# Social relevance of science and technology

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*With growing emphasis on globalization and privatization, the institutions of development have moved far away from moral and ethical philosophies to scientific inquisitiveness, technology development, efficiency and governance. But all along the focus is on ultimately addressing to fulfil social obligation of making the society better. Therefore, it is only an approach of 'unified science' with moral and social sympathy that can provide enduring solutions to this persistent quest.*

## History of scientific development

Talking about development of science and technology (S&T) in the era of pre-industrial revolution, it was always understood that it is only the 'unified science', a balanced integration of philosophy, ethics, science, technology, sociology, economics and anthropology alone that can make this earth spaceship sail towards a sustainable development.

Unfortunately, the intellectual progress that has followed since then, has divided the world of knowledge and search for knowledge into specialities growing away from social reality and relevance by drawing boundary walls between disciplines within sciences, social sciences and technological applications. This is not something new. As far back as 1776, Adam Smith, a thinker of highest intellectual order in those days in England, with his mastery in astronomy, polymathematics, sciences and many other disciplines, wrote a book *An Inquiry into the Nature and Causes of the Wealth of Nations*. The very first chapter of that book talked on 'specialization and division of labour'. He wanted to highlight the usefulness of these two concepts in industrial management and trade. Specialization leads to intensification of efforts and division of labour to efficiency and hence progress towards accumulation of wealth. But it was all written for a different reason: wealth as the only ultimate indicator of development, for which man-made capital accumulation was the only means.

Industrial revolution took place taking rides on such notions, with engineering and scientific innovations, development and applications. But it divided the world of humans into different sets of class society, with problems of discontinuity in labour participation (e.g. as organized and unorganized sectors), incoherence between needs and innovations (e.g. nuclear and weapon technologies), incompetence of labour to adjust to emerging industrial and management needs and problems (e.g. skilled and unskilled workers), and degradation and depletion of natural resources (e.g. soil erosion, loss of top soil) and so on.

This has led to conflicts among the scientific community itself on the role of S&T for social and economic development to the extent that even the common man is often misguided about the usefulness of such developments. Albert Einstein[1] had realized way back in 1934 this increasing conflict between science and technology and its relevance to society. Just to quote from one of his addresses at the end of the world crisis in the 1930s:

> 'If there is anything that can give a layman in the sphere of economics the courage to express an opinion on the nature of the alarming economic difficulties of the present day, it is the hopeless confusion of opinion among the experts .... As I see it, this crisis differs in character from past crises in that it is based on an entirely new set of conditions, arising out of the rapid progress in the methods of production. Only a fraction of the available human labour in the world is now needed for the production of the total amount of consumption goods necessary for life ...')[1].

He had also talked about making science and technological development based on more and more societal decisions, on different occasions.

## The state of development today

The present-day world views development differently, with an angle of human development, human dignity, empowerment and sustainable development. For this, there is a need for bringing a balance between three types of wealth, namely man-made capital resources, natural resources and human capital as the three ingredients. The promotion of this balance requires for sure, a meeting point among science, engineering, technology and social sciences.

India has a long history of developmental visions. One can begin with what M. Visvesvaraya[2] said about making Mysore (the erstwhile state) a modern state with prosperity. As far back as in 1903 when he built the first ever hydel dam and power generation plant at Shivanasamundram near Mysore, Visvesvaraya had well thought-out schemes of modernizing the country by taking big leaps. He had realized the weaknesses and strengths of the society simultaneously. In his own words:

> 'The people themselves are, as a rule, passive and unaggressive. They are guided rather by the opinion of the caste of community than by a common national standard of life, thought and work, by century-old traditions and superstitions rather than by the collective experience of the modern world .... Through leaning on others, large numbers of people have become reduced to social parasites.'

But he went on to say[2]:

> 'If, as suggested in this book, the utilization of India's man power and material resources is placed in the forefront of national aims, if the people's general and technical knowledge is developed, if private initiative is stimulated, if all the latest inventions and discoveries are applied to increase production, if foreign experience is adapted to Indian conditions and fully utilized and useful foreign institutions readily adopted, if in short, all the improvements necessary and possible are in-

troduced, the development of India, politically, economically and socially, will proceed at a pace which may be one of the outstanding futures of the coming generation.'

Time has come to take a full turn around and seek solutions to the worldly problems on a 'unified science' basis. Therefore, social sciences also cannot stand out in isolation as providing solutions to all problems. But it may be useful to recount the social issues to be kept in mind while we seek technological and scientific solutions.

## Policies to bring science, technology and social sciences together

In this respect the Science Policy Statement of the Government of India (1958) is a good starting point. It talks about the role of the 'state' in cultivation of science and scientific research, to ensure adequate supply of scientific manpower, training for scientific applications, dissemination of knowledge, and to ensure that the benefits of all these go to people of the country.

The Indian Technology Policy Statement in 1983 talks about S&T development as a basis for economic progress, making the activities meeting the aspiration of the people, within the bounds of our own culture, our own resources, knowing well that the technological developments do influence the lifestyles as well as social expectations of the people.

The Indian Council of Social Science Research, established in 1958, also has been emphasizing from time to time about bridging the knowledge gaps between social relevance of scientific development and societal aspiration and expectations[3]. However, over time one notices a growing cleavage between the scientific and technology community and the people. This was recognized by none else than the late Vikram Sarabhai, almost four decades ago[4]. He had identified the need for a management approach to take S&T to the people. Among the many suggestions that Sarabhai made to the policy makers, in his own words, some of the most relevant are:

- The biggest obstacle to innovation most often arises from social factors within organizations rather than the absence of technological know-how or equipment.
- To apply ourselves to people before we can apply ourselves to the problems.
- For relating science to the real problems of society and for the application of results, a cooperative research association involving industry as a partner has many advantages over laboratories.
- Fast increasing urbanization and growing poverty need to be addressed in our development programmes.
- Recycling waste, increasing soil fertility and promoting genetic engineering, reducing pollution, increasing transparency on technical knowledge to the consumers, improving communication, etc. are some the major solutions to be taken up on priority basis.
- Solutions which provide increasing interdependence between social and political organizations, cooperation, as well as a recognition of ecological principles.
- Multi-disciplinary efforts and recognition of multivalence of individuals and institutions.
- Regard for cultural heritage of the nation to be kept in mind.

## What kinds of social issues need to be addressed?

It may be useful to list some of the major social issues which need to be accounted for while taking the development of scientific and technological progress. They are listed by no means in terms of priorities, though.

- There is a growing concern in the society today that some of the engineering and technological developments have gender bias. Examples of 'not much attention given to female health and psychological issues, over-burden of family and work-force responsibilities' can be cited.
- There is also an increasing concern about such developments to have some locational bias (such as urban bias), leading to regional and spatial disparity.
- There are increasing concerns about the use of resources, somewhat being unconcerned about the future generational requirements (an issue of intergenerational equity). Examples of technologies being biased to fossil oils, entropic accumulation of waste which cannot be got rid-off, etc., can be given.
- With the planning process in place for the last 58 years, poverty has still remained the single most burning social issue, which leads to unrest, conflicts between social groups, starvation and frustration with scientific and technological development. There is a moot question on the negative contribution of development of S&T to disregard this social devil.
- Indian industrial development has been by and large based on small-scale enterprises. But the technological development addresses mass-scale production or meets upper-class consumption needs. The expression 'appropriate technology' has vanished from the wisdom of scientific enquiry.

## Challenges in integrating social and natural sciences and engineering methods

Social scientists have been talking about their own failure on many of these fronts. Referring to use of natural and ecological resources unboundedly, a well-known social scientist, Kenneth E. Boulding[5] had warned in mid-1960s about man's growing outlook about earth as a closed spaceship:

> 'Economists in particular, for the past, have failed to come to grips with the ultimate consequences of the transition from the open to the closed earth . . . . I would argue strongly also that our obsession with production and consumption to the exclusion of the "state" aspects of human welfare distorts the process of technological change in a most undesirable way.'

Social systems are complex. They involve people with a variety of inhomogeneous characterizations and descriptions. There is a constant struggle on addressing social issues at 'individual' vs 'societal' basis. However, on a practical basis some of the major and commonly talked about social ills are:

- Levels of poverty and income inequality.
- Gender bias in social configuration.
- Regional inequity due to technology hubs and urban biases.

- Intergenerational equity due to over-exploitation of natural resources and non-development of alternative technologies and resource choices.
- Lack of scientific and technical skills to meet basic needs of the society.
- Imbalanced emphasis on development meant for elite consumption.
- Lack of emphasis in technology development on health and quality of life requirements.
- Ignoring indigenous knowledge and technology has alienated a large section of the population from the mainstream of technology and development.
- Increasing neglect of employment as a major instrument of empowerment and adding human dignity.

All these call for a continuing dialogue between scientific, engineering and social scientific communities to take the technological developments addressing these priority issues beyond success in laboratories and publications.

In terms of possible directions to take the process of integration of social and natural science methods, it can be stated that a balanced approach is required in the promotion of technological developments between the small, medium and large-scale industries, and between local, rural and urban people. This calls for public sector research and technology institutions to opt for careful project selections and dissemination procedures to the people on a large scale. Additionally, a PPP mode should be explored to further this process to bridge the gaps between the sectors mentioned above. Some legal changes are also required to make transfer of indigenous technology on some kind of patenting and royalty basis, and also some kind of 'technology audit' to ensure gender and regional balance and employment creation in the process of implementation.

Some development has taken on these lines, with several of the IITs, ICAR, ICMR, CSIR and several engineering institutions having introduced divisions of Humanities and Social Sciences, or undertaking research studies on agriculture, heathcare, demographic transition, labour-intensive technologies, clean technologies, alternative energy sources, etc.

A large number of institutions in the NGO sector have also been actively engaged in the promotion of this unified approach of technology development, promotion for redressing social problems, some as their mission and some as additional social commitments. A recent phenomenon is increasing involvement of private sectors not only in technology development, but also to make sure that they have social approvals.

On the occasion of 70th birthday of Mahatma Gandhi, in 1939, Einstein said the following.

> '... a politician whose success rests not upon craft nor the mastery of technical devices, but simply on the convincing power of his personality ... Generations to come, it may be, will scarce believe that such a one as this ever in flesh and blood walked on this earth'[6].

Since Gandhi was a representative of the poor and exploited population, perhaps Einstein meant that his statement is also generalizable.

In the end, it may be useful to recall theoretical physicist Stephen Hawking, who put up a question on Internet in 2006: 'In a world that is in chaos politically, socially, and environmentally, how can the human race sustain another 100 years?'. Among the over 25,000 people who logged on to give their answers, there were many who wanted to know what Hawking's own answer would be. Finally his response came: 'I do not know the answer. That is why I asked this question'.

But the quest must go on.


1. Einstein, A., In *Mein Weltbild*, Amsterdam, 1934; reproduced in Einstein, A., *Ideas and Opinions*, Rupa & Co, New Delhi, 1979, p. 87.
2. Visvesvaraya, M., In *Restructuring India*, P.S. King & Sons, Westminster, UK, 1920, p. 8, 14.
3. Indian Council of Social Science Research, 'Restructuring the Indian Council of Social Science Research', Report of the Fourth Review of Committee of ICSSR, New Delhi, March 2007.
4. Sarabhai, V., *Science Policy and National Development*, The Nehru Foundation, Ahmedabad, 1974.
5. Boulding, K. E., In *The Economics of Coming Spaceship Earth* (eds Markandya, Anil and Julie Richarson), John Hopkins Univ. Press, Baltimore, 1966, p. 27.
6. Einstein, A., In *Out of My Later Years*, Philosophical Library, New York, 1950; reproduced in Einstein, A., *Ideas and Opinions*, Rupa & Co, New Delhi, 1979, pp. 77–78.



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