ASSESSMENT OF ECONOMIC VIABILITY OF TECHNOLOGIES

Shekhar Singh *
Planning Commission

The assessment of the economic viability of technologies and technological projects is usually done through the application of the cost-benefit analysis method. There are at least three types of cost-benefit analysis that have become progressively popular over the years : financial cost-benefit analysis, economic cost-benefit analysis and social cost-benefit analysis.

The cost-Benefit Analysis Method

The task of evaluating technologies and projects has always been fraught with uncertainties. To establish the financial and economic viability of technologies and projects, traditionally a financial and economic cost-benefit analysis has been carried out. However, in the last few years this method of evaluation, especially in the way it has been applied, has been losing credibility. In addition, there has been increasing demand to also evaluate the social impact of technologies and projects, including the impact they have on the lives of the people and on the environment.

The experience of people whose lives have been affected by dangerous or inappropriate technologies has been very unpleasant, to say the least, and this has led, perhaps for the first time, to the scrutiny of new technologies, and their anticipated costs and benefits, by individuals and organisations outside the government.

The cost benefit analysis method of evaluating technologies and projects is today being questioned primarily for the following reasons:

1. Scrutiny of past projects has shown that even those costs and benefits which are easily quantifiable and therefore could be easily anticipated within the traditional, financial and economic, framework have often been wrongly estimated.

   Not only have the costs been under estimated, but the benefits have also been exaggerated.

---

* On the faculty of the Indian Institute of Public Administration, and Honorary Adviser (Environment & Forests) to the Planning Commission. The views expressed in this paper are the author's personal views.

2. It has now been recognized that there are additional costs of most technologies and projects which have not been taken into consideration in the cost-benefit analysis. The two most significant among these are the sufferings of the affected people and the impact on the environment.

It is also now generally recognized that it would be impossible to measure these in purely financial or economic terms.

3. In general, though no retrospective cost-benefit analysis has been done of technologies and projects in India, to compare their actual costs and benefits with those anticipated, the evidence available on the basis of studies of some projects and technologies suggests that many of them have had higher costs than benefits, and certainly much inferior cost-benefit ratios to what was anticipated or required. This has resulted in a belief that technologies and projects must be evaluated in a wider and more realistic perspective.

Different Types of Cost-Benefit Analysis

A financial cost-benefit analysis only considers the purely monetary costs to be incurred, like the cost of inputs and labour. Similarly, it takes into account only the monetary benefits flowing to the project, like income from sale of technology, the water rates collected for irrigation projects, or revenue earned through sale of electricity from electricity projects.

An economic cost-benefit analysis considers the economic costs of the project which are to be borne by the society, for example the loss of produce from land to be submerged or used, or the economic loss of fisheries, or timber and firewood, even though this is not a monetary outflow from the project. Among benefits it would consider the economic benefits of enhanced electricity, consumer commodities or crop production, even though this does not represent a monetary inflow to the project.

A social cost-benefit analysis calculates the non-economic costs and benefits that the project has, for example the dislocation and suffering of the people who have been rendered jobless or ousted. It similarly seeks to examine the non-economic benefits, for example the benefits from better communication, quicker travel or provision of drinking water. A social cost-benefit analysis also includes an environmental impact assessment, assessing for example the biological loss due to destruction of forests, pollution, or benefits like better sanitation.

All these methods of analysis together give the ability to appraise a given project, and to compare it to other possible projects which have been similarly analysed. It is therefore essential, in order to appraise a project, that alternatives to the project under construction be adequately studied to provide the option of making the optimum investment choice.

While conducting a cost-benefit analysis, it has to be ensured that all the quantifiable financial, economic and social costs and benefits are computed, and computed realistically.

Next, the project has to be implemented in as short of time as possible, and certainly within the stipulated period, to ensure that the benefits become available as soon as possible and that the costs remain within the levels anticipated.

Retrospective Cost-Benefit Analysis

To verify the accuracy of cost-benefit projections, it is necessary to look at technologies and projects in retrospect and evaluate whether they were within the stipulated costs and are giving the projected benefits, and if not, why not.

The major issues that remain outstanding, even after such a cost-benefit analysis has been done can be summarised as follows:

1. *The need for a class benefit analysis*

In India, with its stark social and economic disparity, there is an avowed commitment to equity and socialism. The Constitution of India, for example, describes the nation as a "sovereign Democratic, Socialist Republic". It is therefore not enough for a project to have benefits greater than costs, it must be ensured that the benefits of the project go primarily to the poor, while the costs are borne primarily by the rich. In any case, the converse is certainly not justifiable.

Even where technologies are found to be financially and economically viable and are assessed to have greater social benefits than costs, it is important to assess which strata of society such a technology benefits. Unfortunately, technologies are often introduced which appear to be economically viable but which end up in widening the gap between the rich and the poor.

One reason why this happens is because very often technological innovations make low return activities or resources into high economic return activities or resources. The control over such activities and resources also consequently shifts from the poor to the rich and powerful. This is especially the case where a technology is sought to be introduced in societies which are stratified, economically and socially, and where the poorer segments of the society, though in a majority, have not been able

to organise themselves into an effective social and economic force.

At a macro level, the changes in ownership of agricultural land especially in "green revolution" areas, the shift of control over forests, mineral resources, water and building materials are all examples of this. Internationally, much of the logic of colonialism and neo-colonialism is based on enhanced production capabilities made possible through technological innovations. At a macro-level, the development of motorised transport and refrigeration has deprived the poor and the children of thousands of villages in India access to milk, fresh fruit and other locally grown food-stuff.

Another example of this is perhaps the efforts to introduce a rope making machine in areas of Saharanpur District, Uttar Pradesh, where traditionally 40,000 families belonging to the socially and economically backward classes have been making rope (Ban) from a local grass species called Bhabbar. The activity of making rope out of this grass is very labour intensive and requires long hours of work from all members of the family. The consequent productivity and income levels are very low and despite hard work, these families remains among the poorest of the poor.

There was, some years back, a well intentioned effort to introduce a machine that could make the task of these families much easier and could significantly increase their productivity and income. However, when some such machines were introduced on an experimental basis many of the rich traders in Saharanpur, who till then had not shown any interest in the rope making activity because of the poor economic returns, became interested and procured some of these machines. By following the age old pattern of artificially lowering the price of rope, they ensured that many of the traditional rope makers went out of business and were forced to become wage labourers in their facilities on income levels which were even lower that what they could earn on their own.

The introduction of this new technology, therefore, threatened to disrupt the social and economic life of the region by transferring control over the activity from the poorest of the poor to the well-to-do, but for the happy circumstance that these machines did not finally work and the whole initiative had to be scrapped. This is one of the many examples that can be cited of how the introduction of technology into a stratified society, which is not yet organised for ensuring social justice, can actually be counter productive. Similar experiences have been recorded in the area of agriculture, especially during the introduction of a high yielding varieties, and in social and farm forestry.

The conversion of poor and degraded agricultural lands into Eucalyptus, Casuarina and Poplar plantations in many parts of the country have not only denied these lands to small and marginal farmers, and landless people who used them for marginal agriculture, but has also significantly reduced the demand for agricultural labour in the rural areas.

The lesson to be learnt from all this is not that technology upgradation and introduction are undesirable. On the contrary, they are crucial and there can be no future for the society unless rapid technological advancement takes place. However, the important lesson is that the introduction of technologies must be preceded by a process of social organisation and that the choice of technologies and the method of introduction must be determined on the basis of the prevailing social realities.

Another major reason why a class-benefit analysis is important where questions of technology are concerned, is that very often a new technology converts resources traditionally being used by poor rural communities into new commodities which, by virtue of their cost and availability, are accessible only to the rich and the urban. When huge hydro electric projects submerge vast areas of forests and agricultural lands, these sustainable resources which have been supporting rural populations for hundreds of years, in effect get converted into electricity which is mainly diverted to urban areas, industrial complexes and to rich farmers. Whereas in a narrow financial and economic sense, such projects can be established to be beneficial. However, in terms of distributive justice, such projects are undesirable, especially when the basic needs of the poor are sacrificed for luxury and wasteful consumption of the rich.

2. Costing social and environmental parameters

One of the major difficulties in assessing technologies is the inability to put accurate costs to social and environmental parameters. Economics, as a science, has this inherent weakness that it can only quantify the cost of those commodities which are either an input to, or an output of, an economic activity. It can only give a replacement cost. For example, it can cost a tree in terms of the replacement cost of the timber and the coal-energy equivalent that it could provide, or the fertilizer potential of its leaves and perhaps the food potential of its fruits. However, the many other functions of a tree, especially its ecological functions which cannot be replaced by an economic process, become valueless.

Similarly, the health hazards that a technology might pose can only be measured economically in terms of person-days lost or the cost of hospitalisation and medication. There is no

way of measuring human misery and social dislocation in economic terms.

Such difficulties have led to these environmental and social costs being totally ignored while assessing technologies, which are not socially or environmentally viable. Alternatively, this has led to the attaching of notional and mostly irrational costs to social and environmental parameters, thereby making a mockery of the whole process of cost-benefit analysis.

Despite this being a very major constraint in the proper assessment of technologies, very little effort seems to have been, at least in India, to try and develop capabilities to more accurately reflect social and environmental costs in cost-benefit analysis. There has also been an unwillingness to accept that even non-quantifiable parameters should have an influence while assessing the economic viability of technologies.

3. *Questions of optimality*

A cost-benefit analysis makes no sense unless it involves an analysis of alternative technologies and options and is used to determine optimality. Even in our day to day lives, the statement of the cost of a commodity cannot be a basis for deciding whether that commodity is worth buying. We always try and discover what is the cost of other commodities with the same utility, and what would be the cost of not purchasing this commodity.

Unfortunately, very few technologies in India are ever assessed in terms of their optimality. In most cases, the question of the sort of technology to be used is pre-determined and then efforts are made, by making marginal adjustments and changes, to establish the economic viability of the pre-selected technology. This obviously leads to a situation where even when such a technology is in itself economically viable, it is not the best option available and in that sense not desirable. Major changes in our methodology for assessing technologies, and in our planning and implementation processes, are urgently required in order to ensure that society gets the best available options.

4. *Lack of objective standards of professionalism*

One of the major reasons why there continue to be angry debates regarding the desirability of various types of technologies, is the general lack of confidence, among the public and among concerned professionals and planners, regarding the process of techno-economic assessments. Part of the problem comes out of the lack of objective standards by which the technoeconomic viability of certain technologies can be measured. However, much of the problem arises out of past experiences where professionals and professional organisations involved in assessing the viability of technologies were either incompetent or ineffective. The disaster at Bhopal, the acknowledged health

impacts of many pesticides and drugs, and the health and environmental hazards posed by many processes, are some of the many examples of this.

If, therefore, the introduction and development of technology is to have the support of the public, the indicators which determine its viabililty must be objective, and easily understandable and demonstratable. Professionals who are involved in assessing such technologies must be both competent and objective. There must also be a very rigourous system of evaluation, so that where an approved technology is subsequently proved to be sociallly or economically unviable, those who were involved in assessing it must be made answerable. Such measures would go a long way in building up the confidence of the people in modern technology and in ensuring that technology becomes a means of development, rather than development becoming an alibi for the promotion and inappropriate technologies.