

RESEARCH & DEVELOPMENT STATISTICS AT A GLANCE

2022-23



DEPARTMENT OF SCIENCE & TECHNOLOGY

MINISTRY OF SCIENCE & TECHNOLOGY

GOVERNMENT OF INDIA

NEW DELHI-110016 (INDIA)

March 2023

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सत्यमेव जयते

डॉ. एस. चंद्रशेखर
Dr. S. Chandrasekhar



वयुधेव कुटुम्बकम्

ONE EARTH • ONE FAMILY • ONE FUTURE



सचिव
भारत सरकार
विज्ञान एवं प्रौद्योगिकी मंत्रालय
विज्ञान एवं प्रौद्योगिकी विभाग
Secretary
Government of India
Ministry of Science and Technology
Department of Science and Technology

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 2022–23 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. Akhilesh Gupta, Dr. Rabindra Kr. Panigrahy, and Mr. Pramod Kr. 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.

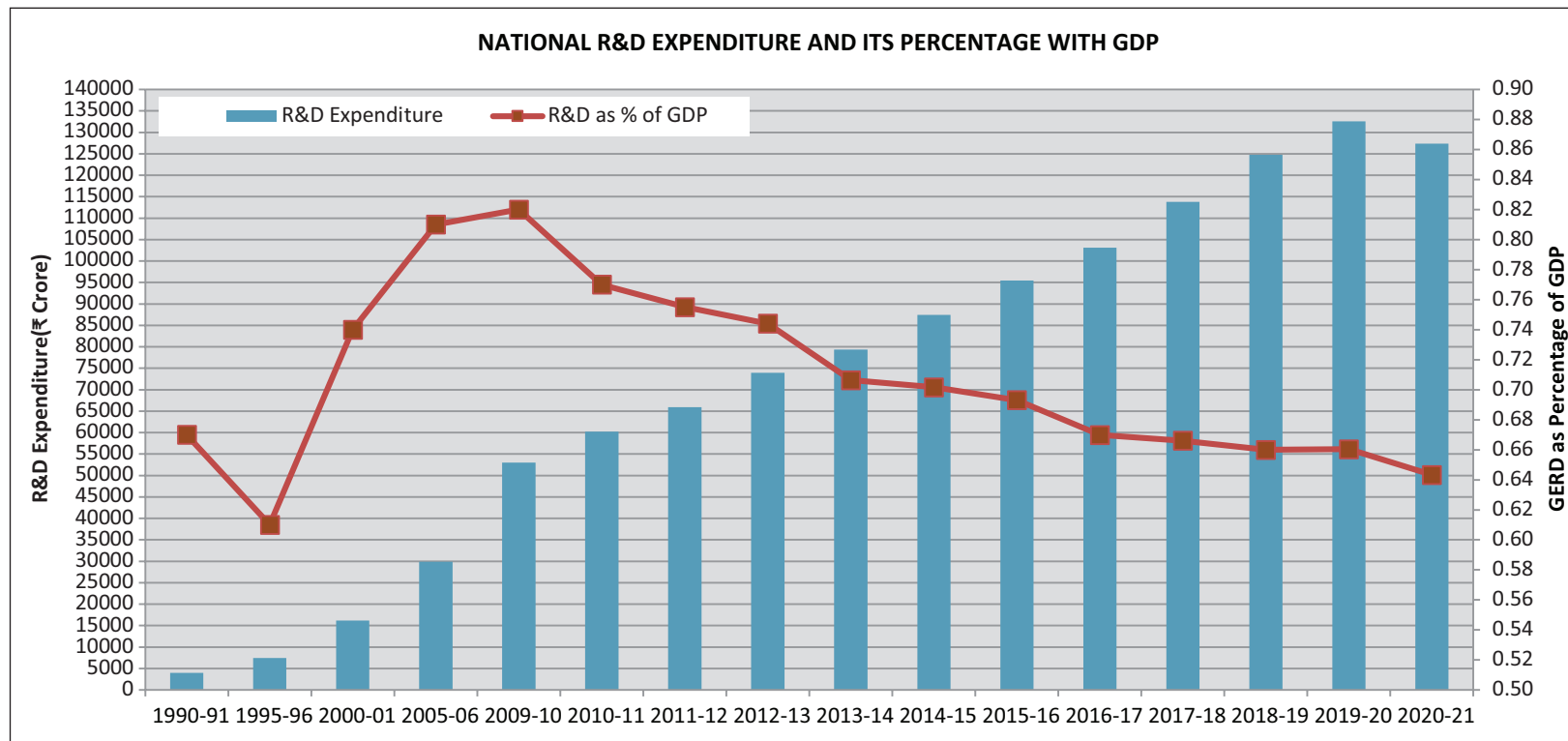
Dr. S. Chandrasekhar

Technology Bhavan, New Mehrauli Road, New Delhi - 110016

Tel: 0091 11 26511439/ 26510068 | Fax: 00 91 11 26863847 | e-mail: dstsec@nic.in | website: www.dst.gov.in

MAJOR HIGHLIGHTS

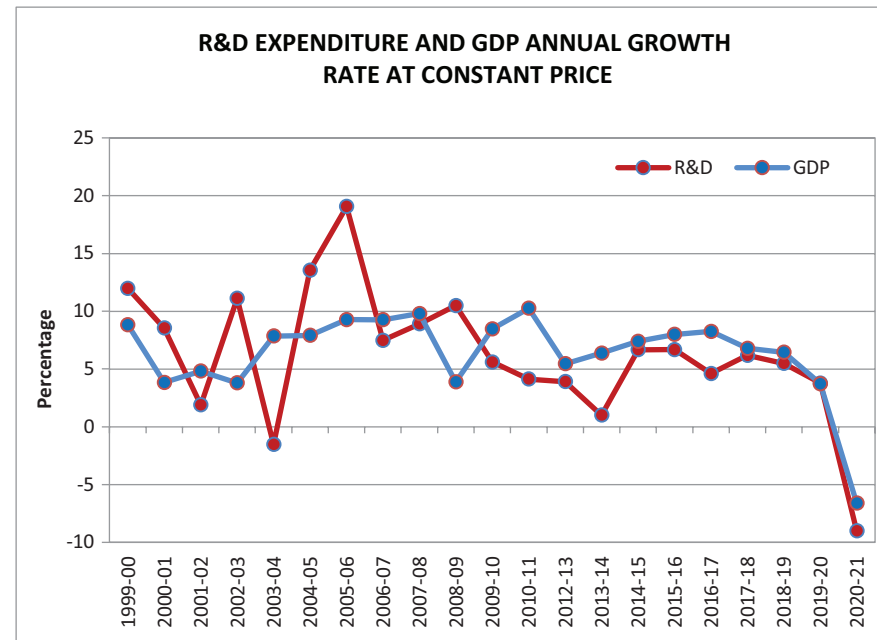
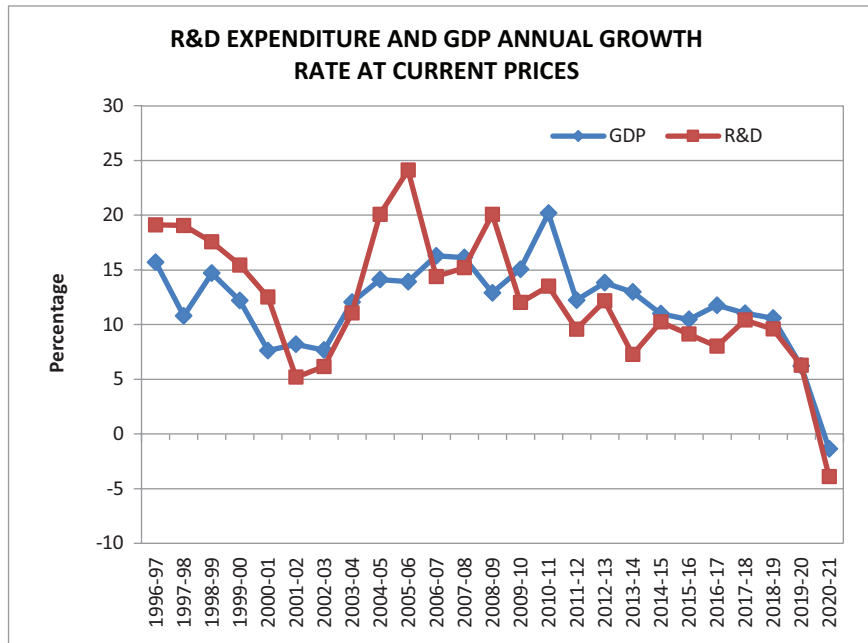
- ❖ The Gross Expenditure on R&D (GERD) in the country has been consistently increasing over the years and has more than doubled from Rs. 60,196.75 crore in 2010–11 to Rs. 127,380.96 crore in 2020–21.



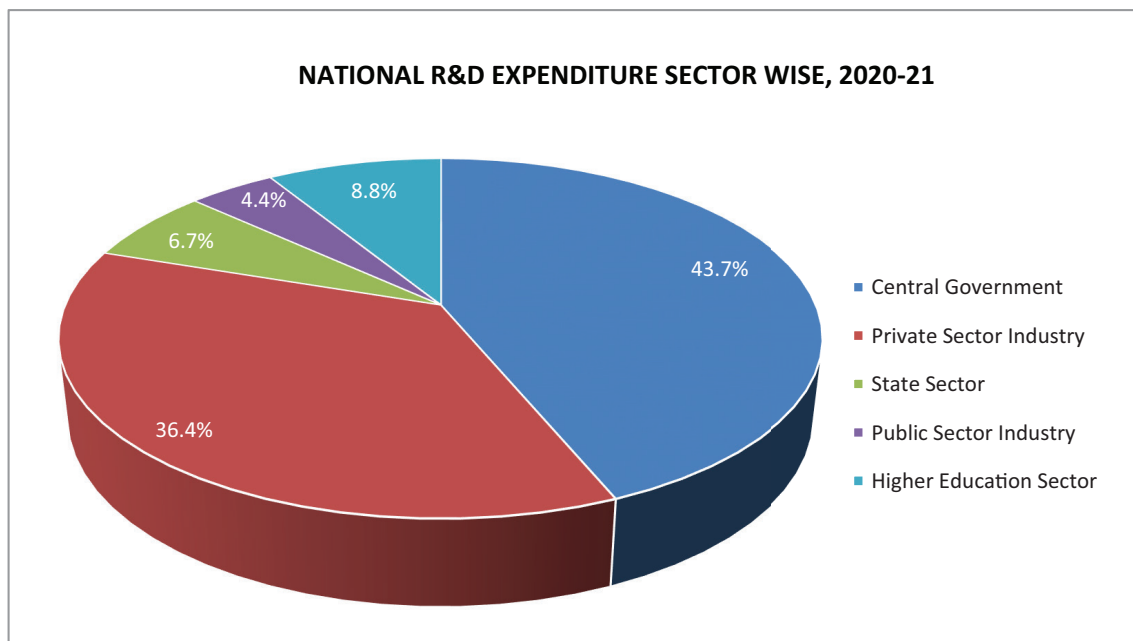
Source: NSTMIS, Department of Science & Technology, Government of India

- ❖ India's GERD as percentage of GDP remained at 0.66% and 0.64% during the years 2019–20 and 2020–21, respectively.
- ❖ India's per capita R&D expenditure has increased to current PPP\$ 42.0 in 2020–21 from current 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 to 2017–18 (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. From 2017–18 onwards, the annual growth rate of GDP R&D expenditure almost remained the same.

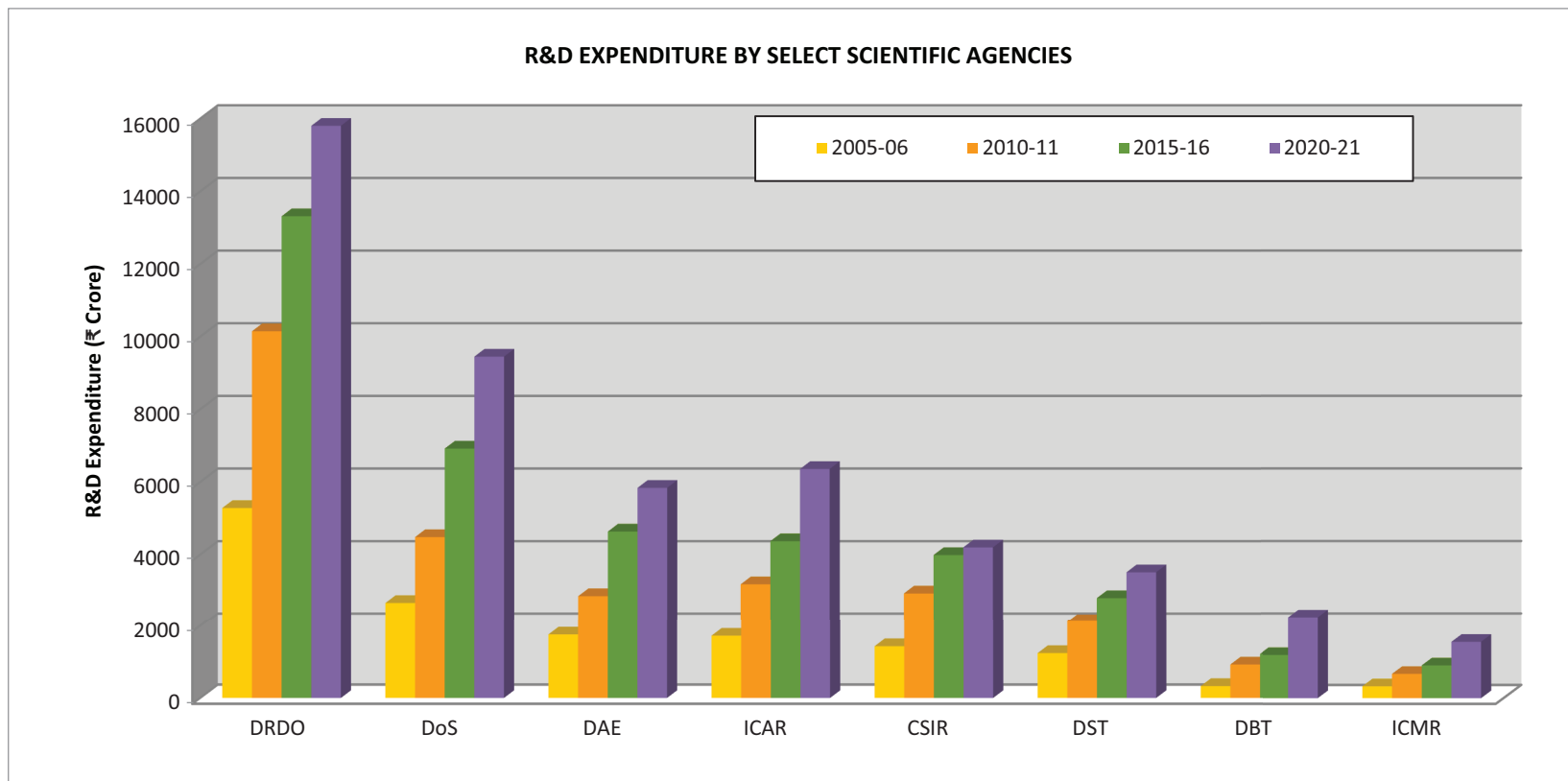


- ❖ India’s GERD increased to 57.9 billion current PPP\$ in 2020–21 from 50.3 billion current PPP\$ in 2014–15.
- ❖ As per UNESCO Science Report 2021, India accounted for 3.1% of world GERD in 2018.
- ❖ World GERD increased to 2232.57 billion current PPP\$ in 2018 from 1859.13 billion current PPP\$ in 2014.



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

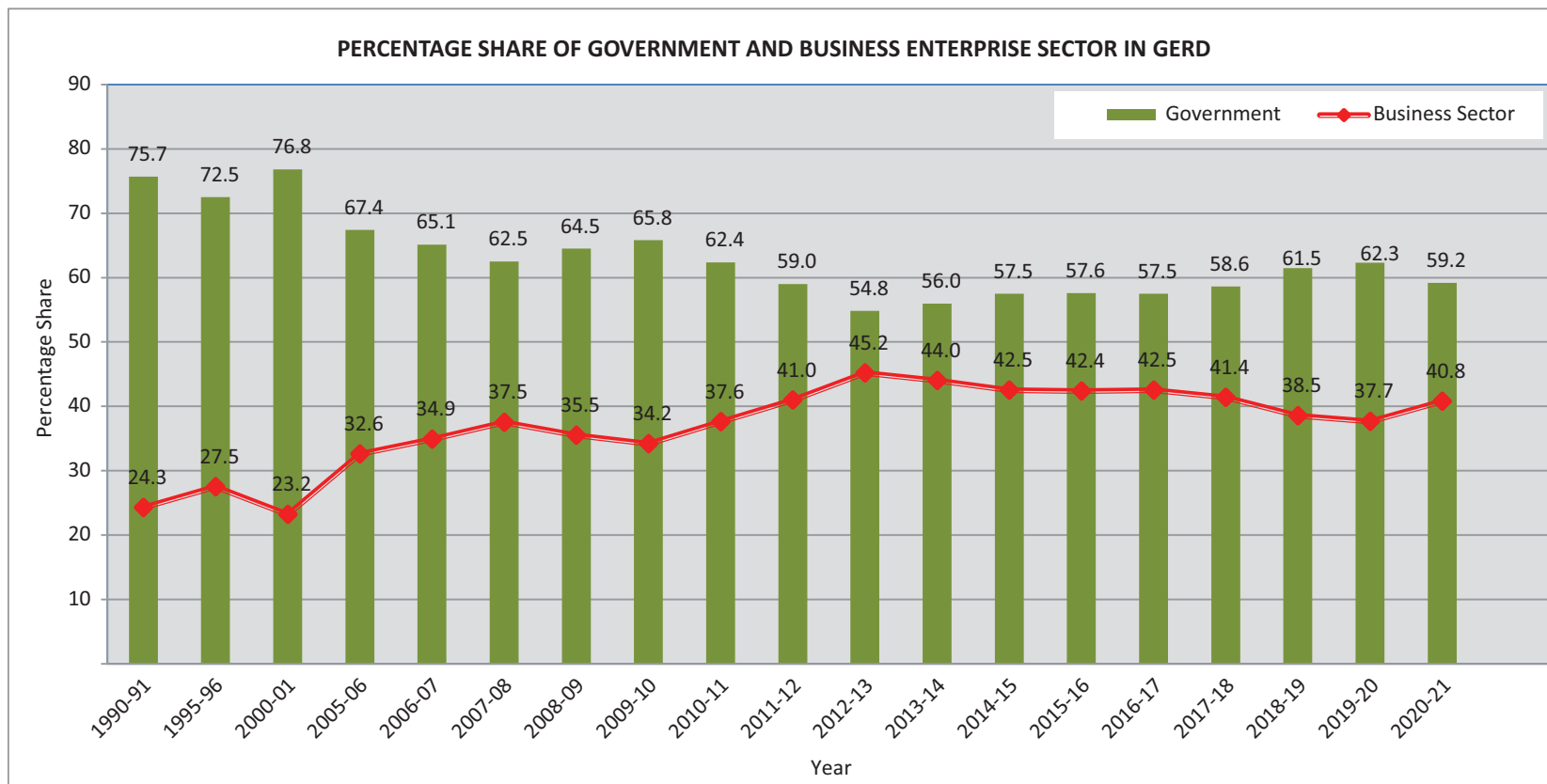
- ❖ GERD is mainly driven by the Government sector comprising Central Government (43.7%), State Governments (6.7%), Higher Education (8.8%) and Public Sector Industry (4.4%) with Private Sector Industry contributing 36.4% during 2020–21.



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

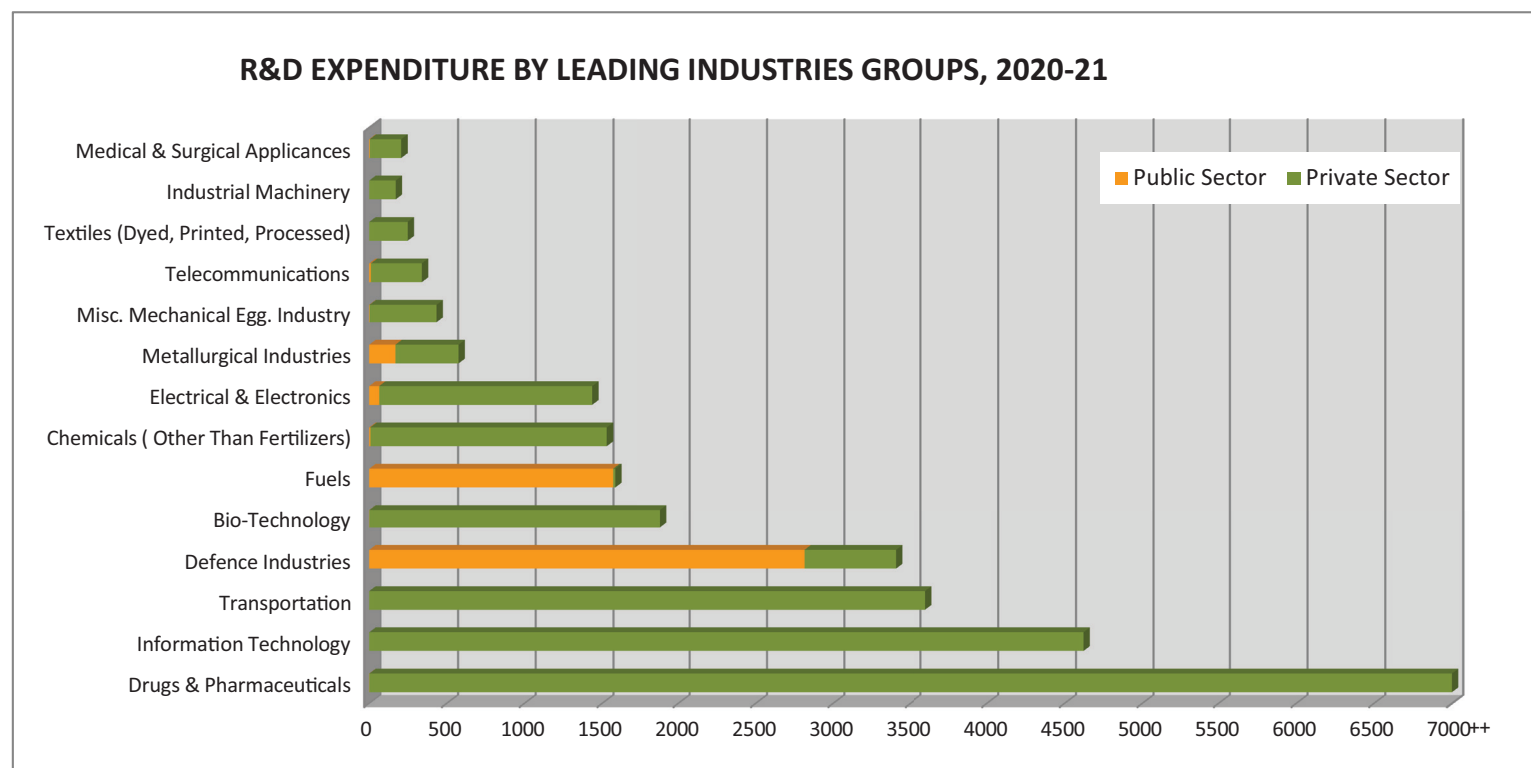
- ❖ During the year 2020–21, 84% of the R&D expenditure incurred by Central Government sources came from 12 major scientific agencies.
- ❖ Amongst the 12 Central Government major scientific agencies, DRDO accounted for the maximum share of 30.7% of R&D expenditure followed by DOS (18.4%), ICAR (12.4%), DAE (11.4%), CSIR (8.2%) and DST (6.8%), DBT (4.4%) and ICMR (3.1%), MeitY (2.2%), MoES (1.5%), MoEFCC (0.8%), and MNRE (0.1%) during 2020–21.

- ❖ Business Enterprise (Industrial) sector participation in GERD has been around 40% during the last 5 years.
- ❖ Public sector R&D units spent 0.30% of their sales turnover on R&D as compared to 1.46% by Private sector in 2020–21.



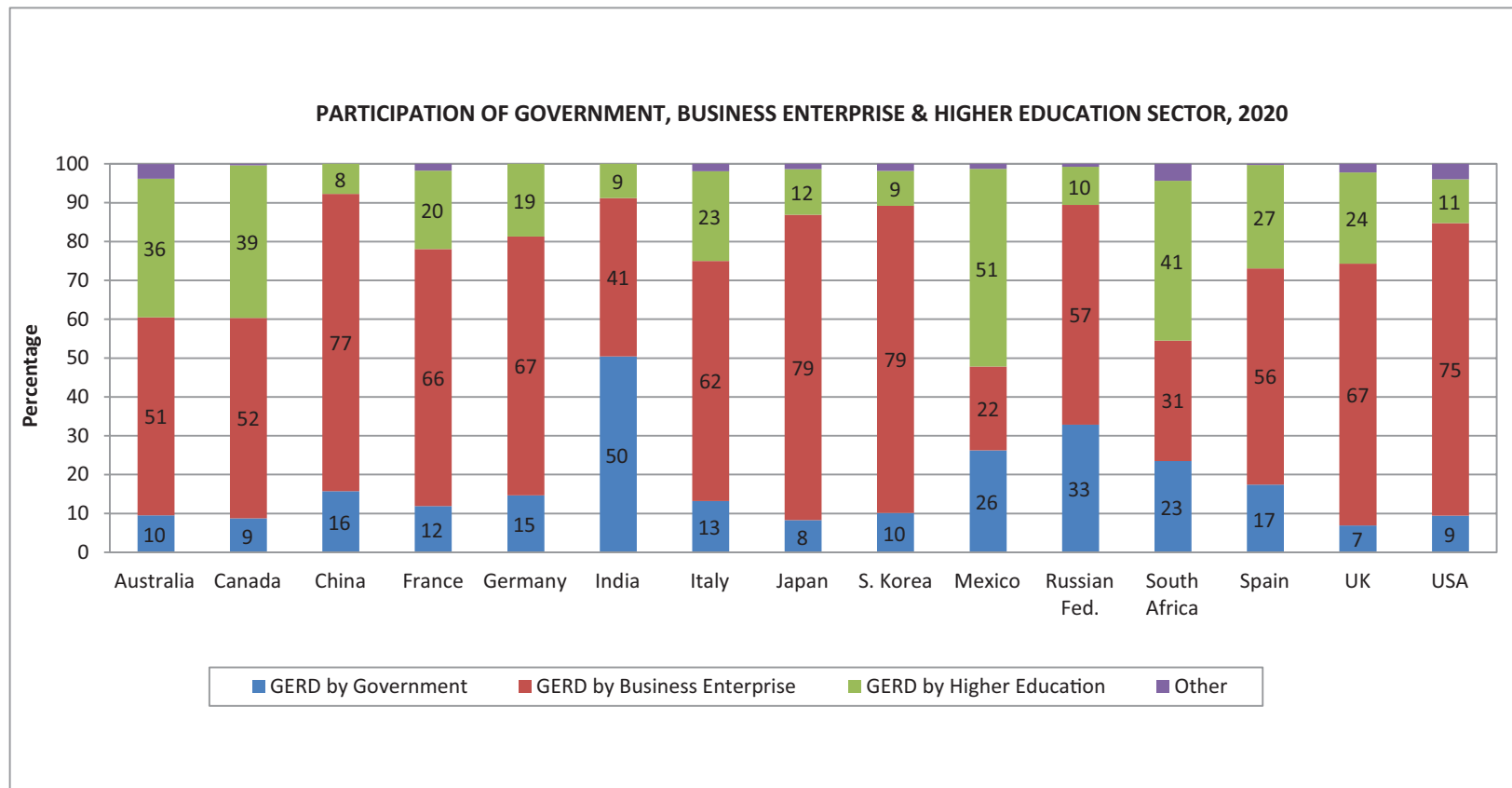
Source: NSTMIS, Department of Science & Technology, Government of India

- ❖ During 2020–21, Public Sector R&D was led by Defence Industries followed by Fuels and Metallurgical Industries while Drugs and Pharma, Textiles, Information Technology, Transportation, Biotechnology Industries, etc., dominated the Private Sector R&D.
- ❖ In industrial R&D, Drugs and Pharmaceuticals occupied the first place with a share of 33.6% followed by Information Technology 9.9%, Transportation 7.7%, Defence Industries 7.3% and Bio-technology 4%, respectively during 2020–21.



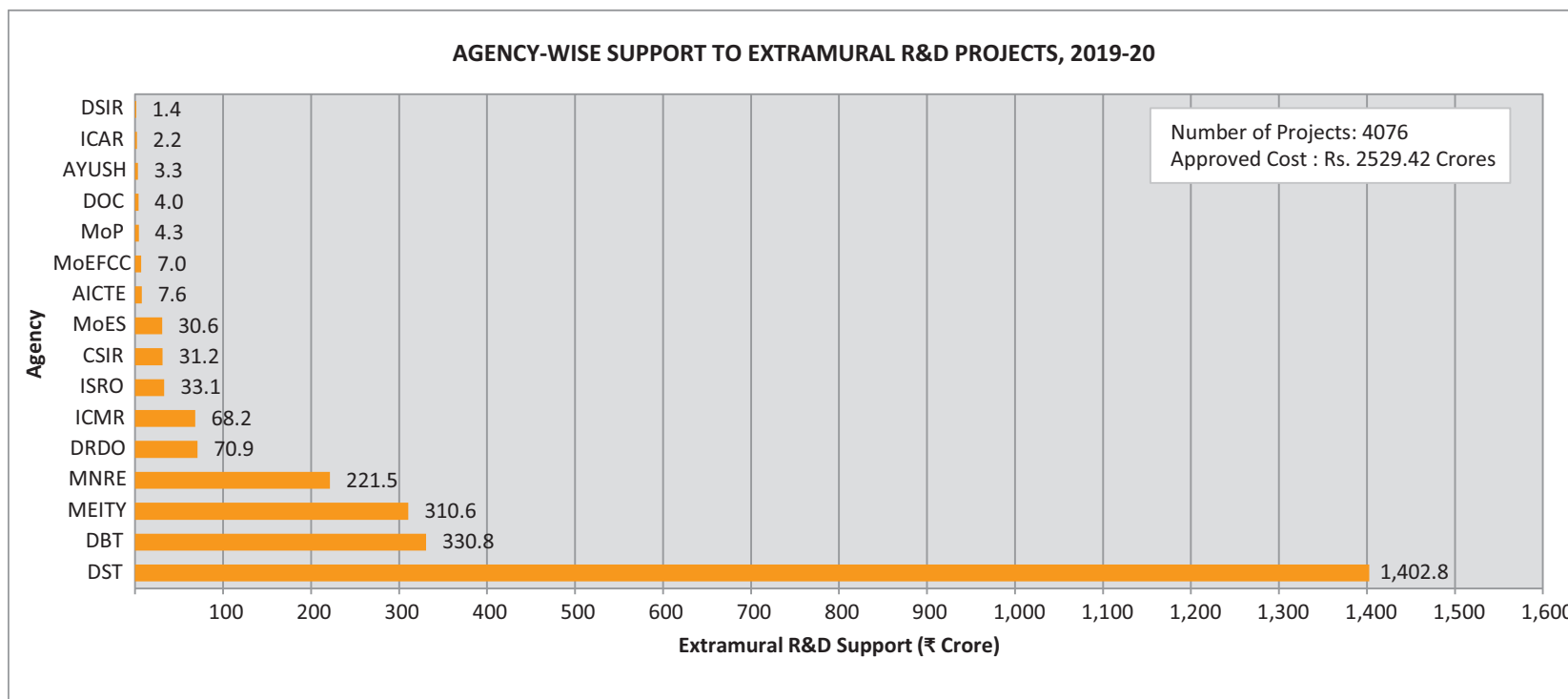
Source: NSTMIS, Department of Science & Technology, Government of India

- ❖ India stands in contrast with select developed and emerging economies with 59% 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 select countries.
- ❖ 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, South Korea and USA.



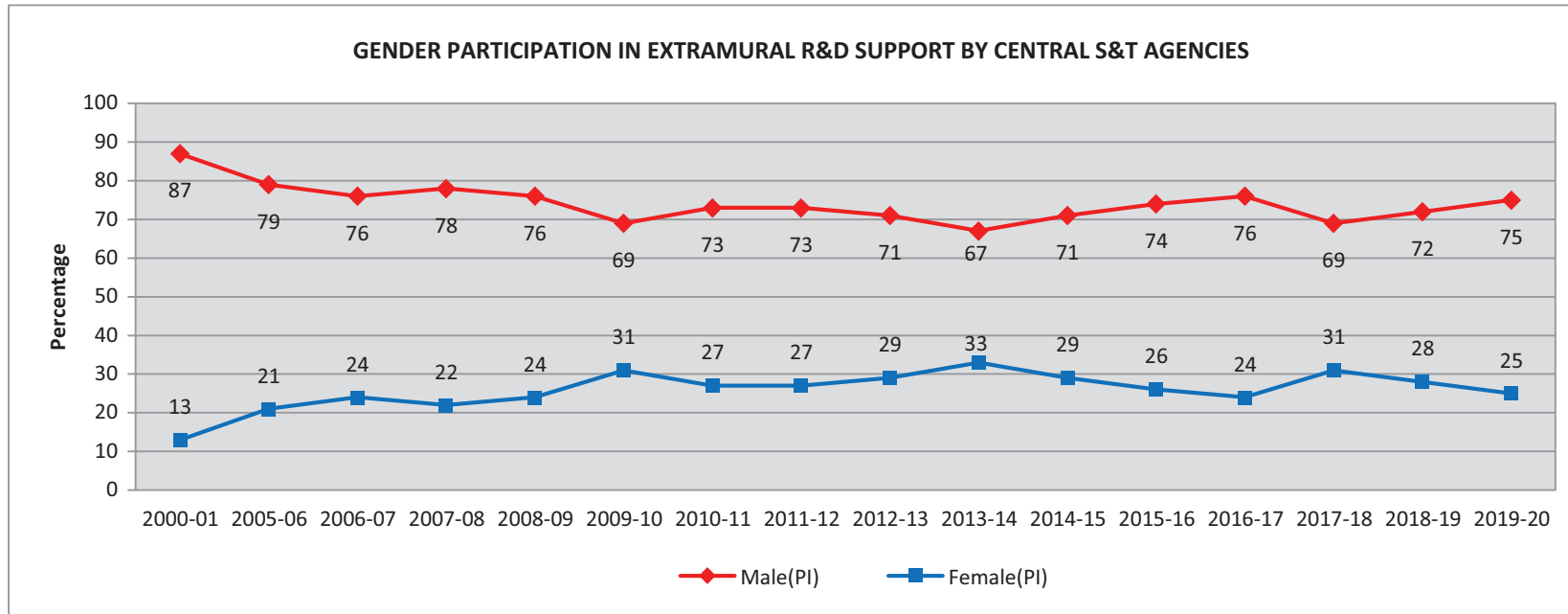
Source: Main Science and Technology Indicators (MSTI), OECD, September 2022 and India-Data collected and compiled by NSTMIS, DST, GoI
 Note: Reference year: 2019-Australia, South Africa, and UK

- ❖ Extramural R&D support by Central Government Agencies increased to Rs. 2529.42 crore in 2019–20 from Rs. 2454.02 crore in 2016–17. Its share in the national GERD was 1.9% during 2019–20.
- ❖ The Department of Science and Technology (DST) and Department of Biotechnology (DBT) were the two major players contributing 55% and 13% respectively of the total extramural R&D support in the country during 2019–20.
- ❖ Academic sector received 70% of the total extramural R&D support during the year 2019–20.



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

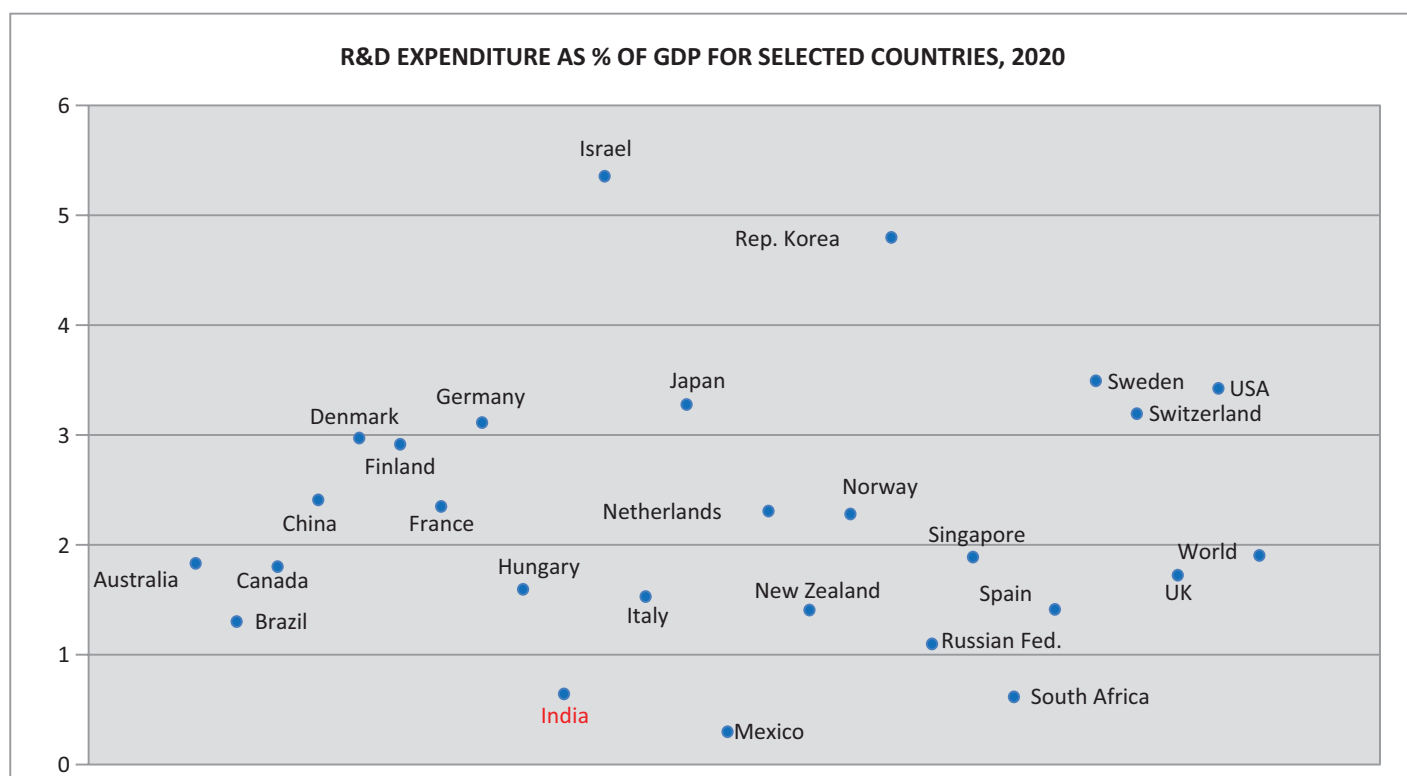
- ❖ Women participation in extramural R&D projects has increased significantly to 25% in 2019–20 from 13% in 2000–01 due to various initiatives undertaken by the Government in S&T sector. In absolute terms, 848 women Principal Investigators (PIs) during 2019–20 availed extramural R&D support as against 232 in 2000–01.



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

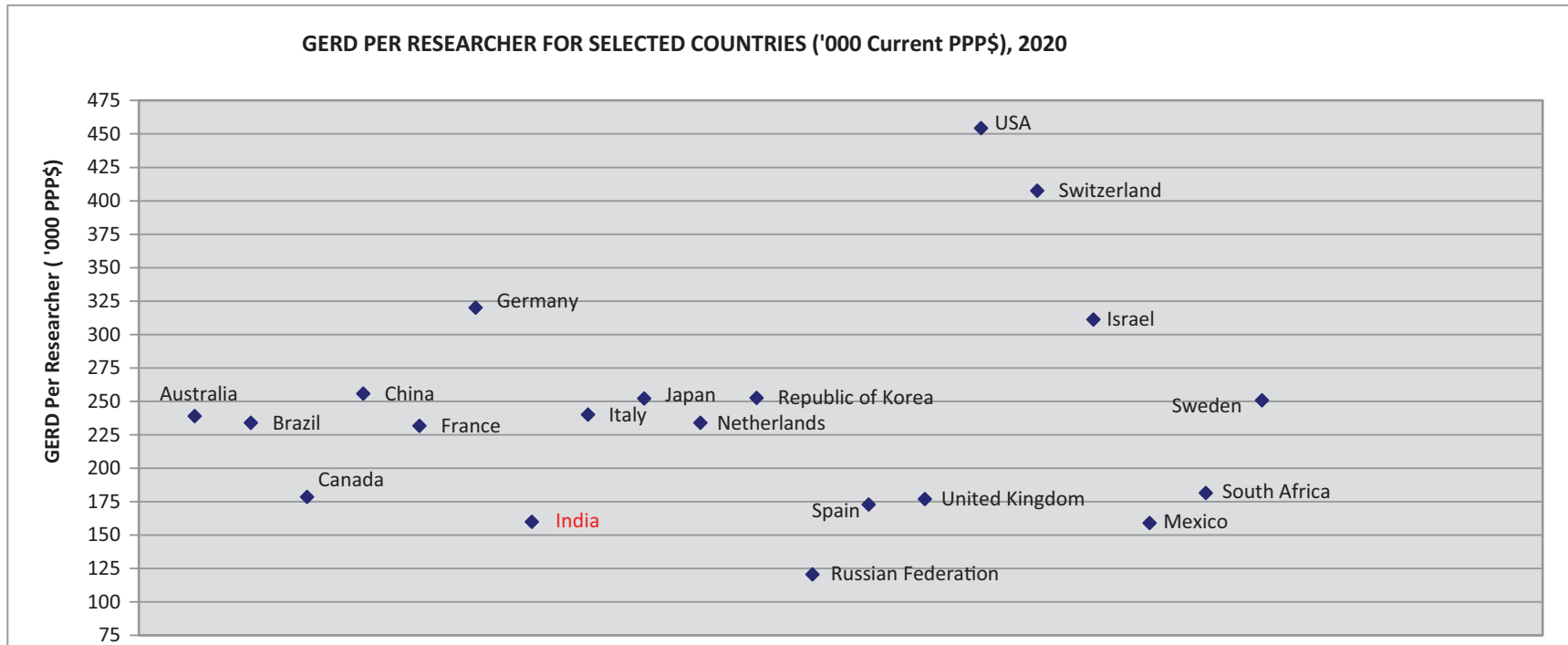
- ❖ As on 1st April 2021, nearly 5.55 lakh personnel were employed in the R&D establishments in the country including in-house R&D units of public and private sector industries. Out of which, 3.62 lakh (65.3%) were performing R&D activities while 0.95 lakh (17.1%) and 0.98 lakh (17.6%) personnel were engaged in auxiliary and administrative/non-technical support activities respectively.
- ❖ As on 1st April 2021, there were 67,441 (18.6%) women out of total 3.62 lakh R&D personnel directly engaged in R&D activities.

- ❖ As per Science and Engineering (S&E) Indicators, 2022, NSF, USA 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 the number of PhDs awarded in Science and Engineering (S&E) after USA (41,071) and China (39,768).
- ❖ India spent 0.64% of its GDP on R&D in 2020–21, while the same amongst other developing BRICS countries was—Brazil (1.3%), Russian Federation (1.1%), China (2.4%), and South Africa (0.6%). This ratio was 0.3% for Mexico.
- ❖ Most of the developed countries spent more than 2% of their Gross Domestic Product (GDP) on R&D.



Source: Main Science and Technology Indicators (MSTI), OECD, September 2022, UNESCO Website & India- R&D Statistics, 2022–23

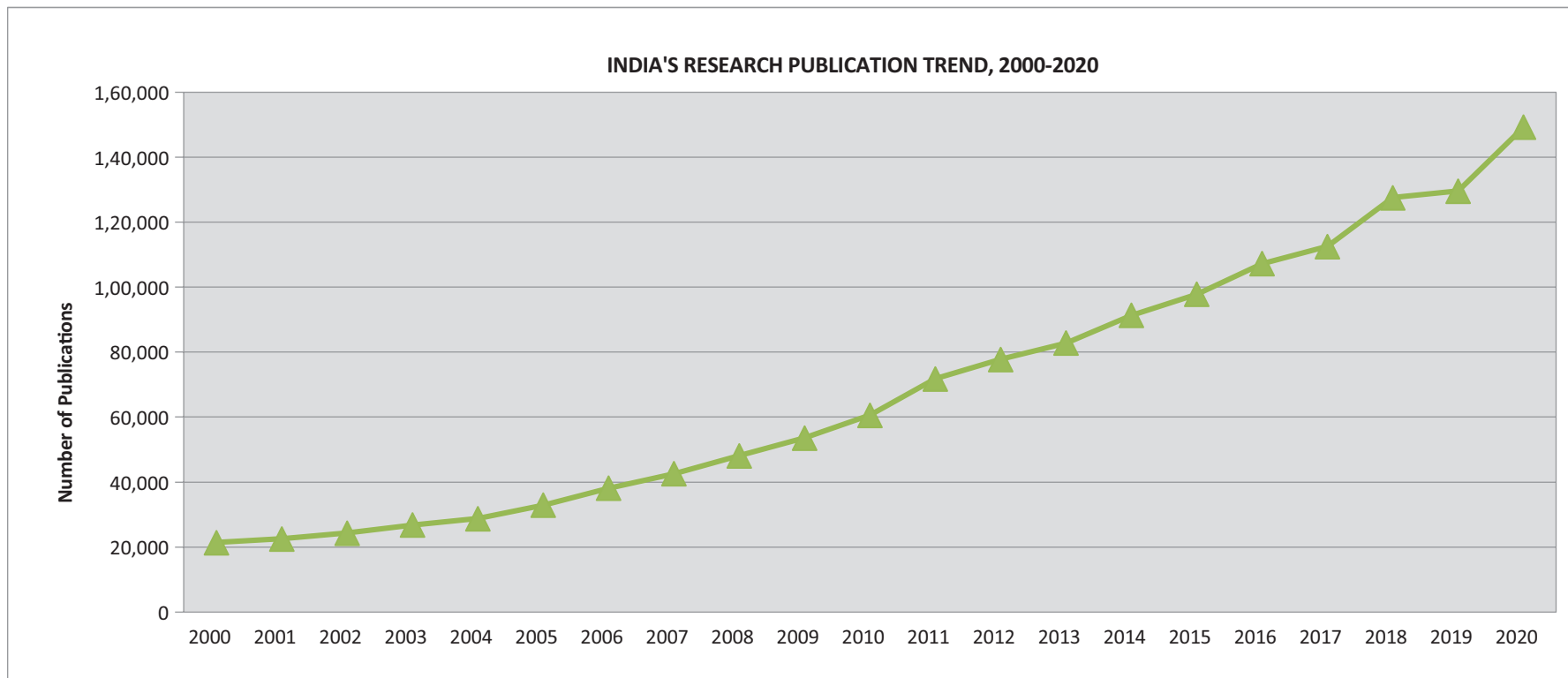
- ❖ Number of researchers per million population in India has increased to 262 in 2020 from 255 in 2017, 218 in 2015, and 110 in 2000.
- ❖ Amongst the developed countries, Republic of Korea topped the list with 8714 researchers per million population in the world followed by Israel (8342), Sweden (7930), Denmark (7692), Finland (7527) and Singapore (7287) during 2020.



Source: Main Science and Technology Indicators (MSTI), OECD, September 2022, UNESCO website & India- R&D Statistics, 2022–23

- ❖ India's R&D expenditure per researcher was 160 ('000 PPP\$) during 2020–21 and was ahead of Russian Federation, Hungary and Mexico.

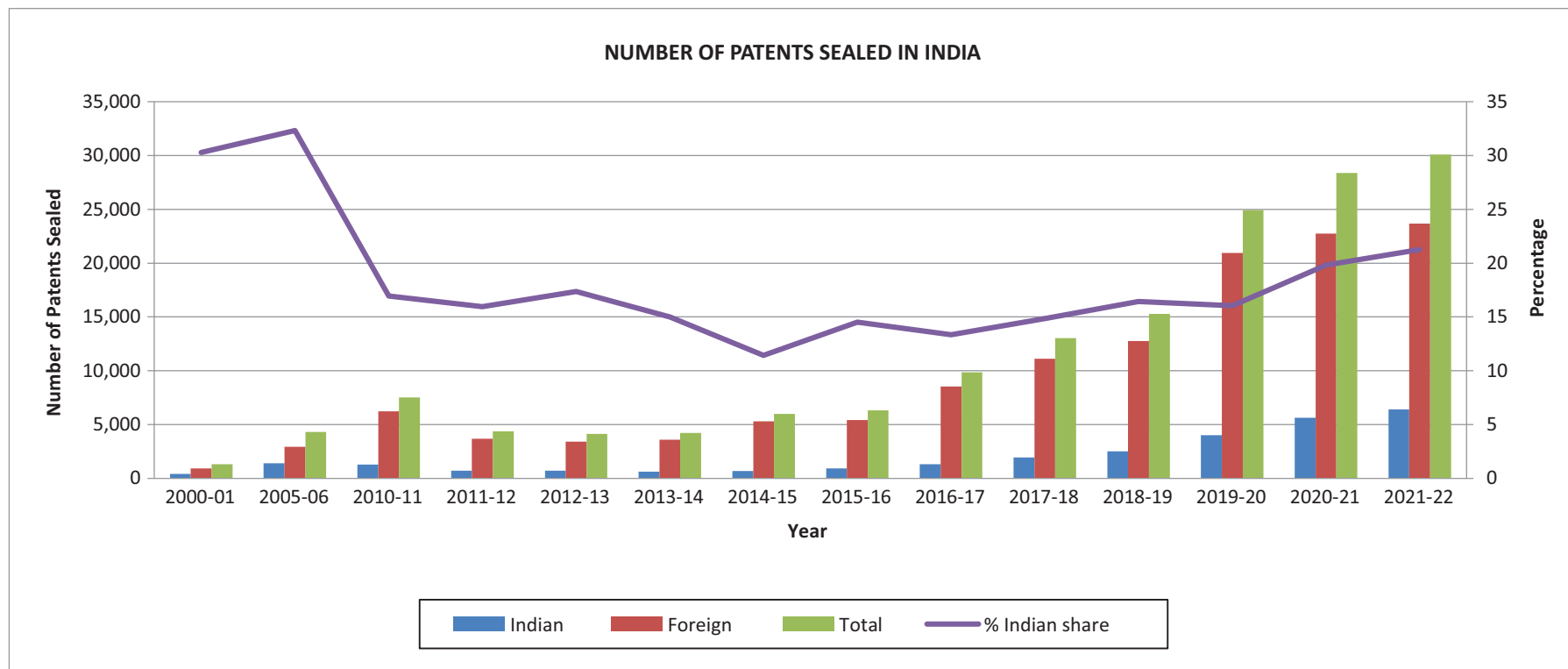
- ❖ India's scientific publication output has shown a rising trend during the last decade. India has grown faster than many developed and developing countries such as USA, UK, Germany, France, Japan, South Korea, Brazil, etc.



Source: NSF database, Science and Engineering Indicators, 2022

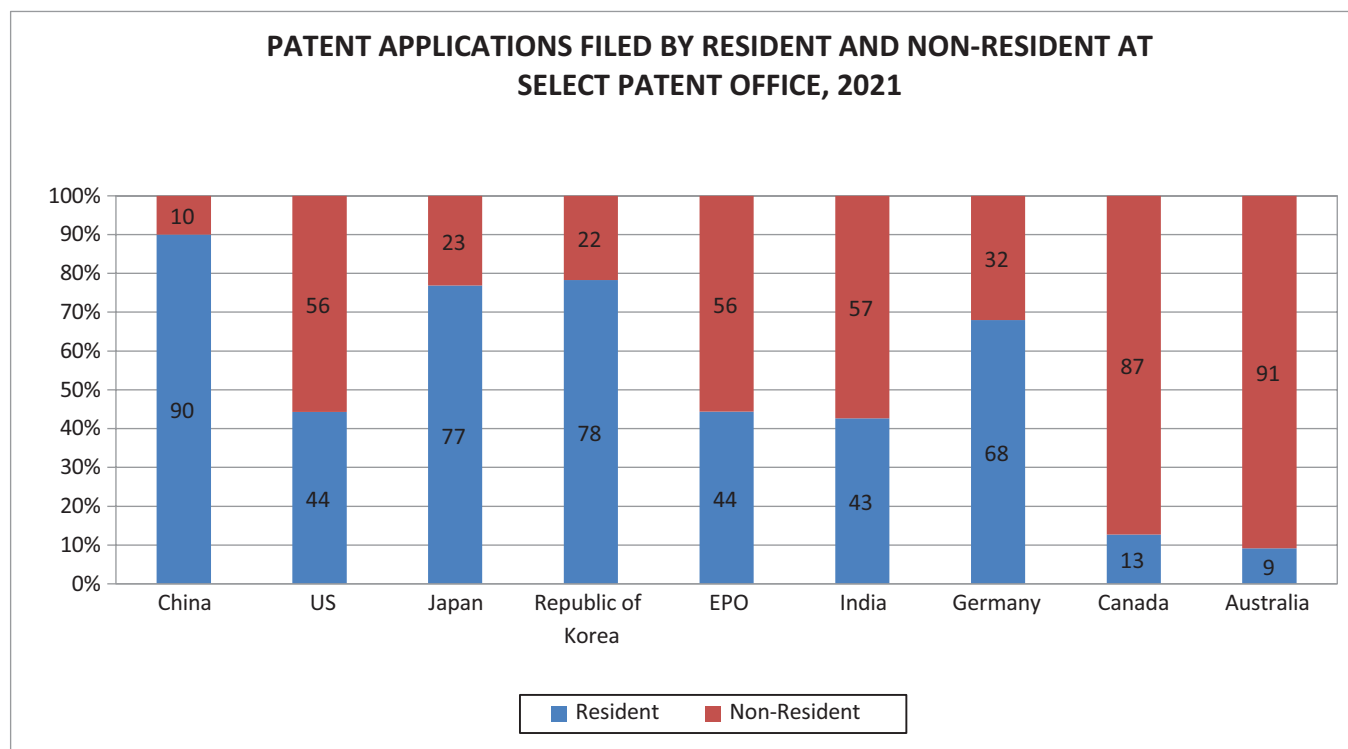
- ❖ India's research output in publication has increased by 2.5 times from 60,555 in 2010 to 149,213 in 2020 as per NSF database, USA.
- ❖ India's growth rate of scientific publication was 9.4% as against the world average of 4.3% during 2010–20 as per the NSF database.
- ❖ India's share in global research publication output has increased over the years from 3.1% in 2010 to 5.1% in 2020 as reflected in NSF database.
- ❖ During 2020, India was ranked at 3rd in scientific publication output as per the NSF database. India is ranked ahead of many developed and developing countries including BRICS except China.

- ❖ During 2020, India’s largest publication output were in Computer & Information Science (18%) followed by Engineering (17%), Health Sciences (16%), Biological & Biomedical Sciences (12%), Physics (11%) and Chemistry (8%) as per Science & Engineering Indicators 2022, NSF, USA.
- ❖ During 2021–22 a total of 66,440 patents were filed in India. Out of which, 29,508 (44%) patents were filed by Indian residents.
- ❖ As per WIPO Report 2022, India is ranked at 7th position in terms of Resident Patent Filing activity in the world.
- ❖ Patent applications filed in India are dominated by disciplines like Computer/Electronics, Mechanical, Communication and Bio-medical.



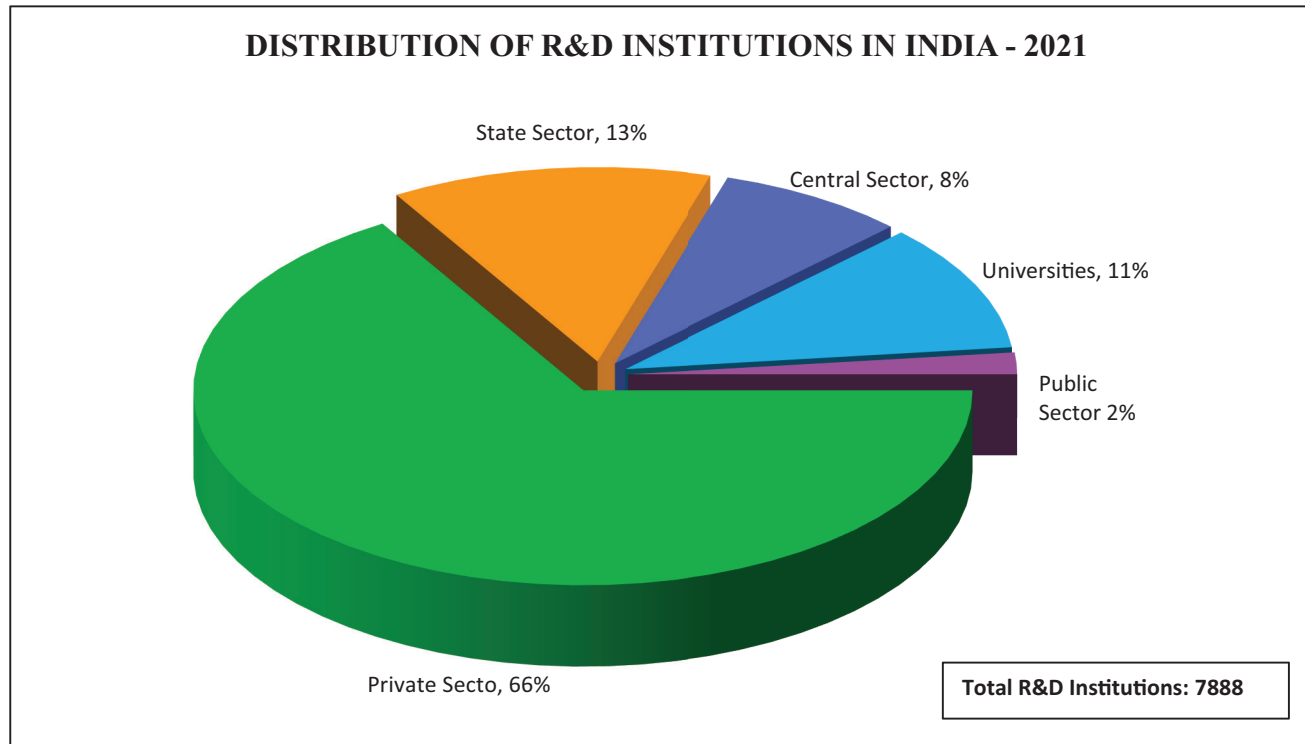
Source: Controller General of Patents, Design and Trade Marks-Annual reports

- ❖ Nearly 67.1% of the foreign patents filed in India during 2021–22 were from five countries, viz., USA (32.7%), Japan (13.1%), China (10.5%), Germany (7.3%), and Switzerland (3.6%).
- ❖ According to WIPO Report 2022, India’s Patent Office stands at the 6th position amongst the top 10 Patent Filing Offices in the world.



Source: WIPO Report, 2022

- ❖ As per Directory of R&D Institutions, 2021, there were 7888 R&D institutions in the country, out of which 66% were in private sector.



Source: NSTMIS, DST, Government of India

SALIENT FEATURES

The forthcoming edition of the Research & Development Statistics 2022–23 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

Research & Development Statistics 2022–23 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.

NSTMIS SURVEY TEAM:

Dr. Akhilesh Gupta, Sr. Adviser & Head, PCPM (NSTMIS), DST (akhilesh.g@nic.in)
Dr. Rabindra Kr. Panigrahy, Scientist 'E', PCPM (NSTMIS), DST (rabindra.p@nic.in)
Mr. Pramod Kr. Arya, Scientist 'C', PCPM (NSTMIS), DST (pk.arya@nic.in)

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Acronyms:

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
DBT: Department of Bio-Technology	DST: Department of Science & Technology	MoEFCC: Ministry of Environment & Forest and Climate Change	PCRA: Petroleum Conservation Research Association
DRDO: Defence Research & Development	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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