UNIT-5 : SCIENCE AND TECHNOLOGY POLICY IN INDIA

UNIT STRUCTURE

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5.1 LEARNING OBJECTIVES

After going through this unit, you will be able to

- analyse the concept of Science and Technology Policy
- explain the different Science and Technology policies of India

5.2 INTRODUCTION

In the previous unit, you have been introduced to the basic concept of science communication along with the history of science journalism in India. In this unit, you will be given a brief overview of the science and technology policy in India .

5.3 SCIENCE AND TECHNOLOGY POLICY IN INDIA

Science and economic development of a country go hand in hand. They are in fact interrelated. India has come a long way since it attained independence way back in 1947. Since then the government of India has been strongly aware of both needs – the need to build up a powerful science base and the need to ensure that science is not only restricted to the university laboratories and other scientific organisations. Under the leadership of some illustrious leaders India managed to steadily climb up the ladder of success in the field of science and technology. Be it Rakesh Sharma's epoch making experience of being the first Indian to travel in space ,C.V Raman's contribution in the field of Physics or the Pokhran tests, India has managed to etch its name among the world's elite. The economic reforms of the 1990's opened up new vistas of development and planning with special emphasis laid on the development of

Information and Communication Technology. India has been able to build up a capacity in a wide range of areas of modern technology , from software engineering to heath biotechnology. This has enabled the country to engage itself in the global knowledge economy and deliberate on certain issues pertaining to dissemination of scientific knowledge. The key to national prosperity lies in the effective utilisation and combination of three factors - technology, raw materials and capital . Among them, human capital can be considered to be the pedestal on which the wealth and prosperity of a nation depend on. For effective utilisation of human capital for industrialisation , specialised technical and training skills are necessary.

It is necessary to have a robust and full-fledged science and technology policy in place in order to chart out a path towards scientific and economic development. The first such policy was taken in 1958 which is known as the Scientific Policy Resolution of 1958. This was followed by the Technology Policy Statement of 1983, Science and Technology Policy of 2003 and the latest being Science, Technology and Innovation Policy of 2013. Now let us discuss in brief some of the important policies of Science and Technology of the Indian Government.

5.3.1 Scientific Policy Resolution of 1958 :

The policy laid emphasis on the cultivation of science and scientific research in its three aspects – pure, applied and educational. It also aimed at providing the best possible training to research scientists and other technical personnel who would contribute towards nation building.

The SPR, 1958 resolved to *"foster, promote and sustain"* the *"cultivation of science and scientific research in all its aspects"*. It was assumed that the technology would *"flow"* from the country's established science infrastructure. Let us now look at the aims of the Scientific Policy Resolution of 1958 as has been stated by the Government of India-

a. to foster, promote and sustain, by all appropriate means, the cultivation of science, and scientific research in all its aspects- pure, applied and educational
b. to foster, promote, and sustain, by all appropriate means, the cultivation of science, and scientific research in all its aspects - pure, applied, and educational;
c. to ensure an adequate supply, within the country, of research scientists of the highest quality, and to recognize their work as an important component of the strength of the nation;
d. to encourage, and initiate, with all possible speed, programmes for the training of scientific and technical personnel, on a scale adequate to fulfil the country's needs in science and education, agriculture and industry, and defence;
e. to ensure that the creative talent of men and women is encouraged and finds full scope in scientific activity;
f. to encourage individual initiative for the acquisition and dissemination of knowledge, and for the discovery of new knowledge, in an atmosphere of academic freedom; and
g. in general, to secure for the people of the country all the benefits that can accrue from the acquisition and application of scientific knowledge.

5.3.2 Technology Policy Statement of 1983 :

The Scientific Policy Resolution of 1958 gave the much needed impetus towards building a strong agricultural and industrial base as well as a scientific manpower which is impressive in quality , numbers and range of skills. Special emphasis was given on the development of right form of technology in accordance with the needs of the society covering the agricultural and the service sectors along with the manufacturing sector. Manufacturing sector covers a wide spectrum of areas ranging from small scale industries to the medium and heavy industries. Thus technology must be implemented taking into account various economic, social and cultural factors so that it is properly utilised in the different sectors. This Technology Policy Statement is in response to the need for guidelines to cover this wide-ranging and complex set of inter-related areas. The basic objective of this policy was the development of indigenous technology and efficient absorption and adaptation of imported technology appropriate to national priorities and resources. The aims of this policy are-

a. attain technological competence and self-reliance, to reduce vulnerability, particularly in strategic and critical areas, making the maximum use of indigenous resources
b. provide the maximum gainful and satisfying employment to all strata of society, with emphasis on the employment of women and weaker sections of society
c. use traditional skills and capabilities, making them commercially competitive
d. ensure maximum development with minimum capital outlay
e. identify obsolescence of technology in use and arrange for modernisation of both equipment and technology
f. develop technologies which are internationally competitive, particularly those with export potential
g. improve production speedily through greater efficiency and fuller utilization of existing capabilities and enhance the quality and reliability of performance and output
h. reduce demands on energy, particularly energy from non-renewable sources
i. ensure harmony with the environment, preserve the ecological balance and improve the quality of the habitat; and
j. recycle waste material and make full utilization of by-products.

The Technology Policy of 1983 emphasized on the need to attain technological competence and self-reliance. By self-reliance we mean relying on one's power and resources rather than depending on others. This policy espoused this very concept of self-reliance whereby optimum utilisation of resources would be stressed on. This would go a long way in reducing the overdependence on other developed nations for procurement of resources and technology. In order to achieve this objective, the role of different agencies has to be identified, responsibilities assigned and necessary linkages must be established.

In order to be self-reliant, the technology base needs to be strengthened where manpower training would be accorded pride of place. It was mentioned in the policy that special attention would be accorded to the promotion and strengthening of the technology base in newly emerging and frontier areas such as information and materials sciences, electronics and biotechnology. However, this calls for substantial financial investments and strengthening of the linkages between various sectors such as educational institutions, research and development establishments, and industry and government machinery.

Technology Policy Statement of 1983 had drawn up certain priorities as given below-

Need for Perspective Planning

In order to develop any form of technology it is necessary to draw up a proper plan where requisite investments can be made in relevant areas without much wastage. It was categorically stated that the cost and time element involved in the import of technology and indigenous development will be given consideration. Moreover, those ministries concerned with large investments and production activities in areas like food, health and energy was said to be provided with appropriate technical support though suitably structured science and technology groups.

Employment

One of the important thrust areas of the policy was the employability of the workers. It was said that conditions would be created for the full utilization of scientific talent. Special emphasis would be given for the improvement of standards of living of those engaged in traditional activities while diversification of labourers in the decentralized sector will be done in order to reduce drudgery.

Energy

Energy is one of the most important and scarce input that is necessary for running industrial houses and other agriculture based industries. It was said that measures would be taken to avoid wastage or non-optimal use of energy. Thus, research and development in the energy sector will aim at improving the efficiency of its production, distribution and utilization , as well as improvement of efficiency of its production, distribution and utilization as well as improvement of efficiency in processes and equipment.

Efficiency and Productivity

Technology which has already been employed by a number of industries will be evaluated on a continuous basis in order to realise maximum benefits in terms of increased production and lower costs, specially in the public-sector enterprises.

In the field of development of technology, it was mentioned that special emphasis would be laid on food, health, housing, energy and industry. This has been cited below-

- agriculture including dry-land farming;
- optimum use of water resources, increased production of pulses and oilseeds;
- provision of drinking water in rural areas, improvement of nutrition, rapid reduction in the incidence of blindness, eradication of the major communicable diseases (such as leprosy and tuberculosis) and population stabilization;
- low-cost housing;
- development and use of renewable non-conventional sources of energy; and
- industrial development

5.3.3 Science and Technology Policy 2003

Science and technology have has unprecedented impact on economic growth and social development. It has made its presence felt in almost all the sectors be it in social sector, economic or scientific sector. Scientific and technological developments today also have deep ethical, legal and social implications. The ongoing globalisation and the intensely competitive environment have a significant impact on the production and services sectors.

The Science and Technology Policy of 2003 marked a paradigm shift from the earlier policies. It addressed the issues related to the field of science and technology together. It emphasized on Research and Development ("**R&D**") for addressing national problems and calls for integrating programmes of socio-economic sectors with the national Research and Development system. It also articulated upon the need for technological innovation and creation of a national innovation system. The main objective of the policy which was launched in January, 2003 was to raise India's overall research intensity from 0.80% of GDP in 2003 to 2.0% of GDP by the end of the tenth five year plan. Even though it fell short of the target, yet the GDP/GERD ratio stood at 0.88% in 2007.

The main objectives of the Science and Technology 2003 policy are –

a. To ensure that the message of science is disseminated to each and every citizen of India so that they can participate and contribute their ideas in the development of science and technology.
b. To ensure food, agricultural, nutritional, environmental, water, health and energy security of the people on a sustainable basis.
c. To mount a direct and sustained effort on poverty alleviation, enhancement of livelihood security, removal of hunger and malnutrition, reduction of regional imbalances and generation of employment by incorporating scientific tools and techniques.
d. To foster and encourage scientific research in universities and other academic, scientific and engineering institutions by attracting the brightest young minds
e. To promote women empowerment and facilitate their participation in the field of science and technology
f. To provide necessary autonomy and freedom of functioning for all academic and R & D institutions so that a perfect ambience is created which is conducive for work.
g. To make use of science and technology to protect, preserve , evaluate and update the extensive knowledge acquired over the long civilizational experience of India
h. To accomplish national strategic and security-related objectives by using the latest advances in science and technology
i. To encourage research activities in areas relevant to the economy and society like agriculture, water, health, education, industry etc.
j. To establish an Intellectual Property Rights (IPR) regime which maximises the incentives for the generation and protection of intellectual property by all types of inventors.
k. To ensure that efforts are made to have high speed access to information at affordable costs
l. To encourage research studies for prevention and mitigation of natural hazards.
m. To promote science and technology cooperation at the international level.

Primary and secondary education in Science and Technology are critical in building up a scientific community in the long run. This is because, if proper training and education are not provided at the base level to the budding scientists, then it will be difficult to induct them in the

different science and technology based sectors in the near future. An important initiative was taken in this policy whereby it was decided that infrastructure for science and engineering in the academic institutions would be modernized. Emphasis would be made on the development of science laboratories in schools and colleges.
A major initiative to modernize the infrastructure for science and engineering in academic institutions will be undertaken. It will be ensured that all middle and high schools, vocational and other colleges will have appropriately sized science laboratories. Science, engineering and medical departments in academic institutions and universities and colleges will be selected for special support to raise the standard of teaching and research. To begin with, a significant number of academic institutions, specially the universities, as also engineering and medical institutions, would be selected for this support to make an impact. Flexible mechanisms for induction of new faculty in key areas of science would be developed.

5.3.4 Science ,Technology and Innovation Policy 2013

Science, Technology and Innovation Policy 2013 is one of the important science and technology policies as instituted by the Department of Science and Technology, Government of India. Science, Technology and Innovation can be said to be the main drivers of economic development the world over. Technology and innovation stems from science which in turn is responsible for heralding the growth of science and technology globally including India. The Scientific Policy Resolution(SPR) of 1958 resolved to 'foster, promote and sustain' the 'cultivation of science and scientific research in all its aspects'. The Science and Technology Policy (STP) of 2003 brought science and technology together and emphasized the need for investment in research and development. This policy called for integrating programmes of socio-economic sectors with the national research and development system to address national problems as well as creating a national innovation system.

Science , Technology and Innovation Policy (STI) 2013 is of utmost importance because having a proper policy in place sets the momentum for the growth of indigenous technology based industries and manpower. The previous policies mainly focussed on having a sound base on science and technology. The policy of 2013 laid special emphasis on innovation which can be said to be an act of introducing new methods, ideas or products. In this context, it implies science and technology based solutions that are successfully deployed in the economy or the society. Thus, innovation has assumed centre stage in the developmental goals of the country. It is worth mentioning here that India has declared 2010-20 as the 'Decade of Innovation'. So, the government of India stressed on the need to come up with a policy to synergize science, technology and innovation and subsequently established the National Innovation Council (NInC).

STI Policy : A new paradigm

It goes without saying that science, technology and innovation co-exist together and their integration leads to new value creation. India's position on the world map will be determined by its performance in the field of science and technology. Thus, resources need to be tapped and utilised in a proper way. This would go a long way in generating a balanced and sustainable development. New mechanism must be adopted and models must be developed in order to address the pressing challenges of energy, environment, nutrition, water and sanitation, healthcare, skill development and unemployment. 'Innovation for inclusive growth'

is the new catchphrase as it implies ensuring success, and availability and affordability of solutions to a large section of population. This policy will give the much needed push towards investment in science based projects and innovation in select areas of socio-economic importance.

Thus, the key elements of the Science, Technology and Innovation Policy are listed below-

- Promoting the spread of scientific temper amongst all sections of society
- Enhancing the skill for applications of science among the youth from different sections of the society
- Charting careers in science, research and innovation specially for the bright young minds
- Establishing world class infrastructure for research and development in order to gain global leadership in select areas of science
- Positioning India among the top five global scientific powers by 2020
- Linking contributions of science, research and innovation system with inclusive economic growth agenda and combining priorities of excellence and relevance.
- Creating an environment for enhanced Private Sector Participation in the field of research and development
- Enabling conversion of research and development (R & D) outputs into societal and commercial applications by replicating hitherto successful models as well as establishing of new PPP(Public Private Partnership) structures
- Seeding science and technology (S & T) based high risk innovations through new mechanisms
- Fostering resource-optimized, cost effective innovations across size and technology domains
- Triggering changes in the mindset and value system to recognise, respect and reward performances which create wealth from knowledge derived from science and technology
- Creating a robust national innovation system

Investment in Research and Development

'Economic superpower' is a term that is meant for those countries which have abundant supply of resources at their disposal and the necessary technology backed by well trained scientists and technicians. It is known to all and sundry that technology , specially indigenous must be given more emphasis. As compared to global investments in science, technology and innovation, India's R & D investment is less. Both the public and the private sector must pump in more and more money in research activities specially in the field of science and technology.

As per the 2011-12 Research and Development Statistics Report of the Ministry of Science and Technology, Government of India , the gross expenditure on Research and Development (GERD) in the country has been consistently increasing over the years and has doubled from 24,117.24 crores in 2004-05 to Rs.53,041.30 crores in 2009-10. It is estimated to be Rs. 62, 053.47 crores in 2010-11 and Rs. 72,620.44 crores in 2011-12. The gross budgetary support for the science and technology sector has significantly increased during the last decade. The

impact of such increase is becoming evident. India ranks ninth globally in the number of scientific publications and 12th in the number of patents filed. The Composite Annual Growth Rate (CAGR) of Indian publications is around 12±1% and India's global share has increased from 1.8% in 2001 to 3.5% in 2011.

Summing up, we can say that the different science and technology policies of India over different periods of time have had a deep impact on the economy of the country. Such policies set the motion for the development of science and technology. The twelfth five year plan (2012-17) had laid emphasis on the development and growth of science and technology. It said that technology partnerships must be built with States through new models of technological solutions, design, development and delivery. It further stated that creation of Peta-scale supercomputing facilities must be given due focus and large Indian industries must be encouraged to establish globally benchmarked Research & Development centres. It is worth mentioning here that the Union Budget for the year 2015-16 have earmarked Rs. 1500 million for the purpose of research and development. This shows that the country has taken up the cause of the development of science and technology on a war footing with special emphasis on developing Institutes of excellence.

CHECK YOUR PROGRESS

Q.1 :What are the three factors on which the prosperity of a country depends upon?

Q.2 : What was the name of the first science and technology policy of India and when was it implemented?

Q.3 : Which decade has been designated by India as the 'Decade of Innovation'?

Q.4 : What is the importance of having a science and technology policy?

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5.4 LET US SUM UP

- The key to national prosperity lies in the effective utilisation and combination of three factors - technology, raw materials and capital .
- Human capital can be considered to be the pedestal on which the wealth and prosperity of a nation depend on.
- The scientific policy resolution of 1958 laid emphasis on the cultivation of science and scientific research in its three aspects – pure, applied and educational.
- The Technology Policy of 1983 emphasized on the need to attain technological competence and self-reliance.
- The Science and Technology Policy of 2003 marked a paradigm shift from the earlier policies. It addressed the issues related to the field of science and technology together.
- Science , Technology and Innovation Policy (STI) 2013 is of utmost importance because having a proper policy in place sets the momentum for the growth of indigenous technology based industries and manpower.

5.5 FURTHER READING

1) Heptulla, Najma (1986) , *India's progress in science and technology*, Oxford and IBH Pub. Co.

2) Nanda, J.N (2004), *Science and Technology in India's Transformation*, Concept Publishing Company, New Delhi

3) Singh, Ashok Kumar (2008*), Science and Technology for Civil Services Examinations,* Tata McGraw-Hill, New Delhi

5.6 ANSWERS TO CHECK YOUR PROGRESS

Ans to Q.No 1 : The key to the prosperity of a country lies in the effective utilisation and combination of three factors - technology, raw materials and capital .

Ans to Q No 2 : The name of the first science and technology policy of India was 'Scientific Policy Resolution'. It was implemented in the year 1958.

Ans to Q No 3 : The decade from 2010-2020 has been designated by India as the 'Decade of Innovation'.

Ans to Q No 4 : Science and Technology Policy is an integral part for the development of any country. It is necessary to have a robust and full-fledged science and technology policy in place in order to chart out a path towards scientific and economic development. This sets the momentum for the growth of indigenous technology based industries and manpower.

5.7 POSSIBLE QUESTIONS

A. Short Questions (Answer each question in about 150 words)

Q.1 : What is the importance of having a robust science and technology policy in place ?

Q.2 : What are some of the priorities that the Technology Policy Statement of 1983 had drawn up ?

Q.3 : What are the main objectives of the Science and Technology 2003 policy ?

B. Long Questions (Answer each question in about 300-500 words)

Q.1 : “Primary and secondary education in Science and Technology are critical in building up a scientific community in the long run” – Explain.