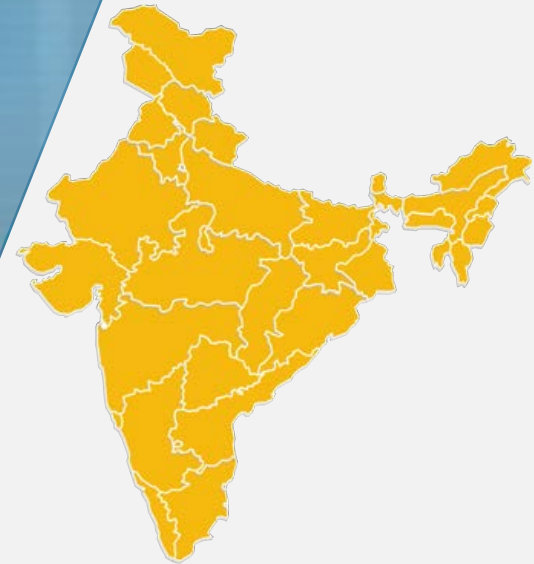


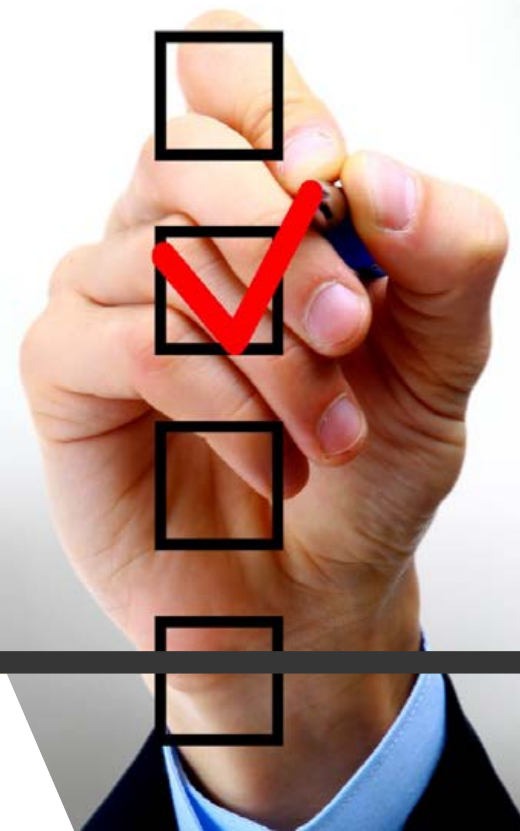
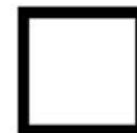
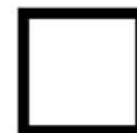


# SCIENCE AND TECHNOLOGY



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## Huge talent pool

- Third largest technical manpower in the world.
- As of 2018-19, there are 933 universities in the country.
- Global share in scientific publications rising at a CAGR of ~12 per cent.
- India ranks 8th in the world in terms of number of students graduating in science and engineering stream.
- India stood at third spot in number of science and engineering publications in the world

## Policy framework

- Policies aimed at projecting India as a Science and Technology powerhouse and promoting both public and private sector involvement in the R&D practice.
- Women Scientific programme to expose women more and more towards research.

## Rising investments

- With more and more multinational companies setting up their R&D centres in India, the sector has seen an uptrend in investments in recent years.
- Under the Union Budget 2019-20, the Government of India announced the largest ever allocation of Rs 5,880 crore (US\$ 841 million) to the Ministry of Science and Technology , Rs 2,580 crore (US\$ 369.15 million) to Department of Biotechnology and Rs 4,895 crore (US\$ 700.38 million) to the Council for Scientific and Industrial Research.

## Large consumer base

- With a Rs 190.54 lakh crore (US\$ 2.64 trillion) economy in FY19 SAE and per capita income of over Rs 143,048 (US\$ 1,982.65) in FY19AE, India presents a unique opportunity for companies to tap the huge consumer base demanding technologically advanced products.
- Demand for cheap and durable products that could meet the local requirements drives the need for innovation.

*Note: SAE – Second Advance Estimates  
Source: RBI, India Budget*

COMPLETE

**ADVANTAGE INDIA**



- Rising income and evolving lifestyles have led to higher demand for aspirational products.
- Indian companies' investments in R&D is not surprising given the importance of innovation to sustain competition.
- Indian players are set to benefit from expiration of patents.
- Expanding middle class and increasing affordability are demand drivers for technologically advanced products.

**Robust demand**

- India's medical technology (MedTech) sector is forecasted to reach US\$ 9.6 billion in 2022 and US\$ 7.8 billion in 2020 from US\$ 5.7 billion in 2017.
  - India is the top exporter of IT products and has the third largest pharma sector and a fast-growing contract research segment.
    - Third largest technical manpower in the world.
  - For designing and testing the product, government is setting up high-tech R&D facility by bringing together scientific research and commercial activities into roof.

**Attractive opportunities**

- Establishment of CoEs in various areas; NMITLI initiative on PPP basis.
- Increased investments by private players; setting up of R&D centers.
- The total number of patent applications filed by the Indian scientists and inventors increased to 47,854 in FY18 from 45,444 in FY17.

**Rising private activity**

- PPP for promoting exchange of scientific knowledge and R&D.
- The Patent Prosecution Highway programme was adopted on a pilot basis for three years.
- Amendments to the Patents Act (1970) to make it TRIPS-compliant.
- Adoption of Science, Technology and Innovation Policy 2013.

**Policy support**

## ADVANTAGE INDIA

**Notes:** CoE - Center of Excellence, PPP - Public Private Partnership, TRIPS - Trade Related Aspects of Intellectual Property Rights, NMITLI - New Millennium Indian Technology Leadership Initiative, NIC - National Innovation Council; Figures mentioned are as per latest data available, PWC report

**Source:** IPI India Annual Report, TechSci Research

# MARKET OVERVIEW



# EVOLUTION OF SCIENCE AND TECHNOLOGY POLICY FRAMEWORK IN INDIA

2013

- **Science, Technology and Innovation Policy** aims to develop synergies between science, technology and innovation. Ethnic diversity and varying demographics attracted investment from various players.

2014

- **New Initiatives** such as SWAYAM (Study Webs of Active-Learning for Young Aspiring Minds), etc. have been taken to support young talent and attract innovation
- "Innovation of Science Pursuit for Inspire Research (INSPIRE)" initiative was launched to communicate with the youth population and attract talent to the scientific field
- The total plan outlay allocated under the Union Budget 2015-16 for the Department of Science and Technology is around US\$ 557.1 million.

2015

- **Scientific and Technological (S&T) Activities Survey 2015-16** aims to collect data on resources devoted to R&D in science and technology. The information is collected from about 5000 R&D organisations present across the country.

2016

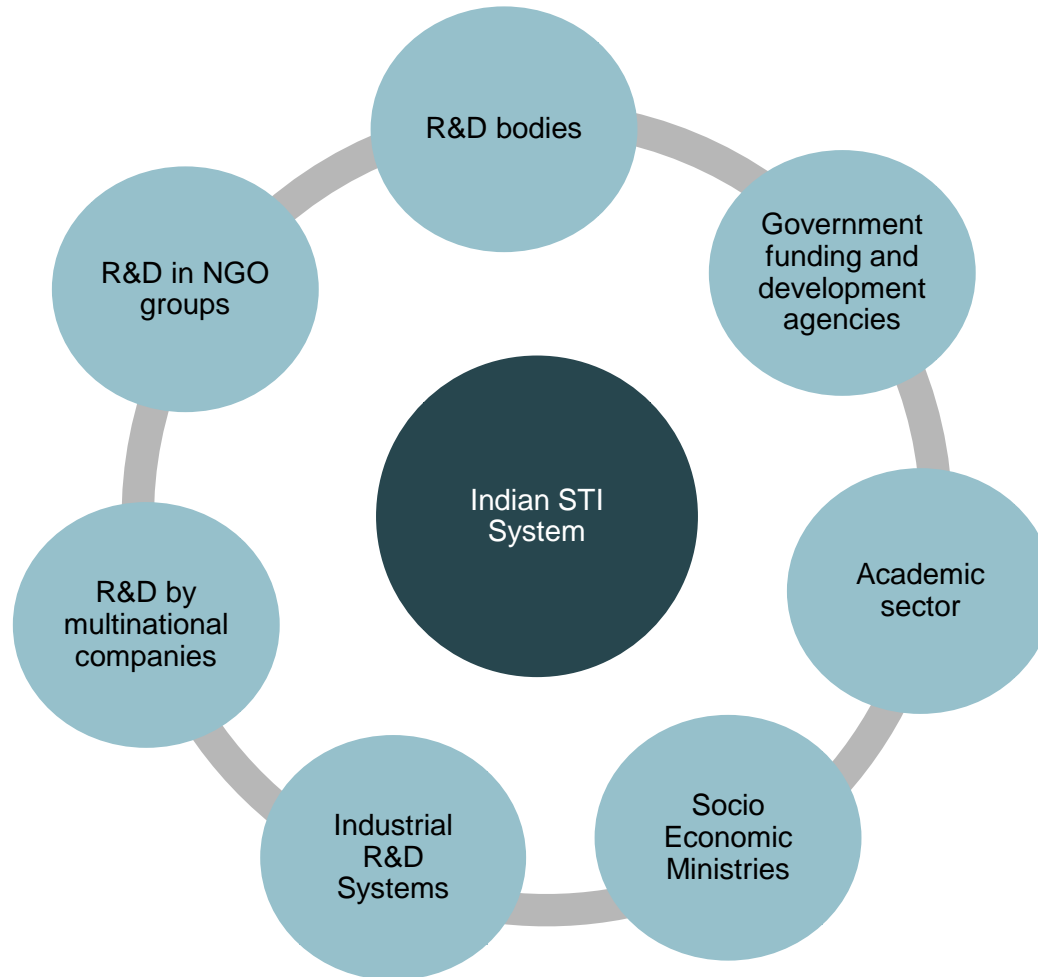
- **New Initiatives** such as the Science, Technology, Innovation and Creation of Knowledge (STICK) framework has been taken by the Indian government to support innovation.

2017

- **Achievement:** Indian Space Research Organisation (ISRO) made history on the launch of its Polar Satellite Launch Vehicle (PSLV) rocket placed with 104 satellites into the space in a single mission.

*Source: Department of Science and Technology, Ministry of HRD, Government of India, Union Budget 2015-16*

# INDIAN SCIENCE AND TECHNOLOGY SYSTEM



*Note: STI refers to Science Technology and Innovation*

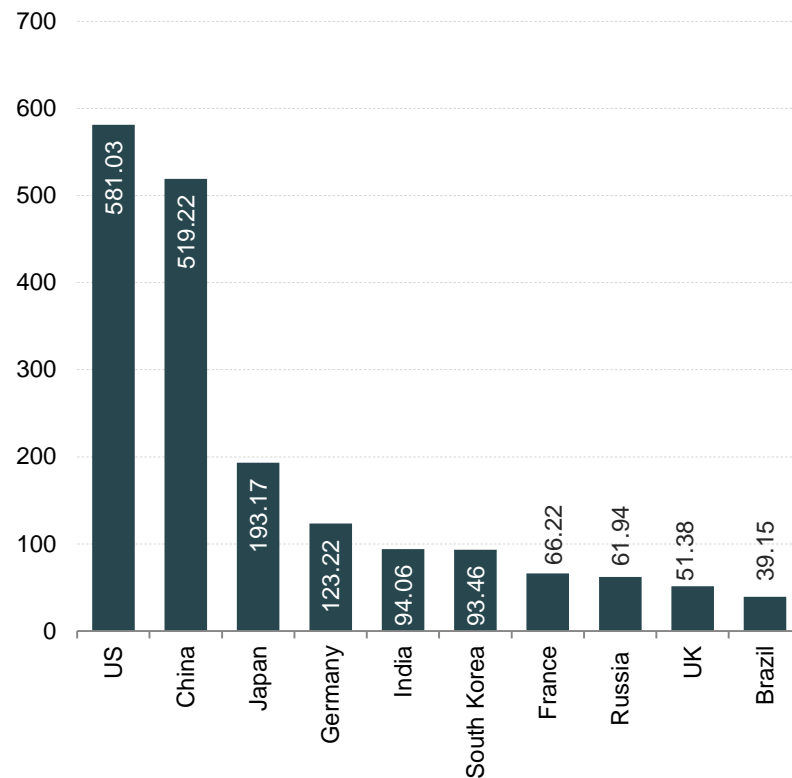
*Source: Changing Indian STI Landscape Presentation, Department of Science and Technology*



# INDIA AMONG THE WORLD'S LEADING R&D INVESTORS

- India's R&D investments forecasted to increase to US\$ 94.06 billion\* in 2019 from an estimated US\$ 86.24 billion in 2018.
- R&D investments has helped Indian companies to overcome tight competition with affordable products internationally.
- The Indian Robot Mitra, designed in Bengaluru and made in China, which can recognise people by their nationalities and guide customers in a bank, attracted the attention of Chinese manufacturers at an information technology (IT) event held at Dalian, China.

Expected expenditure of world's leading R&D investors in 2019F (US\$ billion)



**Notes:** R&D - Research and Development, F – Forecast., \* in Purchasing Power Parity terms  
**Source:** Nature Magazine, Battelle, R&D Magazine

## India has a strong network of science and technology institutions and trained manpower

- India is among the top-ranking countries in the field of basic research.
- It has the 3rd largest scientific and technical manpower in the world.
- 162 universities award 4,000 doctorates and 35,000 postgraduate degrees annually.
- The Council of Scientific and Industrial Research runs 44 research laboratories.
- India ranks 7th among highly productive countries in science and technology research.
- In January 2018, South Korea-based technology major, Samsung, is planning to hire 1,000 engineers from top institutes for the company's three R&D facilities in India.
- Similarly, in February 2018, Bosch India Group announced plans to hire 10,000 engineers over the coming years to work on futuristic technologies at its R&D center in India.
- Britain and India research partnership to reach GBP 400 million (US\$ 544 billion) by 2021, which includes 175 different UK and Indian research institutions and more than 100 industry partners.

## Strengthening India's position in research through investment

- India's R&D investments forecasted to increase to US\$ 94.06 billion in 2019 from an estimated US\$ 86.24 billion in 2018.
- India ranks third in global research publication output
- A series of new investments were recently announced by Cisco India to enhance cyber security infrastructure in India. It will enable to build transparent and secure digital infrastructure environment for accelerating India's digital transformation. For strategic cyber security cooperation.
- In February 2019, India and Finland signed a Memorandum of Understanding (MoU) for funding and implementing ambitious industry-led innovative and transnational projects in the biotechnology sector.
- Cisco India has signed an MoU with Indian Computer Emergency Response Team (CERT-In) to establish a threat intelligence sharing programme.
- Under the National Initiative for Developing and Harnessing Innovations (NIDHI) programme, Indian Government plans to invest US\$ 29.75 million for setting up 100 incubators across the country in the next 4 years to support start-ups.

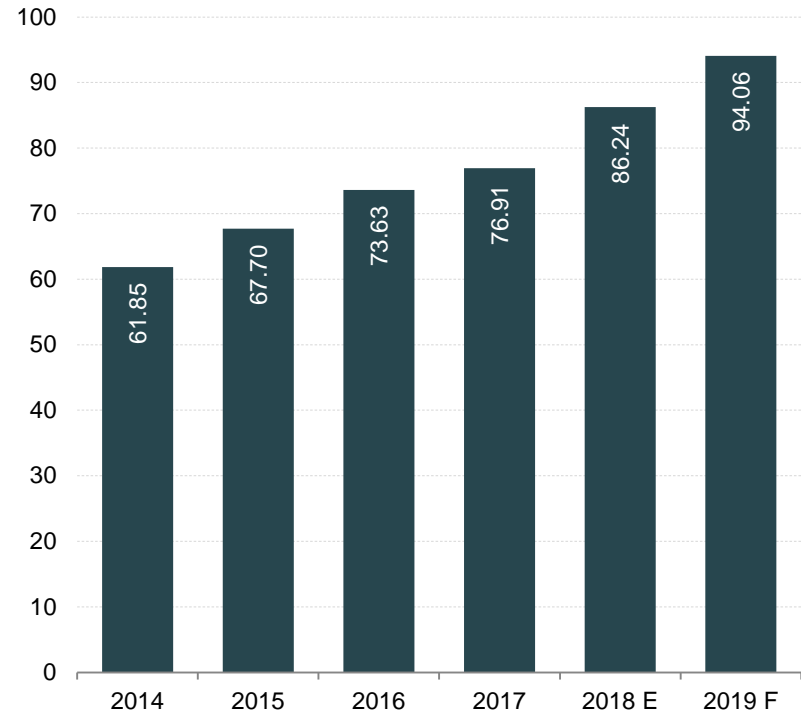
*Notes: R&D - Research and Development, \* in Purchasing Power Parity terms*

*Source: R&D Magazine*

# STRONG GROWTH IN R&D INVESTMENTS IN INDIA OVER THE YEARS

- India's share of global R&D spending rose to 3.80 per cent in 2018 from 3.70 per cent in 2017.
- By 2022, R&D expenditure is targeted to reach at least 2 per cent of the GDP by 2022.
- To facilitate protection and commercialising of IPRs, these schemes will be providing access to high-quality Intellectual Property services and resources. Moreover, under these schemes, the central government bears the fees of the facilitators for patents, trademarks or designs that a startup may file. Startups only must bear the cost of the statutory fees payable.
- India was ranked at the 13th position by Nature Index in 2017.
- As per Union Budget 2019-20, government to set up National Research Foundation for R&D.

R&D spending in India (US\$ Billion)

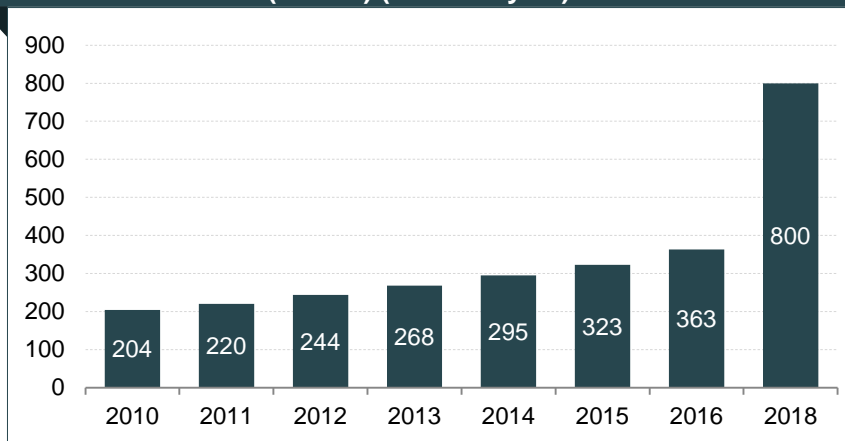


**Notes:** R&D – Research and Development, E – Estimate, F – Forecast, in Purchasing Power Parity terms

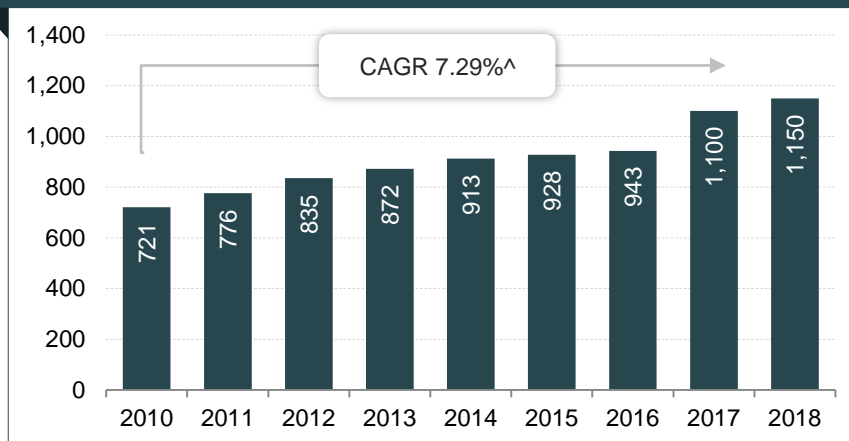
**Source:** R&D Magazine, International Monetary Fund, World Bank, CIA Fact Book, OECD, Department of Science and Technology

# INDIA IS FAST EMERGING AS A GLOBAL R&D HUB

**MNC R&D centers workforce in India  
(in 000') (As of May 18)**



**MNC with R&D centers in India As of May 18)**



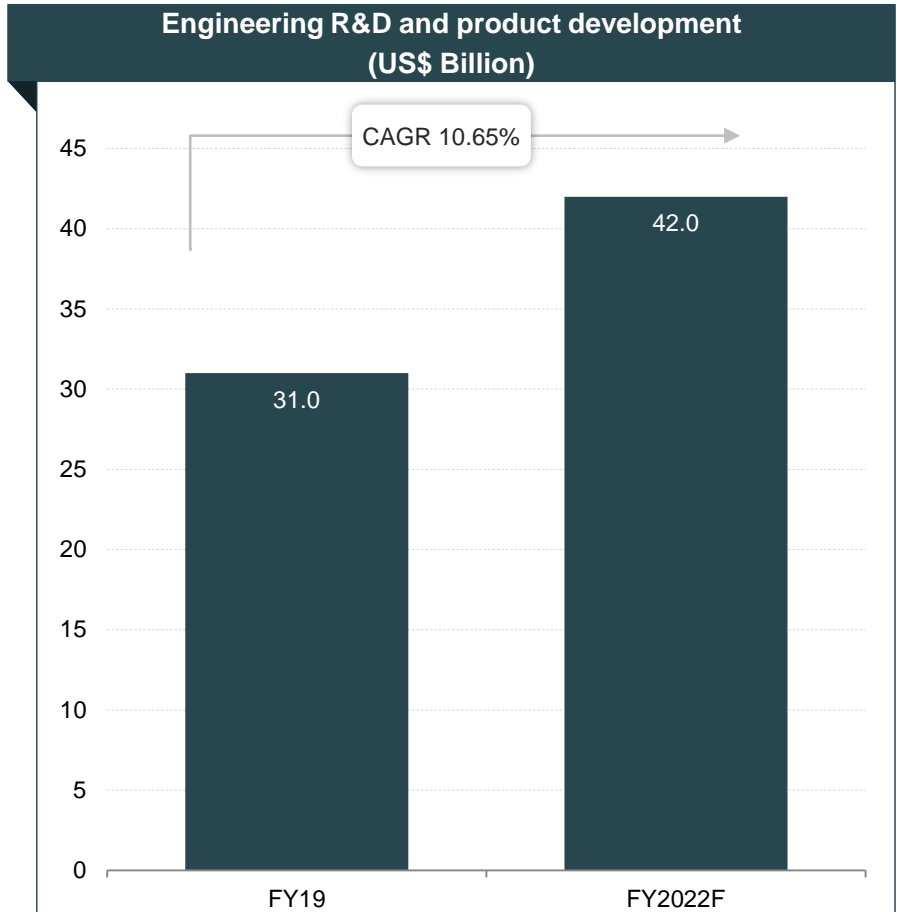
- The number of MNC R&D centers in India has grown at a CAGR of 7.29 per cent to 1,100 in 2017 from 721 in 2010 and reached 1,150 in 2018 (As of May 18).
- During 2010-18\*, the workforce in MNC R&D centers increased at a CAGR of 18.63 per cent and reached more than 800,000 in 2018 (As of May 18).
- Intex, a modern speakers manufacturing company, is looking to step up research spend to introduce the latest generation wireless and NFC speakers.
- In 2018, Nissan Motor Company Ltd signed an MoU with the Kerala government to set up its first global centre for digital operations.

*Notes: MNC – Multinational Corporations, R&D - Research and Development, ^ CAGR upto 2017*

*Source: : Zinnov Consulting - Crossing the value chasm,*

# INDIA IS ALSO GARNERING THE BENEFITS OF R&D OUTSOURCING

- India has become one of the most preferred location for engineering offshoring. Companies across sectors (such as IT, consumer electronics, personal devices, medical electronics, telecom and automobiles) are now offshoring complete product responsibility.
- Engineering R&D products and services are growing at the fastest rate in technology sector in Indi currently.
- The engineering R&D and product development market in India is forecasted to grow at a CAGR of 10.65 per cent to reach US\$ 42 billion by FY22 from US\$ 31 billion in FY19.
- Newer capabilities such as supply chain, regulatory compliances and manufacturing engineering are being developed by Engineering R&D Service providers.
- Service providers in Europe are increasingly looking at scaling up and setting offshore operations in India to access cost effective large talent pool.

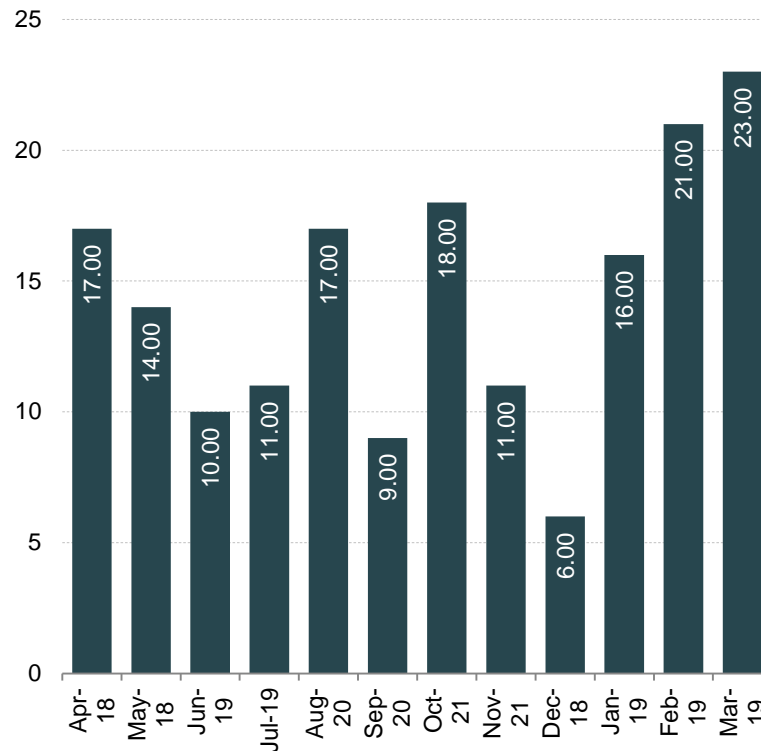


**Notes:** R&D - Research and Development, IT - Information Technology; Figures mentioned are as per latest data available  
**Source:** The IT-BPM Sector in India 2018 report by NASSCOM

# GLOBAL 500 COMPANIES PRESENCE IN INDIA

- The top 500 R&D spenders contribute over US\$ 614 billion with the top 100 R&D spenders alone contributing 66 per cent to the global R&D spend.
- In India, TVS Motors, Bosch, Tata Motors and Mahindra and Mahindra have topped the list of R&D innovators in the automobile industry. India, being ahead of China, South Korea and Japan, is generating huge opportunities for Indian automobile brands.
- In January 2018, Samsung proposed to hire 1,000 engineers this year from top institutes of India such as IITs, NIITs, Delhi College of Engineering, BITS Pilani, Manipal Institute of Technology and IITs among others.
- IBM's India inventors contributed over 800 patents in year 2017, making India the second highest contributor after the US region.

## Promotion of In-House R&D units



*Note: FY18 data for expenditure by in-house R&D units is expected to be updated by April 2019 from Department of Scientific and Industrial Research (DSIR) Annual Report FY18*  
*Source: Zinnov – Crossing the value chasm*

## Organisation

## Business description



### Council of Scientific and Industrial Research (CSIR)

- CSIR is India's largest R&D organisation, with 38 national laboratories, 39 outreach centers, 3 Innovation Complexes, 5 units, 4600 active scientists supported by about 8000 scientific and technical personnel. On an average, CSIR files about 200 Indian patents and 250 foreign patents per year. About 13.86 per cent of CSIR patents are licensed, a number which is above the global average.
- CSIR is ranked at 84th among 4851 institutions worldwide and was the only Indian organisation among the top 100 global institutions in 2014. CSIR filed 171 patents in India and 405 patents abroad in FY18.
- In April 2018, CSIR bagged National Intellectual Property Award (IP) in the category Top R&D Institution / Organization for Patents and Commercialization and signed a Memorandum of Understanding (MoU) with DoT for establishing a nationwide time stamping and time synchronization network.
- In May 2018, CSIR was awarded Clarivate Analytics India Innovation Award 2018 in the Government Research Organizations Category.
- In August 2018, Hindustan Aeronautics Limited (HAL) ordered critical composite air-frame components worth more than Rs 100 crore (US\$ 14.92 million) from CSIR.



### Defence Research and Development Organisation (DRDO)

- DRDO is engaged in design and development of weapon systems and equipment in accordance with the requirements of the military services.
- DRDO had a network of 50 labs and establishments to carry out research. As of FY20, it has over 7,410 personnel in Defence Research and Development Services (DRDS) and about 25,000 other scientific, technical and supporting personnel. DRDO offered around 450 patents for free access to industries in 2019.
- Its research areas include aeronautics, armaments, combat vehicles, electronics, instrumentation engineering systems, missiles, materials, naval systems, advanced computing, simulation and life sciences. In June 2015, DRDO's ballistics test facility got inaugurated in Ramgarh.



### Indian Council of Agricultural Research (ICAR)

- ICAR is one of the largest national agricultural organisations in the world. It consisted of 69 institutes and 63 agricultural universities across India. ICAR has filed 1,045 patent applications, out of which 21 were granted, on a cumulative basis up to FY18.
- It is the apex body for coordinating, guiding and managing research and education in agriculture, including horticulture, fisheries and animal sciences in India.

Source: Organisational websites

## Organisation

## Business description



### India Space Research Organisation (ISRO)

- The organisation has 19 centers across India to pursue R&D activities and ISRO currently has a constellation of 9 communication satellites, 1 meteorological satellite, 10 earth observation satellites and 1 scientific satellite.
- Its research areas include communication satellites for television broadcast, telecommunications and meteorological applications and remote sensing satellites for management of natural resources.
- Space technology incubation center was launched in Tripura, Agartala. It is one of the six centers, planned to build national capacity in new locations, as of September 2018.
- By the end of May 2019, the radar imaging satellite RISAT 2BR1 to be launched.
- "In January 2019, the Polar Satellite Launch Vehicle (PSLV-C44) successfully inserted two satellites, Microsat-R and Kalamsat-V2, into their orbits.
- In April 2019, the Polar Satellite Launch Vehicle (PSLV-C45) launched EMISAT and 28 satellites for international customers.
- India's largest liquid hydrogen storage tank was shipped on May, 2019.



### Indian Council of Medical Research (ICMR)

- ICMR is the apex body in India for the formulation, coordination and promotion of biomedical research and one of the oldest medical research bodies in the world. ICMR has filed 12 patent applications in 2016-17.
- The council has a fleet of 21 institutes (mission oriented national institute), 6 regional medical research centres and 5 units engaged in medical research.
- The council's research priorities encompass the areas of communicable diseases, fertility control, maternal and child health, nutritional disorders and non-communicable diseases such as cancer, cardio-vascular diseases, blindness and diabetes.



### Centre for Development of Advanced Computing (C-DAC)

- C-DAC is a premier R&D organisation of the Department of Information Technology (DIT).
- It is engaged in research in the areas of supercomputers, applied electronics, technology, applications and health informatics.
- C-DAC filed 16 patent applications in FY18^.

*Note: R&D - Research and Development, ^ - FY19 data is expected from C-DAC annual report expected to 2019*

*Source: Organisational websites, TechSci Research*



## Organisation

## Business description



### Indian Institutes of Technology (IITs)

- It is a group of autonomous engineering and technology-oriented institutes of higher education.
- Indian Institutes of Technology (IITs) is planning to monetise intellectual properties (IPs) by exploring tie-ups with firms that invest in "inventions". In FY18, IITs filed 400 patent applications.
- Indian Institutes of Technology and Germany's Heidelberg University are collaborating for the research training.



### National Dairy Research Institute (NDRI)

- NDRI is engaged in research, teaching and extension activities in areas of dairy production, processing, management and human resource development.
- Its research activities focus on improving dairy productivity, innovating milk processing technologies and disseminating information to the various stakeholders in dairy business to make dairying a self-sustaining business.
- In FY17, R&D activities comprised 76 in-house and 63 externally funded research projects. In FY17 NDRI filed two patents and three patents were granted.\*



### Indian Institute of Science (IISc)

- IISc is one of the earliest instances of PPP for a research institute in India.
- It is engaged in research in various departments of science such as biological, chemical, electrical, mathematical, physical and mechanical sciences. A new center for Brain Research is expected to contribute to future growth.
- The number of patents granted stood at 13 in 2017-18\*.

*Note: R&D - Research and Development, IP - Intellectual Property, ^ - Figures mentioned are as per latest data available, \* - data expected to be updated from IISc annual report in 2019*

*Source: Organisational websites, IP India, TechSci Research*

## Organisation

## Business description



Hindustan Unilever Limited

### Hindustan Unilever Limited

- HUL is credited with innovations in product areas such as structured bar soap, fairness cream, zero alcohol soap, poly-coated scouring bar for dishwashing, fortified salt, instant tea, critical components for a water purifying device, and value-added (nature care) tea.
- Worldwide, HUL has over 20,000 registered patents and patent applications.



### Tata Steel Limited

- Tata Steel undertakes research in areas such as raw materials and coke, iron and ferro alloys, steel making, coated products, materials characterisation and joining, materials modelling and product design and refractory technology.
- The total value of the patents and trademarks stood at Rs 46.5 million (US\$ 0.72 million), as on FY18.
- The cumulative patents filed till FY18 were 964 and 418 patents were granted as on FY18.



### Cipla Limited

- Cipla's R&D division focuses on new product development and new drug delivery systems across a range of therapies
- The company invested Rs 10.74 billion (US\$ 166.64 million) on R&D in FY18.
- In FY18, out of 35 filed patents, 24 patents were successfully granted.
- It is among the top companies domestically in R&D spending.

*Note: R&D - Research and Development, ANDA – Abbreviated New Drug Application*

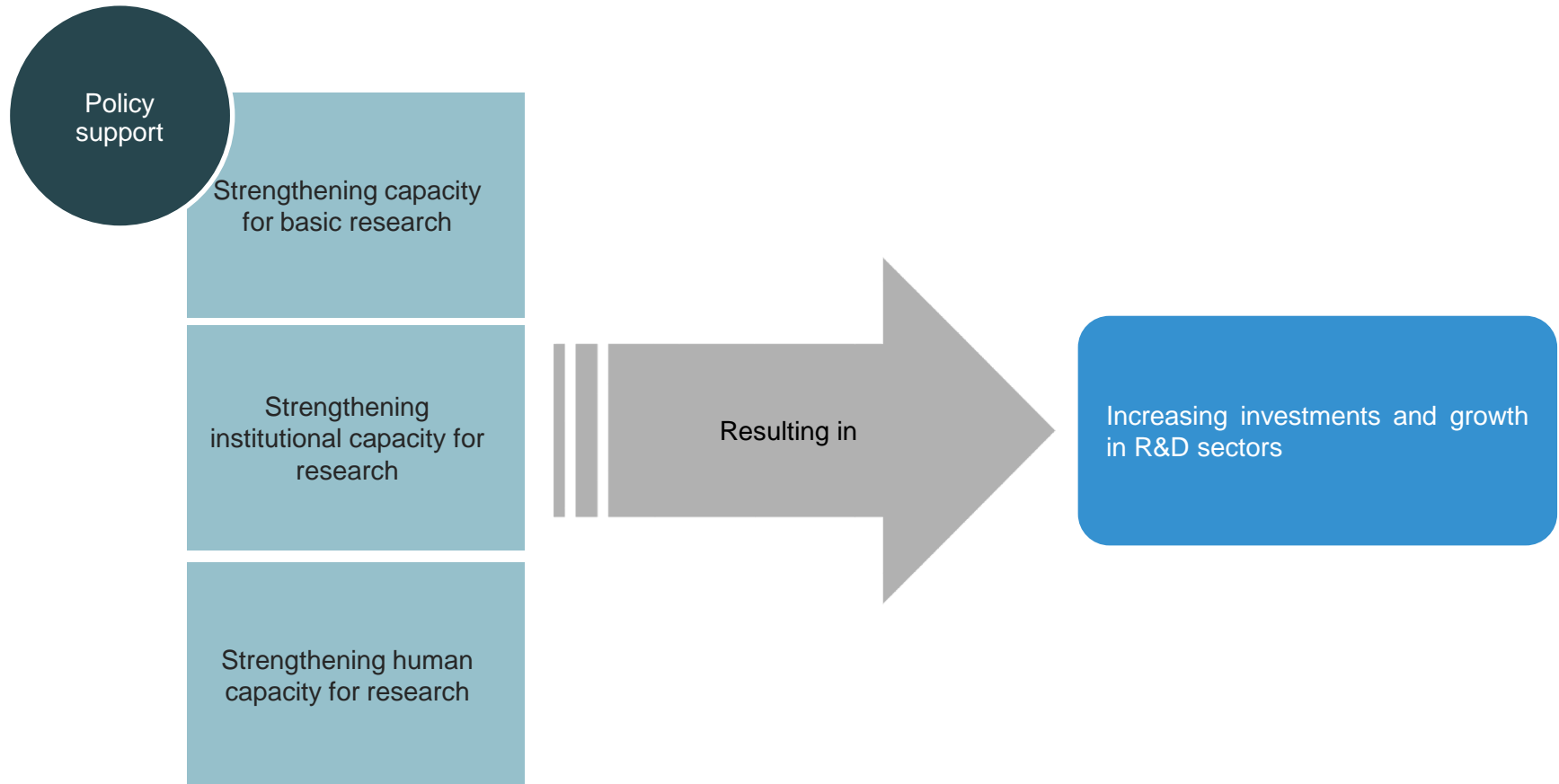
*Source: Organisational websites*

COMPLETE

# GROWTH DRIVERS



# STRONG POLICY FRAMEWORK TO PROMOTE INDIA AS A R&D HUB



*Note: R&D - Research and Development*  
*Source: ICRA, Deloitte, PWC, TechSci Research*

# KEY GOVERNMENT INITIATIVES...(1/3)

National Knowledge Network	<ul style="list-style-type: none"><li>▪ A state-of-the-art multi-gigabit (multiples of 10 Gbps) pan-India network is planned to link some 5,000 nodes in India. It will be the sole vehicle for international connectivity in future</li></ul>
National Innovation Council	<ul style="list-style-type: none"><li>▪ 2010–2020 has been declared the Decade of Innovation to stimulate innovations and produce solutions for societal needs such as healthcare, energy, infrastructure, water and transportation</li></ul>
Improving Academia	<ul style="list-style-type: none"><li>▪ Innovation universities would be set up as public private partnerships to develop new hubs of education, research and innovation</li><li>▪ The Educational market in India has the potential of reaching US\$ 180 billion by FY20 with the increasing demand for quality education.</li></ul>
Prime Minister Research Fellows (PMRF)	<ul style="list-style-type: none"><li>▪ In February 2018, the Union Cabinet has approved implementation of 'Prime Minister Research Fellows (PMRF)' scheme, which will promote the mission of development through innovation, at a total cost of Rs 1,650 crore (US\$ 245.94 million) for a period of seven years beginning 2018-19.</li></ul>
High Performance Computer (HPC) System called 'Mihir'	<ul style="list-style-type: none"><li>▪ In January 2018, the High-Performance Computer (HPC) System called 'Mihir' was inaugurated at the National Centre for Medium Range Weather Forecasting (NCMRWF) at Noida, which is expected to improve India's capacity at weather forecasting.</li></ul>
ASEAN scheme	<ul style="list-style-type: none"><li>▪ In February 2018, Federation of Indian Chambers of Commerce and Industry (FICCI) and the Department of Science and Technology along with the support of Government of India launched India Research Training Fellowship (AIPTF) with the motive to support and facilitate mobility of young talented researchers from Association of Southeast Asian Nations (ASEAN) countries to India.</li></ul>
IMPRINT	<ul style="list-style-type: none"><li>▪ In February 2018, Union Government of India announced grant of Rs 1,000 crore (US\$ 155.55 million) for the second phase of Impacting Research Innovation and Technology (IMPRINT), a fund created by Department of Science and Technology and Ministry of Human Resource and Development.</li></ul>

*Source: Department of Science and Technology, Government of India, and Other Government websites*

# KEY GOVERNMENT INITIATIVES...(2/3)

## National Council for Science and Technology Communication (NCSTC)

### Key focal points include:

- Aims at promoting scientific thinking.
- Communicating science and technology to masses using digital media, folk media and digital media.
- Focus on training in science and technology communication, incentive programmes, production and dissemination of S and T software, development and research in S&T.
- Important initiatives under NCSTC include Mathematics Awareness Resources and Initiatives (MARI), campaigns over Year of Scientific Awareness, the National Science Day, the National Children's Science Congress, Science Express, etc.

## Big Data Initiative (2016)

- An innovative R&D perspective to promote big data science, technology and applications within the country.
- Aims at developing core generic technologies, tools and algorithms for wide applications in industries, government and academia.
- Extraction of useful knowledge hidden in in-size data repositories.
- Understanding the current status of industry in terms of policy framework, distinct players providing services across sectors, market size, SWOT of industry, etc.

## Interdisciplinary Cyber Physical Systems (ICPS)

- To promote R&D in this emerging field of research, Department of Science and Technology (DST) Launched Interdisciplinary Cyber Physical Systems (ICPS) with an outlay of Rs 3,660 crore (US\$ 507.28 million).
- Under the mission, 15 Technology Innovation Hubs, six Application Innovation Hubs and four Technology translation Research Hubs are going to be established in the next five years.

Source: News articles, Government websites, swissnex India

# KEY GOVERNMENT INITIATIVES...(3/3)

Small Industry initiative	<ul style="list-style-type: none"><li>▪ In February 2018, Union Ministry of Science and Technology developed an interface to enable transfer of technologies from Council of Scientific and Industrial Research (CSIR) laboratories to small-scale industries.</li></ul>
Other initiatives	<ul style="list-style-type: none"><li>▪ The Government of India is planning to launch a National Artificial Intelligence Centre under the Ministry of Electronics and Information Technology by July 2019.</li><li>▪ In January 2019, the Government of India launched two science communication initiatives, DD Science and India Science by Department of Science and Technology along with Doordarshan and Prasar Bharti to enhance science communication and develop scientific knowledge.</li></ul>
Innovate India Platform	<ul style="list-style-type: none"><li>▪ In July 2018, Atal Innovation Mission along with MyGov launched “Innovate India Platform” with the aim of providing a common point for all the innovation happening across India.</li></ul>
Development initiatives in rural areas	<ul style="list-style-type: none"><li>▪ The benefit of section 80-IB has been extended to new hospitals with 100 beds or more that are set up in rural areas; such hospitals are entitled to 100 per cent deduction on profits for 5 years</li></ul>
Science, Technology and Innovation (STI) Policy, 2013	<ul style="list-style-type: none"><li>▪ This initiative aspires India to become one of top five global scientific power by 2020.</li><li>▪ It is developed to boost India's global share of scientific publications to 7.0 per cent from present 3.6 per cent.</li><li>▪ It aims to promote international participation, establish world class infrastructure, create attractive opportunities in the field of science, research and innovation.</li><li>▪ To also enable high risk innovation and boost private sector participation in the field of science and technology.</li></ul>

Source: News articles

# POLICY SUPPORT AIDING GROWTH IN THE SECTOR

## PPP in R&D

- Exchange of scientific knowledge between research centers, national laboratories, institutes of higher learning and the industry.
- The Indian Government plans to involve the private sector in R&D mainly for sectors like vaccines, drugs and pharmaceuticals, super computing, solar energy and electronic hardware. The govt. has announced to create a US\$ 16 million fund for setting up R&D units with the help of industries.
- The government has created a US\$ 1.1 billion public-private partnership fund to support R&D in India.

## Funded institutions and foreign universities

- Government has announced to set up five new All India Institute of Medical Sciences in Jammu and Kashmir, Punjab, Tamil Nadu, Himachal Pradesh, Assam and set up of IIT in Karnataka and Dhanbad.
- Foreign universities permitted to enter the higher education system in India by establishing their own campuses or joint ventures with existing universities.
- Atal Innovation Mission with US\$ 24.84 million will boost the academicians, Entrepreneurs and researchers to work towards innovation.
- The Government of India and Government of Canada signed a MoU to encourage cross-border partnerships in the areas of research and industry academic collaboration..

## Union Budget 2019-20

- The allocation to the Department of Science and Technology (DST) has been increased to Rs 5,580 crore (US\$ 798.39 million) as against the previous budget.
- Under the Union Budget 2019-20, the Government of India announced the largest ever allocation of Rs 13,056.24 crore (US\$ 1.86 billion) to the Ministry of Science and Technology. The Department of Atomic Energy has been allocated Rs 16,925.51 crore (US\$ 2.32 billion).
- The Ministry of Earth Sciences was allocated Rs 1,901.76 crore (US\$ 263.58 million), which is an increase of 5.65 per cent as against the previous budget.

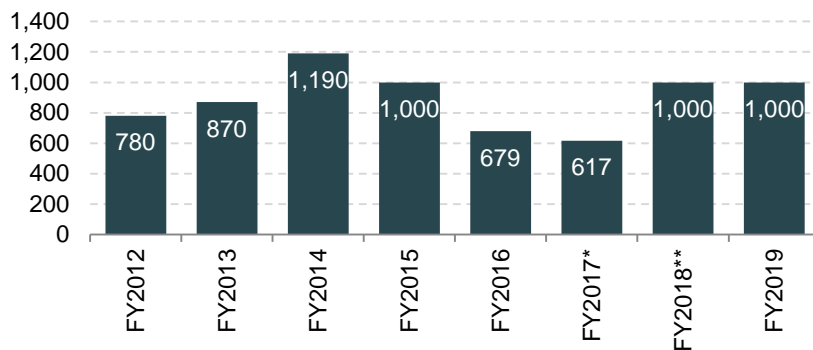
*Note: PPP - Public Private Partnership*

*Source: Battelle, Electronics for You, Organisational websites*

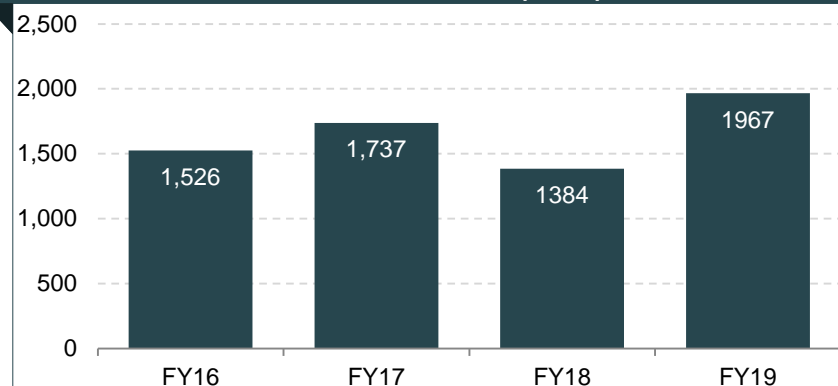


# STRENGTHENING HUMAN CAPACITIES FOR GROWTH

### INSPIRE fellowship growth profile



### Number Students Enrolled in The Council of Scientific and Industrial Research (CSIR)



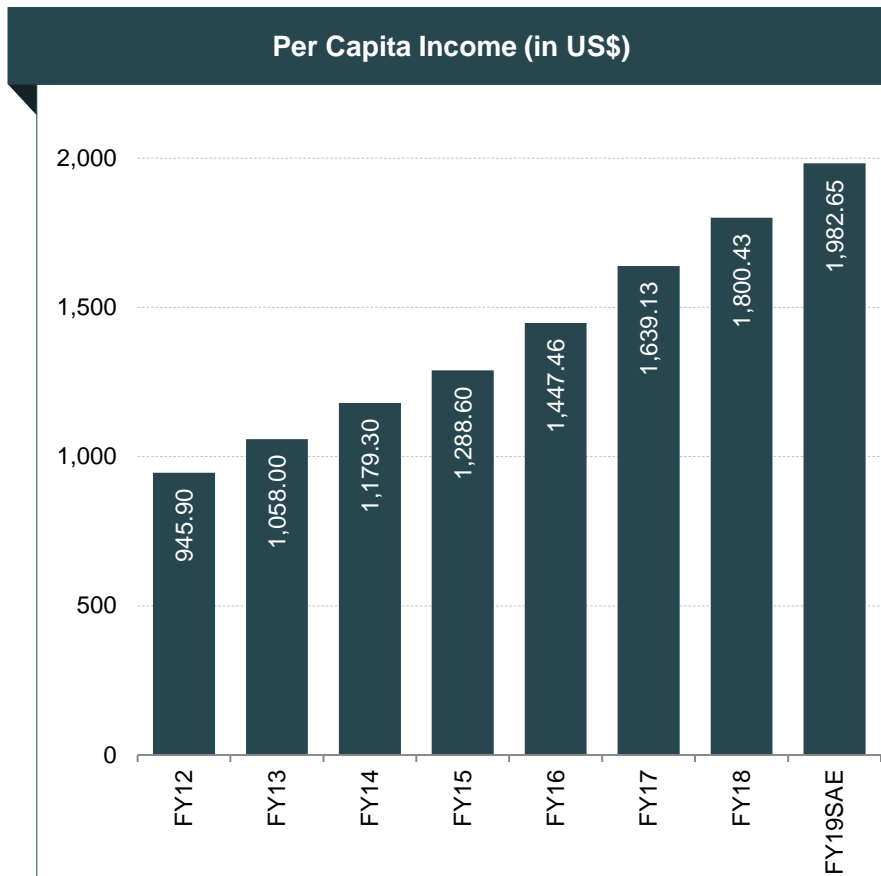
- In recent years, the Indian Government has implemented several fellowship schemes to nurture human capacity for advanced research in the country. During FY16-18, a total of 18,600 young scientists have been benefited through various young scientists programmes of SERB/DST and CSIR.
- The number of students enrolled in the various constituent laboratories of Council of Scientific Research and Industrial Research (CSIR) increased to 1,967 in FY19 from 1,526 in FY16.
- The period between 2010-20E has been declared as the “Decade of Innovation” by the nation and the need for the establishment of National Innovation Council has been emphasised. To fuel the growth innovation in science and technology STI (Science, Technology and Innovation) Policy 2013 was formed.
- In 2008, Government launched Innovation in Science Pursuit for Inspired Research (INSPIRE) scheme, through which the Government awarded 2,150 research fellowships for doctoral research and 270 faculty awards for post doctoral researchers. A total of 1,000 students were enrolled in FY19.

**Note:** Pursuit for Inspired Research (INSPIRE), \*Upto November 2016, \*\* up to December 2017, ^ - Figures mentioned are as per latest data available, , SERB - Science and Engineering Research Board, DST - Department of Science & Technology, data expected to be updated from Department of Science and Technology Annual Report FY19

**Source:** NSTMIS, Department of Science and Technology

# LOCAL DEMAND ATTRACTING INVESTMENTS FROM MNCs ... (1/2)

- India presents a unique opportunity for companies manufacturing technologically advanced products, registering per capita income of Rs 143,048 (US\$ 1,982.65) in FY19.
- An expanding middle class and rise in purchasing power of rural residents have boosted demand for innovation and development of cheap and durable products that could meet the local requirements.
- Rising per capita income in India to bring boom in R&D investments in the country with more and more of foreign players shifting R&D bases to India.
- Qualcomm, plans to invest US\$ 8.5 million on design initiatives in India, which would include funding its innovation labs at Hyderabad and Bangalore, for R&D.
- During 2019-20, the country's per-capita monthly income is estimated to have risen by 6.8 per cent to Rs 11,254 (US\$ 159.29).



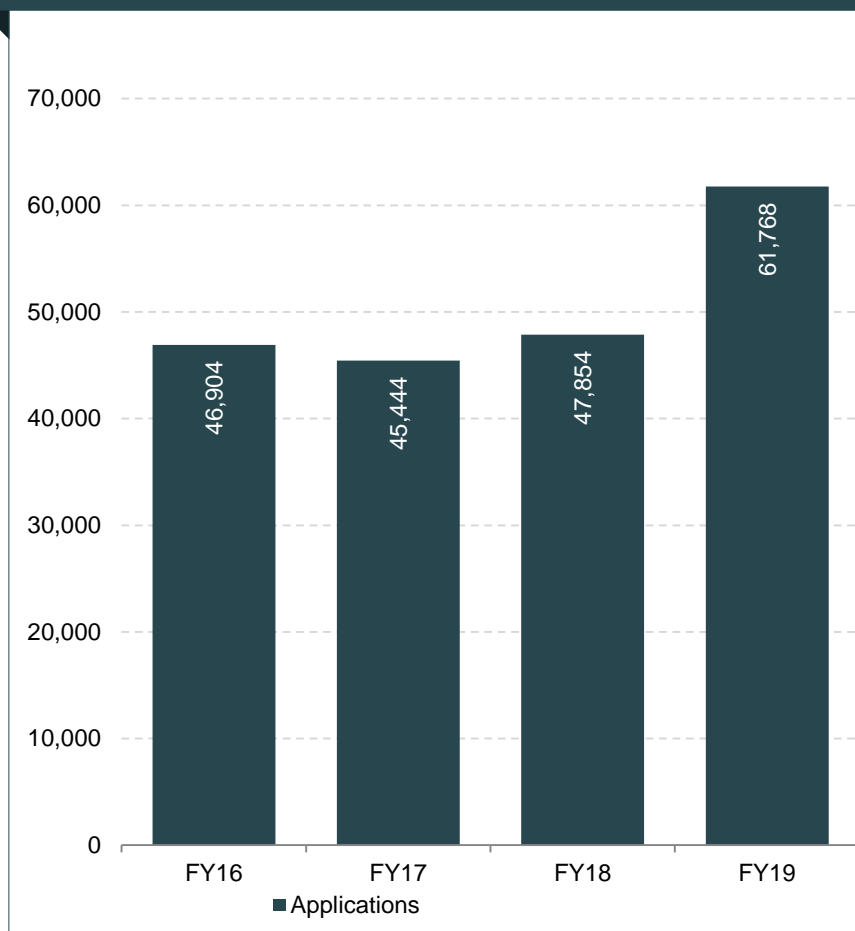
*Note: PE – Provisional Estimates, SAE – Second Advance Estimates*

*Source: IMF, World Bank, India Budget, Government of India Press Information Bureau Government of India, Ministry of Statistics and Programme Implementation*

# LOCAL DEMAND ATTRACTING INVESTMENTS FROM MNCs ... (2/2)

- Lower development cost, rising technology intensity and growing local demand for top of the line unique technology products have attracted R&D investments from foreign companies in India, making it one of the largest outsourcing provider in R&D segment.
- India ranks 2<sup>nd</sup> position for scientific publications in BRICS nations
- India ranks at 6<sup>th</sup> position for scientific publications and ranks at 10<sup>th</sup> for only resident patent applications.
- The total number of patent applications filed by scientists and inventors in India increased to 61,788 in FY19 (up to Dec18) from 47,857 in FY18.

Number of Applications for Patents (up to Dec 18)



Source: Lok Sabha

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OPPORTUNITIES



# R&D OPPORTUNITIES IN VARIOUS SUB SECTORS IN INDIA

## ICT and wireless technology

- Establishment of Software Technology Parks of India (STPI'S).
- National Policy of IT aims at bringing the power of ICT within the reach of all its citizens to enable India to emerge as a global hub for IT by 2020.
- Cloud computing presents endless opportunities in wireless technologies.

## Pharmaceuticals and Health Care

- 3rd largest pharmaceuticals market by 2020.
- A new Health Policy 2015-2025 to focus on healthcare for all holistically.

## Manufacturing technologies

- Automation and environmental sustainability are the key focus areas for manufacturing companies.
- The National Manufacturing Policy targets at creating 100 million additional jobs in the sector by 2025.
- Planned expenditure in R&D in manufacturing sector increased by 63 per cent in 2016-17 as compared with that in 2015-2016.

## Material energy

- Multi-disciplinary research to combine emerging concepts in nanotechnology with fundamental metallurgical chemistry is the way forward.

## Bio-energy

- Bio-energy is emerging as a promising alternative to meet rural energy needs in India.
- Targets set by Bioenergy Programme: By 2020, 20 per cent blending of fossil fuels will be done, cost effective production system for algal biofuel, next generation biofuels produced from agricultural waste.

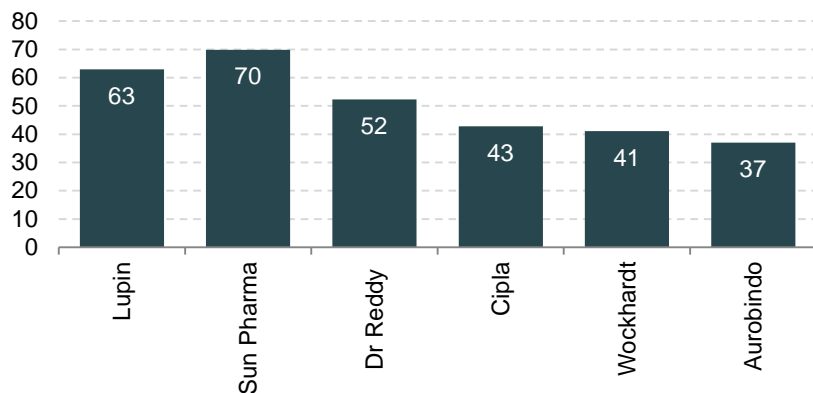
## Water technologies

- The water demand of industry will account for 8.5 per cent and 10.1 per cent of the total fresh water abstraction in 2025 and 2050 respectively.
- R&D efforts should concentrate on developing technologies for treatment, recycling, recovery, reuse and efficient use of water.

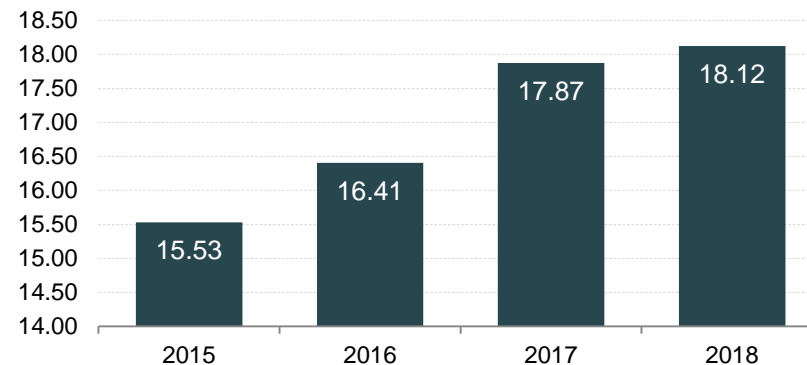
Source: Make In India, FICCI

# RISING R&D ACTIVITIES IN THE INDIAN PHARMACEUTICAL SECTOR

**R&D spending by top pharma companies in Q3 FY19 (US\$ million)**



**Annual Turnover of Indian Pharmaceutical Market (US\$ billion)**



- India's domestic pharmaceutical market turnover reached Rs 129,015 crore (US\$ 18.12 billion) in 2018, growing 9.4 per cent year-on-year (in Rs) from Rs 116,389 crore (US\$ 17.87 billion) in 2017.
- On an average, pharmaceutical companies spend 17 per cent of its revenue on Research and Development (R&D). No other industry spends more on R&D.
- India's medical technology (MedTech) sector is forecasted to reach US\$ 9.6 billion in 2022 and US\$ 7.8 billion in 2020 from US\$ 5.7 billion in 2017.
- Overall R&D expense by Indian companies has been around 5 per cent of sales and is expected to increase in coming years.
- R&D spending by top pharma companies in FY 2018 was US\$ 1.34 billion.
- Indian Pharmaceutical market reached US\$ 33 billion in 2017.

*Note: F denotes Forecasted*

*Source: Make in India, FICCI, Ministry of Chemicals and Fertilizers- Department of Pharmaceuticals, TechSci Research, PWC report*

## India Innovation Growth Programme

- The aim is to accelerate innovative Indian technologies into the global market
- This programme is a joint initiative of FICCI, Dept. of Science and Technology, Govt. of India and others
- The Government's focus is on using the world class commercialisation strategies and business development assistance to expand in the global market

## Human capital development

- Special incentive mechanisms are being developed to stimulate research in universities and develop young leaders in science and engineering
- The policy framework is being devised to enable school science education reforms, by improving teaching methods and science curricula

## Investment to promote Research

- Government is promoting investments in basic research to improve research quality to meet global standards and to address national challenges
- Leveraging international S&T co-operation, the government has planned co-investment of resources for joint initiatives with Australia, Canada, Germany, etc.
- The government has its focus on investing in R&D of technologies that address the needs of rural India

## Attracting investment from private sector

- Through Science, Technology and Innovation Policy, the Government is promoting the establishment of large R&D facilities in PPP mode with provisions for benefits sharing
- Promoting multi-stakeholder participation in the Indian R&D system
- As per recent RBI (Reserve Bank of India) norms, start-ups can now access foreign currency loans of up to US\$3 million in a year, under the External Commercial Borrowing (ECB) route

## Recent Developments

- Indian Space Research Organisation (ISRO) will launch its first Indian human mission by 2022.
- ISRO launched its second lunar satellite Chandrayaan-2 on 22 July 2019.
- ISRO announced its third lunar mission Chandrayaan-3.

*Source: Science, Technology and Innovation Policy 2013; Department of Science and Technology*

## Promoting innovation

- Through Science, Technology and Innovation policy, the Government promotes mechanisms for nurturing technology business incubators and science led entrepreneurship. Also promoting incentives for commercialisation of innovations with focus on green manufacturing.
- The Government of India and Italy has announced the next phase of Industrial Research and Development Cooperation programme to promote cooperation between the research institutes and industry to enable conversion of technological solutions.
- The Government of India is extensively promoting research parks technology business incubators (TBIs) and (RPs) which would promote the innovative ideas till they become commercial ventures.
- The Government of India, Tata Trusts and Lockheed Martin has earmarked investments worth US\$ 2 million for providing support to startups under the India Innovation Growth Program (IIGP).

## Attracting investment from private sector

- The Indian Institute of Science Education and Research (IISER), which served as a part of a global team of scientists, proposed to set up a LIGO (Laser Interferometer Gravitational Wave Observatory) detector in India. LIGO will help in detection and observation of gravitational waves.
- GridRaster Inc, working in the virtual and augmented reality space, has raised US\$ 2 million as seed funding, which will be used for marketing and product development.
- As of November 2018, the Midea Group invested Rs 13.5 billion (US\$ 190 million) for construction of a science and technology park in India.

*Source: Science, Technology and Innovation Policy 2013, News Articles*



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# INDUSTRY ORGANISATIONS



## National Academy of Sciences

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Fax: 91- 33- 2402551  
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Fax: 91- 11- 23235648  
Email: [esoffice@insa.nic.in](mailto:esoffice@insa.nic.in)

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Fax: 91- 11- 26856635  
Email: [inae@nda.vsnl.net.in](mailto:inae@nda.vsnl.net.in)

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Fax: 91- 11- 26864570  
Email: [dstinfo@nic.in](mailto:dstinfo@nic.in)

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# USEFUL INFORMATION



- CAGR: Compound Annual Growth Rate
- GDP: Gross Domestic Product
- FDI: Foreign Direct Investment
- FY: Indian Financial Year (April to March)
  - So FY12 implies April 2011 to March 2012
- GOI: Government of India
- MNC: Multinational Company
- GERD: Gross Expenditure on Research and Development
- STI: Science Technology and Innovation
- Y-o-Y: Year on Year
- INR: Indian Rupee
- US\$ : US Dollar
- LCV: Light Commercial Vehicle
- PPP: Public Private Partnership
- Wherever applicable, numbers have been rounded off to the nearest whole number

# EXCHANGE RATES

## Exchange Rates (Fiscal Year)

Year INR	INR Equivalent of one US\$
2004-05	44.95
2005-06	44.28
2006-07	45.29
2007-08	40.24
2008-09	45.91
2009-10	47.42
2010-11	45.58
2011-12	47.95
2012-13	54.45
2013-14	60.50
2014-15	61.15
2015-16	65.46
2016-17	67.09
2017-18	64.45
2018-19	69.89

## Exchange Rates (Calendar Year)

Year INR	INR Equivalent of one US\$
2005	44.11
2006	45.33
2007	41.29
2008	43.42
2009	48.35
2010	45.74
2011	46.67
2012	53.49
2013	58.63
2014	61.03
2015	64.15
2016	67.21
2017	65.12
2018	68.36

Source: Reserve Bank of India, Average for the year

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