

Visions for India: public participation, debate and the S&T community

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This article is an exploration into the nature, width and scope of science and technology visioning exercises in India, particularly in the context of how these narratives are presented and discussed in Current Science, one of India's premier science journals. We categorize these visions into two broad categories – one is a vision that is more individual and/or domain-specific; the other is the institutionalized vision that has a larger mandate and canvas and that creates imaginaries of the future and/or provides horizons for society and S&T to move towards. Prominent examples of the latter are India's Technology Vision 2020 and the most recent, Technology Vision 2035. We observe that visioning exercises in the country have been and continue to be taken up quite prominently, but narratives and debates around them are present only marginally in Current Science. We discuss possible reasons for this and conclude with the hope that more attention will be paid to such exercises and documents on the accounts of investments that are made in them, on the implications these visions have and the importance of imaginaries of the future they create for society, country and for S&T.

Keywords: Technology visions, technology assessment, visioning exercise.

'The document articulates a vision for all Indians in 2035. This is not a vision of technologies available in 2035, per se; rather it is a vision of where our country and compatriots should be in 2035 and how technology would bring this vision to fruition.'¹ (p. 21).

Large scale visioning exercises have been carried out in India at regular intervals by various government bodies, both at the national and state levels. TIFAC (Technology Information, Forecasting and Assessment Council), a premier institution under the aegis of the Department of Science and Technology (DST), Government of India (GoI), recently put out a vision named Technology Vision 2035 (TV-2035), about how India should look like in 2035. One of the main assertions of TV-2035, as the above quote indicates, is that this is a vision for all Indians. Visioning exercises are meant to foster a collective debate through which we identify where we as a society should aspire to be in the future. Such structured exercises are premised on the idea that making of such public visions influences future narratives and development of science and technology (S&T), even as they invoke S&T in narratives about the future society. There is often a claim/expectation in the making of these visions, that they are a product of public debate, engagement and

participation. And it is this specific aspect of the process of visioning that we seek to explore in this article, mainly through its narratives and visionings in *Current Science*. We will use the case of India's TV-2035 to reflect on the implications of the apparently scarce public engagement during and after visioning even among the wider S&T community¹.

Rationale of visioning exercises

Visioning exercises are recognized as public exercises geared to identify the horizons and goals which a society can work towards. While visions ought to reflect the normative goals and values that a society finds desirable, an important trajectory in this practice is the development and deployment of S&T that are analogous to the publically articulated vision. This model of development of technology deviates from an understanding of technology development as organic, and underscores the importance of involving different social groups to direct the development and deployment of S&T in socially desirable ways. Techniques like visioning, forecasting, backcasting, technology assessment, and fore-sighting are all seen as part of this broader constellation of ideas and processes to direct and channelize upstream R&D to be in consonance with the societal vision. The development of the idea of visioning and various attendant techniques have an important historical context: they were a direct

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response to the dangers from the catastrophic failures of technology witnessed in the latter half of 20th century, prominent examples being the use of atomic bomb in World War II, the ‘three mile nuclear accident’ in the US, the nuclear meltdown in Chernobyl and the Bhopal gas tragedy in India in 1984 (refs 24, 28). Technology was ‘biting back’²⁴ (p. 569) and efforts were begun to understand the gamut of the impacts of its development.

Technology assessment (TA) was institutionalized first in 1972 at the US Office of Technology Assessment (OTA), and followed in other Organization for Economic Co-operation and Development (OECD) countries in the 1970s and 1980s (ref. 29). The US Congress Act that established OTA, sought assessments that would ‘provide unbiased information concerning the physical, biological, economic, social and political effects’ of technologies^{21,22}. Ely *et al.*²¹ note that TA traditionally focused on individual technologies and could only ‘provide inadequate accounts of the social, technical and ecological complexities and uncertainties at stake, and (therefore paid) insufficient attention to the power relations that often control technological changes’. These were unable to ‘account for complex physical, social and political realities that are crucial to achieve sustainability and development goals’ and what is needed therefore is to ‘position technologies within dynamic pathways of change at the system level, recognize alternative understandings of these systems by different groups within society and attempt to build resilience in the face of pervasive uncertainty’. New configurations of TA were needed which would accommodate the different diversities and value systems that existed in society; account for the different values embedded in power hierarchies, be more participative, inclusive and transparent in deciding technology pathways to achieve development goals.

While the OTA in US itself was shut down in 1995, the idea of TA has grown and taken on more complex forms in different parts of the world, particularly in countries of Western Europe like the Netherlands, Germany, Denmark and UK, emerging as ‘new models of technology assessment’ (...) (which) combine citizen and decision-maker participation with technical expertise²¹ (p. 7). The new models include constructive technology assessment^{23,30}, participatory technology assessment³¹, real-time technology assessment (RTTA)³², open-source technology assessment or e.TA³³, integrative participatory technology assessment (IPTA)³⁴, or a third generation of technology assessment³⁵. These new approaches are more broad-based and inclusive forms of appraisal and recognize that there are a wide range of norms and values extant in society that have a bearing on technology assessment, particularly on ‘upstream’ issues, such as ways in which issues and problems get defined, or over the choice of effects or impacts to assess²¹.

Though we are specifically focusing on practices of visioning in this article, the intention is to look at them as

part of the broader constellation of ideas and processes such as assessment, forecasting, foresighting and imaginaries³⁶, which deal with the nature of S&T’s relationship with society and its future.

Visioning in India

The emergence of TIFAC, a premier institution that has prepared two prominent vision documents, can be intellectually located within the aforementioned concern for a broader understanding and direction of technology through explicit visioning, foresight and assessment. TIFAC was created as an autonomous body under DST in 1988 as a response to the ‘need for undertaking technology forecasting and assessment on a systematic and continuing basis highlighted in GoI’s Technology Policy Statement (TPS) of 1983 (ref. 38). It is indicative of an acceptance that societal influences on and of S&T have to be accounted for, and that the choice in trajectories of development and deployment of S&T in India cannot be the brief of scientists and technologists alone.

Relevant here are the many vision documents that have been brought out in the past decades and the various public authorities that have produced them. The most prominent formal visioning carried out in India prior to TV-2035, was the one related to the formulation of Technology Vision 2020 (TV-2020). Produced by TIFAC in 1993, it was a set of 17 documents covering 16 technology areas and one service sector. This was released by the then Prime Minister (PM), H. D. Deve Gowda, and claimed to ‘provide directions for national initiatives in S&T’⁴. TV-2020 became prominent in the public sphere on account of its association with the late A. P. J. Abdul Kalam, then chair of TIFAC and widely seen as the person at the helm of the TV-2020 process.

Kalam had even emphasized the need for a vision for a ‘Developed India’ in his acceptance speech as the President of India in 2002. The 10th Planning Commission (2002–2007) had also constituted a separate committee that prepared a report on ‘India Vision 2020’⁵, covering a broad range of developmental issues that went beyond the development of S&T. Significantly, the 10th Five Year Plan is said to have marked the return of ‘visionary planning’ after a long interregnum of cautious optimism⁶. Under the guidance of the Planning Commission, a special chapter on ‘Vision of Punjab 2020’⁷ was also included in the State Development Report of Punjab prepared by Centre for Research in Rural and Industrial Development (CRRID). The Science and Engineering Research Council under DST had prepared vision documents in six S&T disciplines (note 2) in the mid-90s and a vision document on biotechnology, prepared by the Department of Biotechnology (DBT), was released by the then PM, A. B. Vajpayee in 2001 (ref. 8). At the state level, Andhra Pradesh Vision 2020 (refs 9, 10) was

formulated in 1999 under the guidance of the then Chief Minister, Chandrababu Naidu. The government of Karnataka published a Vision 2020 (ref. 11) document in 2009, and constituted a Vision Group on Science and Technology under the chairmanship of C. N. R. Rao in the same year. The North Eastern Council prepared a Vision 2020 document in 2008 for 'Peace, Progress and Prosperity' of the North Eastern Region¹², while Tamil Nadu's state Infrastructural Development Board released a Vision 2023 (ref. 13) document in 2012 for the strategic development of infrastructure in the state. A Vision 2018 document was released by Madhya Pradesh state planning commission to 'lay foundations for the state's growth and development'¹⁴ and the Himachal Pradesh government recently launched PEHAL, a vision document for Shimla district¹⁵.

While it is not our endeavour to provide an exhaustive list of visioning exercises or to analyse their substantive contents in this article, the extent and scope of such processes is indicative of the government's recognition that visioning is important for development in general, and development through S&T in particular. Significantly, the present government has accepted, endorsed and owned TV-2035 even though the process was initiated when their political adversary, the United Progressive Alliance (UPA), was in power. That the PM himself released TV-2035 in 2016 attests to the endorsement it has from the highest political quarters; it may be noted, similarly, that the PM of the day, H. D. Deve Gowda had released TV-2020 in 1993 and the same was the case with the Science Technology and Innovation Policy (STIP) 2013, that was released in 2013 by the incumbent PM, Manmohan Singh.

It is indeed a reasonable inference that there is a similar recognition about the importance of visioning and its techniques within the techno-scientific establishment in India, given that prominent techno-scientists like A. P. J. Kalam and Anil Kakodkar have held prominent positions in a premier agency like TIFAC.

Technology Vision 2035: technocracy and public representations

India Technology Vision 2035 (TV-2035) (refs 1, 16), released in January 2016 by PM Narendra Modi, has an overarching vision statement that is sought to be achieved by roadmaps for 12 distinct sectors (note 3). Purportedly, these roadmaps were identified following in-depth analyses and discussions seeking to provide the existing status, future projections and the gaps or challenges besides plotting the future technology trajectories¹ in each of the identified sectors. The vision document aims to root itself into the collective aspirations and expectations of the people and ambitions of the youth in 2035 as the country grows¹. Further, it considers the technological 'people-

scape' of India to be as important as its technological landscape.

The exercise of putting together TV-2035 has been wide-ranging in its scope, depth and ambition; it involved a broad canvas of engagement that was carried out for over three years with direct involvement of about 5000 experts and nearly 20,000 other indirect contributions¹. The vision documents and roadmaps for different sectoral groups that constitute the overall vision are presently under preparation and are expected to be released in due course.

Notwithstanding claims that TV-2035 is not a vision only of technologies available, a careful reading suggests that it is indeed a vision of technology and that too of a particular type. This is amply demonstrated, for instance, in the overview Technoscape that the vision articulates for the Food and Agriculture (F&A) sector. The future for India's F&A sector is exclusively technological according to TV-2035, suggesting, as it does technologies like advanced genomics and phenomics, robotic farming, hydroponics/aquaponics, nanotechnology applications, biofortification, apomyxis for fixing hybrid vigour and molecular manufacturing of food. It is most unlikely that representatives of the farmer, who in different ways dominate the political, economic and physical landscape of the country, have had any contribution in this vision. Striking in this narrative, also, is the complete absence of existing knowledge systems, farming practices and traditional farming technologies that are being considered again in scientific discourses, including in *Current Science*¹⁷⁻²⁰, for their qualities of sustainability for agriculture, resilience and even productivity. This is a vision in which real time agriculture and agriculturists are present only in name.

That this vision does not reflect the concerns of contemporary farmers is also starkly connected to the composition of the team that has formulated this vision. The vision is mainly created by the techno-scientific bureaucracy. Of the 24 names listed as key contributors, only a couple are from outside the formal S&T architecture of the country. The rest are all serving scientists or bureaucrats in institutions like Defence Research and Development Organisation (DRDO), various Council for Scientific and Industrial Research (CSIR) laboratories and the Indian Institutes of Technology (IITs), former bureaucrats/administrators like former secretaries to the government or former heads of some important S&T establishments. Citizens and the peoplescope that TV-2035 claims to include, appear missing in vision creation and in visioning. If at all they are present, they are present primarily as recipients of the vision, like the one for agriculture explicitly indicates. The agency of citizens and of 'other' knowledge systems is conspicuous by its absence, raising concerns about the ability of S&T establishments to conduct such consultative and representative visioning processes even when they are claiming to do so.

Broader societal engagement in visioning

It is important to note that the aspiration to include citizens in processes of technological choices, its development, and of broader visioning are all today a requirement in global governance, including that of technology. This invocation of citizens is not imposed from outside the techno-scientific establishments but has emerged from within the logic and trajectories of modern S&T development. This logic is evident and clear in the extensive literature of technology assessment (TA)²¹⁻²³, in the development of engineering ethics field²⁴, the framework of responsible research and innovation (RRI)^{25,26} and of the larger, more generic field of science and technology studies (STS)²⁷. It is within this logic that we seek to place the creation of TIFAC in 1988, and the claims of participation made in TV-2035.

In contrast to the expectations and claims of engagement in TV-2035, this vision has emerged purely from within the S&T establishment in India and, as mentioned earlier, is dominated by futuristic technologies that have little resonance with contemporary concerns and realities of large sections of our society. Although there is little of the peoplescope in TV-2035 that it claims to represent, the least that can be expected is a rich body of debate and critique about them, at least among the S&T community.

It is with this idea that we looked through *Current Science*, an important (perhaps the most important) space for the S&T community, to share and exchange attendant ideas. How have issues of visioning, and of the various narratives been discussed and debated in *Current Science*? What emerges is the sheer absence of discussions and debate on visions and visioning which is most conspicuous (note 4).

There is, for instance, not much engagement with the process or the content of TV-2035 in *Current Science*. While it might be argued that TV-2035 is too recent a document for its contents to be debated in a peer-reviewed journal like *Current Science*, the absence of any substantial discussion on most of the visions and visioning exercises listed earlier, is striking. This is particularly noteworthy in case of TV-2020, which despite Kalam's high profile and the visibility that it gained, is hardly discussed here. The only substantive comment on Kalam and Rajan (and TIFAC's) TV-2020 found is a review in 1998 by Yashpal⁴¹ of Kalam and Rajan's book *India 2020: A Vision for the New Millennium*³⁹. Other than that there is only a brief response that appeared in a 1999 issue of *Current Science*⁴². TV-2020 initiated in 1993 involving some of the country's most prominent S&T institutions and their leaders finds virtually no other mention in *Current Science*. Similarly, the process for the formulation of TV-2035 has been going on for nearly four years now, yet there is no account of this in such a significant journal.

A similar point might be made of the Science Technology and Innovation Policy (STIP)⁴³ that was released in 2013 by the then PM, Manmohan Singh. While STIP was discussed and debated in *Current Science* to some extent⁴⁴⁻⁴⁸, yet it is inadequate in light of the relevance and bearing such policies have on research priorities, resources and infrastructure that are at the heart of S&T enterprises.

This, we believe, signifies a worrying aspect of visioning in the country. Even if we consider visioning as merely about S&T, they seem to be so narrowly crafted that they are not a product of debate or subsequent discussion even within the wider S&T community. This absence could, at one level, be due to certain editorial policies and preferences of the journal itself. This appears consistent with a paucity of attention in *Current Science* to the analysis of S&T by social sciences/humanities – very few research papers are published here on the politics of knowledge, politicization of science or scientization of politics, even though there exists more literature in the social studies of S&T. Further, that participation in and critique of S&T visioning and visions is so dismal becomes doubly significant since visioning appears to be mostly in the hands of the techno-scientific establishment. This shows the failure of the scientific bureaucracy, reflecting the general neglect witnessed in important issues at the intersection S&T, policy and society⁴⁹.

This importance can be understood if one looks at TIFAC's previous document, TV-2020, which gained significance due to its association with A. P. J. Kalam, the 'scientist-president' of India. A careful reading of *India 2020: A Vision for the New Millennium*³⁹, that Kalam published along with his associate Y. S. Rajan, leads to important questions on the comprehensiveness and appropriateness of this vision for a country as huge and diverse as India. This is amply evident in the stress and prominence (not) given to certain sectors in Kalam and Rajan's account. Crucial issues like access to clean drinking water, which is a daily struggle for millions in this country, get only a marginal mention in this vision; matters of defence supplies and production, Indian space programme, and nuclear technology, all put together under Strategic Industry, get an entire chapter in addition to repeated references and invocation in other parts of that narrative. Writing in the journal *Futures*, Kishen Pattnayak⁴⁰ notes pertinently that 'Abdul Kalam's development vision is a by-product of his military vision (...) (that) war and development are concomitants in modern civilization'. Evidently there will be serious and complex implications for citizens and our democracy when such visions and visioning exercises dominate the narrative of the nation and its future, even as they claim to be its representatives.

Visioning processes in India appear to be characterized by a distinct inability to come up with visions that have wider resonances than what is considered appropriate by the top brass of the techno-scientific establishment. And

even this is marked by virtually no debate, discussion and critique from the rest of the S&T community, leave alone from other sections of the society. The processes are dominated by these miniscule (albeit powerful) spaces not only for a S&T vision, but also for visions for a collective future. S&T processes no doubt have an important space, but they can only be one among other key components. If various actors have to come together for formulating visions and suitable S&T trajectories, then the current institutional set up needs to be modified to perform such important tasks.

Notes

- We use visioning here as a term that is inclusive and also linked at the same time to other ideas and processes such as assessment, technology futures, foresighting, etc.³⁶.
- The six disciplines were Chemical Science, Earth and Atmospheric Science, Engineering Science, Life Science, Mathematical Science and Physical Science.
- The sectors are Education, Medical Sciences and Healthcare, Food and Agriculture, Water, Energy, Environment, Habitat, Transportation, Infrastructure, Manufacturing, Materials and Information and Communication Technology (ICT).
- It needs to be noted here that a certain (limited) level of engagement with the narrative of visions about S&T does exist in *Current Science*. What is salient about these engagements is that they are not assessments of visioning exercises like TV-2020 and TV-2035, but revolve primarily around specific sectors and articulations about the visions of specific individuals regarding techno-science or development. Examples would include C. Rajagopachari's⁵⁰ message to the 1947 Indian National Science Congress titled 'The Future of Indian Science' that was carried in the same year in *Current Science*; the Science and Engineering Research Council's (SERC) Vision 2005 for the Earth Sciences⁵¹ that appeared in 1996; and K. L. Chopra's 'Technical Education – Vision 2010'⁵² that was published in 1997. There have been opinion pieces as well – correspondence from S. B. Kabiraj with the title 'Science in India: vision and reality'⁵³ in 1995, P. Balaram's editorial in 2000 titled 'Visions and Nightmares'⁵⁴ and a note in 2010 on Madan Mohan Malaviya's vision on S&T on the occasion of his 150th birth anniversary⁵⁵. There have been detailed sectoral assessments as well, like the one on biotechnology in 1991 (ref. 56) and one on 'Water for India in 2050'⁵⁷.
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