

RESEARCH & DEVELOPMENT STATISTICS AT A GLANCE

2019-20



DEPARTMENT OF SCIENCE & TECHNOLOGY

MINISTRY OF SCIENCE & TECHNOLOGY

GOVERNMENT OF INDIA

NEW DELHI-110016 (INDIA)

March 2020

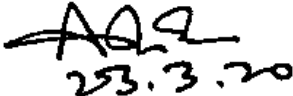
FOREWORD

The Department of Science & Technology (DST) is primarily a policy making body for S&T sector in India. The role and criticality of data in the formulation of evidence-based policies is paramount for building a strong and viable science, research and innovation ecosystem for the country. National Science and Technology Management Information System (NSTMIS), DST has been continuously engaged in generating Database for S&T sector since 1973 and for international comparability, UNESCO/OECD guidelines on standards/concepts/definitions have been adopted for collection of science statistics.

Salient findings of the national S&T survey launched in the year 2018-19 for compilation of the latest R&D Statistics and Indicators are presented here mainly in the form of graphical presentations. Scope and coverage of data on R&D expenditure and human resources has been enlarged by including multinational companies and enterprises not covered by the Department of Scientific and Industrial Research (DSIR) under its R&D recognition scheme. Further the survey analysis has been complemented and enriched by the secondary sources such as higher education in S&T, patents etc. including bibliometric analysis of scientific publications.

Planning and execution of the national S&T survey is an in-house exercise of DST. It is a culmination of the NSTMIS, DST team effort comprising Dr. Parveen Arora, Dr. A. N. Rai and Mr. P. K. Arya.

I thank all scientific agencies and in-house R&D labs in public and private for providing data / inputs contained in this compilation. It is hoped that this publication would be useful for evidence based planning for Indian Science Sector.



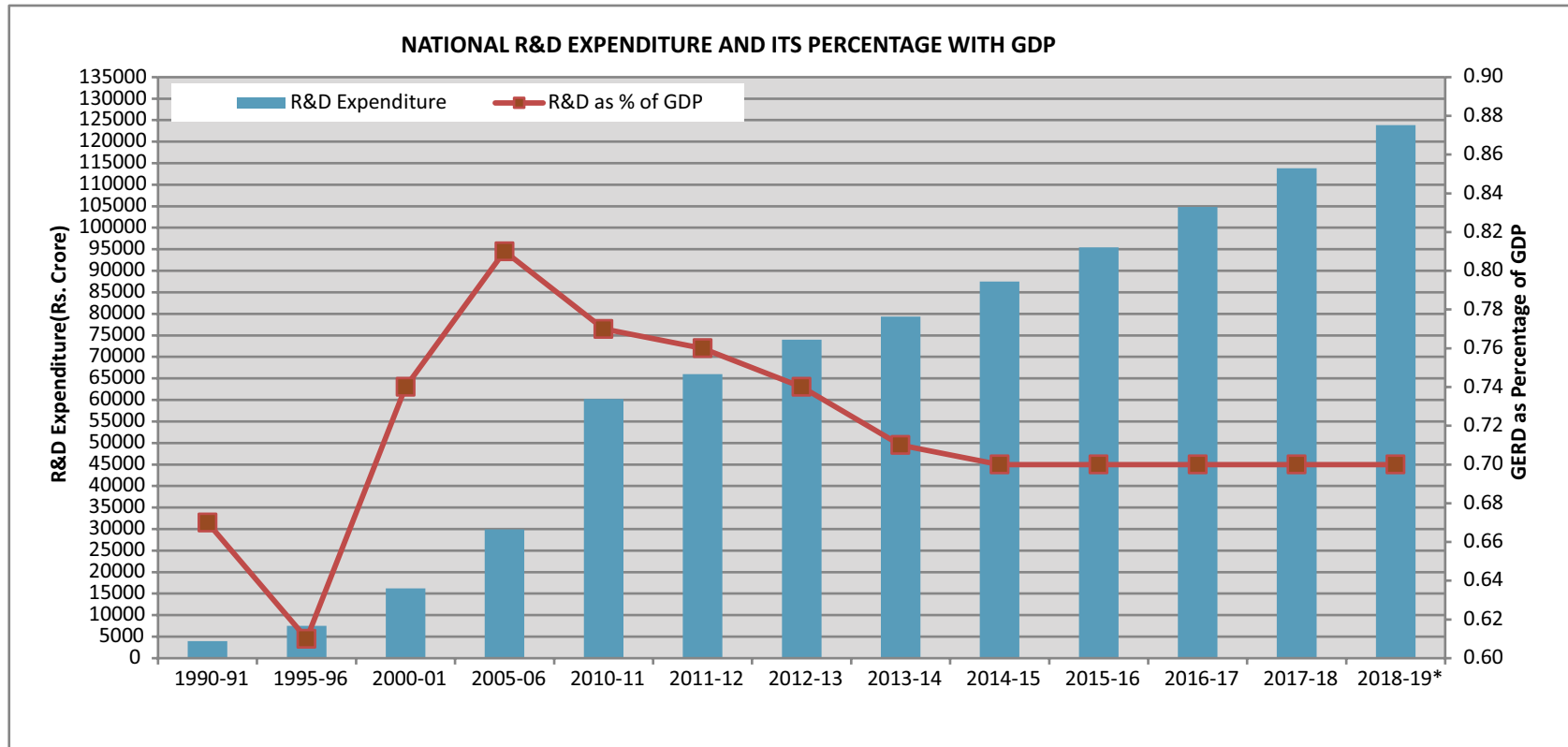
23.3.20

(Prof. Ashutosh Sharma)
Secretary
Department of Science & Technology
Government of India

March 2020

MAJOR HIGHLIGHTS

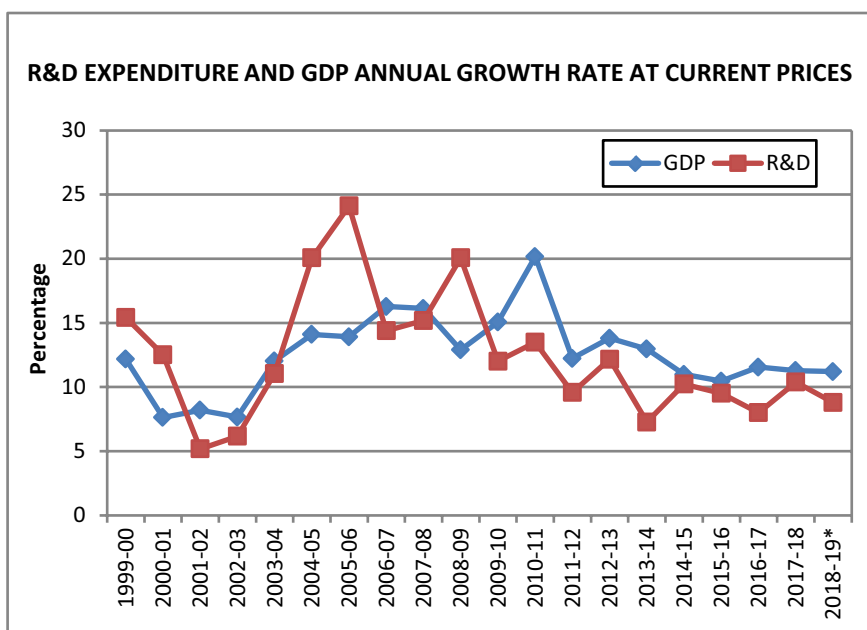
- ❖ The Gross expenditure on R&D (GERD) in the country has been consistently increasing over the years and has nearly tripled from Rs. 39,437.77 crore in 2007- 08 to Rs. 1,13,825.03 crore in 2017-18. It is estimated to be Rs. 1,23,847.70 crore in 2018-19.



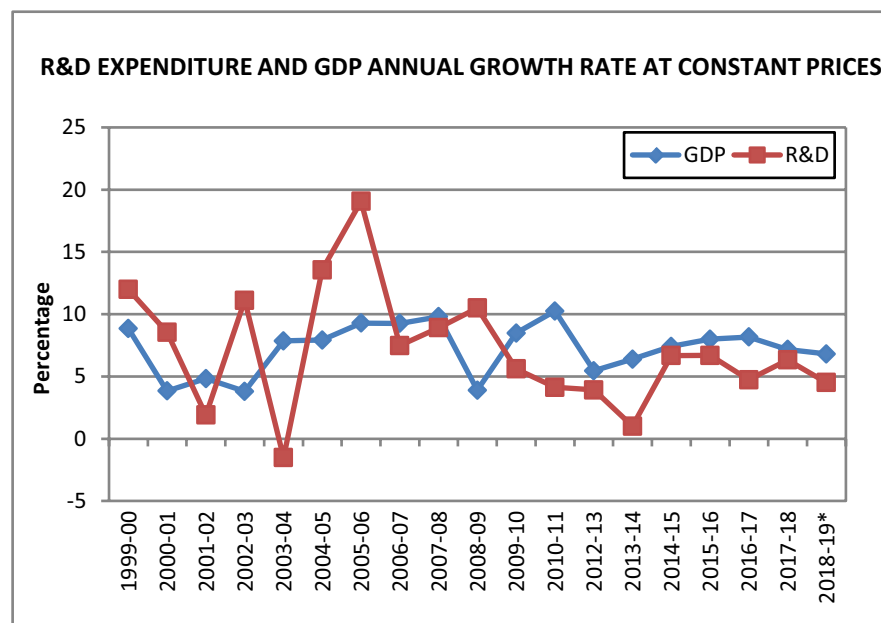
* Estimated. Source: NSTMIS, Department of Science & Technology, Government of India

- ❖ India's GERD as percentage of GDP remained at 0.7% during the years 2017-18 and 2018-19 respectively.
- ❖ India's per capita R&D expenditure has increased to PPP \$ 47.2 in 2017-18 from PPP \$ 29.2 in 2007-08.

- ❖ R&D expenditure and GDP, in absolute terms have shown a consistent rising trend over the years. The annual growth rate of R&D (both at current and constant prices) remained higher than that of GDP prior to 2000-01 while fluctuating thereafter.
- ❖ GDP since 2009-10 onwards (both at current and constant prices) has surpassed the annual rate of growth of R&D. One of the reasons could be the revision of the GDP series with a new base year 2011-12 involving a comprehensive coverage of industrial and service sectors, thus leading to higher GDP and its growth rate.

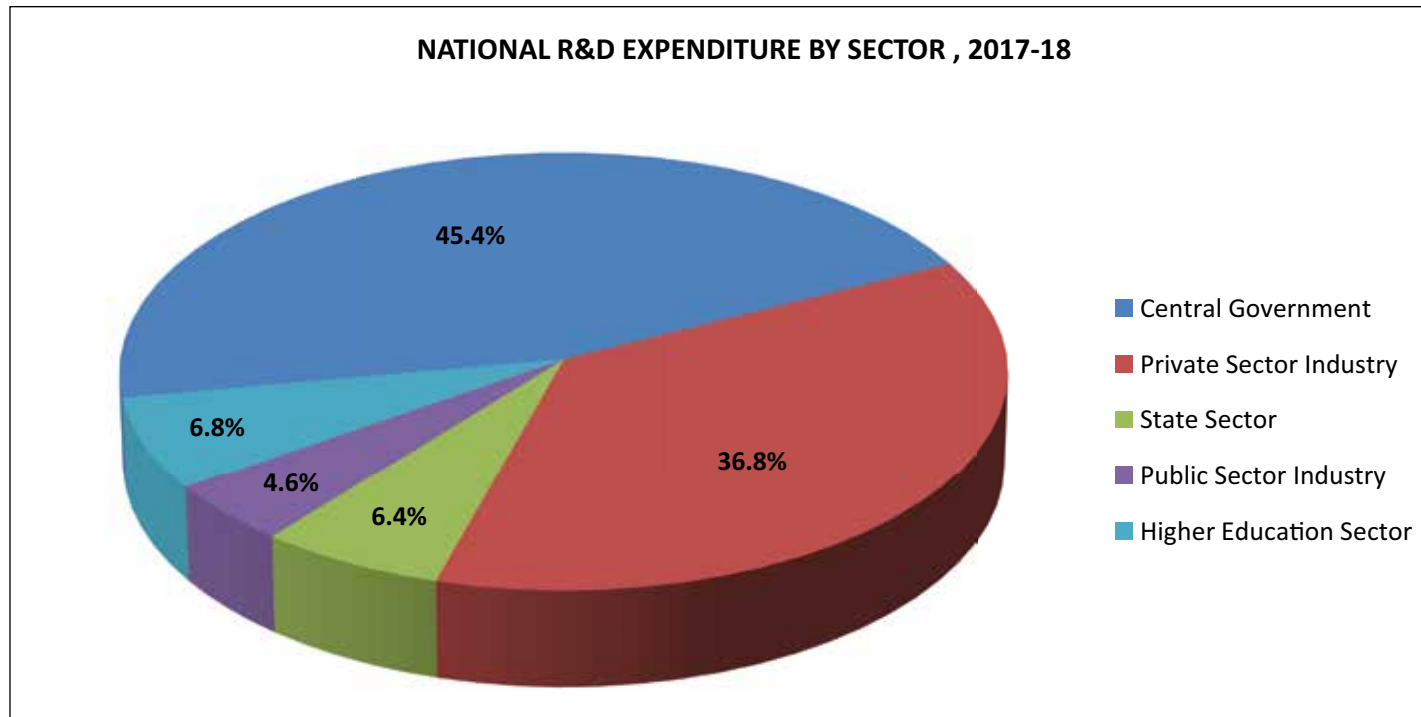


*estimated



- ❖ India's Gross Expenditure on R&D (GERD) increased to 63.2 billion PPP \$ in 2017-18 from 50.3 billion PPP\$ in 2014-15. It is estimated to be 68.8 billion PPP\$ in 2018-19.
- ❖ India accounted for 2.9% share in World GERD during 2017-18.

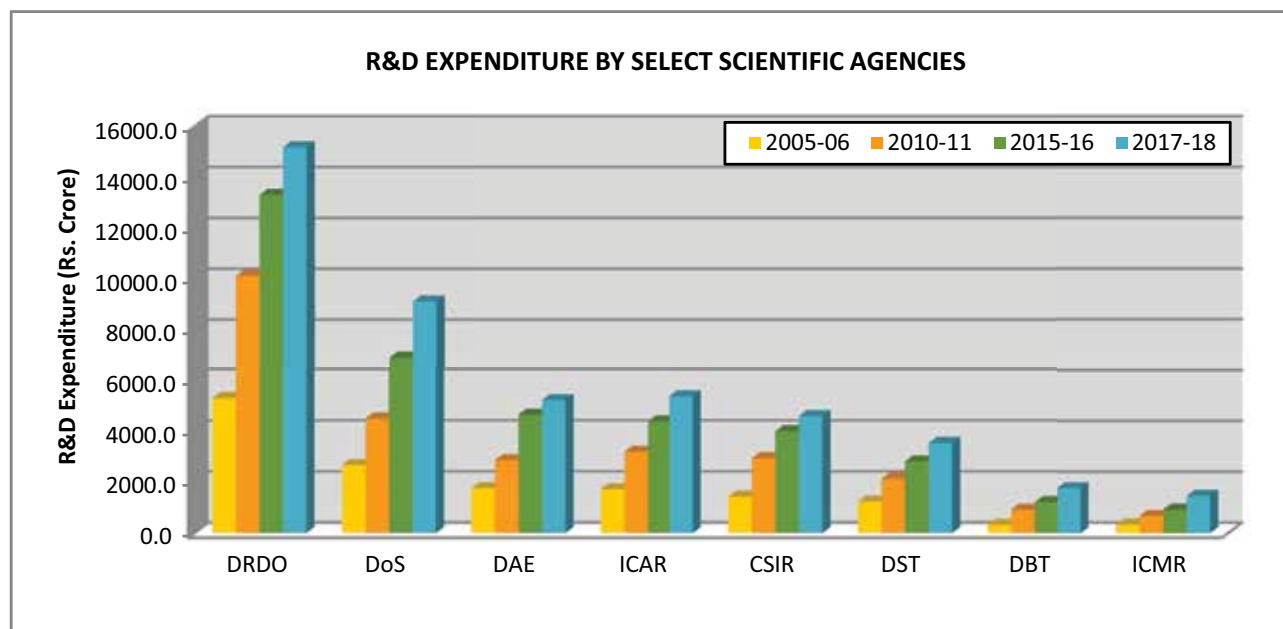
- ❖ World GERD increased to 2192.38 billion PPP\$ in 2017-18 from 1859.13 billion PPP\$ in 2014-15 . It is estimated to be 2323.92 billion PPP\$ in 2018-19.



Source: NSTMIS, Department of Science & Technology, Government of India

- ❖ Gross Expenditure on R&D (GERD) is mainly driven by the Government sector comprising of Central Government 45.4%, State Governments 6.4%, Higher Education 6.8% and Public Sector Industry 4.6% with Private Sector Industry contributing 36.8% during 2017-18.

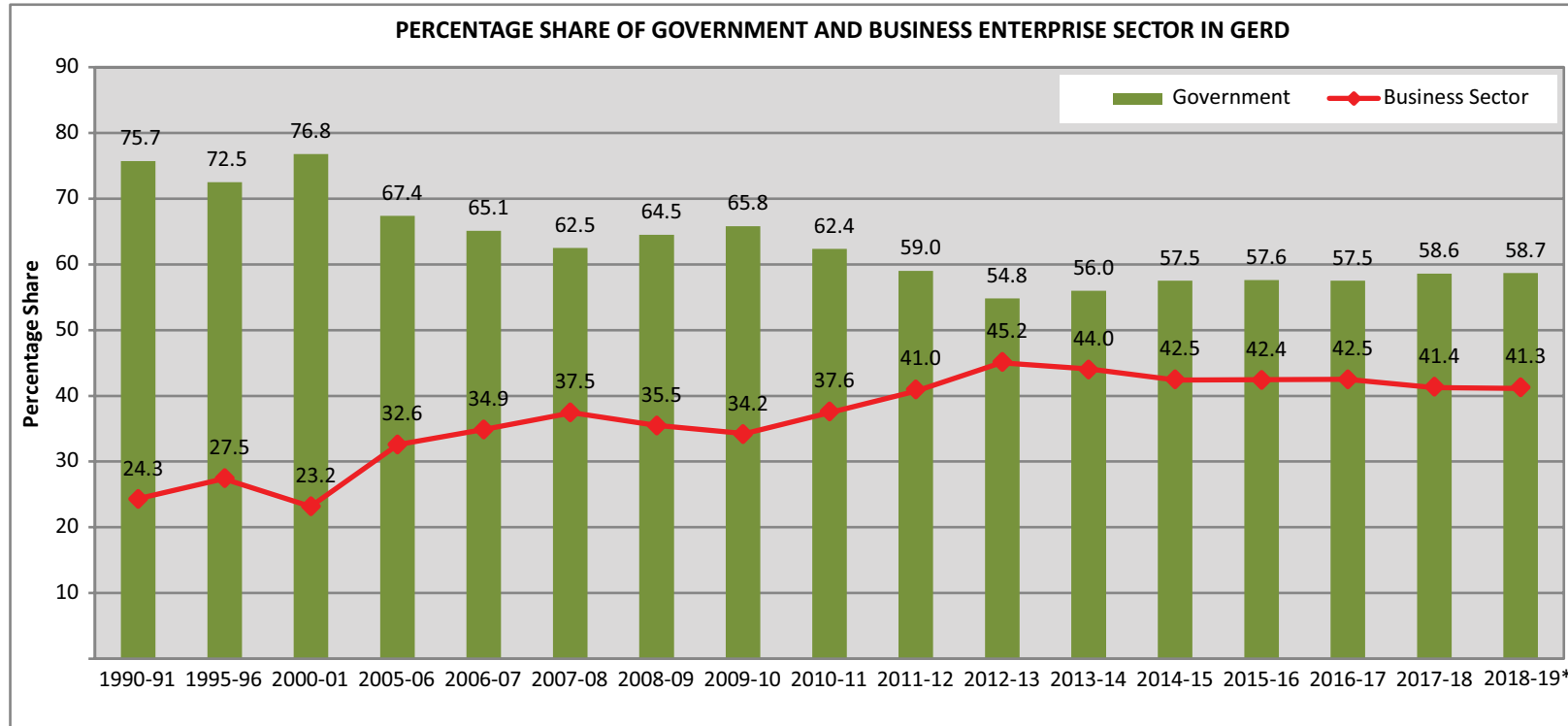
- ❖ During the year 2017-18, 93% of the R&D expenditure incurred by Central Government sources came from 12 major scientific agencies.



Source: NSTMIS, Department of Science & Technology, Government of India.

- ❖ Amongst the 12 Central Government major scientific agencies, DRDO accounted for the maximum share of 31.6% of R&D expenditure followed by DOS (19.0%), ICAR (11.1%), DAE (10.8%), CSIR (9.5%) and DST (7.3%), DBT (3.7%) and ICMR (3.1%), MoES (2.3%), MEITY (0.8%), MoEFCC (0.5%), MNRE (0.1%) during 2017-18.

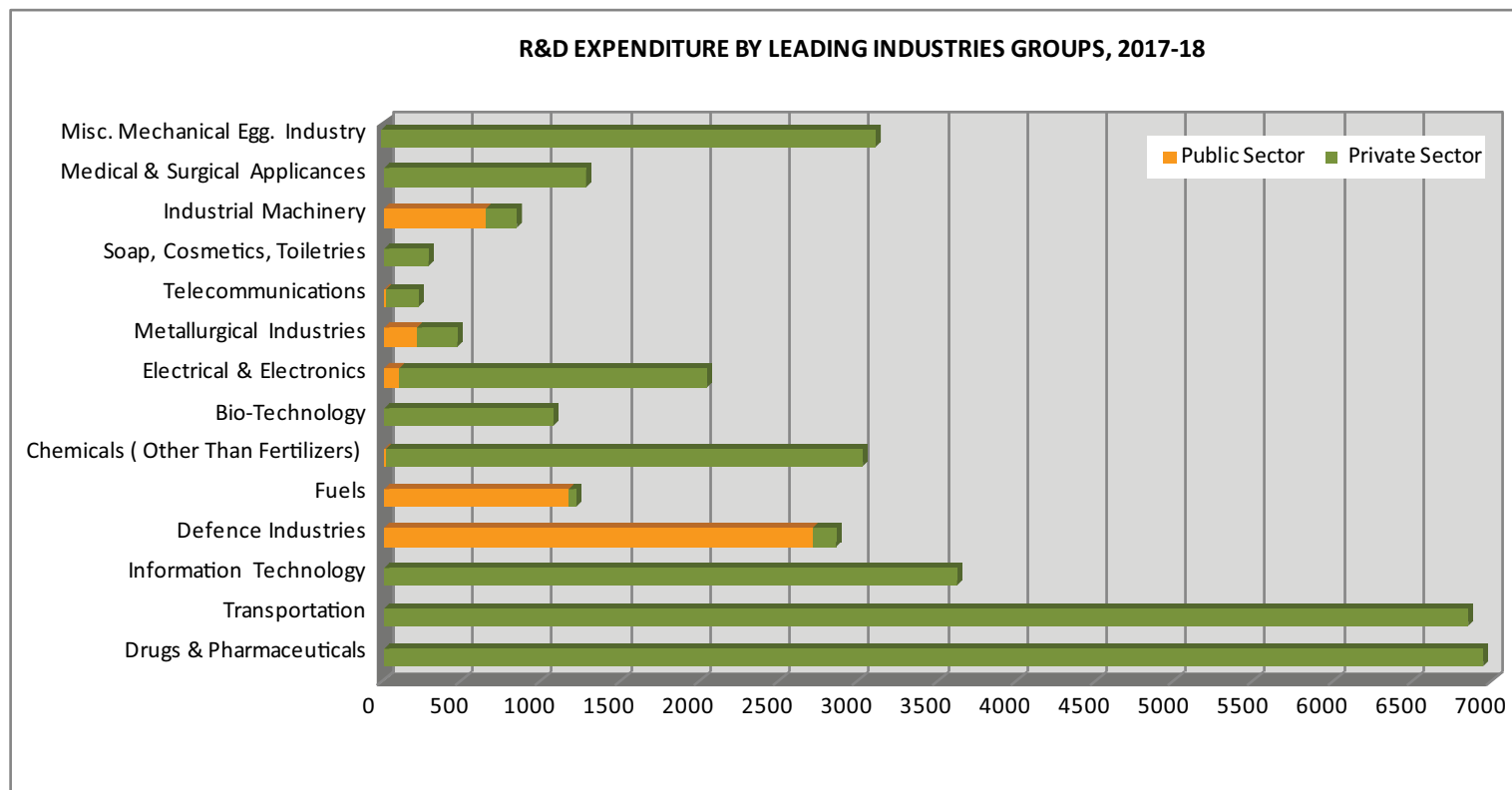
- ❖ Business Enterprise (Industrial) sector participation in GERD has been just over 40% during the last 5 years.



Source: NSTMIS, Department of Science & Technology, Government of India.

- ❖ Public sector R&D units spent 0.29% of their sales turnover on R&D as compared to 1.48% by Private sector in 2017-18.

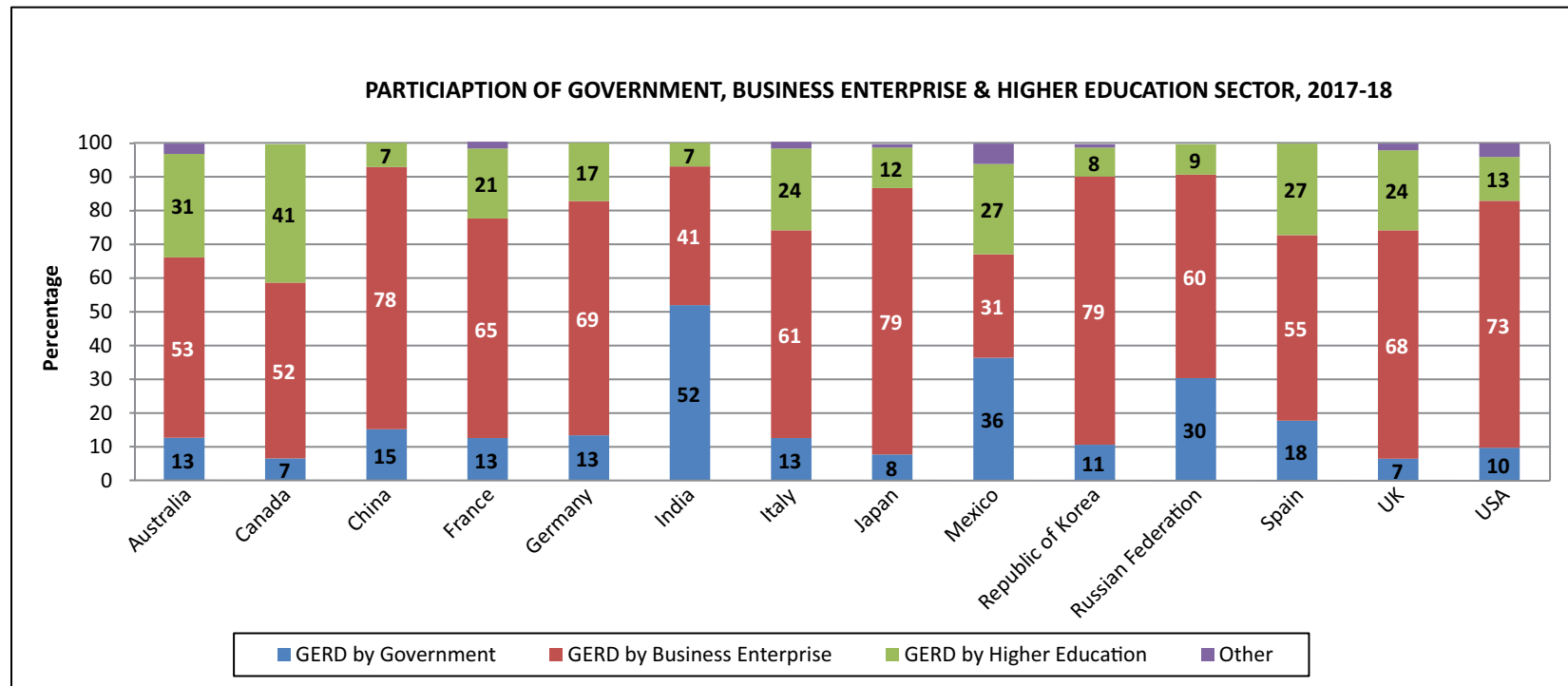
- ❖ During 2017-18, Public Sector R&D was led by Defence Industries followed by Fuels and Industrial Machinery while Drugs and Pharma, Transportation, Information Technology, Mechanical Engineering Industries etc dominated the Private Sector R&D.



Source: NSTMIS, Department of Science & Technology, Government of India.

- ❖ In industrial R&D, Drugs and Pharmaceuticals occupied the first place with a share of 24.3% followed by Transportation 16.4%, information Technology 8.7%, Chemical (other than fertilizer) 7.2% and Defence Industries 6.8% respectively during 2017-18.

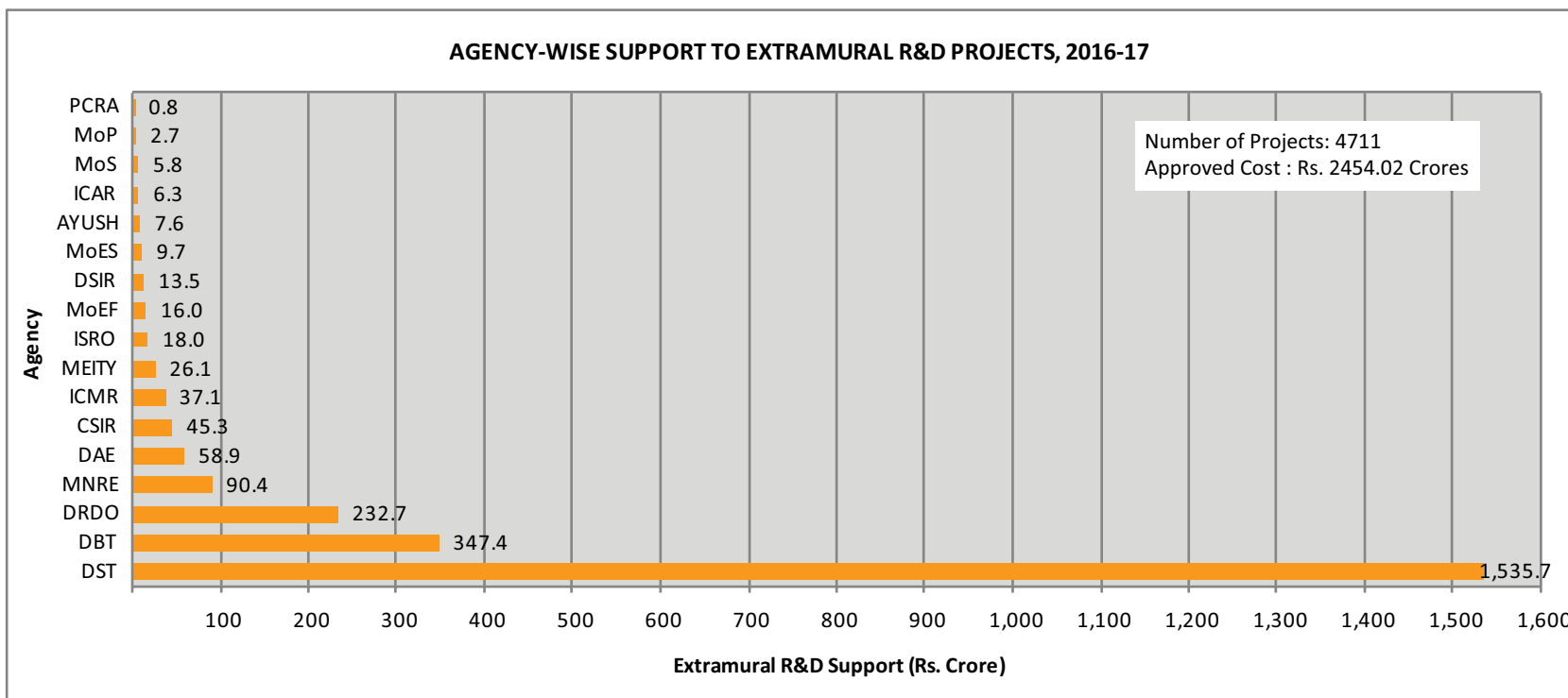
- ❖ India stands in contrast with select developed and emerging economies with nearly 60% participation in GERD being made by the government including Higher Education Sector. Though participation of Higher Education Sector in GERD by India is quite low among the select countries.



Source: NSTMIS, Department of Science & Technology, Government of India.

- ❖ In most of the developed and emerging economies, the participation of Business Enterprises in GERD is generally more than 50%. In fact it is more than 70% for China, Japan, Korea and USA.

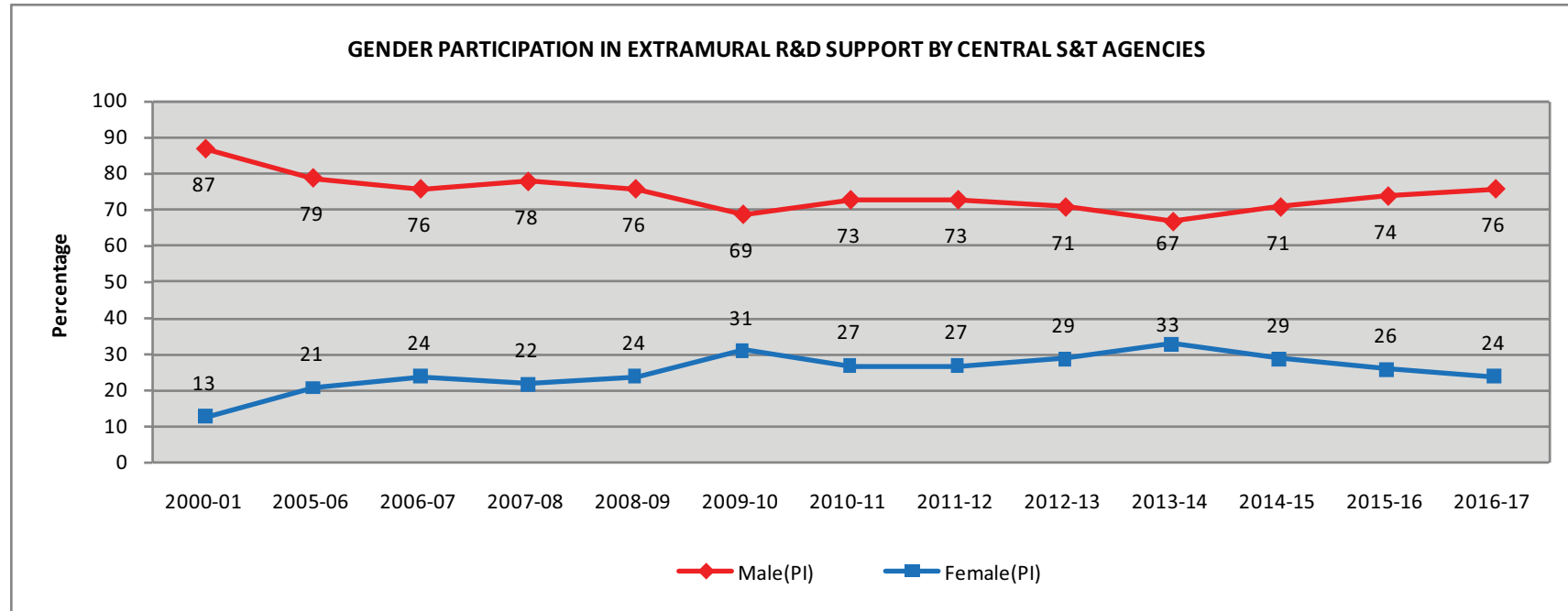
- ❖ Extramural R&D support by Central Government Agencies increased to Rs. 2454.02 crore in 2016-17 from Rs 2002.12 crores in 2014-15. Its share in the national GERD was 2.4% during 2016-17.
- ❖ The Department of Science and Technology (DST) and Department of Biotechnology (DBT) were the two major players contributing 63% and 14% respectively of the total extramural R&D support in the country during 2016-17.



Source: NSTMIS, Department of Science & Technology, Government of India.

- ❖ Academic sector received 70% of the total extramural R&D support during the year 2016 -17.

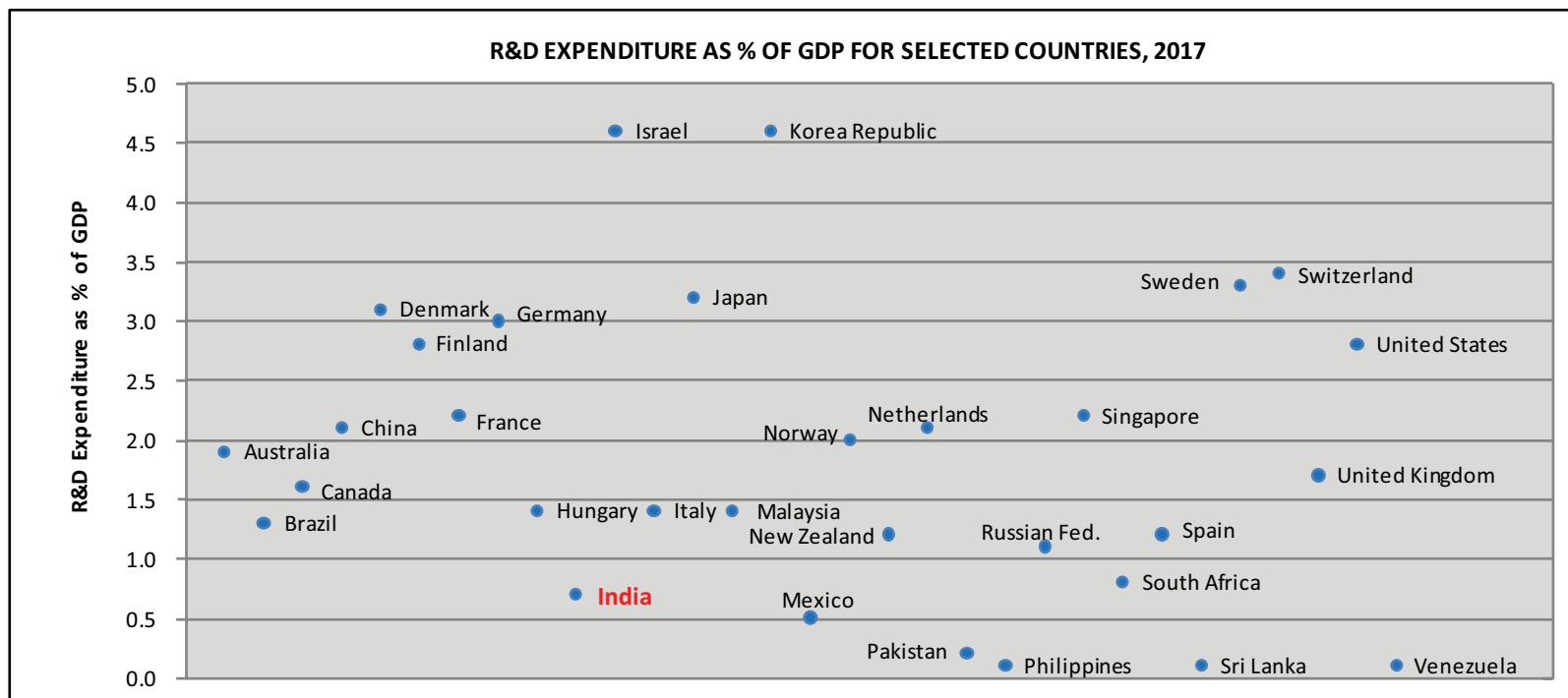
- ❖ Women participation in extramural R&D projects has increased significantly to 24% in 2016-17 from 13% in 2000-01 due to various initiatives undertaken by the Government in S&T sector. In absolute terms, 941 women Principal Investigators (PIs) during 2016-17 availed extramural R&D support as against 232 in 2000-01.



Source: NSTMIS, Department of Science & Technology, Government of India

- ❖ As on 1st April 2018, nearly 5.52 lakh personnel were employed in the R&D establishments in the country including in-house R&D units of public and private sector industries. Out of which, 3.42 lakh (61.8%) were performing R&D activities while 0.98 lakh (17.9%) and 1.12 lakh (20.3%) personnel were engaged in auxiliary and administrative / non-technical support activities.
- ❖ As on 1st April 2018, there were 56,747 (16.6%) women out of total 3.42 lakh R&D personnel directly engaged in R&D activities.

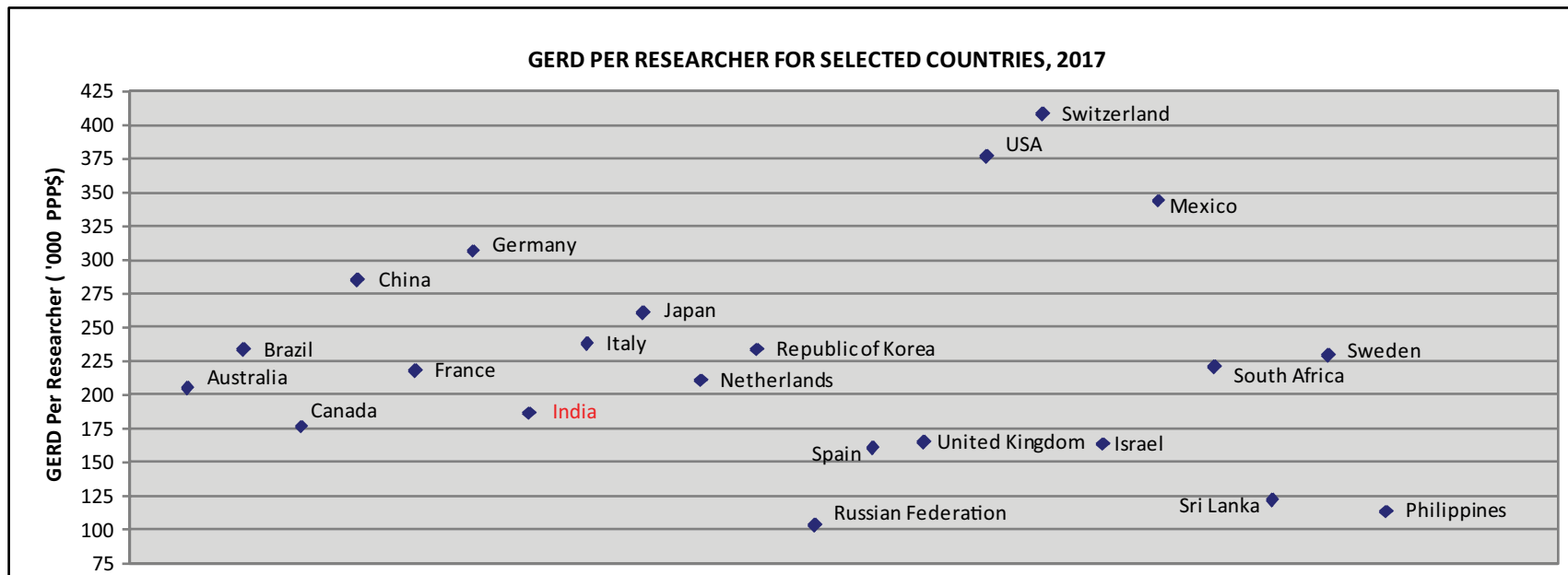
- ❖ Out of the total 40,813 Doctorates in the country, 24,474 (60.0%) Doctorates were from the S&T discipline during 2018-19. India occupies 3rd rank in terms of number of Ph. D.'s awarded in Science and Engineering (S&E) after USA (39,710 in 2016) and China (34,440 in 2015).
- ❖ India spent 0.7% of its GDP on R&D in 2017-18, while the same among other developing BRICS countries was Brazil 1.3%, Russian Federation 1.1%, China 2.1% and South Africa 0.8%. This ratio was 0.5% for Mexico, 0.2% for Pakistan and 0.1% for Sri Lanka.



Source: NSTMIS, Department of Science & Technology, Government of India

- ❖ Most of the developed countries spent more than 2% of their Gross Domestic Product (GDP) on R&D.

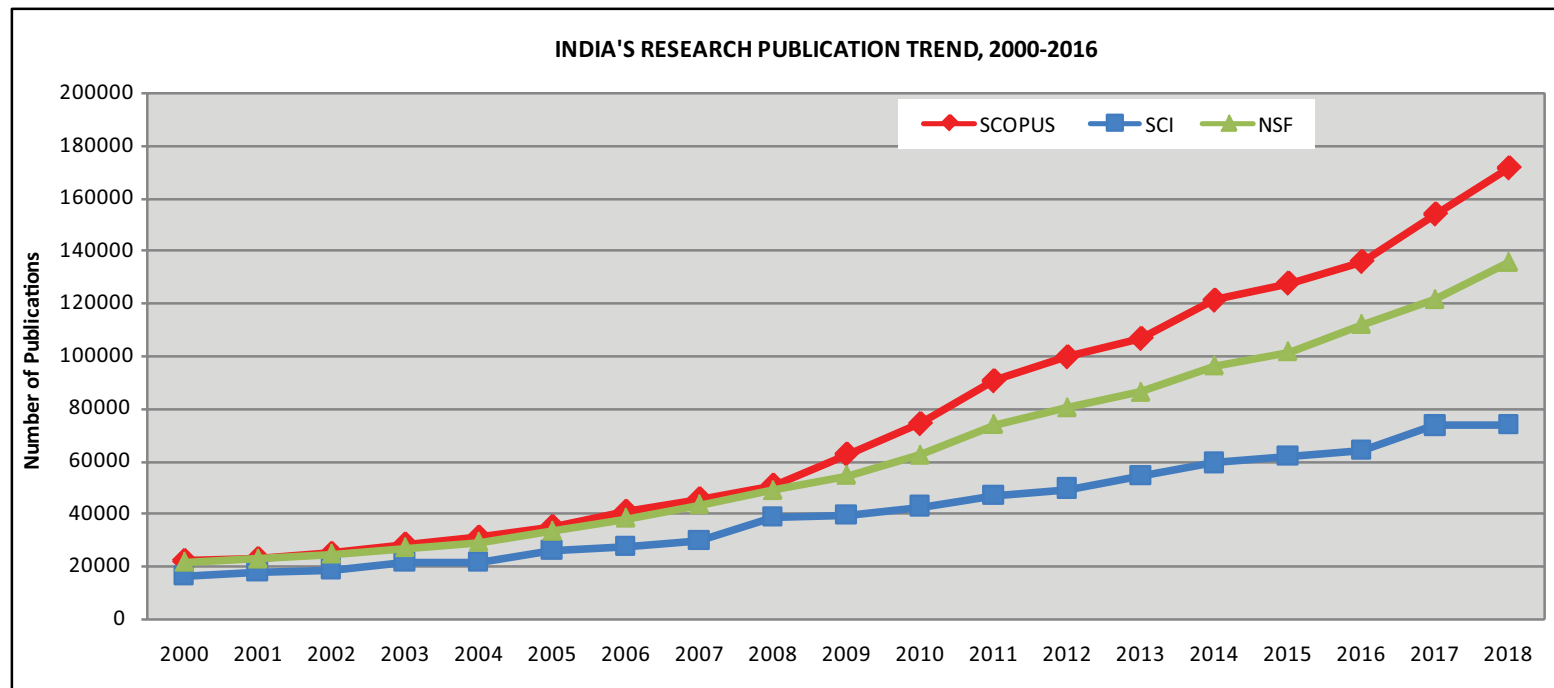
- ❖ Number of researchers per million population in India has increased to 255 in 2017 from 218 in 2015 and 110 in 2000.
- ❖ Among the developed countries, Israel topped the list having with 8,342 researchers per million population in the world followed by Denmark (7,899), Sweden(7,597), Republic of Korea (7,498) and Finland (6,722) during 2017.



Source: NSTMIS, Department of Science & Technology, Government of India.

- ❖ India's R&D expenditure per researcher was 185 ('000 PPP\$) during 2017-18 and was ahead of Russian Federation, Israel, Hungary, Spain and UK.
- ❖ India's scientific publication output has shown a rising trend during the last decade. India has grown faster than many developed and developing countries such as USA, UK, Germany, France, Japan, Korea, Brazil, etc.

- ❖ India's significant increase in research output is reflected in publication databases: by 50% from 90,864 in 2011 to 1,36,238 in 2016 in SCOPUS; by 36.5 % from 47,081 in 2011 to 64,267 in 2016 in SCI; and by 83.1% from 74,143 in 2011 to 1,35,788 in 2018 in NSF.

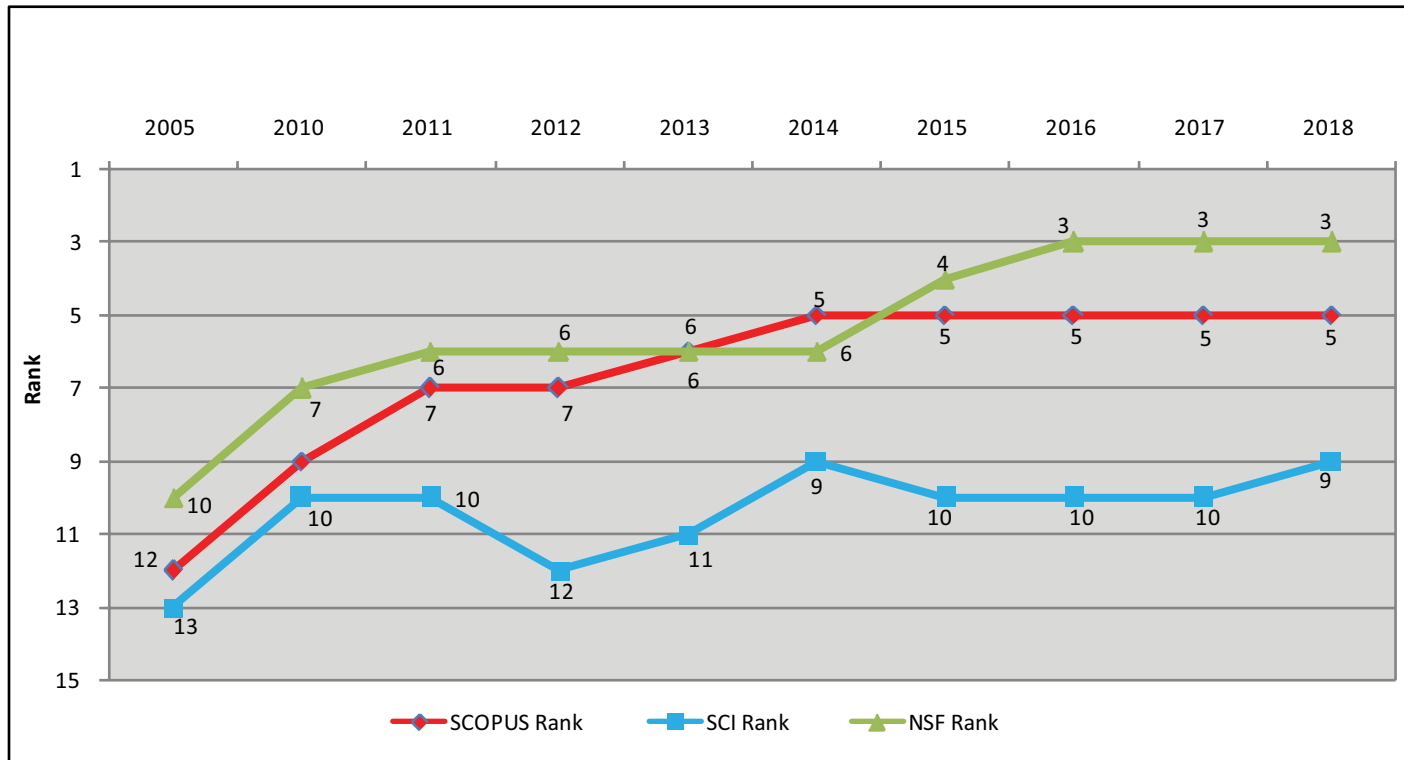


Source: NSTMIS, DST Commissioned Study (SCOPUS; SCI Database), 2019 and NSF database, Science and Engineering Indicators, 2020.

Note: Data for the years 2017 & 2018 for SCOPUS and SCI database is as per Advanced trends.

- ❖ During 2011-2016, India's growth rate of scientific publication as per the SCOPUS and SCI database was 8.4% and 6.4% as against the world average of 1.9% and 3.7% respectively. It was 10.7% as against the world average of 3.8% during 2008-18 as per the NSF database.
- ❖ India's share in global research publication output has increased over the years as reflected in publication databases: 5.4% in 2016 from 4.0% in 2011 in SCOPUS; 4.1% in 2016 from 3.6% in 2011 in SCI; and 5.3% in 2018 from 3.6% in 2011 in NSF.

- ❖ During 2018, India was ranked at 3rd, 5th and 9th in scientific publication output as per the NSF, SCOPUS and SCI database respectively. It is primarily due to varying methodological choices adopted by different citation databases. India is ranked ahead of many developed and developing countries including BRICS except China.

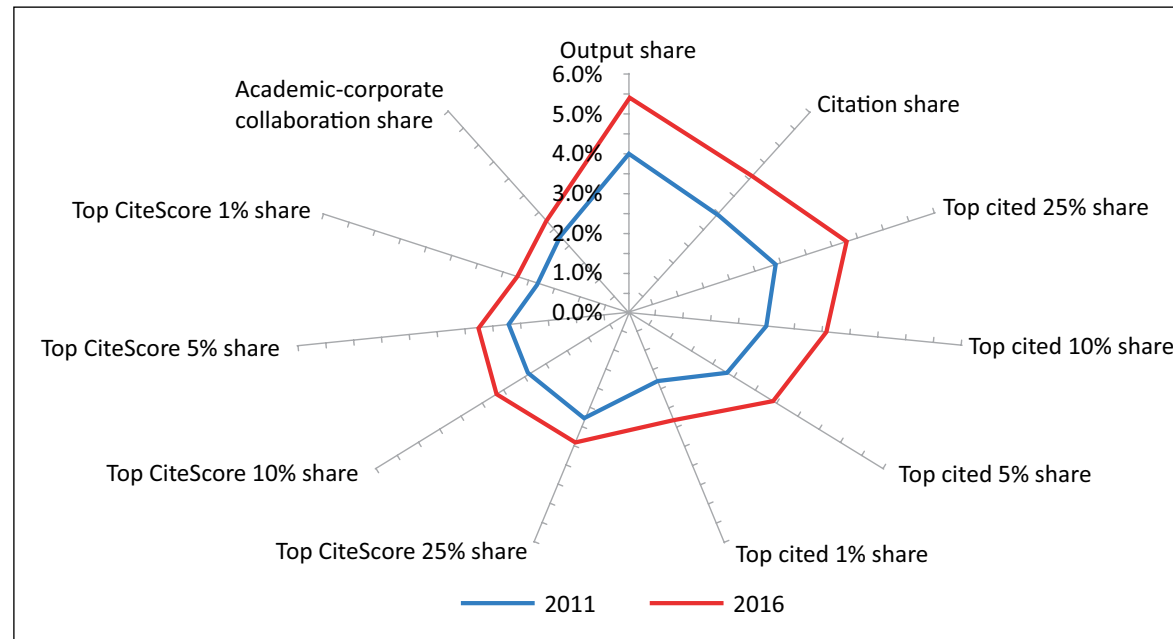


Source: NSTMIS, DST Commissioned Study (SCI; SCOPUS Database), 2019 and NSF database, Science and Engineering Indicators, 2020

- ❖ During 2011-16 as per SCI database, India's largest share of global research publications were in Chemistry (7.2%), Agricultural Sciences (6.6%), Pharmacology and Toxicology (6.3%), Material Science (6.2%), Physics (5.2%), Biology and Bio-chemistry (4.9%), Engineering (4.7%) and Microbiology (4.6%).

- ❖ During 2011-16 as per SCOPUS database, India's largest share of global research publications were in Pharmacology and Toxicology (13.2%) followed by Veterinary Sciences (7.4%), Chemistry (7.1%), Chemical Engineering (6.8%), computer Science (6.2%), Material Science (5.6%), Energy (5.4%), Environmental Science (5.3%), Physics & Astronomy (5.2%), Engineering (5.0%) and Agricultural & Biological Sciences (5.0%).

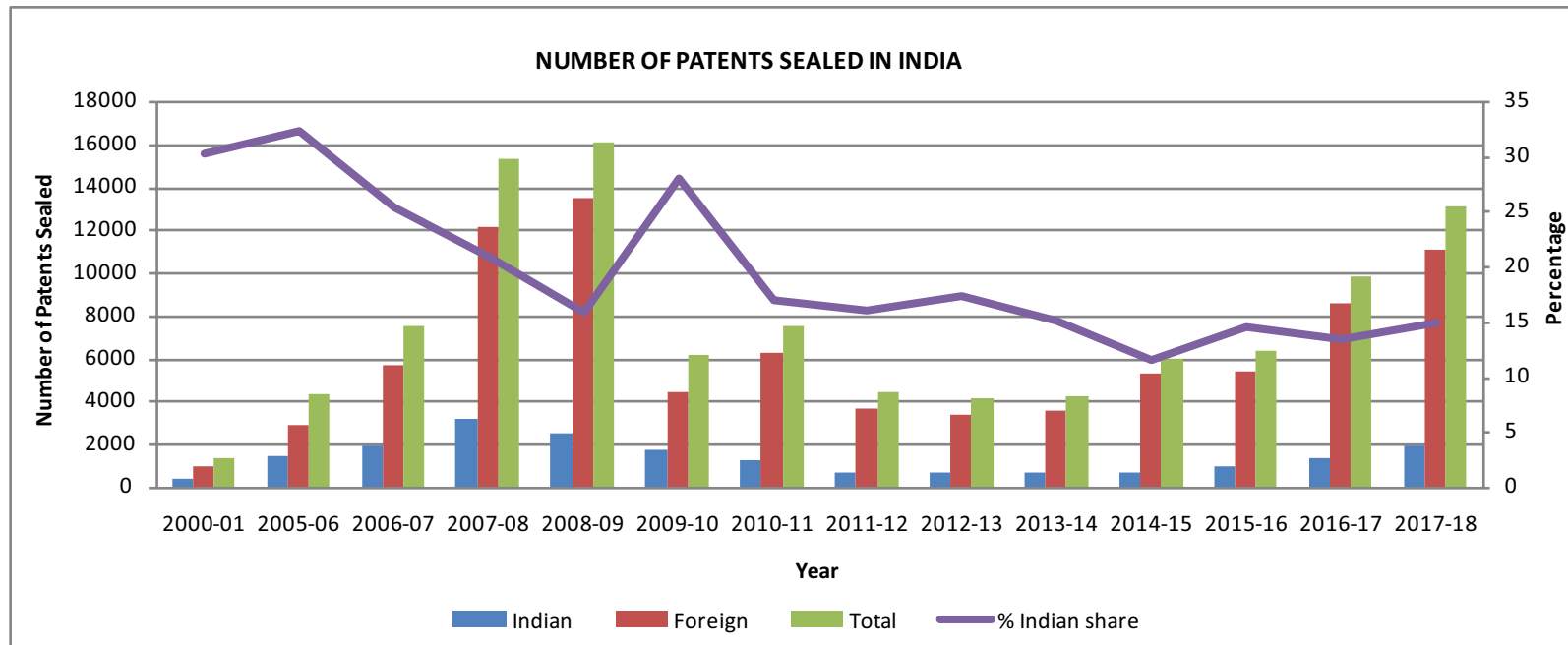
INDIA'S OUTPUT, IMPACT AND KNOWLEDGE TRANSFER, 2011-16



Source: NSTMIS, DST Commissioned Study (SCOPUS Database), 2019

- ❖ India's growth is quite aggressive at the very top end of the excellence scale. India held 4.3% of world share in top 25%, 3.6% in top 10%, 3.4 % in top 5% and 2.8% in top 1% of highly cited publications during 2016. The highly cited publications were mainly concentrated in the fields such as Engineering, Physics & Astronomy, Computer Science and Material Science.

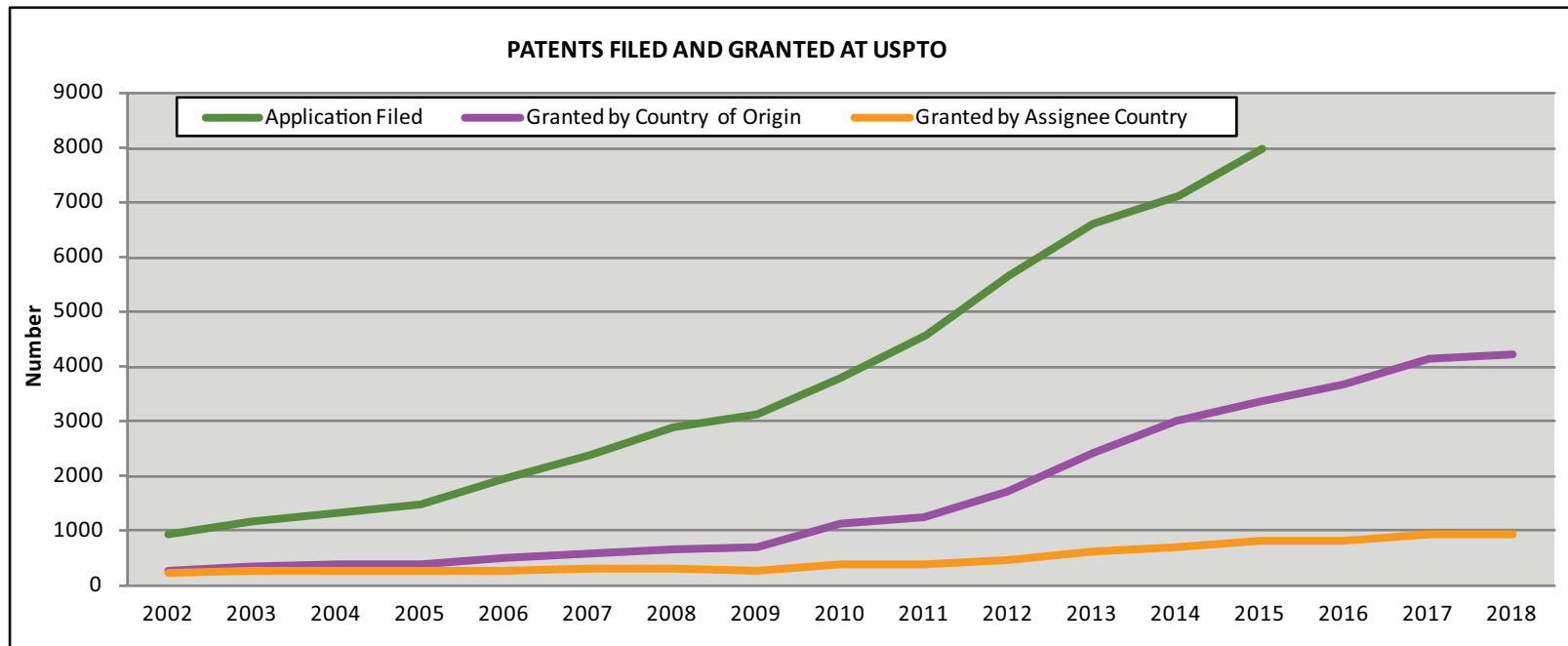
- ❖ During 2017-18 a total of 47,854 patents were filed in India. Out of which 15,550 (32%) patents were filed by Indian residents.
- ❖ As per WIPO report 2019, India is ranked at 9th position in terms of Resident Patent Filing activity in the world.



Source: Controller General of Patents, Design and Trade Marks-Annual reports

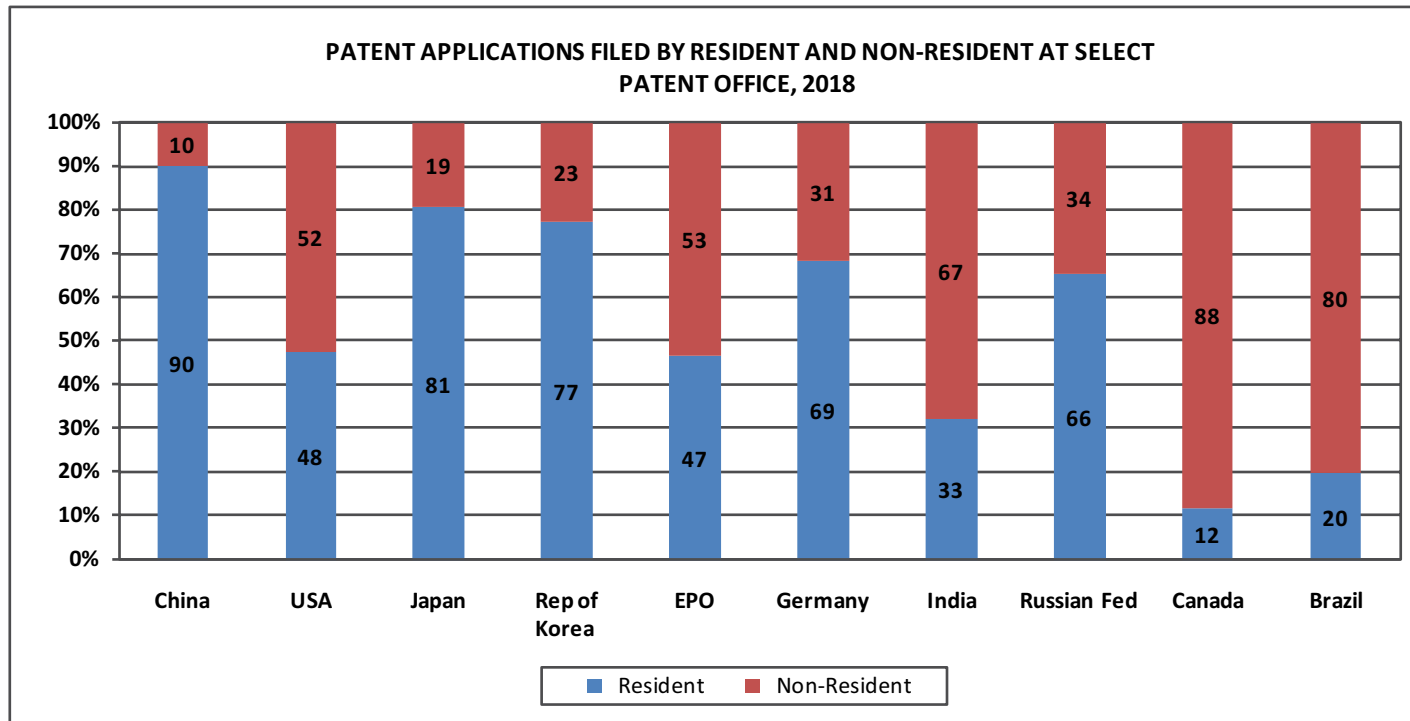
- ❖ Patent applications filed in India are dominated by disciplines like Mechanical, Chemical, Computer/Electronics and Communication.
- ❖ Nearly 62% of the foreign patents filed in India during 2017-18 were from four countries viz USA (31.5%), Japan (13.9%), Germany (8.6%) and China (8.0%).

- ❖ India's Patent Applications Filed and Granted at USPTO have shown a rising trend since 2005 onwards.



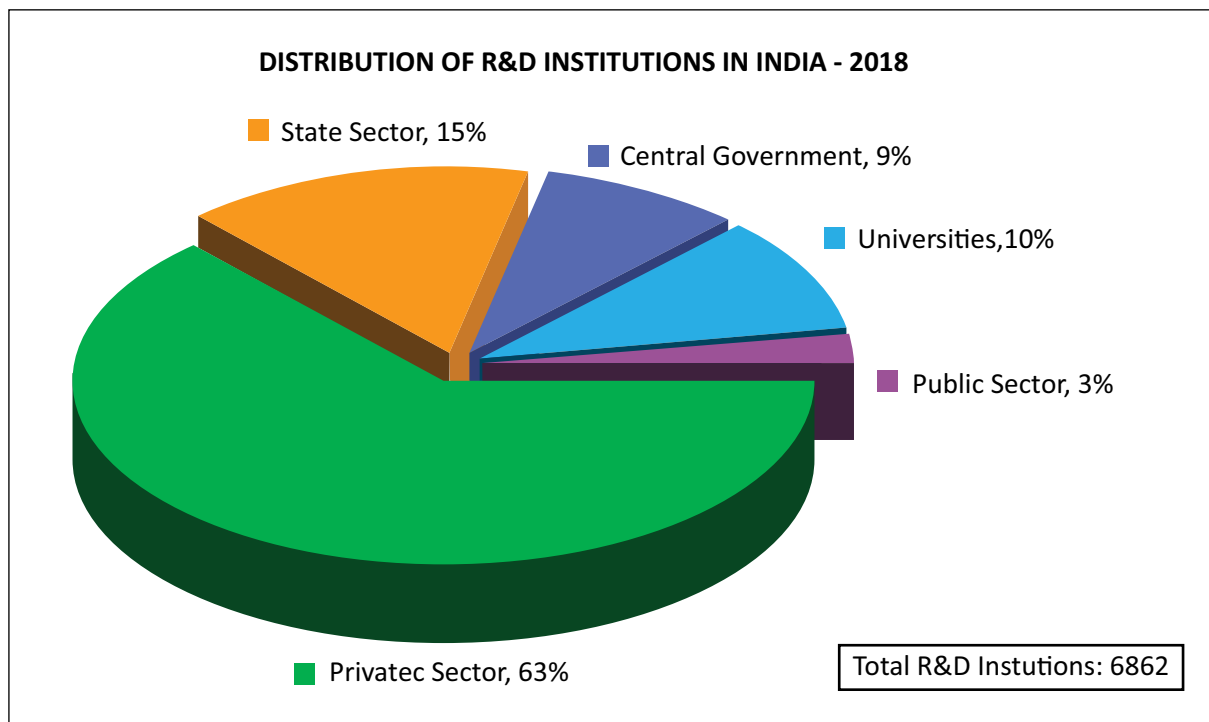
Source: USPTO (Patent Application Filed data available only upto 2015)

- ❖ According to WIPO, India's Patent Office stands at the 7th position among the top 10 Patent Filing Offices in the world.



Source: WIPO Report, 2019

- ❖ Total 6,862 R&D institutions were surveyed as a part of the National R&D Survey 2018-19. 63% of the R&D Institutions surveyed were in the private sector.



Source: NSTMIS, DST, Government of India

SALIENT FEATURES

The forthcoming edition of the Research & Development Statistics 2019-20 contains detailed S&T Indicators Tables on the following themes:

- ❖ National R&D expenditure and break-up of this into various sectors
- ❖ National R&D expenditure and percentage of Gross National Product
- ❖ National R&D expenditure at current and constant prices
- ❖ R&D expenditure by Major Scientific Departments/Agencies
- ❖ R&D expenditure by Public/Joint Sector companies
- ❖ Sector-wise R&D Manpower etc.

Research & Development Statistics 2019-20 will also provide information from secondary sources on Enrolment and Outturn of S&T personnel, Patents as well as International S&T comparisons. The report is referred as a source book on S&T by the policy makers, planners, researchers, scientists and technologists both nationally and internationally.

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The present publication is uploaded at

www.dst.gov.in ; www.nstmis-dst.org

Acronym:

AYUSH: Dept. of Ayurveda, Yoga, Naturopathy, Unani, Siddha & Homoeopathy	DRDO: Defence Research & Development Organisation	MeitY: Ministry of Electronics and Information Technology	MoS: Ministry of Steel
CSIR: Council of Scientific & Industrial Research	DSIR: Dept. of Scientific & Industrial Research	MNRE: Ministry of New & Renewable Energy	MoWR: Ministry of Water Resources
DAE: Department of Atomic Energy	DST: Department of Science & Technology	MoEFCC: Ministry of Environment & Forest and Climate Change	PCRA: Petroleum Conservation Research Association
DBT: Department of Bio-Technology	ICMR: Indian Council of Medical Research	MoES: Ministry of Earth Sciences	UGC: University Grants Commission
DoS: Department of Space	ISRO: Indian Space Research Organisation	MoP: Ministry of Power	

Unit: 1 Crore = 10 million; 1 million = 10 lakh



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