



CENTRE FOR AMBITION
(An Institute for Civil Services)

SCIENCE & TECHNOLOGY POLICY

2.1 Development of Science & technology policy:

The development of a nation largely depends on the total stock and capacity of knowledge in the field of science and technology. A perusal of the evolution of science and technology in India reveals the fact that some evidences of technological development were found during the Harappa civilization. The town planning, drainage and metallic tools, all were technologically during the Harappa civilization. A system of weights and measures were also in practice.

The growth of science and technology in India has also been guided by its geographical, climatic, socio-economic and anthropogenic factors. We will confine our discussion to the development and growth of science and technology in the first phase of independent India in this chapter.

The foundation of scientific and technological development was laid by Pt. Jawahar Lal Nehru. He, in fact tried to institutionalize both higher education and science and technology. A 22-member committee recommended the establishment of India Institutes of Technology. Following this, India came out with its first science policy in 1958. Further, in the 1960s India took help from the erstwhile Soviet Union in the development of space science and technology. The Nehruvian Vision intended to see India getting transformed into a modern and technology driven economy. Therefore, from time to time specific science and technology policies were formulated.

Presently, among Asian nations, India spends about 10 per cent of its total expenditure on research and development. As compared to others, its status is not satisfactory. According to estimates, there are 140 researchers every ten lakh population against 4,651 in the US. In this backdrop, the government of India has proposed a new policy, which has been discussed at the end of the chapter.

2.2 National Science Policy, 1958

One of the most striking features of this policy was that it stressed on basic research in almost all fields of science. The policy envisaged that scientific information should be disseminated at individual level. Demand management in the field of scientific development was also given much impetus. Moreover, it laid emphasis on making available the required infrastructure for the scientific community to speed up the process of development. By far, the most important feature was that it realized the importance of a participatory approach and focused on the involvement of the scientific community in decision making.

2.3 Technology Policy Statement, 1983

The Policy statement was of the view that India must attain self-reliance in most of the sectors. This, inter alia, included optimum utilization of available resources. Further, the policy statement drew the attention towards creating productive and gainful employment opportunities by using scientific and technological developments.

We know that diversity in India has contributed to conservation and preservation of the traditional skills. The policy statement, therefore, should commit to making such skills practically applicable and commercially viable. This was possible only when the new technologies were brought down to the grass root level.

The policy statement also gave priority to the creation and development of institutional, legislative and financial infrastructure so that environment friendly technological progress was speeded up. During 1980s India badly required steps to reduce or eliminate rural–urban divide. Realizing this, the policy statement expressed hope that technology would ensure multilateral development. Moreover, the policy statement also laid emphasis on such technologies, which could support cottage and village industries.

Skill development is inevitable as regards demand management. Considering this requirement, the policy gave guidelines to formulate a strategy to promote skill development.

2.4 Technology Policy Statement, 1993

After the establishment of Technology Information, Forecasting and Assessment Council (TIFAC) in 1988, a new policy was put in place in 1993. Some of its main points were as follows:-

1. Growth of science and technology in India with the objective of dissemination of technical information in remote areas.
2. Utilization of scientific resources for achieving the goals of sustainable development.
3. Optimum utilization of natural resources.
4. Promotion to the process of human resource development in the field of science and technology.
5. Formulation of short–term and long–term programmes for the priority sector on the basis of social and economic development.

It is to be noted that this was the period of economic liberalization and there was a growing need of scientific and technological advancements. At international level, the concept of sustainable development had already gained ground and like other countries, India also needed specific Policies to support the concept and achieve the targets of sustainable development.

2.5 Science & Technology Policy, 2001

A new and comprehensive policy was formulated in 2001 with a view to give a positive direction to the scientific and technological developments. Though a decade–old economic liberalization had created a number of institutional and infrastructural facilities, a number of problems also surfaced, which needed to be solved immediately. In fact, research laboratories were facing acute financial crisis. Considering all such problems, the government of India decided to spend about 2 percent of GDP on scientific and technological developments. Some of the major objectives of the policy were as follows:-

1. Ensuring water and food security
2. Autonomy to educational and research institutions and making them accountable.

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3. Establishing a strong and intimate relationship between public and private agencies operating in the field of science and technology.
4. Creation of infrastructural facilities for national defence.
5. Management of natural disasters.
6. Use of science and technology as an instrument of international cooperation and promotion of material and intellectual resources to achieve common goals.
7. Ensuring people's participation in scientific and technological programmes.
8. Promotion of scientific researchers at university and national levels.
9. Special focus on growing importance of science in higher education.
10. Complete participation of women in research and development programmes.

These objectives make it crystal clear that the policy laid emphasis on human resource development and management. It was also decided to make creativity central to higher education and the reason attributed to this was that this could remove the social and economic barriers. Another striking feature was that in the field of biodiversity, human resource development was given maximum impetus. The policy intended to strengthen the system imparting science education and targeted to create an outline of various research programmes at University level. In fact, 25 universities and 25 technical institutions were selected for formulating basic science and research based programmes. Above all, priority was also given to modernize medical and engineering institutions. The policy also envisaged for adequacy of funds recognizing the significance of fiscal complications for management of science and technology. In order to promote science and technology in a hassle-free environment the policy proposed to create a National Science and Technology Board. Moreover, recognizing that science-industry relationship plays a critical role in national development, the policy proposed participation of industries in technical education and promotion of basic researches.

2.6 Science & Technology Policy, 2003

In the last couple of decades, we have seen that while the political world is shrinking, the society continues to expand. In this backdrop, the science and technology Policy 2003 believes in national reconstruction, economic development, growth and stability. Though development and equitable distribution of resources was taking place, there was a growing need of devising an altogether new strategy for protecting economic rights and making India an economic power. In recent years, the social, economic, legal, ethical and above all, behavioural aspects were being emphasized. Globalization has contributed greatly to the development of a new consciousness in the field of science and technology. We have started thinking how to use scientific and technological developments for achieving the targets inclusive growth, that is, how to address both the pace and pattern of growth. The main tenets of the policy, inter alia, include the following:

1. Steps to ensure the trickling of the benefits of scientific and technological developments down to the grass root level.
2. To ensure food, agriculture, nutrition, health, water and energy security on equitable basis.

3. To reduce the rural–urban divide.
4. Adequate availability of health and nutritional services across the country.
5. All out efforts for poverty alleviation.
6. Promotion of scientific researchers at university level.
7. Use of scientific and technological advancements for preserving, conserving and defending the cultural and civilisational milieu of India.
8. Creation and development of a strong system for protecting the intellectual property rights.
9. Scientific and technological empowerment of women by ensuring their total participation in all such activities.
10. To meet the security and defence–related requirements through scientific and technological developments and advancements.
11. Coordination between public and private sector in the field of science and technology.
12. To make the early warning and management systems stronger to mitigate disasters like flood, drought, earthquake, cyclones, landslides etc.
13. Steps to promote international cooperation in the field of science and technology.

These broad objectives clearly reveal that the government through this policy intends to integrate India's scientific and technological developments with all those taking place in different parts of the world. A well–knit strategy has also been devised on the basis of the suggestions given by various experts so that all implementation bottlenecks could be removed. However, maximum focus has been given on research and development in almost all fields to sustain the role of science and technology in national development. Another striking feature of the policy is that it has rightly recognized the role of India's federal policy in its implementation. Hence, support of states in its implementation has been sought.

The government of India has also realized that the scientific and technological advancements in India need to be made increasingly dynamic and productive. Therefore, implementation, assessment and review, at all levels need to be strengthened. In this backdrop, a high–level consultative committee has been proposed to advise the authorities periodically. The committee will comprise experts from various sectors including the industries. Candidly, the intention of the policy is to strengthen science–industry relation and to ensure adequate investments for research and development.

The policy envisages creation and development of infrastructure especially for improving medical and engineering researches. This will make the institutions get modernized and work efficiently. Considering the rapid changes in all fields including science and technology, the Government has decided to take all possible steps for human resource development and also to ensure total participation of women in all such programmes and projects.

It is a well known fact that science and technology contributes greatly to meeting security and defence requirements of the nation. In this context the Government has shown its commitment through the policy to strengthen India's defence capabilities.

Taking advantage of the globalised and economically liberalized world, the policy proposes to set up an Autonomous Technology Transfer organization to take advantage of all such transfers taking place across the world.

2.7 Need of a New Science & Technology Policy

It is expected that by the end of the 11th policy, there will be a growing need of a new strategy not only for making India's gross domestic Product (GDP) Technology-driven but also to assess the economic impact of research and development. Realising this, specific guidelines will be given in the 12th plan for investments in science, technology and innovation. Hence, the Government is contemplating to formulate a new science and technology policy with an aim to promote innovations.

At present, India spends about 1 percent of its GDP on research and development however, it needs to be increased urgently if India wants to remain in global competition. It is expected that the limit of expenditure will be raised to 2 percent of GDP.

In the last few years Gross Expenditure on Research and Development (GERD) has emerged as an important parameter to measure the technological status in many countries. This was the reason that global expenditure on research and development in the last couple of decades in the 20th Century was over \$1 trillion. In a number of countries the technology induced GDP has become about 25–50 per cent. Moreover, the way intellectual property right regime has assumed significance, India also realizes that there is a pressing need of a new policy which will focus on all such issues.

Science, Technology & Innovation Policy, 2013

The STI Policy seeks to send a signal to the Indian scientific community, both in the private and public domain, that *science, technology and innovation should focus on faster, sustainable and inclusive development of the people*. The policy seeks to focus on both *STI for people and people for STI*. It aims to bring all the benefits of Science, Technology & Innovation to the national development and sustainable and more inclusive growth. It seeks the right sizing of the gross expenditure on research and development by encouraging and incentivizing private sector participation in R & D, technology and innovation activities.

The policy also seeks to trigger an ecosystem for innovative abilities to flourish by leveraging partnerships among diverse stakeholders and by encouraging and facilitating enterprises to invest in innovations. It also seeks to bring in mechanisms for achieving gender parity in STI activities and gaining global competitiveness in select technological areas through international cooperation and alliances. The policy goal is to accelerate the pace of discovery, diffusion and delivery of science led solutions for serving the aspirational goals of India for faster, sustainable and inclusive growth. A Strong and viable Science, Research and Innovation System for High Technology led path for India (SRISHTI) are the goal for the STI policy.

THE KEY FEATURES OF THE STI POLICY 2013 ARE

- Promoting the spread of scientific temper amongst all sections of society.
- Enhancing skills for applications of science among the young from all social sectors.
- Making careers in science, research and innovation attractive enough for talented and bright minds.
- Establishing world class infrastructure for R&D for gaining global leadership in some select frontier areas of science.

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- Positioning India among the top five global scientific powers by 2020 (by increasing the share of global scientific publications from 3.5% to over 7% and quadrupling the number of papers in top 1% journals from the current levels).
- Linking contributions 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 with societal and commercial applications by replicating hitherto successful models, as well as establishing of new PPP structures.
- Seeking S&T based high risk innovation through new mechanisms.
- Fostering resource optimized cost-effective innovation across size and technology domains.
- Triggering in the mindset & value systems to recognize respect and reward performances which create wealth from S&T derived knowledge.
- Creating a robust national innovation system.

ASPIRATIONS OF THE POLICY

The main aspirational elements of the STI policy are:

- Raising Gross Expenditure in Research and Development (GERD) to 2% from the present 1% of the GDP in this decade by encouraging enhanced private sector contribution.
- Increasing the number of Full Time Equivalent (FTE) of R&D personnel in India by at least 66% of the present strength in 5 years.
- Increasing accessibility, availability and affordability of innovations, especially for women, differently-abled and disadvantaged sections of society.

MECHANISMS

Wide ranging mechanisms are envisaged to be deployed to realize the policy aspirations, a few of these are:-

- Promoting the spread of scientific temper amongst all sections of society.
- Enhancing skill for applications of science among the young from all social strata.
- Making careers in science, research and innovation attractive enough for talented and bright minds.
- Empowering women through appropriate STI inputs and investments
- Facilitating private sector investment in R&D centres in India and overseas.
- Promoting establishment of large R&D facilities in PPP mode with provisions for benefits sharing.
- Permitting multi stakeholders participation in the Indian R&D system.

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- Treating R&D in the private sector at par with public institutions for availing public funds.
- Bench marking of R&D funding mechanisms and patterns globally.
- Aligning Venture Capital and Inclusion Innovation Fund systems.
- Sharing of IPRs between inventors and investors.
- Modifying IPR policy to provide for marching rights for social good when supported by public funds and for co-sharing IPRs generated under PPP.
- Providing incentives for commercialization of innovations with focus on green manufacturing.
- Closing gaps in the translation of new findings at the grassroots and the commercial space.
- Forging strategic partnerships and alliances with other nations through both bilateral and multilateral cooperation in science, technology and innovation.
- Triggering ecosystem changes in attitudes, mindset, values and governance systems of publicly funded institutions engaged in STI activities to recognize, respect and reward performances which create wealth from S&T derived knowledge.

POLICY IMPLEMENTATION

Implementation of the proposals contained in the Policy will necessitate consultations with different government departments/ministries and agencies besides consultations with overarching, science and engineering academies industry and business associations etc. Accordingly DST will establish a Policy Implementation Group to expeditiously operationalise the proposals within the next two years.

BACKDROP

Former Prime Minister, Indira Gandhi had announced the Technology Policy Statement (TPS) at the Science Congress in January 1983. It focused on the need to attain technological competence and self-reliance. Several of the statements of TPS were implemented. Subsequently, a Science and Technology Policy (STP) was announced in 2003, seeking to bring science and technology (S&T) together. It basically called for integrating programmes of socio-economic sectors with the national R&D system and the creation of a national innovation system. The world has changed vastly since then in all spheres of human activity. New paradigms of innovation have emerged, arising, among others, out of the pervasive intrusion of internet and globalization. Even then systems that foster innovation have become country and context specific. India has declared 2010-20 as the "Decade of Innovation." India's demographics have changed significantly too. The youthful populations have high expectations and aspirations of the nation. The Science, Technology and Innovation Policy (STI) 2013 approved by the Union Cabinet is in furtherance of this declaration and aims to bring perspectives to bear on Science & Technology led innovations in the changing context.