

India's Tryst with Destiny- Establishment of the Highest Level of Engineering and Technology



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Introduction

The national commitment to build the new India was eloquently expressed by Jawaharlal Nehru in the first breath, as India achieved Independence at the midnight, August 15, 1947: “Long years ago, we made a tryst with destiny, and now the time comes when we shall redeem our pledge... We have to build the noble mansion of free India...” India has very far to go. Engineering and Technology will be the central activity in building this ‘noble mansion’. In view of the vast challenges and some severe constraints, determined efforts with vision and discretion are needed.

The author got involved in this challenge by several chance events and his experiences are presented to contribute to the policy formulation in this context. There have been two streams of the author’s activities, one relating to Water and the other relating to Technology Policy Formulation, both in a way interacting as the author’s activities advanced. Each will therefore be presented separately first, with the integration brought out at the end.

Author’s Increasing Involvement in the Development of Water Resources

The author passed from out Thomson College of Civil Engineering, Roorkee (now IIT Roorkee) in 1946 and was engaged in the Irrigation Department, Government of the United Provinces (now Uttar Pradesh), under the British regime. He was associated with India’s water resources at increasingly higher levels of activity, starting with the construction of one of the first hydro-engineering station, Khatima Power House, and next the first major dam in Ganga basin-Rihand.

He and his wife, who had also been working in the area of education, decided to advance their knowledge and go to USA for higher studies. Fortunately both were awarded Fulbright Travel Grant and Assistantships at the university. As they completed their doctoral studies, both were offered jobs at the US University but they preferred to return to their country and serve her. Indian Institute of Technology (IIT), Kanpur was just being established, essentially by a consortium of US universities led by MIT. He was invited to join as Head, Department of Civil Engineering, being the first professor appointed in the engineering section. He was the oldest faculty member, aged 37 years! Vipula Chaturvedi also joined the Humanities Department.

To be engaged in establishing a new IIT in a leading capacity was an exciting experience. But, it was cut short as the Government of Uttar Pradesh, to which the author still belonged, recalled and appointed him as the Director, Designs, Ramganga Dam, the first major water resources project on River Ganga system in the Himalayas. This also meant that he became a Member, Board of Consultants of all major projects in the Himalayas, working with the

leading Indian and International engineers, who constituted this forum. It was an even more challenging assignment.

As the Ramganga Project design was completed, he got an invitation from IIT Delhi, which was being established, to join it as one of their senior most faculty member. This was also exciting, but what made it even more so was that it led to collaborative research with Harvard regarding the development of India's waters, which continues to this date¹. This came through an interesting chance international interaction, both for Harvard and the author.

Harvard is hardly a leading engineering institution, but development of the art and science of water resources was being revolutionized by the emerging science of system analysis, undertaken collaboratively by engineers and economists (Mass et al 1962). Harvard was the leader in this emerging area. At this very time Harvard became involved in the development of the Pakistan waters during President Kennedy's regime. He was willing to give money to General Ayub Khan, her NATO partner, but not for purchase of military equipment. It was brought to his attention that West Pakistan was suffering from a serious salinity problem of her irrigated areas and she will be glad to get technical and financial help. This was offered by Kennedy and was gladly accepted by the General. This task was undertaken by Roger Revelle, an important scientific and political person, serving Kennedy at the highest level (Revelle et al 1964). After its completion, the Harvard scientists undertook the challenge of the management of the waters of East Pakistan (which ultimately became Bangladesh). This led to her involvement in the management of Ganga waters. Harvard scientists suggested that the development of Ganga waters should be planned in terms of this emerging science of systems analysis (Rogers 1967). Dr.K.L.Rao, the Minister of Irrigation, also got the same message from Prof.Warren Hall, whom he met in California, as he had gone there to study its water development in the context of his scheme of transferring waters from Ganga to Cauvery. Nobody in the Government of India (GoI) knew what systems analysis was and what was meant. Close interaction developed between Dr.Rao and the author. He was keen on the modernization of water resources activities of India, but the bureaucracy was indifferent, a great problem in the area of public service technology modernization, which continues.

Continuing the story, close collaboration developed between the author and Harvard, thanks to the support of the Ford Foundation, which continues. (The author's wife has also been active in her field of education, thanks to Roger Revelle, who was also a leading educationist, working as a Member of the Kothari Education Commission. She would work at the US universities with which the author gets associated). Roger Revelle and the author got engaged closely in the development of India's waters since 1971, first independently and later collaboratively, as both of us considered that the development of India's waters can be totally transformed. We demonstrated that the monsoon waters could be stored by charging the groundwater. Thereby we could more than double the water availability, and even more importantly, put water in the hands of the farmer, making him independent of the bureaucrats and gods! Roger called his proposed revolutionary technology Water Machine and later adopted the author's independent development, Chaturvedi Water Machine. We worked closely, organized workshops of Indian and US scientists to have our proposals discussed. Ultimately we submitted them personally to the then Planning Commission Member in this area, Prof.M.S.Swaminathan, to which the then Secretary, Ministry of Water Resources, Government of India, Patel, was also invited. He took the responsibility of getting our proposals examined but instead, put them aside. He was hooked to his 'absurd' scheme of Interlinking of the Rivers of India, which unfortunately still dominates the official thinking and even gets wrongly reported even on behalf of the Academy².

Dr.K.L.Rao had proposed transferring of Ganga waters to south India, joining it with Cauvery ultimately. He had proposed pumping of the waters up to cross the Vindhyas. The author, who had been working closely with him, considered use of hydroelectric energy for this purpose, generated in the Himalayan Rivers. Working on this idea, a novel way of developing hydro-energy, storing it, and transferring the waters to south occurred to the author. This has been called Chaturvedi Water Power Machine.

Another idea regarding provision of water in the Gangetic basin has been proposed by a US firm which was involved in exploring oil in it, in collaboration with the concerned Government of Indian agencies. They did not find oil but artesian waters were noted. The US Company later carried out detailed investigations regarding the availability of water. On completion, they proposed its development. The World Bank organized a meeting in Washington to which the former Secretary, Ministry of Water Resources, C.C. Patel and the author were invited. The author considered it an excellent idea but Patel was against it, perhaps because it ran foul with his absurd scheme of Interlinking of Rivers of India. The scheme is not talked of any more.

The author had been proposing to the Government of India, Ministry of Water resources since the beginning of this century that the development of India's water should be undertaken in terms of these proposed advances in a coordinated integrated manner. Presentations were made to the Central Water Commission (CWC) but nothing happened. But the author persisted. He brought out the subject of again to the attention of the Minister. He desired that a workshop on the subject be organized by the Ministry. The proposed revolution was again brought out in the Workshop, held by the Ministry on November 10, 2009. We demonstrated that the development of India's waters can be revolutionized through several novel technologies that we have been developing: (1) Chaturvedi Water Machine, (2) Chaturvedi Water Power Machine, (3) Development of Artesian Waters and (4) Integrated Surface Water, Ground Water and Power (Chaturvedi 2009). This has been brought out comprehensively in three books (Chaturvedi 2011a, Chaturvedi 2011b, and Chaturvedi 2012). They have been submitted to the Government of India. But action in the area, which is being suggested to the Government at the highest level for a very long time, continues to be ignored!

However, a chance event has provided hope. The Chief Minister of Uttar Pradesh, Akhilesh Yadav, happens to have Environmental Engineering specialization, up to Masters Level, from an Australian university. The three recent books by the author, bringing out the formidable challenges India will be facing in the management of her water resources as India undertakes her development and the revolution needed and possible as proposed by the author came to his attention. He could appreciate the subject, in view of his personal enlightenment, and he invited the author to guide the development of Uttar Pradesh waters. A Workshop of the State officials and concerned professors at IITs in and adjoining UP, to achieve the highest level of technological activity in this area, is proposed to be organized shortly. Hope some action follows.

Establishment of the Centre for Policy Studies at IIT Delhi

The author got involved with the establishment of a Centre for Policy Studies at IIT Delhi concurrently with his involvement in the advancement of water resources, the two interacting a bit too.

Prof. Subramanian Swamy joined IIT Delhi from Harvard. He is very dynamic person. Coming from Harvard, he was aware of the developments in the area of Systems

Engineering. He organized a seminar in which interested faculty from all disciplines were invited to participate, to share their ideas and experiences in the context of the challenges that they may be studying, with particular concern about the evaluation of their developments from the societal perspective, of which, economic valuation is an important concern. This brought Prof. Satsangi from Electrical Engineering, Prof Prem Vrat from Mechanical Engineering, and the author, a Civil Engineer, besides Prof. Swamy, together, all of whom were a bit knowledgeable and interested in this area. Unfortunately, Prof Swamy was lost to IIT Delhi for some reasons but we continued, though not with that much dynamism. A Centre for Systems Studies was established at the IIT Delhi.

It is increasingly being emphasized that a new perspective and approach to human development has to be considered. Society, Economy, and Environment are one integrated system, and their management has to be considered integrally. Advances have been made to develop the appropriate policies, based on participative interactive management, backed by system dynamic modeling (Bossel 1998). We have extended it in Indian perspective (Chaturvedi 2013b).

An important extension follows, which is directing the establishment and development of an important aspect of technology study at some major international educational institutions-Technology Policy Study Programmes. The author got involved in this area through his own experiences. Some of the author's friends at international engineering institutions were also developing similar ideas. They have much more opportunity of experimentation and established Centre of Policy Studies, MIT, with which the author interacts closely, during his summer sojourn at Harvard. An Indian scholar at Harvard, Ambuj Sagar was actively involved in it.

Attempts at Implementation of the Ideas

Establishment of the Centre for Technology Policy Studies at IIT Delhi

Fortunately, three Indian scientists at Harvard conveyed to IIT Delhi to come over and establish the program in this area. IIT Delhi concurred, after considerable hesitation. We lost two of them but one, Prof.Ambuj Sagar, did come and join.

Another development was taking place at IIT Delhi, thanks to the vision of its Chairman, Prof. M.G.K. Menon. He proposed establishment of Professorial Chairs, whereby an identified Professor gets additional funds equivalent to his salary, from endowments made by people to establish a Chair at IIT Delhi, to undertake his activities with freedom. He can only take about 20% of it personally, but he gets freedom to travel around, hire research scholars and so on, without any questions asked! This also entitles the donor to participate in these activities closely, thereby enabling additional support and insight in the subject to the IIT Professor and the opportunity to the donor to contribute.

IIT Delhi has established Centre for Policy Studies, the first anywhere in India. The author has donated the required sum of Rs.40 lacs for the establishment of a Professorial Chair in this area. The identified professor, one of the three who had wanted to come back to India to establish this Centre, Prof. Ambuj Sagar, has been appointed Vipula and Mahesh Professor there. He is undertaking the activity with commitment, in collaboration with MIT and some other leading international institutions, and the author.

Advancing Technology in the Water Area in India

We brought out above, the challenges that India faces in the development and management of her waters and the tremendous opportunities in revolutionizing the area. We also brought out how some action has got started of late, thanks to the interest of an enlightened young political leader Shri Akhilesh Yadav. His vision and support, as discussed above is inspiring. India's water problems abound and the academicians have to take dynamic initiative.

History also demands it. Thomson College of Civil Engineering was one of the world's first engineering college, established in 1846, in the context of the construction of the Ganga Canal (Cautley 1870). Thomson, was the Chief Engineer and later the Governor of UP, in whose name the college was therefore established.

Some examples of the problems and suggestions for their resolution may be given. India's water development depends greatly upon Nepal as most of the Himalayan Rivers originate there. The Nepal Ambassador happened to be a doctoral student of the Prime Minister, Manmohan Singh. He was tremendously knowledgeable and he appreciated the revolutionary India-Nepal collaborative development of Ganga waters through the Chaturvedi Water Power Machine, proposed to him by the author. It can be undertaken only if Nepal undertakes collaborative development with India. It will increase the hydroelectric potential several fold, with benefits equally to both countries. This will easily resolve the current stalemate as it brings tremendous advantage to Nepal (as well as to India). It will and greatly contribute to the development of both the countries. Action is being taken by the author to implement the idea.

To give another example, the states are quarrelling amongst themselves about their water entitlement as most of the rivers are interstate. It can be easily resolved if we develop and manage water scientifically, as proposed by us, instead of continuing to follow the age old technology of canal irrigation. We have enough water to meet every states needs if it is developed scientifically.

Another interesting example is the development of Brahmaputra waters, leading to the resolution of China-India dispute (Chaturvedi 2013a). Indeed, our activities have been appreciated by China and they have shown interest in them³.

We proposed to IIT Roorkee that they had the world's largest faculty in the water area and they have the opportunity to contribute in the area in one of the most challenging manner. The Director appreciated the suggestion and invited the author to implement his ideas, appointing him Distinguished Visiting Professor. We have established a Vipula and Mahesh Chaturved Professor in water at IIT Roorkee, making a donation of Rs.45 lakhs, and are attempting to help them to establish themselves as the leading world institute in this area.

Conclusion

As we stated at the outset, Engineering and Technology will be the central activity in building the 'noble mansion' of India, on which India embarked after achieving independence, under the leadership of Nehru. In view of the vast challenges and some severe constraints, determined efforts with vision and discretion are needed. Indian efforts, so far, have not been very pleasing. Korea, starting at the same level as India, has forged far ahead. China is also doing better. We have to commit ourselves to attain the highest levels, far surpassing any other country, as Japan decided when she undertook her development (Yamamura 1996).

Notes

1. We have spent several years at Harvard and several US universities as Visiting Scientists or Professors. It continues by our spending the summers at Harvard in informal collaborative research now.
2. The author was invited by the Parliamentary Committee, Government of India, to obtain his views on the subject. He demonstrated that it is an 'absurd' scheme (Chaturvedi 1998, 1999). The Working Group of the National Commission on Integrated Water Resources Development of India (1998), of which Prof. Bharat Singh, the author, Prof. A. Chawla were Chairman and Members respectively, has also demonstrated in its report and categorically stated, that it is totally unwarranted. Unfortunately, this is overlooked on account of certain reasons.
3. India and China have dispute about Brahmaputra waters. We have proved that it can be easily resolved (Chaturvedi 2013a). The author was contacted by a Chinese embassy representative in this context. Interestingly, the last Chinese President was a water resources engineer, engaged in the development of Brahmaputra waters in Tibet!

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