2

Policy, Infrastructure and Resources for Pre-patenting Activities

Creative ideas emerge from peoples' minds. Expression of creative ideas in physical forms leads to new and novel creations. This process of conversion of creative ideas into physical form is a long-drawn process. It requires an appropriate and facilitating system in place in the form of policy instruments, S&T infrastructure and financial support of the Government as well as that of the industrial and banking sector. India has been maintaining an enabling and distinguished tradition in the field of science and technology. Before Independence in 1947, some of the important achievements that brought name and fame to the nation pertained primarily to the field of astronomy, mathematics, health care, chemistry and metallurgy. The astronomical observatory both at Jaipur and New Delhi, the 'Rustless Wonder' – the Iron Pillar at Mehrauli, New Delhi, surgical instruments, and the concept of 'zero' reflect some of the areas of science and technology where Indian dominance has been known the world over. The contributions of eminent scientists like P.C. Ray, J.C. Bose, Meghnad Saha, C.V. Raman, S.N. Bose, K.S. Krishnan, P.C. Mahalanobis, S. S. Bhatnagar and S. Ramanujan are well known. Though the establishment of an infrastructure for science and technology started taking shape prior to the Independence, the major developments took place only after the Independence in 1947. As far as the policy framework specifically for S&T is concerned, it came into existence predominantly after the Independence.

Salient features of the S&T policies, infrastructure, created for the development of S&T and financial and manpower resources devoted to S&T activities in the country are mentioned below.

- In general, to secure for the people of the country all the benefits that can accrue from the acquisition and application of scientific knowledge.

2. Technology Policy Statement, 1983

The Scientific Policy Resolution, 1958 and the process of planned development helped the country in achieving a strong agricultural base, sound science and technology infrastructure, and adequate scientific and technical manpower. This sound base witnessed the extension of scientific knowledge and technological advances across the country. A need, therefore, was felt to bring out a new policy instrument in the form of technology policy to identify certain thrust areas for development of indigenous technology, and also to encourage import substitution in order to conserve foreign exchange reserves. The Technology Policy Statement, 1983 was, therefore, brought out with the following objectives[2]:

- Attain technological competence and self-reliance to reduce vulnerability, particularly in strategic and critical areas, making the maximum use of indigenous resources;
- Provide maximum gainful and satisfying employment to all strata of the society, with emphasis on the employment of the women and weaker sections of the society;
- Use traditional skills and capabilities, making them commercially competitive;
- Ensure the correct mix between mass production technologies and production by masses;
- Ensure maximum development with minimum capital outlay;
- Identify obsolescence of technology in use and arrange for modernization of both equipment and technology;
- Develop technologies that are internationally competitive, particularly those with export potential;

- Improve production speedily through greater efficiency and fuller utilization of existing capabilities and enhance the quality and reliability of performance and output;
- Reduce demands on energy, particularly energy from non-renewable sources;
- Ensure harmony with environment, preserve the ecological balance and improve the the quality of habitat; and
- Recycle waste material and make full utilization of by-products.

Thrust Areas under Technology Policy Statement, 1983

The Technology Policy Statement, 1983 laid special emphasis on the development of sectors like food, health, housing, energy and industry. In particular, stress was laid on:

- Agriculture, including dry farming;
- Optimum use of water resources, increased production of pulses and oil seeds;
- Provision of drinking water in rural areas, improvement of nutrition, rapid reduction in the incidence of blindness, eradication of major communicable diseases (such as leprosy and tuberculosis), and population stabilization;
- Low-cost housing; and
- Development and use of renewable non-conventional sources of energy and industrial development.

3. Science and Technology Policy, 2003

The Scientific Policy Resolution of 1958 and Technology Policy Statement of 1983, in conjunction with other policy instruments such as the Industrial Policy, Export and Import Policy and the Fiscal Policy accelerated the pace of developing sound science, technology and industrial base in relation to capacity to manufacture sophisticated equipment, instruments,

various drugs and raw materials. Recognizing the importance of globalization and liberalization of import of technology and trade and intellectual property regime, the Government brought out a new Science & Technology Policy in the year 2003. The objectives of this Science and Technology Policy, 2003 included[3]:

- To ensure that the message of science reaches every citizen of India, man and woman, young and old, so that we advance scientific temper, emerge as a progressive and enlightened society, and make it possible for all our people to participate fully in the development of science and technology and its application for human welfare. Indeed, science and technology will be fully integrated with all spheres of national activity;
- To ensure food, agricultural, nutritional, environmental, water, health and energy security of the people on a sustainable basis;
- To mount a direct and sustained effort on the alleviation of poverty, enhancing livelihood security, removal of hunger and malnutrition, reduction of drudgery and regional imbalances, both rural and urban and generation of employment, by using scientific and technological capabilities along with our traditional knowledge pool. This will call for the generation and screening of all relevant technologies, their widespread dissemination through networking and support for the vast unorganized sector of our economy;
- To vigorously foster scientific research in universities and other academic, scientific and engineering institutions; and attract the brightest young persons to careers in science and technology, by conveying a sense of excitement concerning the advancing frontiers, and by creating suitable employment opportunities for them. Also to build and maintain centers of excellence which will raise the level of work in selected areas to the highest international standards;
- To promote the empowerment of women in all science and technology activities and ensure their full and equal participation;

- To provide necessary autonomy and freedom of functioning for all academic and R&D institutions so that an ambience for truly creative work is encouraged, while ensuring at the same time that the science and technology enterprise in the country is fully committed to its social responsibilities and commitments;
- To use the full potential of modern science and technology to protect, preserve, evaluate, update, add value to and utilize the extensive knowledge acquired over the long civilizational experience of India;
- To accomplish national strategic and security-related objectives by using the latest advances in science and technology;
- To encourage research and innovation in areas of relevance for the economy and society, particularly by promoting close and productive interaction between private and public institutions in science and technology. Sectors such as agriculture (particularly soil and water management, human and animal nutrition, fisheries), water, health, education, industry and energy including renewable energy, communication and transportation would be accorded highest priority. Key leverage technologies such as information technology, biotechnology and materials science and technology would be given special importance;
- To substantially strengthen enabling mechanisms that relate to technology development, evaluation, absorption and upgradation from concept to utilization;
- To establish an Intellectual Property Rights (IPR) regime that maximizes the incentives for generation and protection of intellectual property of all types of inventors. The regime would also provide a strong, supportive and comprehensive policy environment for speedy and effective domestic commercialization of such inventions so as to be maximal in the public interest;
- To ensure, in an era in which information is key to the development of science and technology, that all efforts are made to have high-speed access to information, both in quality and

- Linking contribution of science, research and innovation system with the inclusive economic growth agenda and combining priorities of excellence and relevance;
- Creating an environment for enhanced private-sector participation in R&D;
- Enabling conversion of R&D output into societal and commercial application by replicating hither to successful models as well as establishing of new PPP structure;
- Seeding S&T based high-risk innovations through new mechanisms;
- Fostering resources-optimized, cost-effective innovation across science and technology domains;
- Triggering changes in the mindset and value system to recognize, respect and reward performance that creates wealth from S&T derived knowledge; and
- Creating a robust national innovation system.

2.2 INCENTIVES AND SUPPORT MECHANISMS

2.2.1 Incentives for R&D

Various countries have attempted to stimulate innovation activities in a variety of ways keeping in view the needs of their industries and research institutions. In the Indian context, a number of fiscal incentives and other support measures have been brought in force from time to time for promoting R&D in industry and also for encouraging the utilization of locally available R&D options for industrial development. The current incentives include the following:

- 100% write-off of revenue expenditure on R&D under Section 35 (1) (i) of the Income Tax Act[5].
- 100% write-off of capital expenditure on R&D in the year the expenditure is incurred under Section 35 (1) (iv) of the Income Tax Act[5].

- Weighted tax deduction @ 200% under Section 35 (2AA) of the Income Tax Act[5] to the sponsor of research programs in universities, IITs and approved national laboratories functioning under the aegis of the Indian Council of Agricultural Research (ICAR), Indian Council of Medical Research (ICMR), Council of Scientific and Industrial Research (CSIR), Defence Research and Development Organization (DRDO), Ministry of Information and Communication Technology, Department of Biotechnology, and Department of Atomic Energy. The Head of the concerned national laboratory or the university or the Indian Institute of Technology can give the requisite approval of the sponsored research programs with effect from 1st October, 1996. Prior to this, the DSIR was the nodal scientific department to administer this incentive.
- Weighted tax deduction @ 200% on R&D expenditure (excluding expenditure incurred on land and building) incurred by the DSIR approved in-house R&D centers under Section 35(2AB) of the IT Act[5].
- Tax holiday for ten consecutive assessment years beginning from the initial assessment year to companies whose sole object is 'The Scientific and Industrial Research and Development,' and who are approved after the 31st day of March, 2000 but before 1st April, 2007[6].
- Income-tax exemption @ 175% to donations made to approved Scientific and Industrial Research Organizations under Sections 35 (1) (ii) and 35 (1) (iii) of the Income Tax Act[5].
- Accelerated depreciation allowance for investment on plant and machinery made on the basis of indigenous technology under Rule 5(2) of the I.T. Rules[7].
- Customs Duty exemption to public funded R&D institutions and privately funded scientific and industrial research organizations, both for capital equipment and consumables needed for R&D (Notification No. 51/96 - Customs, dated 23rd July, 1996)[8].

within six months from the date of importation and a certificate from the jurisdictional Assistant Commissioner of Central Excise or the Deputy Commissioner of Central Excise, as the case may be, is produced before the Assistant Commissioner of Customs or Deputy Commissioner of Customs, as the case may be, at the port of importation. The total value of goods imported is limited to 25% of the FOB value of exports made during the preceding financial year. It is necessary to produce a certificate, from the Joint Director General of Foreign Trade in the Ministry of Commerce and Industries, Goverment of India, certifying the value of exports made during the preceding financial year and the value of goods already imported under this Notification during the current financial year. The goods imported should not be transferred or sold for seven years from the date of installation.

2.2.2 Support Mechanisms

The Government has instituted certain schemes that are aimed to extend financial support to industry to further their research efforts. Some of the major schemes are listed below. The details of these schemes can be downloaded from the websites of the respective departments.

- Partial financial support to research, development, design and engineering products proposed by industry under Technology Development and Demonstration Program (TDDP) under the scheme of DSIR[6].
- Promotion of technology transfer from national laboratories and nationally funded R&D programs to industry through public sector organizations like National Research Development Corporation, a public sector unit of the Department of Scientific and Industrial Research, Government of India[6].

- Support in the form of loans/grants for industrial R&D by Technology Information, Forecasting and Assessment Council (TIFAC) of the DST[11].
- Support to industry for R&D through sector-specific programs of scientific and economic ministries/departments[11].

2.3 SCIENCE AND TECHNOLOGY INFRASTRUCTURE

2.3.1 Committees on Science and Technology

A number of high-level committees have been constituted by the Government from time to time to guide/advise on matters related to the growth of science and technology and to monitor the implementation of S&T policies[12]. The members of these committees are drawn from a wide cross-section of S&T fields.

The first such committee was the Scientific Advisory Committee to Cabinet (SACC) which was constituted in 1956. This Committee was replaced by the Committee on Science and Technology (CoST) in 1968. Subsequently, in 1971, the Government constituted the National Committee on Science and Technology (NCST) under the chairmanship of Deputy Chairman, Planning Commission to integrate the planning process with the socio-economic development through S&T. The first major exercise of formulating a comprehensive S&T plan for the country was done by the National Committee on Science & Technology, while the 5th Plan was in the process of formulation. On the advice of NCST, the Department of Science and Technology was set up in 1971 to implement and coordinate activities that are multi-disciplinary in nature and involve several agencies/ministries.

The Committee on Science and Technology was replaced by the Science Advisory Committee to the Cabinet (SACC) in 1981. This Committee was instrumental in the simplification of administrative processes for S&T ministries/departments and also in recommending better facilities for S&T personnel. In 1986, the SACC was also replaced by the Science Advisory Council to the Prime Minister (SAC-PM). The SAC-PM prepared the Perspective Plan in 2001

1. Central Ministries/Departments

The overall structure of S&T in India under this group can be broadly classified into two categories. In the first category fall the scientific departments whose sole function is either to undertake or promote scientific research. For example, the Department of Atomic Energy is responsible for undertaking intramural as well as extramural research in the field of atomic energy and related areas. On the other hand, the Department of Science and Technology is charged with the responsibility of promoting research in all the areas of science and technology. The department as such does not undertake any research work. For undertaking research activities, such departments/ministries have set up separate research agencies/institutions. For example, the Department of Science and Technology has independent institutions like Bose Institute, Indian Association for Cultivation of Science, Raman Research Institute, etc. to undertake research activities. The Council of Scientific and Industrial Research, Indian Council of Agricultural Research and Indian Council of Medical Research have been set up to undertake research activities in the field of industrial, agricultural and medical research respectively. These agencies, in turn, have set up research institutions under their administrative control to take up research activities in specific areas like the National Physical Laboratory, Indian Institute of Chemical Technology, Indian Agricultural Research Institute, and National Institute of Immunology.

In the second group fall the departments that are primarily responsible for promoting or regulating economic activities like the Ministry of Energy, Ministry of Railways, Ministry of Surface Transport, etc. Research activities of such departments have very strong relationship with their socio–economic activities. RDSO at Lucknow under the Ministry of Railways, Central Power Research Institute at Bangalore under the Ministry of Energy, Central Water and Power Research Institute at Pune under the Ministry of Water Resources and many more are such institutions which are associated with the socio–economic ministries.

The Central Government has currently, 14 scientific departments/ councils specifically engaged in S&T activities. About 285 national laboratories and institutions are affiliated to these departments which are charged with the primary responsibility of undertaking scientific research. These departments/councils are:

1. Department of Science and Technology (DST)
2. Department of Biotechnology (DBT)
3. Department of Atomic Energy (DAE)
4. Department of Space (DOS)
5. Defence Research and Development Organisation (DRDO)
6. Ministry of Earth Sciences (MoES)
7. Department of Scientific and Industrial Research (DSIR)
8. Ministry of New and Renewable Energy (MNRE)
9. Ministry of Communication & Information Technology(MCIT)
10. Ministry of Environment & Forest (MoEF)
11. Department of Health Research (DHR)
12. Council of Scientific and Industrial Research (CSIR)
13. Indian Council of Agricultural Research (ICAR)
14. Indian Council of Medical Research (ICMR)

2. State Ministries/Departments

The State Governments, on the pattern of the Central Government, have set up departments/ministries to undertake research activities that are specific to them. State Governments concentrate mainly on research in agriculture, animal husbandry, public health, irrigation and forestry. To further research in these areas, they have

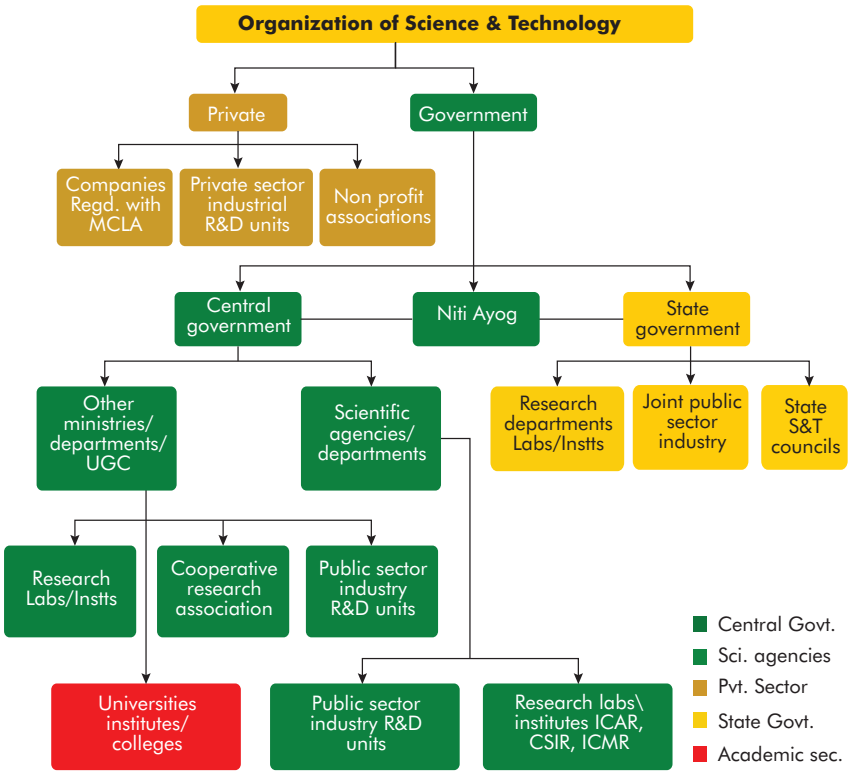
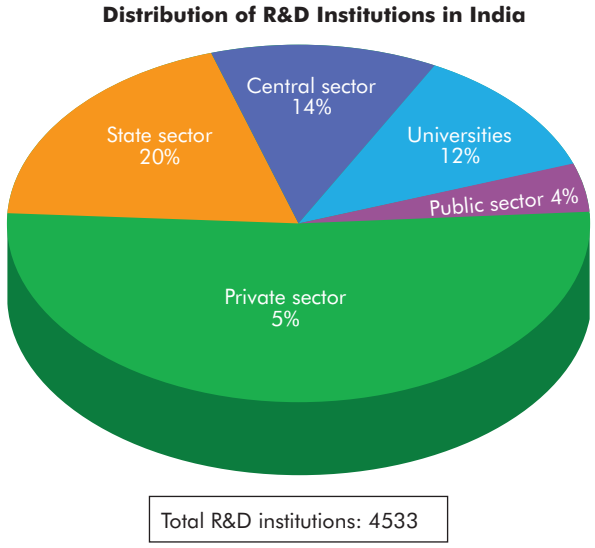


Figure 2.1

5. R&D Institutions in India

As mentioned earlier, a mojority of the government departments/ ministries have a number of research institutions under their administrative control to undertake research. The total number of such institutions in the country as per the latest R&D Statistics, 2011-12[13] brought out by the Department of Science and Technology is around 4,533. This includes the in-house R&D units, universities, colleges and non-profit scientific and industrial research organizations. 50% of the R&D institutions fall in the private sector.

Sector-wise distribution of the R&D institutions in the country is shown below in Figure 2.2.



Source: R&D Statistics, 2011-12, DST, GOI

Figure 2.2

2.4 NATIONAL R&D RESOURCES

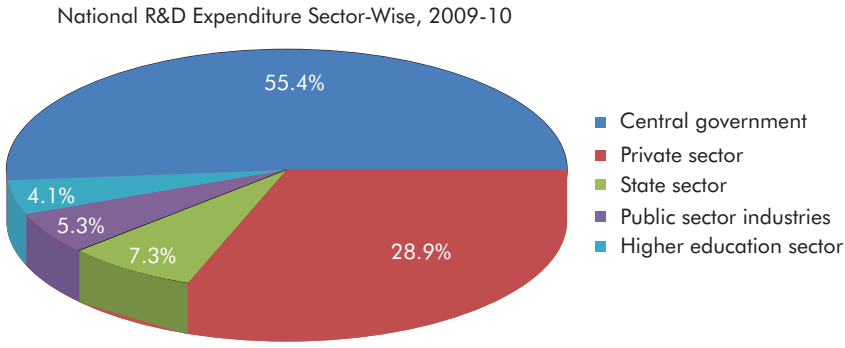
The Research and Development statistics brought out by the Department of Science and Technology, Government of India, highlights the national expenditure incurred on R&D in a block of years starting from 1990. The national expenditure on R&D includes the expenditure incurred by the in-house R&D units of public and private industrial enterprises, institutions set up under the aegis of CSIR, ICAR, ICMR and other government funded institutions, universities, colleges and SIROs. The national investment on R&D activities attained a level of Rs. 53041.30 crores in 2009-10[13]. The same is estimated to rise to the level of Rs. 72620.44 crores in 2011-12. During the year 2009-10, around 0.87% of the Gross Domestic Product (GDP) was spent on R&D. It has yet to achieve the target of 2% as reflected in the S&T Policy of 2013.

The pattern of this expenditure on R&D is shown below in Figure 2.3.

It is very clear from the above figure that though the national expenditure on R&D in absolute numbers has been on rise from year to year but it has always remained less than 1% as a percentage of GDP.

2.4.1 Sectoral Composition of R&D

The data compiled by the Department of Science and Technology, Government of India, as presented in the following Figure 2.4, shows that the Central Government makes the highest contribution that is nearly 55.5% on R&D activities. The industrial sector contributes to the tune of 34.00% in R&D. The rest comes from the State Governments and the Higher Education Sector.

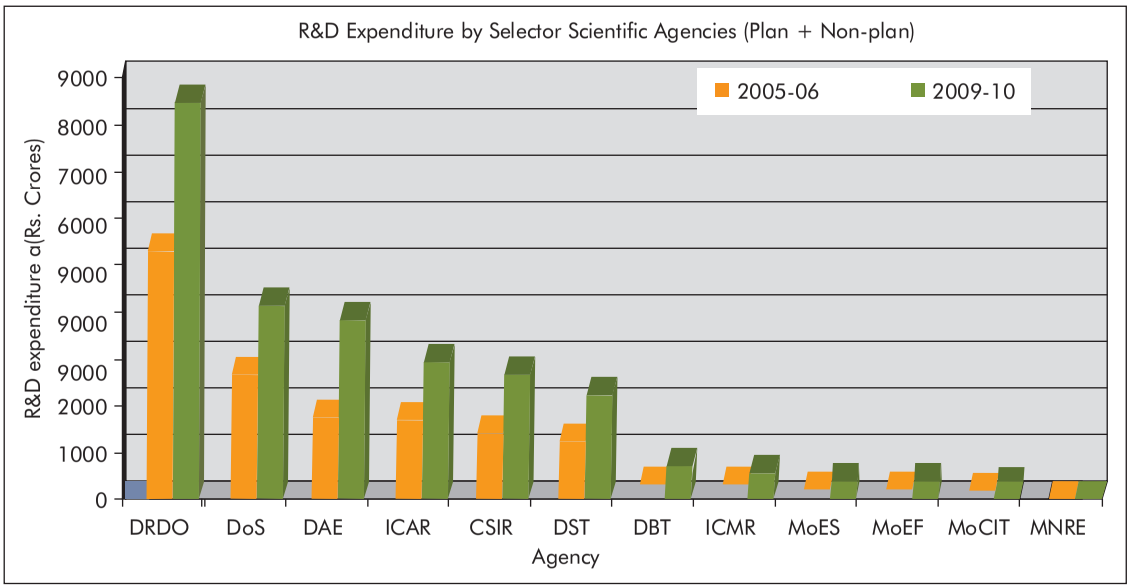


Source: R&D Statistics, 2011-12, DST, GOI

Figure 2.4

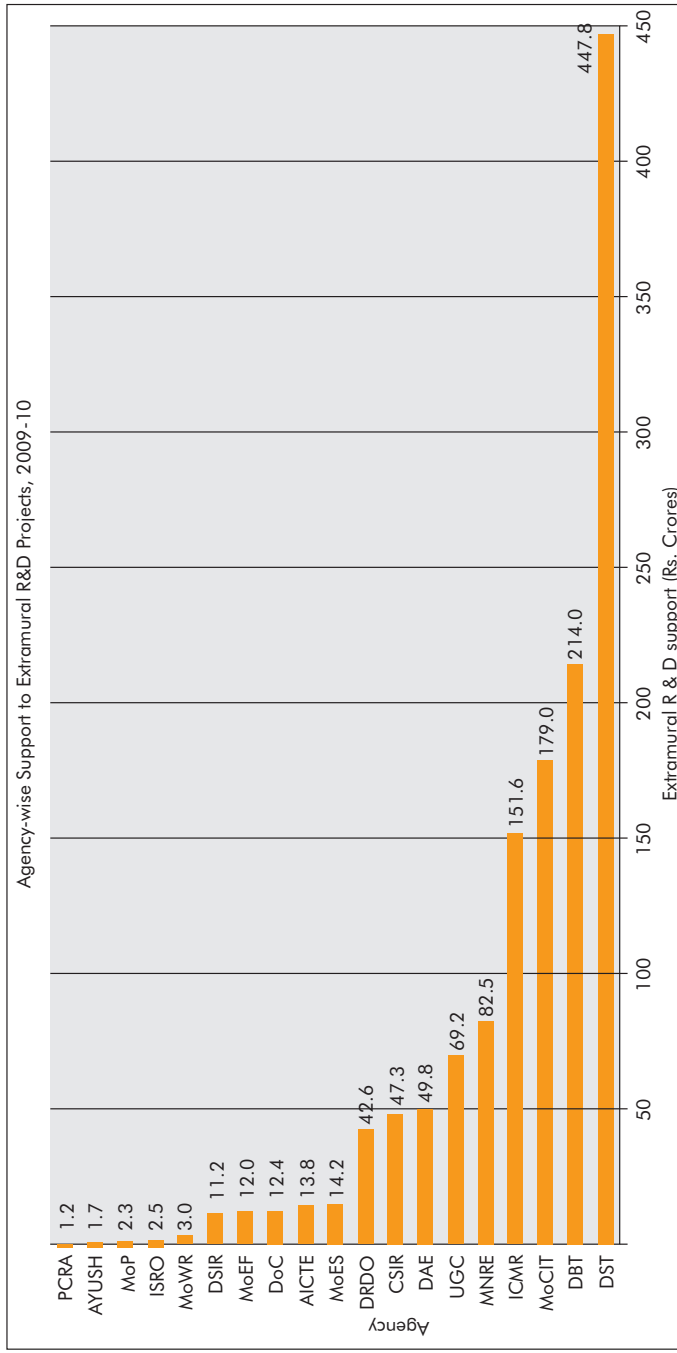
2.4.2 Expenditure by Central Government Agencies

Further, it may be mentioned that 84.6% of the R&D expenditure incurred by the Central Government sources comes from 12 major scientific agencies – DST, CSIR, DRDO, DAE, DBT, DOS, MoES, ICAR, ICMR, MICT, MNRE and MoEF and the remaining 15.4% expenditure comes from other central ministries/departments/ public sector industries. Amongst the major scientific agencies, Defence Research and Development Organization (DRDO) accounts for 31.6% of the expenditure which is the highest among the scientific agencies. The R&D expenditure over the years by the major Central Government agencies may be seen in the following Figure 2.5



Source: R&D Statistics, 2011-12, DST, GOI

Figure 2.5



Source: R&D Statistics, 2011-12, DST, GOI

Figure 2.6

Government of India[6,19]. The basic objective of NRDC is to develop research, carried out at the national institutions, up to a level/ scale worthy of the application by the industry and also to promote invention in the country. The Corporation is an organic link between the industry and the institutions including the universities for transferring the knowledge generated in the research institutions and to protect such know-how through patents, registration of designs, trademarks and geographical indications as the case may be. Some of the success stories that can be cited just to illustrate include 'Artificial Heart Valve' and 'Spirulina Algae'. Keeping in mind the scope of the book, only the subject of patenting dealt with by NRDC has been mentioned here.

The technology of the 'Heart Valve' was developed by Sree Chitra Tirunal Institute of Medical Science and Technology, Thiruvananthpuram after being adequately funded by the NRDC. It has been patented in India and the US and is being commercialized by an Indian company at a much lower price as compared to the imported heart valves.

The technology of the 'Spirulina Algae' was developed by AMM Murugappa Chettiar Research Centre, Chennai, a non-profit institution, in the private sector. It was up-scaled with the help of NRDC and later on commercialized by M/s NEW Ambaji Estates Ltd at Severyapuram. The patent for this invention has been obtained in India.

The NRDC has been assisting the researchers in all aspects of patenting, from patent search to patent filing through a dedicated cell created for this purpose. This assistance is provided under the scheme, Program for Inspiring Inventors and Innovators (PIII), a Plan scheme of the Department of Scientific and Industrial Research. The financial assistance to the inventors covers expenditure for the filing of patents in India and overseas. The current guidelines and the format for application for seeking financial assistance may be accessed from the website of the corporation at: *www.nrdcindia.com.*

2.5.2 Patent Facilitating Centre, TIFAC, New Delhi

The Patent Facilitation Centre (PFC) has been functioning under the aegis of Technology Information, Forecasting and Assessment Council (TIFAC), Department of Science and Technology, Government of India since 1995[11]. The basic objective of the PFC is to render financial, technical and legal support to the researchers primarily in the academic institutions, apart from creating general awareness about the intellectual property rights. In view of the vastness of the country, the PFC has set up a number of Patent Information Centers in universities and State Councils in various States to provide patent-related assistance to researchers located in the vicinity of such institutions. The PFC has a panel of patent attorneys to provide legal support to researchers for filing patents. The guidelines to be followed by the researchers for seeking any assistance on IPR related issues can be had from the website of TIFAC: *www.tifac.org.in*

2.5.3 Biotechnology Patent Facilitation Cell, DBT, GOI, New Delhi

The Department of Biotechnology, Ministry of Science & Technology, Government of India set up this cell in July 1999[15] to create awareness on IPR-related issues specially in the field of biotechnology. The cell is a single window both for the awareness creation as well as for filing patents by the biotechnologists in India and overseas. The necessary details can be downloaded from the website: *www.dbt.nic.in.*

2.5.4 Ministry of Micro, Small and Medium Enterprises, New Delhi

The National Manufacturing Competitiveness Council, Government of India, has been stressing on the technological advancement of the Micro, Small and Medium Enterprises (MSME)

to registered micro, small and medium enterprises and also the startup companies for filing international patents. The scheme, currently, covers expenditure up to 50% or 15.00 Lakhs whichever is lower for international applications. The terms and conditions of the grant and the application form can be had from the website of the DeitY: *www.deity.gov.in*

2.6 INVENTIONS PATENTED IN INDIA

The Indian Patents Office handles receiving, examining and granting patents to the inventions made in India and overseas. Year-wise patents granted/sealed by the Indian Patents Office to the Indian, and foreign applicants are shown in the following Figure 2.7.

It is evident from the figure that the number of patents granted to Indian inventors is far below the number of patents granted to foreign inventors. During the year 2010-11, around 7500 patents were granted in India. Only 17% of the patents belonged to Indian inventors. As per the Annual Report 2013-14 of the Controller General of Patents, Designs and Trade Marks[14], 4381, 4126 and 4227 patents were granted during 2011, 2012 and 2013 respectively. During 2013-14, the Council of Scientific and Industrial Research ranked first among the top 10 Indian applicants from scientific and research & development organizations in filing patent applications in India as given below:-

Top 10 Indian Applicants for Patents (Scientific and Research & Development Organizations)

S. No.	Name of Scientific and Research & Development Organization	Applications Filed
1	Council of Scientific & Industrial Research	267
2	Defence Research & Development Organization	116
3	Indian Council of Agricultural Research	71
4	Department of Biotechnology, Government of India	34
5	Jubilant Life Sciences Limited	29

S. No.	Name of Scientific and Research & Development Organization	Applications Filed
6	G H R Labs and Research Centre	26
7	Hetero Research Foundation	17
8	Centre for Development of Advanced Computing	17
9	Indian Council of Medical Research	14
10	Indian Space Research Organization	12

Source: Annual Report, 2013-14, (CGPDTM)

In the category of institutes/universities, Indian Institute of Technology (collectively) ranked first in filing patent applications in India as shown below:-

Top 10 Indian Applicants for Patents (Institutes and Universities)

S. No.	Name of Institute/University	Applications Filed
1	Indian Institute of Technology (Collective)	342
2	Amity University	92
3	Saveetha School of Engineering, Saveetha University	74
4	Bharath University	37
5	Indian Institute of Science	32
6	G.H. Raisoni College of Engineering	27
7	Siddaganga Institute of Technology	24
8	Sree Chitra Tirunal Institute for Medical Science and Technology	20
9	University of Calcutta	15
10	Sastra University	13

Source: Annual Report, 2013-14, (CGPDTM)

In the category of foreign applicants, M/S Qualcomm Incorporated ranked first in filing patent applications as given below.

5. Section 35, Income Tax Act, 2015 (See Appendix 2.1)
6. Annual Report 2014-15, Department of Scientific & Industrial Research, Ministry of Science & Technology, Government of India
7. Rule 5 (2) of Income Tax Rules

   Depreciation:

   (2) Where any new machinery or plant is installed during the previous year relevant to the assessment year commencing on or after the 1st day of April, 1988, for the purposes of business of manufacture or production of any article or thing and such article or thing—

   (a) is manufactured or produced by using any technology (including any process) or other know-how developed in, or

   (b) is an article or thing invented in,

   a laboratory owned or financed by the Government or a laboratory owned by a public sector company or a University or an institution recognised in this behalf by the Secretary, Department of Scientific and Industrial Research, Government of India,

   such plant or machinery shall be treated as a part of a block of assets qualifying for depreciation at the rate of [40] percent of written down value, if the following conditions are fulfilled, namely:—

   (i) the right to use such technology (including any process) or other know- how or to manufacture or produce such article or thing has been acquired from the owner of such laboratory or any person deriving title from such owner;

   (ii) the return furnished by the assessee for his income, or the income of any other person in respect of which he is assessable, for any previous year in which the said machinery or plant is acquired, shall be accompanied by a certificate from the Secretary, Department of Scientific and Industrial Research, Government of India, to the effect that such article or thing is manufactured or produced by using such technology (including any process) or other know-how developed in such laboratory or is an article or thing invented in such laboratory; and

15. Annual Report 2014-15, Department of Biotechnology, Ministry of Science and Technology, Government of India
16. Annual Report 2014-15, Ministry of Micro, Small and Medium Enterprises Government of India.
17. Annual Report 2014-15, Department of Electronics and Information Technology, Government of India
18. www.msme.gov.in
19. www.nrdcindia.com

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