enhancement in the medium-term expenditure framework (MTEF)

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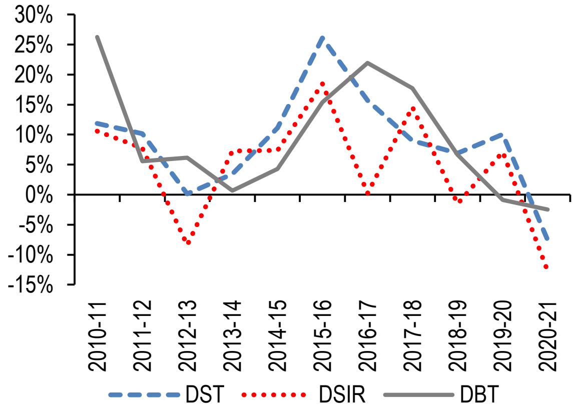
allocation to the DST.[5] MTEF provides a three-year rolling target for the expenditure of a department.[6] The Committee recommended that DST should pursue the Ministry of Finance for revision of the MTEF to a higher base level. This will help DST in carrying out its new initiatives and future plans.[5]

Figure 2: Department-wise year-on-year growth in expenditure

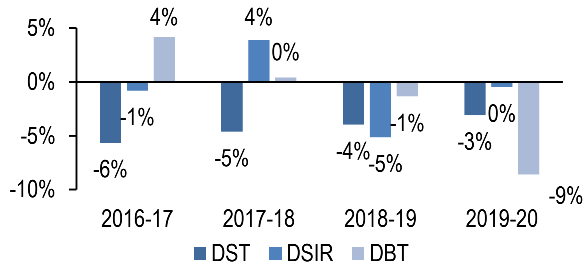


Note: Expenditure for 2020-21 is as per revised estimates.
Source: Expenditure Budget; PRS.

Fund Utilisation

During the 2016-20 period (four years), on average, DST spent 4% less than the budget estimates (Figure 3). The corresponding figures for DSIR and DBT are 1% and 2%, respectively. In 2019-20, DBT spent 9% less than the budget estimates.

Figure 3: Underutilisation



Source: Expenditure Budget; PRS.

Major allocation heads

Department of Science and Technology (DST)

In 2021-22, Rs 1,488 crore has been allocated towards Assistance to Autonomous Bodies (Table 2). Allocation towards Autonomous Bodies is the highest within the Department (25%), followed by allocation towards Institutional and Human Capacity Building (18%), and Innovation, Technology Development and Deployment (16%). The Innovation, Technology Development and Deployment head includes allocation for technology development programme, programmes for socio-economic development, and drugs and pharmaceutical research. About 16% of the total allocation in 2021-22 is towards Statutory and Regulatory Bodies (fourth-highest). Allocation towards Statutory and Regulatory Bodies in 2021-22 is estimated to decrease at a CAGR of 5% over 2019-20.

In 2020-21, allocation towards the Department is estimated to decrease by 21% from the budget stage to the revised stage. Within the Department, heads that have seen a higher cut at the revised stage include: (i) Research and Development (44%), and (ii) Innovation, Technology Development, and Deployment (38%), and (iii) Statutory and Regulatory Bodies (32%). Research and Development head includes allocation for international cooperation, mega facilities for basic research, technology fusion, and applications research.

Table 2: Major Allocation Heads-DST (in Rs crore)

Particular	2019-20	2020-21 RE	2021-22 BE	CAGR(19-20 to 21-22)
Assistance to Autonomous Bodies	1,218	1,375	1,488	11%
Institutional & Human Capacity Building	1,069	911	1,100	1%
Innovation, Technology Development & Deployment	812	656	952	8%
Statutory & Regulatory Bodies of which	1,055	752	950	-5%
(i) SERB	*957*	*742*	*900*	*-3%*
(ii) TDB	*98*	*10*	*50*	*-29%*
Research and Development	584	403	594	1%
Survey of India	434	444	531	11%
Mission on ICPS	123	271	270	48%
Total	**5,407**	**5,000**	**6,067**	**6%**

Note: SERB: Science and Engineering Research Board; TDB: Technology Development Board; ICPS: Interdisciplinary Cyber Physical Systems. RE: Revised Estimates; BE: Budget Estimates.
Source: Expenditure Budget; PRS.

Department of Scientific and Industrial Research

In 2021-22, almost 98% of the total allocation under DSIR is towards the Council of Scientific and Industrial Research (CSIR). In 2020-21, the allocation to the National Laboratories under CSIR is estimated to decrease by 22% at the revised stage.

Table 3: Major Allocation Heads-DSIR (in Rs crore)

Particular	2019-20	2020-21 RE	2021-22 BE	CAGR(19-20 to 21-22)
CSIR of which	4,832	4,208	5,144	3%
(i) National Laboratories	4,532	3,808	4,669	2%
(ii) Capacity Building and Human Resource Development	300	400	475	26%
Industrial Research and Development	7	13	21	75%
Total	**4,872**	**4,252**	**5,224**	**4%**

Note: RE: Revised Estimates; BE: Budget Estimates.
Source: Expenditure Budget; PRS.

Although, allocation towards the Industrial Research and Development head was small (Rs 31 crore at the budget stage in 2020-21), this was cut to Rs 13 crore at the revised stage (by 59%). Expenditure under this head include schemes for: (i) promoting innovations through individual, startups, and small scale industries, (ii) patent acquisition, and (iii) research facilities.

Department of Biotechnology (DBT)

In 2021-22, the highest allocation within this Department is towards Biotechnology Research and Development (Rs 1,660 crore, 47% of the total). This is followed by allocation towards Industrial and Entrepreneurship Development (27%) and Assistance to Autonomous Institutions (23%). Allocation towards Industrial and Entrepreneurship Development in 2021-22 is about four times the actual allocation in 2019-20. Under the Industrial and Entrepreneurship Development, assistance is given for public-private partnership programmes, bio-clusters, and biotech parks. In 2020-21, a higher cut is estimated in the allocation to Research and Development (16%) and Assistance to Autonomous Institutions (29%) at the revised stage.

Table 4: Major Allocation Heads- Department of Biotechnology (in Rs crore)

Particular	2019-20	2020-21 RE	2021-22 BE	CAGR(19-20 to 21-22)
Biotechnology Research and Development	1,305	1,323	1,660	13%
Industrial and Entrepreneurship Development	231	344	960	104%
Assistance to Autonomous Institutions	762	577	807	3%
Total	**2,359**	**2,300**	**3,502**	**22%**

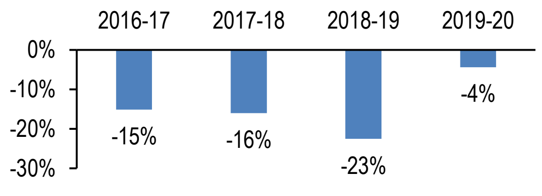
Note: RE: Revised Estimates; BE: Budget Estimates.
Source: Expenditure Budget; PRS.

For the majority of the allocation heads across all three departments, fund utilisation was above 90% during the 2016-20 period. Following are some heads with lower fund utilisation during this period:

Research and Development under DST

Under this head, funds are allocated towards: (i) international co-operation, (ii) National Mission for Nano Science & Nano Technology, (iii) Mega Facilities for Basic Research, (iv) alliance and R&D mission (climate change program), (v) super-computing facility and capacity building, and (vi) technology fusion and applications research. Expenditure under this head at Rs 594 crore comprises 10% of the total expenditure of the department in 2021-22. During 2016-20 period, on average, the actual expenditure was 15% less than the budget estimate.

Figure 4: Underutilisation - Research and Development head under DST

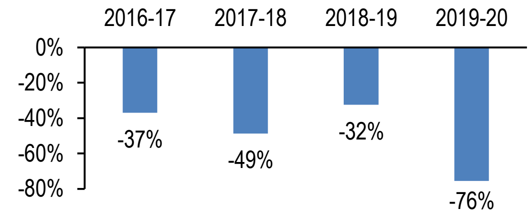


Source: Expenditure Budget; PRS.

Industrial Research and Development under DSIR

Under this head, funds are allocated towards: (i) Promoting Innovations in Individuals, Startups & MSMEs (PRISM), (ii) Patent Acquisition and Collaborative Research & Technology Development (PACE), (iii) Building Industrial R&D and Common Research Facilities (BIRD) and (iv) Access to Knowledge for Technology Development & Dissemination (A2K plus) programmes of the Department. Expenditure under this head at Rs 21 crore comprises less than 1% of the total expenditure under DSIR in 2021-22. The actual expenditure under this head has been substantially lower than the budget estimates in all four years between 2016-17 and 2019-20 (49% on average).

Figure 5: Underutilisation - Industrial Research and Development head under DSIR



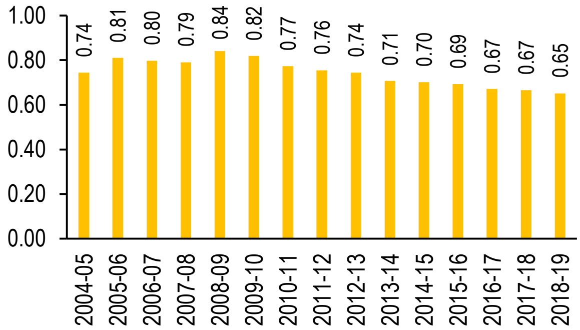
Source: Expenditure Budget; PRS.

Issues for consideration

National expenditure on research and development at its lowest level since 2004-05

The Science, Technology, and Innovation Policy, 2013 had observed that increasing gross expenditure in research and development (GERD) to 2% of GDP has been a national goal for quite some time.[7] This Policy is administered by the Ministry of Science and Technology. GERD includes expenditure on research and development by business enterprises, higher education institutions, governments, and private non-profit organisations. The 2013 Policy had observed that the target for GERD could be achieved by 2018-19 if the private sector at least matches the expenditure level of the public sector.[7] However, as can be seen in Figure 6, the GERD in 2018-19 was estimated to be 0.65% of GDP.[8] Between 2004-05 and 2018-19, GERD reached its highest in 2008-09. However, since then, GERD in terms of % of GDP has been declining. GERD in 2018-19 was the lowest since 2004-05.

Figure 6: Gross Expenditure on Research and Development (Figures in % of GDP)

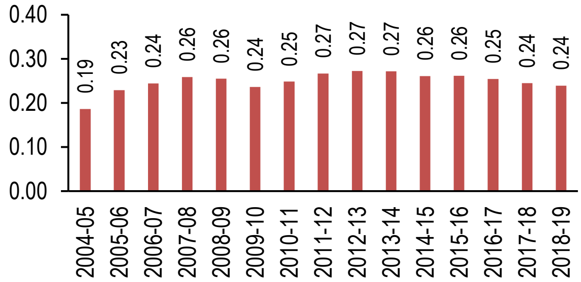


Source: Research and Development Statistics 2019-20; Ministry of Science and Technology; PRS.

Contribution of the private sector

The 2013 Policy had stressed that the expenditure on research and development (R&D) by the private sector needs to go up. It had observed that an increase in private investment is necessary for translating R&D outputs into commercial outcomes. However, the expenditure on R&D by the private sector has decreased from 0.27% of GDP in 2012-13 to 0.24% of GDP in 2018-19 (Figure 7). NITI Aayog (2018) noted that low investment by the private sector in R&D is a key challenge in the development of the innovation ecosystem in the country.[9] Note that the Draft Science, Technology, and Innovation Policy, 2020 seeks to double the GERD and the private sector contribution to GERD in five years.[10] Since October 2019, companies have been allowed to use corporate social responsibility funds (CSR) for contributions towards research.[11] They can spend CSR funds as contributions to public-funded incubators, research organisations and universities engaged in research in science, technology, engineering, and medicine.

Figure 7: Expenditure by the Private Sector on R&D (Figures in % of GDP)

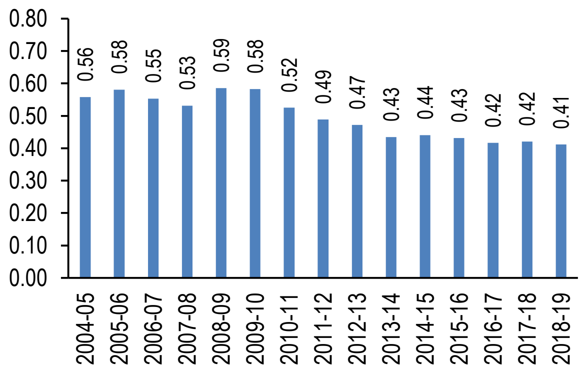


Source: Research and Development Statistics 2019-20; Ministry of Science and Technology; PRS.

Contribution of public sector

The 2013 Policy had observed that the public sector has led the expenditure on R&D in the country. This includes expenditure by: (i) all central government ministries, (ii) public sector units, (iii) state governments, and (iv) higher education institutes. Expenditure by the public sector has also been declining since 2008-09 (Figure 8). In 2018-19, expenditure by the public sector towards R&D in the country (0.41% of GDP) was the lowest since 2004-05.

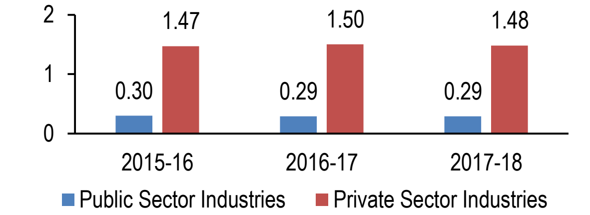
Figure 8: Expenditure by the Public Sector on R&D (Figures in % of GDP)



Source: Research and Development Statistics 2019-20; Ministry of Science and Technology; PRS.

Further, the public sector industries (such as National Thermal Power Corporation Limited (NTPC) and Steel Authority of India Limited (SAIL)) spend a lesser portion of their sales turnover on R&D as compared to the private sector industries (Figure 9). In 2017-18, private sector companies spent 1.48% of their sales turnover on R&D. The corresponding percentage for the public sector industries was 0.29%.

Figure 9: Percentage of sales turnover spent on R&D (Figures in %)

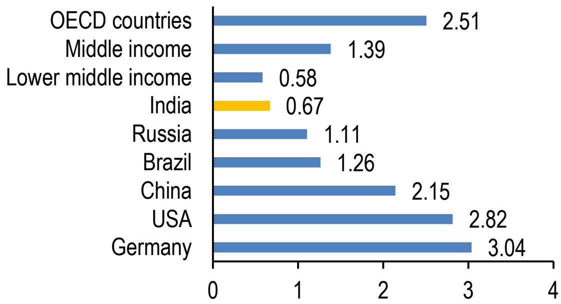


Note: Data for public sector refers to 103 industrial R&D units. Data for private sector refers to 2,007 industrial R&D units excluding scientific and industrial research organisations. The public sector contributed 48% of the total sales turnover of the considered units in 2017-18.
Source: Research and Development Statistics 2019-20; Ministry of Science and Technology; PRS.

International Comparison

If we compare globally, as of 2017, India's GERD was substantially lower than countries such as Germany, USA, China, South Africa, and Brazil (Figure 10).[12] However, India's GERD is higher than the average for lower-middle-income group countries.[12]

Figure 10: Gross Expenditure on Research and Development in 2017 (Figures in % of GDP)

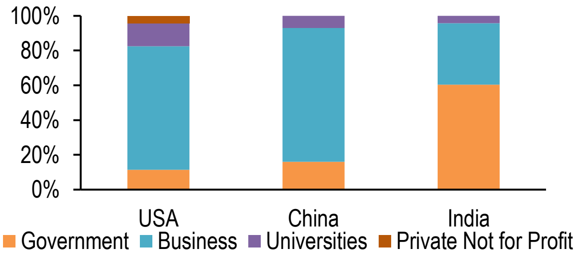


Source: World Bank; PRS.

The Economic Survey (2017-18) had observed that:

- In countries such as the USA, China, Germany, and Japan, the share of the private sector in the overall spending in research and development is significantly higher (Figure 11).[13]

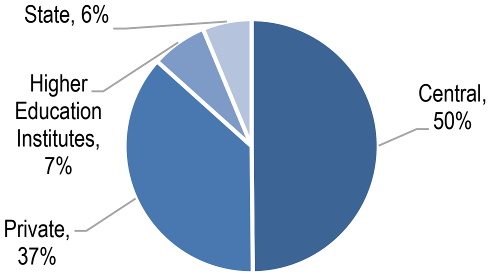
Figure 11: Source-wise funds for research and development in 2015



Source: Volume I, Economic Survey 2017-18; PRS.

- In most countries, the private sector carries out the bulk of research and development even if the government plays an important role in funding. However, in India, the government is the primary source as well as the primary user of funds for R&D.[13] The Standing Committee on Science and Technology (2020) had recommended that the Department of Science and Technology should consider a higher direct allocation to the private sector from its funds for R&D related activities.[5]
- The Economic Survey (2017-18) observed that the government expenditure on R&D is undertaken almost entirely by the central government. There is a need for greater state government spending (Figure 12).[13]

Figure 12: Sector-wise source of funds for R&D in 2018-19



Note: Central sector includes expenditure by central ministries and central public sector units. State sector includes spending by the state ministries/organisations and state agricultural universities. Examples of Higher Education Institutes are IITs and Indian Institute of Science, Bangalore.
Source: Research and Development Statistics 2019-20; Ministry of Science and Technology; PRS.

- The Survey took note of an analysis by a private organisation (Forbes, 2017). According to this analysis, India had 26 firms in the list of top 2,500 global R&D spenders as compared to 301 Chinese companies. 19 of these 26 firms were in three sectors: (i) pharmaceuticals, (ii) automobiles, and (iii) software. India had no firms in five of the top ten R&D sectors as opposed to China, which has a presence in each one of them.[13]
- The Survey observed that in several countries, universities play a critical role in both creating the talent pool for research as well as generating high-quality research output. However, publicly funded research in India is concentrated in specialised research institutes under different government departments.[13] This leaves universities to largely play a teaching role. Hence, universities play a relatively small role in research activities. The Economic Survey recommended linking national laboratories to universities for improvement in the knowledge ecosystem.[13]

Share in global scientific publications increased but target set in the 2013 Policy likely to be missed

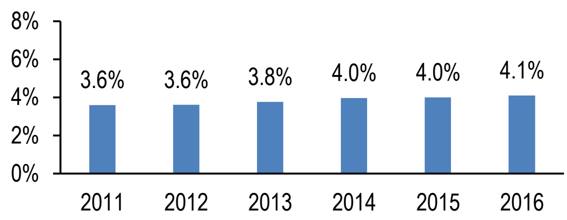
The Economic Survey (2017-18) noted that looking at scientific publications can help in assessing the productivity and quality of research.[13] The Science, Technology, and Innovation Policy 2013 observed that India's share in the global scientific publications had increased from 1.8% in 2001 to 3.5% in 2011.[7] The Policy had set a target of doubling the global share in the scientific publications by 2020.[13] By 2016, India increased its share in the global scientific publication to 4.1% (latest data available).[8] The compounded annual growth rate (CAGR) for scientific publications during the 2011-2016 period for India has been 6.4% as against the CAGR of 3.7% for the world.[8] If the publication output were to grow at the same rate, India's share in 2020 will be about 4.5%. This will be lower than the target set by the 2013 Policy for 2020 (7% share in the global scientific publications).

India's performance on the Global Innovation Index

The Economic Survey (2020-21) observed that:

- Since the inception of the Global Innovation Index in 2007, India entered the top 50 innovating countries for the first time in 2020.[14] Its ranking improved from 81 in 2015 to 48 in 2020. The Global Innovation Index provides detailed metrics about the innovation performance of 131 economies around the world.[15] It assesses political, regulatory, and business environment, education, infrastructure, and market and business sophistication. Sophistication refers to how conducive market/firms are to innovation. For instance, business sophistication includes indicators such as GERD performed and financed by business, knowledge-intensive employment, and research collaboration between industry and universities.
- India has performed above expectation on innovation with respect to its level of development.[14] However, India seems to be underperforming in innovation with respect to the size of its GDP. India lags behind most other large economies (top 10) on most indicators of innovation.[14] India is currently the fifth-largest economy in terms of GDP.
- India must focus on improving its performance on: (i) institutions (political, regulatory, and business environment), and (ii) business sophistication.[14]

Figure 13: Share in Global Scientific Publication (SCI Database)



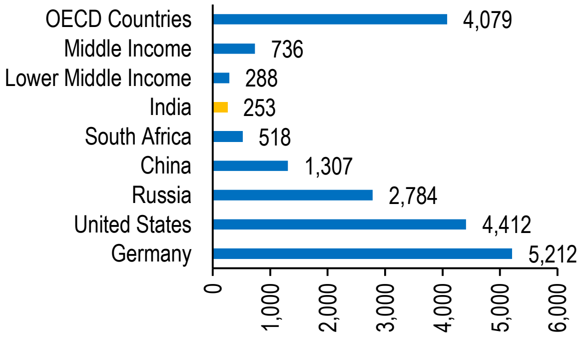
Note: Data is as per the Science Citation Index (SCI) Database.
Source: Research and Development Statistics 2019-20; Ministry of Science and Technology; PRS.

The Economic Survey (2017-18) also observed that in addition to increasing publications, India needs to improve in terms of high-quality research output (measured as highly cited articles).[13] It noted that India lags considerably on this parameter when compared to other large countries such as USA and China.[13]

Low number of researchers per million people

India has a significantly low number of researchers per million people (253 in 2018) when compared to countries such as USA and China.[16] It is also less than the average for lower-middle-income group countries (288 in 2015).[16] In comparison, USA and China had 4,412 (2017) and 1,306 (2018) researchers per million people.[16] The Economic survey (2020-21) observed that among the top 10 economies, the government's contribution to total R&D personnel and researchers was the highest in India.[14] Against an average of 9%, the government's contribution to total R&D personnel and researchers in India was 36% and 34%, respectively.[14] Among the top 10 economies, the contribution of the business sector in R&D personnel and researchers was the second-lowest in India.[14] Against an average of above 50%, the business sector's contribution to R&D personnel and researchers in India was 30% and 34%, respectively.[14]

Figure 14: Researchers per million people



Note: Data belongs to different years. For Germany, China, Russia, and India, the data is as of 2018. For USA, South Africa, and OECD countries, the data is as of 2017. For middle-income, and lower-middle-income countries, the data is as of 2015.
Source: World Bank; PRS.

Note that India's gross enrolment ratio (GER) in higher education itself is low as compared to these countries. In 2018, India's GER in higher education was 26.3%.[17] In comparison, the GER in higher education in countries such as USA, China, and Germany was 88%, 49%, and 70%, respectively.[18] The National Education Policy 2020 recommends increasing GER in higher education to 50% by 2035.[17] The Economic Survey (2017-18) observed that considerable improvement in mathematics and cognitive skills is required at the primary and secondary education level to enable the R&D ecosystem in the country.[13] The National Education Policy 2020 also aims to improve foundational literacy and numeracy and cognitive capacities of students.[17]

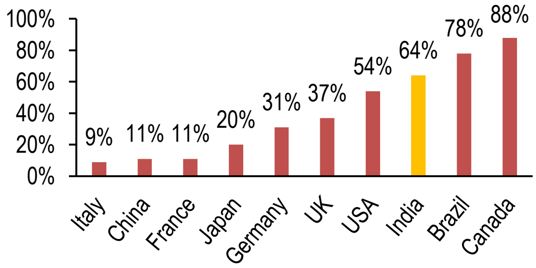
NITI Aayog (2018) had observed that the link between research, higher education, and the industry is weak and nascent in India.[9] It further observed that so far the education system has not focussed on cultivating scientific temperament at an early age.[9] Even in the later stages, the lack of career opportunities in basic sciences leads to the diversion of potential researchers to other rewarding sectors.[9] It had recommended that once the Higher Education Commission is set up, the Commission may consider giving credits for innovation and startups.[9] The Commission should also consider setting up online entrepreneurial development courses in colleges and universities.[9] The Higher Education Commission is proposed to replace the existing regulatory institutions for higher education.

The Economic Survey (2017-18) also noted that more than one lakh people with PhDs, who were born in India, live and work outside India.[13] In USA alone, the number of immigrant scientists and engineers from India increased from five lakh in 2003 to 9.5 lakh in 2013.[13] It noted that government programs such as Ramanujan Fellowship Scheme, INSPIRE Faculty Scheme, and Ramalingaswami Re-Entry Fellowships provide opportunities to Indian researchers residing in foreign countries to work in Indian universities. However, the number of people returning has been modest (243 during 2007-12 and 649 during 2012-17).[13] The Survey recommended enhancing the scope of these schemes to also provide additional support for good research instead of just financial incentive. The additional support should include: (i) laboratory resources, and (ii) ability to hire post-docs.[13]

Resident share in patent applications needs to increase

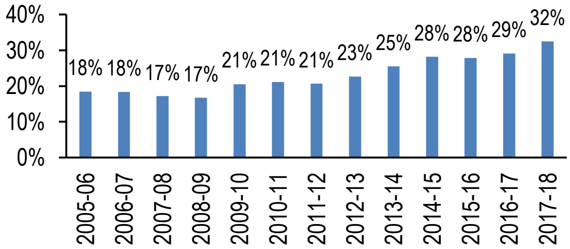
The Economic Survey (2017-18) had observed that patents reflect a country's standing in technology.[13] During the 2007-18 period, the patent applications filed in India grew at a CAGR of 3%.[12] As can be seen in Figure 15, a larger number of patent applications in India are filed by non-residents (64% in 2019) as compared to countries such as China (11%) and USA (54%).[14] However, the share of residents in patent applications has been steadily increasing (Figure 16).[8] The Economic Survey (2020-21) had observed that resident share in the patent applications needs to rise further for India to become an innovation nation.[14]

Figure 15: Percentage of patent applications filed by non-residents in the top 10 economies (2019)



Source: Economic Survey 2020-21; PRS.

Figure 16: Percentage of patent applications filed in India by residents



Source: Research and Development Statistics 2019-20; Ministry of Science and Technology; PRS.

Foreign Direct Investment in R&D remains low

The Office of the Principal Scientific Advisor noted that Foreign Direct Investment (FDI) is one of the key factors for enhancing R&D exports.[19] India's share in global R&D exports was about 2.8% in 2019.[19] R&D exports include: (i) licensing of intellectual property, (ii) technology embodied in exported intermediate goods, (iii) technology transfer through FDI, and (iv) outflow of technical services. India has a trade surplus in R&D services.[19] During 2011-20, India's R&D exports grew at a CAGR of 26.6%, the highest growth among the top 10 exporting countries in R&D.[19] However, R&D accounts for only a tiny share of FDI inflows into India (0.25% in 2018-19).[20] Further, it is mostly concentrated in four sectors - Information and Communication Technology, Natural Sciences and Engineering, Pharmaceuticals, and Clinical Research (more than 80%).[20] The Economic Advisory Council to the Prime Minister suggested a goal of increasing yearly FDI inflow into R&D to USD 300 million by 2022.[21] However, FDI in R&D has been on a decline since 2015-16 (Table 5).[20]

Table 5: FDI equity inflow (in USD million)

Year	R&D	Total	% Share
2015-16	235	40,001	0.59%
2016-17	84	43,478	0.19%
2017-18	107	44,857	0.24%
2018-19	110	44,366	0.25%
2019-20	67	49,977	0.13%

Source: Note titled "FDI into R&D: Current Status and Way Forward" by the Office of the Principal Scientific Advisor; PRS.

Adoption of technologies developed by public-funded research organisations is low

NITI Aayog (2018) had observed that the rate of transfer of technology developed by public-funded institutions such as the Council of Scientific and Industrial Research (CSIR) is relatively low.[9] It highlighted poor marketing skills and information dissemination as key reasons for this.[9] It suggested the following measures to enhance technology commercialisation by public-funded institutions:

- Value addition centres may be set up in these institutions for: (i) upscaling technologies and improving technology readiness level, (ii) coordinating with investors to incubate entrepreneurs, (ii) enabling commercialisation and marketing, and (iii) providing technology support during production.
- A National Technology Data Bank should be created by the Department of Science and Technology which will act as the central database for technologies that are ready for deployment or under development.
- Public funded research institutions should focus on the development and deployment of socially relevant technologies in areas such as clean drinking water, sanitation, energy, healthcare, and organic farming. These technologies have a large potential for commercialisation.

Tax incentives for R&D to the private sector have been reduced

India used to allow a weighted tax deduction of 200% of expenditure towards in-house research and development to corporations.[14] This was reduced to 150% from April 2018.[14] This is going to be reduced further to 100% from April 2021.[14] The Standing Committee on Science and Technology (2020) was informed that withdrawal of tax incentive on R&D as well as exemptions on funds spent in acquiring patents by the private sector, has negatively affected the R&D investment in the private sector.[5] The Committee observed that the tax incentive had stimulated R&D spending by the private sector. It recommended that the Department of Science and Technology should conduct an impact assessment in this regard.[5]

Public procurement does not encourage new and innovative technologies

NITI Aayog (2018) had observed that public procurement is biased in favour of experienced and established products and technologies.[9] This discourages new and innovative technologies offered by startups.[9] It recommended that:

- international competitive bidding should be resorted to only when Indian manufacturers are unable to supply products or services of comparable international quality;
- to adopt innovative technologies, experts or scientific practitioners should be mandatorily included on committees related to public procurement; and
- Indian startups should be given preference in the technical evaluation for public procurement.

Following incentives are available to startups recognised by the Department for Promotion of Industry and Internal Trade: (i) relaxation in prior turnover and prior experience requirements, subject to meeting of quality and technical specifications (notified in March 2016), (ii) relaxation in bid security deposit requirements (notified in July 2017).[22,23,24] Startups can also get the opportunity to work on trial orders with the government.[22] The recognised startups are allowed to offer their products and services for procurement on government's e-marketplace platform.[25] This is aimed at helping startups to introduce unique innovations to government and public sector unit buyers.[25]

Annexure

Table 6 and 7 provide details on the achievements of the Department of Science and Technology and the Department of Biotechnology on key performance indicators as per their respective dashboards.[26,27]

Table 6: Key Statistics-Department of Science and Technology

Indicator	2018-19	2019-20	2020-21 (up to Dec 31, 2020)
Human Capacity Building			
Fellowships provided	1,16,854	92,869	1,030
Number of people trained	20,381	2,805	61,390
Number of conferences	640	389	463
Research and Development			
New R&D Projects	3,658	691	545
Ongoing Projects	7,982	10,479	2,946
Institutional Capacity Building			
New R&D Infra	251	102	156
Innovation and Startups			
Number of Innovations	468	658	617
Startups	898	791	610
International Cooperation			
International Collaborative Visits	3,302	774	1
Ongoing Projects	478	2,931	1,829
Fellowships	66	144	37
Number of Manpower Trained	1,221	569	99
Science and Engineering Research Board			
Number of Ongoing Projects	6,033	26,664	22,283
Number of New R&D Projects	2,492	2,076	1,189
Human Resource Development	2,912	2,049	464
Development Activities	2,212	1,868	0
Autonomous Institutions			
Number of Publications	2,336	2,624	2,453
Number of PhDs Produced	221	296	150
Number of Manpower Trained	1,896	5,452	2,747
Number of Patents Granted	38	98	91

Source: Dashboard of the Department of Science and Technology as accessed on February 14, 2021; PRS.

Table 7: Key Statistics-Department of Biotechnology

Indicator	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21*
Ongoing Projects	2,212	1,955	1,893	2,165	2,460	2,405	2,004
Projects Sanctioned	656	415	552	831	847	594	227
Ongoing International Collaborative Projects	42	66	79	101	139	96	69
Scientists Supported (PI/CoPI)	4,801	4,493	4,569	5,121	5,553	4,521	2,364
Research Personnel (JRF+SRF+RA)	5,766	6,076	6,180	6,195	6,221	6,312	-
CTEP-Proposals Sanctioned							
Conferences	-	-	161	92	83	96	-
Travels	-	-	522	421	314	317	-
Exhibitions	-	-	9	8	9	17	-
Popular Lectures	-	-	6	13	10	28	-
Technologies Generated	117	90	136	75	82	119	-
Publications	2,482	2,494	2,654	1,904	3,478	3,758	-
Patents Filed	186	160	181	102	93	76	-

Note: *as of February 14, 2021. PI: Principal Investigator; CoPI: Co-Principal Investigator; JRF: Junior Research Fellowship; SRF: Senior Research Fellow; RA: Research Assistant. CTEP: Conference, Travel, Exhibition, and Popular Lectures.
Source: Dashboard of the Department of Biotechnology as accessed on February 14, 2021; PRS.

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