



CENTRE FOR AMBITION
(An Institute for Civil Services)

SCIENCE & TECHNOLOGY IN INDIAN PLANNING

3.1 Introduction

Indian has a planned economy. The basic objective of our Five Year Plans has three dimensions political, economical and social. Politically, plans ensure protection of rights, both civil and political including personal liberties. Economically, five year plans intend to equitably distribute resources delivering economic justice and socially, its objective is to establish India as a just and egalitarian society. These constitutional goals are implicitly enshrined in the Directive Principles of state Policy in Part IV of the Constitutions while 'economic and social planning' is explicitly mentioned as entry 20 of the concurrent list in the VIIth Schedule of the constitution. Thus, achieving plan objectives is both a constitutional mandate and socio-economic obligation of the central and state Governments.

Realizing that science and technology plays the most critical role in the national development, it has been integrated with the planning mechanism. It has also been realized that science and technology is responsible for making the economy vibrant, self-reliant and self-governing. This has been the reason why India, since independence has endeavored to bring socio-economic changes through science and technology. The effort has been both on upgrading the traditional skills to make them relevant through the development of advanced capabilities in different fields of science and technology. Efforts have also been made to ensure participation of women and also of the vulnerable groups in all scientific and technological developments. The area of economic liberalization and globalization has furthered the progress of science and technology and of course, the planning mechanism has given a positive direction to it. Thus, it would be apposite to say that the decentralized planning has contributed largely to bring down the scientific and technological developments to the grassroot level providing strength to the process of sustainable development and inclusive growth.

The chapter deals, in brief, various steps taken in Plan I to X for the development and group of science and technology while it gives special attention on the vision and commitment during the 11th Plan Period.

3.2 First Five Year Plan (1951-56)

A strong indigenous capability is extremely important for the development of science and technology in any country. The first plan period, as we know, was a period of creating institutions in almost every sector of development. Of course, science and technology was one of the most important sectors. Further, special attention was also given on research and development at different levels. During the plan period greater emphasis was laid on the provision of additional facilities for the promotion of scientific and industrial researches. The most significant development in this sphere had been the establishment of a chain of national laboratories and research institutes across the country.

IMPORTANT LABORATORIES & RESEARCH INSTITUTIONS SET UP DURING 1ST PLAN

- National Physical Laboratory, New Delhi.
- National Chemical Laboratory, Pune.

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- National Metallurgical Laboratory, Jamshedpur.
- Fuel Research Institutes , Jealgora
- Central Drug Research Institutes, Lucknow
- Central Leather Research Institute, Delhi
- Central Electro-Chemical Research Institutes, Karaikudi
- Central Food Technological Research Institute, Mysore.

Over the years, most of these laboratories and research institutes have emerged as flagship institutions and have achieved worldwide recognition. Thus, through such institutions focus was given on both the fundamental and applied aspects of science and technology. Last but not the least, the financing which was hitherto the responsibility of the Central Government, was shared with the state governments to further the research and development programmes.

3.3 Second Five Year Plan (1956-61)

While the first plan stressed on the establishment of national laboratories and research institutes, the prime objective of the second plan (based on Mahalanobis Model or Operational Research Model) was to develop the existing facilities and to ensure that the works of scientists are brought to the national laboratories. The idea was to ensure that such researches are used in different fields of national development. The second plan marked an important stage in the industrial and technological progress of the country. A very striking feature of the plan was that it realized the need for skilled manpower. This was seminal because scientific and technical manpower constituted one of the major input resources to scientific and technological activities. It is also an indirect measurement of the strength of the country. The planning and formulation of science policy requires the knowledge of the total numerical strength of the qualified human resources namely the total stock and the economically active stock of scientific and technical personnel. Considering this, the Government of India had appointed a Scientific Manpower Committee in 1947 to advise on the best methods of utilizing and augmenting the scientific manpower resources in the country. A scheme on national register for scientific and technical personnel was introduced. Since the registration was voluntary and the response was not up to the mark, the scheme could not serve the purpose of getting information on the stock of such personnel. Hence, the first survey of scientific and technical personnel was conducted along with the 1961 census.

3.4 Third Five Year Plan (1961-66)

It is well recognized that investment in scientific researches makes a large and enduring contribution to the prosperity of the country. An extensive network of institutions engaged in scientific research was created with a view to conducting pure research, applied research and research in specialized fields. Pure research was conducted at university-level while applied and industrial researches were undertaken by national laboratories. Most importantly, research in engineering subjects was given much impetus during the plan period.

3.5 Fourth Year Plan (1969-74)

Integration of industrial research and industrial development was given the top most priority during the 4th plan. A number of institutions outside the purview of the Council of Scientific and Industrial Research (CSIR) were strengthened. By far the most striking feature was that areas like atomic power and space science and technology were focused which ultimately placed India on the international platform as a major player in such areas.

3.6 Fifth Five Year Plan (1974-78)

The 5th Plan, on one hand laid greater emphasis on agricultural research, and on the other, it also emphasized the need to disseminate scientific and technical information. Some of the new areas like dry land farming, pest management, electronics etc. were extensively explored during the plan period.

3.7 Sixth Five Year Plan (1980-85)

Science is both an outlook and a value system. On the other hand, technology must help to speedily improve production through better efficiency and full utilization of capabilities already created in the various sectors of the economy. In this backdrop, the 6th Plan gave priority to nurture talent by a substantial improvement in the general science and technology facilities in universities and research institutions. The Plan laid emphasis on linkages between academic institutions on the one hand and national scientific agencies, laboratories and public sector enterprises on the other. New sectors like plasma Physics, applied microbiology and defence were opened up for basic and fundamental research.

3.8 Seventh Five Year Plan (1985-90)

The approach of the 7th Plan stated the guiding principles should continue to be growth, equity and social justice, self-reliance, improved efficiency and productivity. It also said that there would be an emphasis on policies and programmes which would accelerate growth in food production, increase employment opportunities and raise productivity. It was against these broad conceptual framework that the strategies for the science and technology sector had been formulated. The plan focused on consolidation and modernization of the physical infrastructure required for the development of science and technology and also on utilization of human resources. New areas like micro-electronics, informatics, telematics, robotics, biotechnologies, material sciences, oceanography, earth sciences etc. were given special focus.

3.9 Eight Five Year Plan (1992-97)

During 1990s, globalization of business and research and development have been noteworthy events. However, these also posed serious challenges including resource crunch, balance of payment crisis etc. These challenges created greater demands for scientific and technological developments. Hence, a new policy was released in 1993 stressing on increasing expenditure on science and technology so that new programmes could be introduced and made successful. A striking feature was that policies covering science and technology, industry, finance and agriculture were meaningfully intermeshed. The onset of privatization in various sectors of the economy certainly gave a boost to the scientific and technological developments.

3.10 Ninth Five Year Plan (1997-2002)

The 9th Plan aimed at growth with equity and social justice. The plan envisaged that in the context of exploring new horizons and new vistas of economic prosperity. Science and technology has to remain the main focal point and meet the economic, industrial, trade and societal challenges. The plan took up on mission mode research programmes in the fields of agriculture exports and industry. The existing infrastructure facilities required for the development of science and technology were modernized. The existing facilities were also upgraded. The approach to the Ninth Plan included the following :

1. Need for mounting efforts to control population and improve the levels of food security, economic growth, literacy, health etc.
2. Scientists with exceptional capabilities should be nurtured and supported fully by offering them the facilities comparable with international standards.
3. In some of the chosen fields, the research programmes should be taken up on a mission mode through appropriate restructuring and re-orientation.

3.11 Tenth Five Year Plan (2002-07)

Recognizing the rapidity of globalization, loss of material resources, need of protecting intellectual property rights and the increasingly growing competition among nations, the Tenth Plan laid emphasis on economic and ecological security. This was the reason why the plan stressed on human welfare through scientific and technological advancements. In recent years, it has been found that the Youth has been losing their interest in science and technology. Hence, the plan focused on developing and managing human resources and also on all such aspects which could attract the Youth towards science. It, in fact, intended to create an interface between institutions, industries and research and development. The plan proposed the establishment of Industry - S&T Interface Institutions (ISTIIS) and also the Research Audit Cells (ARCs). These cells were expected to evaluate the performance of research and development programmes.

During the plan period, a network of all research institutions was proposed to be created with a view to transmit the required information across the country which could be helpful for scientific and technological developments.

3.12 Eleventh Five Year Plan (2007-12)

The 11th Plan was committed to rapid and more inclusive growth in addition to ensure a balanced growth across the sectors. That's why it envisioned that science and technology could be used to transform India into a knowledge society. To cite the report of the Steering Committee on Science and Technology for the 11th Five Plan India must try to become 'Global Innovation Leader' across the board in all areas of science and technology. A part of the innovation ecosystem has been encouraged to take risks on the part of the scientists and support of risk taking by the Science and Technology System. Greater the innovation, higher is the risk in converting it into a marketable product or process. The Report further says that a strong and vibrant innovation ecosystem requires an education system, which nurtures creativity and R&D culture and value system which support both basic research and applied research and development, an industry-friendly culture which is keen to interact with academia, a bureaucracy which is supportive, a policy framework which encourages young people to enter into scientific developments in the world and to use technology foresight to select critical technologies in a national perspective.

In this backdrop the 11th Plan addresses the following major areas:

1. Attracting the Youth to Careers in Science

As said earlier in the chapter, young people have been losing their interest in making careers in science. Hence, it has become inevitable to develop a system to overturn this situation. A 15-year career support programme has been proposed under which the brightest of the students at 10+2 stage would be selected and provided support through scholarships/ fellowships till they completed their Ph.D and then guarantee a Job for at least five years afterwards.

2. Basic and Directed Basic Research

The Plan document says that for ensuring sustainable economic development the level of science and technology needs to be raised. It recognizes that basic research is the foundation on which all technologies stand. On the other hand, directed basic research for the developed countries inevitably become a frontier area of basic research for us. The plan says that basic and directed basic research in future require strong and increased funding.

3. Academia- Industry Interaction

In the last couple of decades, India has achieved tremendously particularly in the fields of space science and technology, information and communication technology, atomic power, biotechnologies etc. In this context, it is now pertinent to ensure that our research institutions, national laboratories and industries interact effectively. This will provide strong funding for researches on one hand, and will technologically upgrade the industries, on the other. If industry beings to interact actively with academia, it can also play a greater role in guiding academic activities in the direction of the interests of the industry, be it human resources development, R&D prioritization or, the choice of areas of international cooperation.

4. Rural Technology Delivery

Discussions are being held at various levels of Government to devise a strategy to efficiently deliver technologies in rural areas. The Plan document consider that albeit, a number of programmes have succeeded in terms of development of rural technologies, yet their delivery has remained far from satisfactory. In this backdrop, the plan proposed to introduce a new programme named Science and Technology for Rural Industrialization, Development and Employment (STRIDE) covering NGOs, research institutions and number of government departments. Moreover, five technology delivery centres have also been proposed in the country.

5. Administrative & Organizational Changes

A conducive environment for the promotion and development of science and technology is extremely important. Hence, administrative and organizational changes are essential. This has been strongly considered by the 11th plan.

6. Public Private Partnership

The plan document envisages that a holistic approach is needed for scientific and technological progress in India for which Public–Private partnership has been given a high level priority.

3.13 Twelfth Plan (2012-17)

So far as technology and innovation are concerned the 12th Five Year Plan is that science underpins most breakthrough initiatives, but beyond the domain of science, innovations play a critical role in enhancing delivery of services and enabling access to improved goods. In view of this the 12th plan tells that India needs to stimulate and strengthen its entire ecosystem. The formal scientific and industrial system as well as the innovation ecosystem to develop solutions for the Country's agenda of Faster, Sustainable and more Inclusive Growth.

The 12th plan also recognizes that basic research in India has generally followed global models during the last three decades. The challenge is how to spot, attract, nurture and encourage talents. A strong R & D sector is

important not only for competitive growth but also for addressing key strategic issues. While public funded institutions are generating technology leads, their levels of utilization by commercial enterprises have been limited. The plan concedes that the present level of research funding in India is not adequate and it needs to be substantially enhanced.

Keeping this in view, the Government of India has proposed to increase investment in R&D to Rs.150,000 Crore (about 0.6% of GDP). Partnership with institutes of higher education, schools and science institutes to make science popular among students has also been envisioned. The Government has also proposed to increase the grant for INSPIRE Scholarship for Science students from Rs.640 to Rs.3000 crore.

INSPIRE

- “Innovation in Science Pursuit for Inspired Research”
- An innovative programme sponsored and managed by Department of Science and Technology for attraction of talents in the field of science.
- The basic objective is to communicate to the Youth in order to attract them to science to build the required critical human resource pool.
- It has three components:ü Scheme for Early Attraction of Talent (SEATS)üScholarship for Higher Education (SHE)
- Assured Opportunity for Research Career (AORC)

Further, institutionalization of policy research and preparation of several thematic and periodic reports on R&D sector have also been proposed. Objectives of programmes for strengthening and building human capacity for R&D have been elaborated. The plan envisages an increase in investments in the R&D sector from the current levels of 1% to 1.45% of GDP by 2017. If the private sector engagement in R&D were to double from the current levels by the end of 12th Plan, Public investment into R&D considered necessary could be worked out at US \$ 101 billion over the entire 12th plan period.

3.14 NITI AAYOG : APPROCH TO TECHNOLOGY

The National Institution for Transforming India (NITI) Aayog has been recently set up to replace the Planning Commission to provide relevant strategic and technical advice across the spectrum of key elements of policy. At the heart of the dynamics of transforming India lies a technology revolution and increased access to and sharing of information. In the course of this transformation, while some changes are anticipated and planned, many are a consequence of market forces and larger global shifts. India’s pool of entrepreneurial, scientific and intellectual human capital is a source of strength waiting to be unleashed to help us attain unprecedented heights of success. In fact, the ‘social capital’ that is present in our people has been a major contributor to the development of the country thus far and, therefore, it needs to be leveraged through appropriate policy initiatives.

Urbanisation is an irreversible trend. Rather than viewing it as an evil, we have to make it an integral part of our policy for development. Urbanisation has to be viewed as an opportunity to use modern technology to create a wholesome and secure habitat while reaping the economic benefits that it offers.

Transparency is now a *sine qua non* for good governance. We are in a digital age where the tools and modes of communication, like social media, are powerful instruments to share and explain the thoughts and actions of the

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government. This trend will only increase with time. Government and governance have to be conducted in an environment of total transparency – using technology to reduce opacity and thereby, the potential for misadventures in governing.

Technology and information access have accentuated the unity in diversity that defines us. They have helped integrate different capabilities of our regions, states and eco-systems towards an interlinked national economy. Indeed, Indian nationhood has been greatly strengthened on their account. To reap the benefits of the creative energy that emerges from the Indian kaleidoscope, our development model has to become more consensual and co-operative. It must embrace the specific demands of states, regions and localities. A shared vision of national development has to be worked out based on human dignity, national self-respect and an inclusive and sustainable development path.

