Crisis in Indian science and technology: Some crucial factors for consideration

C. N. R. Rao

Indian Institute of Science and Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore 560 012, India

Like most of the countries in the modern world, India has placed considerable emphasis on the role of Science and Technology in its development and industrial growth. India is one of the few countries which has affirmed its immense faith in science and technology through the science policy resolution as early as 1958. It is with much hope and aspiration that India has built up a large number of institutions devoted to science and higher education in the last four decades. Today, we have a reasonable infrastructure in science and technology which can be exploited for economic development and industrial growth. It would be appropriate to recall the efforts made to integrate science and technology with economic planning. The first effort in this direction was by the National Committee on Science and Technology in the year 1973. Through the efforts of the Science Advisory Committee to the Cabinet, a technology policy was announced in 1983. The Science Advisory Council to the Prime Minister (1986–1990) made considerable effort to bring about those conditions which would enable to fully exploit science and technology for national benefit. In spite of such a background, there is a distinct impression in recent months that science and technology do not figure high in the national value system. In fact, science and technology has not found suitable mention in our industrial policy or in some of the economic policies enunciated recently. This has caused considerable concern in the community of scientists, engineers and technologists. In what follows, I will endeavour to highlight some of the crucial factors related to the role of science and technology that have direct bearing on industrial growth and national development.

★ It is my belief that science and technology as well as higher education should be treated as part of the essential infrastructure for industrial growth. Without the proper input of highly qualified scientific and technical manpower, there is little we can do in innovative technology or even in adapting or purchasing technology. It is, therefore, necessary that we do not forget this immense asset we have in this country. Besides helping to solve some of the pressing problems related to our basic needs, science and technology are necessary ingredients of several aspects of our national endeavour.

★ The key word in the last few months in this country and elsewhere is competitiveness. There can be no competitiveness unless we are able to be innovative in developing technology. If we are going to be global players, innovation has to be at the international level, competing with the most advanced countries. This can only happen with the right inputs of science and technology.

★ There is the important question as to who should support science and technology in the country. Till now, almost all the support is by the government and there is no doubt that in the years to come, because of the increasing demands on our industry, the industry itself will have to support science and technology to a great extent and take up responsibility for supporting some sectors of higher education as well. This would, however, take some time. Until then, it is necessary that government support is maintained. Under no condition should we lose what little we have in terms of S&T capabilities. Otherwise, it would be difficult to come back even to the present level of marginal competence. The government has an important role in this period of transition.

★ It is good to recall that even countries such as Japan are investing heavily in basic scientific research today. From what I understand, they are decreasing their investment in R&D but increasing investment in basic science. This shows the importance that even a technologically advanced country such as Japan is giving to scientific work in the present context. This is because, real competitiveness in the world would be possible only when the country can innovate and compete at the highest level. This requires a strong base in science and engineering.

★ I mentioned that science and technology itself

should be considered as part of the infrastructure. The other important key sectors related to infrastructure are energy, communication and transportation. I am afraid that in these areas, and particularly with respect to S&T in these areas, the percentage of investment has been very meagre. Let me recollect some of the reports that I have read about the status of US today. The US finds it necessary to invest in its infrastructure, including science and technology and higher education, if it has to maintain its technological and industrial leadership. It is expected that US would do so in the next few years.

★ Unless we have a well developed infrastructure in energy, communication and transportation, I see no hope of major industrial development in India. International investment in India will also depend heavily on the development of proper infrastructure. In this context, I suggest that we make use of international and bilateral aid towards infrastructure improvement both in the State and Central sectors.

★ Let me again reinforce what I said earlier about the importance of science and technology and other infrastructure elements. If only economic liberalization was a sufficient condition for advancement today, then the US should never have had problems with its industrial scenario.

★ R&D institutions have to take up definitive responsibilities in technology development. They should not be talking in general terms of process development and feasibility studies, but actually identify those technological products that they will develop both in the short and the medium terms. As far as possible, the products should be for export. They should be held responsible for such product development, and support to these institutions should depend on the quality as well as the relevance of such products. In the long-term, these institutions should take up those R&D projects which can be linked up with technology innovation.

★ Improvement of quality of goods for export and of all aspects of our life in the country requires inputs of S&T and this aspect has to be examined in great detail.

★ Educational institutions have not been adequately used for research and development or in projects related to development. It is high-time that we fully utilize the capability available in some of our educational institutions. Let me remind all those who may have forgotten, that some of the best scientific talent is still in our higher educational institutions, even though these institutions face many problems. Industry has to go to educational institutions for R&D. Incentives to industry to support national S&T as well as educational institutions would be of great value in this respect.

★ Investment in R&D in certain areas has to be made after careful planning. Sub-critical investment will have no benefit. For example, if we are interested in amorphous silicon development for solar photovoltaic, we must invest heavily in this area. Another area where we have to invest heavily is industrial design. Software export can be multiplied provided there is crucial support to certain educational and R&D organizations. I do not see why we cannot organize software export more methodically and purposefully by involving educational institutions as well.

★ Because of globalization of research and development, scientists as well as scientific institutions in India should see whether our R&D facilities and technical manpower can be used to establish various R&D centres with international investment. This would be a good exercise for us and could in fact make bilateral and international collaboration more purposeful.

★ It would be a tragedy if we ignore S&T and higher educational institutions at this crucial juncture in India. What I am saying may not be fully understood by those working in mission-oriented agencies who may feel that everything is going on well. Unfortunately, those of us who work in omnibus laboratories or in higher educational institutions are having considerable difficulty in carrying on our work. The government should do everything possible to see that in this transition period, science in India is not only supported but also scientists in the country feel wanted. Extra funding has to be found at least to adequately support some select institutions which are feeling the pinch of the recent budgets and are unable to afford even minimal library and laboratory facilities.