

## **Science communication in India: policy framework**

Bhanu Pratap Singh, Scientist G and Head  
National Council for Science and Technology Communication (NCSTC-division)  
Department of Science and Technology, New Delhi

### **Abstract**

Science and technology in modern India, cannot be discussed without referring to the discourse which is rooted in the debate initiated by the first Prime Minister of India, Pandit Jawaharlal Nehru (1947-1964). The policy documents that followed, were Scientific Policy Resolution (SPR-1958), Technology Policy Statement (TPS-1983), Science and Technology Policy (STP-2003) and Science, Technology and Innovation Policy (STI-2013). These documents envisioned, articulated and codified aspirations, objectives and strategies to mark the role of science and technology in the nation building.

First three decades after independence saw enlargement of infrastructure in terms of establishment of series of laboratories and facilities to generate S&T knowledge. Every document had emphasized the need to reach out the lay public and spread scientific awareness. The policy to popularise science and technology and foster scientific temper among masses, translated in establishment of institutions such as National Council of Science Museum (NCSM), National Council for Science and Technology Communication (NCSTC), National Institute of Science Communication and Research (NISCAIR) and Vigyan Prasar (VP). Each province was encouraged and financially supported by the central government to establish councils and departments with focus on promotion and popularisation of science and technology.

The Non-Governmental Organisations (NGO) also played a very important role in taking science to the people. The pioneering NGOs which during their initial phases were individual initiative grew into large institutions. NGOs like Kerala Shastra Sahitya Parishad (KSSP), Akhil Bhartiya Andh Shradha Nirmulan Samiti, Marathi Vidnyan

Parishad, NCSTC-Network, Karnataka Rajya Vijnana Parishat, Bharat Jan Vigyan Jatha, Science Centre, (Gwalior) Madhya Pradesh (M.P.) etc., regularly popularised science among large sections of society.

The notion of ‘scientific-temper’ has to be fostered relentlessly to keep the social ethos in sync with modern scientific knowledge. The policy frame-work of science and technology in India enunciated from time to time has continuously empowered the stakeholders including people to intensify the science popularisation.

### **Introduction**

India adopted policy on science through Scientific Policy Resolution (SPR) approved by Indian parliament in 1958, only 11 years after winning its independence in 1947, and proposed ‘to train enough science and technical manpower to fulfil the country's needs in science, education, agriculture, industry and defence’ (GOI, SPR 1958). The country’s political and scientific leadership decided to promote science and technology as a vehicle for the onward journey to progress. Pandit Nehru's commitment and faith in science & technology is expressed in his book *Discovery of India* in these words, ‘*It was science alone that could solve the problems of hunger and poverty, of insanitation and illiteracy, of superstition and deadening custom and tradition, of vast resources running to waste, of rich country inhabited by starving people (Nehru 1946)*’.

### **Cultural perspective**

India as an ancient civilisation has long history of study of natural and celestial phenomenon. Probing natural occurrences and scepticism being integral part of ancient Indian ethos. The evidence of use of S&T goes back to Harappan civilisation (Indus Valley) which had two well laid out cities Mohanjodaro and Harappa (both now in Pakistan), and the major Harappan sites in India which include Kalibangan and the port city of Lothal. This period goes back to about 5000-4500 years BP (Before Present) (Menon M.G.K. 2007).

‘*Nehru’s references of Upnishads and Budha to give an Indian flavour to the concept of the scientific temper was to find resonance decades later in Amartysen’s well-known book, The argumentative Indians, where he demonstrates that the method of*

*reason and reasoning, that the method of sceptical argument, that the acceptance of heterodoxy were, at various times, a defining characteristic of Indian civilisation'* (Jairam R. 2011 Ms).

The contributions of Aryabhata (476-550) in the form of compendium of Mathematics and Astronomy (*Aryabhatiya*), covers Arithmetic, Algebra, Plane Trigonometry, and spherical Trigonometry. It also contains continued fractions, quadratic equations, sums-of-power-series and a table of sines. Brahmagupta (598-668) wrote the famous treatise *Brahmasphuta Siddhanta* contains 25 chapters on several unprecedented mathematical results and introduced the concept of 'ZERO'. Bhaskara-I (600-680) was the first to write the Hindu-Arabic decimal system with a circle for the 'ZERO' and made significant contributions to the study of fractions. During the medieval period, Bhaskara-II (1114-1185) was pioneer in developing some of the principles of differential calculus and its application to astronomical problems computations (Subbarayappa, B.V. et. al. 2007).

The dawn of independence for India was a historical moment after almost 100 years of organised resistance, agitation and struggle. During this period, India saw a revival and revitalisation of many social systems and the nation went through many waves of transformations. The concept of 'scientific temper' might have evolved during these upheavals of Indian freedom movement and find the first mention in the, 'Discovery of India' written by Pandit Jawaharlal Nehru in 1946. He was among the frontline modern leaders of the Indian National Congress during and after freedom struggle.

### **Scientific Policy Resolution (SPR-1958)**

The SPR, with the approval of Parliament, was promulgated with the objective '*to foster, promote, and sustain, by all appropriate means, the cultivation of science, and scientific research in all its aspects- pure, applied and educational*'. The following assertion has a direct bearing on engagement of common man, the resolution calls upon to '*....encourage individual initiative for acquisition and dissemination of knowledge....*' (GOI, SPR 1958). The objective of dissemination of knowledge will certainly entail engagement of people with science and technology. A minimum knowledge, awareness

and familiarity with science and technology is necessary for developing a rational, logical and evidence based conclusions of issues related to life. SPR was the first authentic document of the Indian Government to declare its intention to make S&T a prime vehicle of national development.

The implementation of the SPR resulted into many scientific agencies. These are Defence Research and Development Organisation (DRDO-1958), Department of Space (DOS-1972), Department of Electronics (DOE-1971), Department of Science & Technology (DST-1971) and Department of Environment (DOE-1980) (Aiyagary and Lavakare 1981).

The S&T and scientific temper was considered so critical and important for India that it got a place in Constitution of India Part IVA FUNDAMENTAL DUTIES 51A.h, to '*develop scientific temper, humanism and the spirit of inquiry & reforms*' (R.S. Bedi et. al. 2000). It has got prominent place in all succeeding policy documents.

### **Technology Policy Statement (TPS-1983)**

During 1980s, the strategic and front running technologies became increasingly difficult to import. By now India has constructed strong industrial and agricultural base and a qualified pool of scientific manpower. India, therefore, came with a policy for '*technological self-reliance, improvement in the conditions of weakest sections of the population and the speedy development of backward regions*' (GOI 1983).

The Government of India, therefore, promulgated its technology policy as '*Technology Policy Statement- 1983*'. It was a national vision document that recognised the role and importance of technology in economic growth of the country. It should be noted that the policy statement was issued during the technology denial era. Developed countries refused to transfer technology in key areas of economic development. Political independence, it was realised by the policy makers long back, without economic independence is lame duck. The emphasis of the policy document was on, '*self-reliance and strengthening the technology base*'.

This document emphasized the importance of technology communication to public and proclaimed '*----- and also of those concerned, at all levels, with any sector of economic, scientific, or technological activity, and not least, the understanding and*

*involvement of the entire Indian people. We look particularly to young people to bring a scientific attitude of mind to bear on all our problems.'* It is obvious that 30 years ago India has aspired to engage entire Indian population with science and technology in order to develop scientific and technological temper to solve the problems of daily living. This was a clarion call for change in the mindset of the people.

### **Science and Technology Policy (STP-2003)**

India has already promulgated and implemented scientific policy and technology policy and by the beginning of new millennium-2000 it was felt to rationalise and amalgamate both- science and technology- by adopting a policy, which merges both. The then Prime Minister Sri Atal Bihari Vajpayee stated *'We must take science to the people. All of us are fond of quoting Pandit Jawaharlal Nehru's famous words paying a tribute to your community-namely, that 'scientists are in minority in league with the future'. This is true. But let us also remember that a bright future can be realised only when science is in league with majority of our society' (MST-2003)*. This was reiteration of the necessity of social relevance of S&T.

The S&T policy has an exclusive paragraph devoted to 'Public Awareness of Science and Technology under strategy and implementation plan'. The paragraph reads, *'There is growing needs to enhance public awareness of the importance of science and technology in everyday life, and the direction where the science and technology is taking us. People must be able to consider the implications of emerging science and technology options in areas which impinge directly upon their lives, including the ethical and moral, legal, social and economic aspects. In recent years, advances in biotechnology and information technology have dramatically increased public interest in technology options in wide ranging areas. Scientific work and policies arising from these have to be highly transparent and widely understood.*

*Support for wide dissemination of scientific knowledge, through the support of science museums, planetaria, botanical gardens and the like, will be enhanced.*

*Every effort will be made to convey the young the excitement in scientific and technological advances and to instil the scientific temper in the population at large.*

*Special support will be provided for programmes that seek to popularise and promote science and technology in all parts of the country. Programmes will also be developed to promote learning and dissemination of science through the various national languages, to enable effective science communication at all levels.*

*Closer interaction of those involved in the natural sciences and technology, social sciences, humanities and other scholarly pursuits will be facilitated to bring about mutual reinforcement, added value and impact' (GOI-2003).*

### **Science, Technology and Innovation Policy (STI-2013)**

India has declared 2010-2020 decade for Innovation. It became imperative to weave science, technology and innovation together since all these three can operate, develop and function in separate spaces (GOI-2013). Innovation in technologies can enhance economic and social development and understanding science of technology generally facilitate innovation. The STI policy is a next logical step in the policy domain.

The STI has also recognised the importance of engaging with people as the previous S&T policy documents have done. The new paradigm of the Indian STI enterprise is '*Science technology and innovation for the people*' under the paragraph '*Capturing Aspirations*' which emphasises the importance of the bond between science and society. '*Promoting the spread of scientific temper amongst all sections of the society*' is identified as a key element. It further adds '*Triggering changes in the mind-set and value systems to recognise, respect, and reward performances which create wealth from S&T derived knowledge*'. India traditionally has respected frugality, knowledge over wealth and wealth generating mechanisms. Knowledge has to be for universal good and need not necessarily be converted into wealth. In the modern IPR regime, to change this mind-set is a huge challenge.

The policy underscores the importance of public awareness of science by devoting a whole paragraph for communication of science and technology as;

### **Public Awareness and Public Accountability of Indian STI Sector**

*‘Public understanding of science is an important dimension for introducing and reaching the benefits of modern science and technology to the people. The civilizational aspect of science, or scientific temper, needs to be promoted across all sections of the society systematically. Effective science communication methods by using tools such as National Knowledge Network will be initiated.*

*Public and political understanding of science should be based on evidence and debates with open mind. People and decision makers must be made aware of the implications of emerging technologies, including their ethical, social and economic dimensions’ (GOI-2013).*

Thus, the STI has drawn the attention of nation towards the scientific literacy of the common man and decision makers to ensure the delivery of fruits of modern science and technology to the people.

### **Popularisation and Demonstration of S&T**

India is a diverse and complex country with strong regional preferences including language. There are 22 recognised national languages. The urban and rural areas widely differ in infrastructure and facilities, posing challenges to S&T communication and popularisation.

The Central agencies such as NCSTC, VP, NCSM and NISCAIR played a catalytic role in science communication. The state councils and departments for science and technology have wide linkages with S&T based NGOs. The popularisation of S&T issues/topics are conceptualised by central agencies e.g. NCSTC, modules, resource materials, kits are produced by VP and major NGOs, scientific content, formats, etc. are resourced from experts in NISCAIR and other relevant R&D organisations. Training to generate quality S&T communicators on specific and general S&T issues are organised by NCSTC, VP and NISCAIR at national and regional levels for the personnel drawn from academic media and NGO sectors, identified by State S&T councils/ department or selected directly by the organisers.

NCSTC became functional in 1984 and launched a major out-reach field project, Bharat Jan Vigyan Jatha (BJVJ) in 1987 which was a massive engagement with people

on S&T. People of all walks of life participated through 5 regional Jathas which converged at Bhopal (M.P.) after 500 halts and covering 25,000 kms. of journey. Regional languages were used for communication of focal theme – self reliance and national integration through S&T. A similar exercise was carried out during 1992 - Bharat Jan Gyan Vigyan Jatha (BJGVJ), which became precursor of 'Indian Literacy Mission' launched and implemented by Ministry of Human Resources Development.

Emerging electronic media was used to telecast 13 episodes 'Bharat ki Chhap' on television in 1989, encompassing the S&T contributions of Indian sub-continent. 'Evolution of Man' was a novel audio-serial, conceptualised and developed and was broadcast in 144 part serial from 80 radio stations in 18 regional languages.

There are many superstitions and myths surrounding celestial events such as solar eclipse. The occasion of total solar eclipse during 1995-1999, an event of the century, (Kamble, 1999), and transit of Venus 2004 & 2012 was used to explain science behind these natural events and the whole nation was galvanised through TV, NGOs States S&T Councils and school systems to use the occasion to bust the myths and sensitizing people about Astronomy. A lot of communication materials such as solar filter kit, information brochure, booklets, greeting cards, wall charts, activity kits etc. were distributed freely.

The NCSTC launched a mobile exhibition 'Science-Express' in 2007, a 16 coaches AC train to exhibit 'tunnel of science' in collaboration with Max Planck Society, Germany. It ran for four phases and currently it is running as 'Biodiversity' Special' in collaboration with Ministry of Environment and Forest. It has a class room for training of teachers in innovative pedagogy of science and a hands-on laboratory for kids. The train has run for seven rounds so far and has been visited by more than 10 million visitors.

Celebrations are used as a means of S&T popularisation. The awareness about science has been generated by celebrating Year of Scientific Awareness (YSA) 2004, World Year of Physics (Kamble 2009), Year of Chemistry, 2011, Year of Mathematics 2012 with the collaboration of S&T organisations at state level and enrolling various NGOs spread across the country.

There are a huge network of S&T based NGOs spread all over the country and they actively participate in field projects such as exhibitions, low-cost and no-cost



teaching aid, Jathas, spreading S&T awareness through cultural means such as street plays, drama, community radio etc. Some of the big and experienced NGOs such as KSSP, Eklavya, etc. are capable of producing teaching materials and science popularisation kits and implement the agenda of S&T popularisation.

National Children Science Congress (NCSC) is a unique experiment to popularise the method of science amongst the students in the age group of 10-17 years through research project around a focal scientific theme, relevant to their immediate environment. The programme enrol around a million students, teachers and parents.

## **Conclusion**

India is an ancient civilisation with a strong legacy of intellectual pursuits and keen observation of natural phenomena and intense endeavour to find acceptable explanations. Discussion, consultation and openness to the diverse views has been hallmark of the Indian social ethos. The contributions of ancient India in the field of mathematics, architecture, astronomy and natural philosophy and health have been impressive, but the generation, utilisation and propagation, if any, remained exclusive and elite in character, debarring participation of common man. Our social construct was also responsible for aloofness of S&T endeavours.

India decided, after independence, to make science and technology an integral part of its development strategy. The Indian parliament endorsed Scientific Policy Resolution, as early as in 1958, articulating the vision and aspiration of the nation. Engagement of the common man with S&T was considered a necessary part of this strategy. The S&T communication, popularisation, fostering scientific temper among masses and decision makers has been emphasised again and again through the policy documents promulgated during 1958, 1983, 2003 and 2013. Each document has amply emphasised the importance of science popularisation among the masses. Government and non-governmental organisations have played and are still playing a vital role in fostering the scientific spirits in the country.

A long term research to assess the public understanding of science is being carried out for past 20 years in Kumbh and Ardh Kumbh - a religio-cultural huge

congregation- at Allahabad, to understand relationship between awareness about scientific issues and cultural distance. (Gauhar, et.al.2002)

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