INTERMEDIATE TECHNOLOGY - AN APPROPRIATE DEVELOPMENTAL PATH

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ABSTRACT

A major part of this paper reviews the reasons for the failure of conventional science and technology policies in developing countries. Such policies have overlooked the concerns of the majority of the rural poor. Change is now necessitated by national and global environmental concerns, and by the need to recognize that the welfare of the poor is in the self-interest of all governments.

> *"…the major obstacle to the development of the rural poor is the so-called educated man."*
> *-- Bunker Roy, Indian Express, 1983.*

Alternative or Intermediate Technology is subversive. It questions the current direction of technological development, and forces us to look at our own motivation for working on science and technology issues. It makes us feel awkward, just as Roy's quotation does. As social, economic and political problems increase in our technology-driven world, it is important to inquire where we may have gone wrong, and to seek alternative paths to sustainable development. Could it be that in our mad rush to follow the current norms of development, we have missed out important features of the process of acquiring knowledge, and its subsequent use?

It is in the richer countries, which invested in science and technology (S&T) that most of the technological changes associated with industrial development have taken place. Only one-third of the global population that resides in the developed countries is directly affected by these changes. The remaining two-third, the majority of people, lives in the Third World.

The high living standards in the North, a result of industrialization (and colonization), suggested to the poorer countries that they too could solve their problems by using S&T. The nature of the relationship between S&T and society in the Third World is, however, quite different from that in the North. Much of it is due to the difference in the distribution of populations in their respective urban and rural areas. In the Third World, 70-80 percent of the people are involved in agriculture in the villages, while only 5 percent or less live in the rural areas of the industrialized countries. Such a big difference highlights the need to think carefully about the role of western S&T in the development of the Third World.

WHAT IS DEVELOPMENT?

The concept of 'development' is complex and does not allow for an easy definition. Some may equate development with economic growth, or simply becoming more like the industrialized countries, but others reject such a simple description. This is because economic growth does not necessarily reach the most needy; especially where there is gross inequality in wealth-distribution in the country. Invariably, only the richest 10-20 percent in the developing countries benefit. With Industrialization come problems that the affluent world seems unable to cope with, such as environmental degradation, high degree of urbanization and insatiable consumerism. Far better than, say many observers in the Third World, to avoid the old pattern of 'development' that has been shown to lead to such problems. It seems prudent to emphasize sustainability in production and consumption, combined with desirable characteristics of pre-industrial society, such as decentralization, social integration, resource conservation and so on.

The developing world in the post-colonial era has followed the pattern of the industrialized countries before them. Despite the Gandhian idea of an independence movement that led to economic progress through self-reliance, with an emphasis on small-scale village-level activities, Nehru's socialist leaning copied the Soviet model of industrialization. This led to the setting up of a range of heavy industries in the public-sector, to manufacture goods that were previously imported from Britain and other countries. In addition, the government funded the setting up of a number of institutes of technology and higher learning, to help produce high-quality scientists and technologists.

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Such large-scale undertakings led to optimism that industrialization in these newly developing countries would be rapid and be achieved in far less time than the early industrial countries, such as Britain and Germany. It was believed that the developing countries would be able to acquire the know-how and the resources needed as part of a generous transfer of technology. It was expected that this would come as aid, or through the returning bright students who were sent to the former colonizers to acquire skills and degrees.

This sense of optimism had also infected the United Nations, and it set up an advisory committee to prepare a global plan of action for using S&T for development. But this enthusiasm began to vane by the end of the 1970s. A more skeptical view of the role of S&T arose, as a matter of fact, from the result of the work carried out by the UN and its agencies. This happened as the UN searched for policy measures to help enhance the influence of S&T on development.

RE-THINKING THE WESTERN MODEL

The re-appraisal of the role of Western S&T in developing countries was helped by the UN's Advisory Committee Report (ACAST 1970) [1]. It pointed out that the Third World's meager expenditure on R&D was often uncoordinated and poorly directed, and that the projects undertaken had little or no relation to the needs of the poor countries. Priority was given to areas of 'basic' research, to the exclusion of 'applied' research that had ready applicability to everyday problems, in critical areas such as health, energy, agriculture, transport and housing. Much of the S&T research took its cue from problems that the foreign-trained researchers had picked up from their supervisors in the laboratories of Europe. This elitist activity, which on occasions produced accolades from overseas, was adopted to the exclusion of other equally 'exciting' and socially relevant projects. Here, incentives for R&D workers to produce solutions to such problems would have helped. What was also needed were linkages and infrastructure for product development. The failure to put these in place made research a 'marginal' or 'enclave' activity.

The structure of the post-colonial economies was such that it did not create any significant demand on the local R&D workers to innovate. Most of the country's need for food and natural resources came from agriculture and mining, both of which were not especially research intensive. Utilizing formal agricultural studies and applying this knowledge in practice did not exist; much of what was needed came from traditional local knowledge. Neither the government nor the private sector, which comprised big companies headquartered in Europe, were interested in or had confidence in locally manufactured goods. A complete factory, such as a sugar mill or a fertilizer factory, could be imported and it merely required local labor and management to get it up and running. Turnkey projects were the norm – this suited the government official, who then needn't risk opting for an untried product. It also suited the foreign company, which gained by getting a well-tried product that had worked successfully in the home country, and also in others to which it had been exported.

As a result of all these factors, only weak links were established between S&T and production in the Third World. [*Contrast this with how R&D and industry developed in the industrial countries*]. The turnkey industries needed little more than maintenance technicians. Hence, the highly trained professionals, unable to find work, left to take up jobs in the developed countries. Having been trained in their technologies, they were welcomed -- a reverse form of foreign aid from the poor countries to the rich!

The impact of Western technology imports was to have an even more profound impact on the peasant farmer and the poor urban worker who, without the opportunity of finding overseas employment, found himself unemployed or under-employed. A number of research studies in the 1970s showed how imported technologies generated only a few local jobs and often destroyed thousands that existed. Adding insult to injury, it became apparent that the Third World could not gain from the machinery and processes that had already been developed in the West. Patented technology transferred from a parent company in the developed country to a subsidiary in the Third World was overcharged, often by a factor of ten.

WESTERN TECHNOLOGY'S IMPACT ON RURAL MASSES

In the rural sector, the introduction in the 1960s of Western technology for increasing yield of rice and

wheat had a debilitating impact on the poor farmers. This Green Revolution promised increased yields, but under very demanding conditions and expensive inputs, such as application of regular large doses of fertilizers and water. It disregarded the needs of rain-fed agriculture, which is critical for the survival of a vast number of poor farmers. Through this 'revolution', the rich farmer became richer, buying out the tenant farmer, whose next refuge became the nearby city where he could seek a job as a laborer.

The need for mechanical harvesting that accompanied the high-yield technology greatly reduced the need for the traditional harvesters of rice: women. Moreover, little attention was paid to the small-scale backyard production of food, carried out by women in home gardens. Nor was there any attempt made to improving the technology used in homes, which would help women in their daily chores, e.g. cooking, cleaning, collecting firewood and water, which occupied so much time and effort (Chambers, 1983) [2]. Had the politicians and bureaucrats paid attention to the problems of the poor rural women, the agricultural output and overall health of the rural population would have improved.

The Third World's massive and growing army of unemployed and under-employed people demands the creation of millions of new and more productive workplaces. In practice, this means making available to the rural people, on a large scale, better tools, equipment and facilities. But what are these technologies that will raise the incomes of the rural poor, on a sustainable basis? Who can produce these technologies? How can poor people get access to them, and own them? *These are the questions we should be asking today.*

SCHUMACHER AND INTERMEDIATE TECHNOLOGY

The person who helped analyze this dilemma of Third-World development was Fritz Schumacher. He advocated the idea of Intermediate Technology as an alternative - it was to fit the gap between the centuries-old technologies that the rural poor used and the advanced Western ones. Traditional technologies were not productive enough to get the people out of the poverty trap. At the same time, imported technology was far too expensive for most Third-World people and could not eliminate poverty. In turn, it would never generate the number of jobs necessary to keep the large numbers of the rural population gainfully employed. Schumacher outlined his theory in a series of essays; later compiled into a book (Schumacher 19730) [3], which started a movement that recognized the need for both the developing world and the West to think 'small' so as to ensure sustainability. The message was particularly relevant for the developing world, which until then had tried the high technology route and failed to provide jobs and well being for the vast majority of its population.

To help put his ideas into practice, Schumacher founded the Intermediate Technology Development Group (ITDG), which has undertaken many practical and appropriate projects in sectors such as health, rural development, energy, building-technology, water and sanitation, as well as others. An example of a success-story is the production of bricks for improved construction of homes in the developing countries. In the industrialized world, a large brick-factory produces a million bricks weekly and is very expensive to build and operate. The ITDG developed small-scale alternatives, which produced only 10,000 bricks weekly, using hand-operated methods, and simple machinery. Capital-cost per workplace (i.e. the money used to set up a workplace for a single worker) was UK Pounds 400, compared with hundred times higher cost---workplace for the high-volume factory. The bricks produced in smaller quantities were also only half the price of the others. Such plants were set up in several countries of Africa.

The Third World's own experience with this kind of appropriate technology brought out an alternative system of energy and fertilizer production: biogas fermentation. Much of this work came out of experimental plants set up in India and China. Through a process of anaerobic microbial fermentation, a biogas plant is able to turn vegetable matter, animal manure and other waste materials into nitrogen-rich slurry, which can be used as a fertilizer. The methane gas produced, as a result of the process, is stored and can be used for cooking and even driving electric generators. A comparison of biogas fertilizer plant and the conventional Western fertilizer technology is given in the table below:

Table - 1: Production of fertilizer by Western and Alternative Technologies
(230,000 Tonnes of Nitrogen Per Year)

	Western Technology (large-scale coal-based fertilizer plant)	**Intermediate Technology** (village-scale bio-gas fertilizer plant)
Number of plants	1	26,150
Capital Cost	Rs 1.200 billion	Rs 1.070 billion
Foreign Exchange	Rs 600 million	Nil
Employment	1000	130,750
Energy	About 0.1 million MWH *consumed* per annum	About 6.35 million MWH *produced* per annum

Source: (Reddy 19750) [4]

Examples such as this encouraged many observers to use Intermediate Technology as the model to achieve self-reliance and generate jobs in a sustainable way. This was seen as an appropriate way of reducing the reliance on over-priced and divisive technology obtained from outside. But there were alternative viewpoints, which did not support this optimistic opinion. Was this not a way of keeping the developing world backward by making it get along with second-rate technology? Others felt that such a technology would not be widely accepted, as it was not well grounded in the then-prevailing social and political structures. The proponents of Intermediate Technology viewed it as a means of generating employment and creating a more just society, based on small-scale industry. Unfortunately, this ignored the existing gaping income inequality in the developing world, where the decision-makers who make science and technology policies demand luxury motor cars, expensive kitchen implements, fashionable clothes, lavish houses, etc. Given such a choice of products, the technology for obtaining them cannot be of a small scale and be built cheaply. The continuing inequality of distribution in wealth therefore seemingly condemns the developing countries to continue on their self-destructive path. But this is where political wisdom can ensure a “turn around”, as would an enlightened public globally, which sees the need for change.

CONCLUSIONS

Simplifying technologies to make them efficient and affordable for the rural population requires the finest minds and the most sophisticated equipment to develop it. To help this, our educational and R&D systems need to be designed to encourage a deep involvement of academics and researchers, instead of continuing to train and work on problems that currently interest mainly the advanced Western economies.

The environmental movements in the West are now creating increasing pressure on their governments to review their mode of production, and so develop ‘softer’ technologies based on renewable energy resources. There is also a realization that the increased consumption in thickly populated countries, such as India and China, would lead to massive environmental damage over and above that caused by Western consumption. The West therefore needs to collaborate with the developing countries, to set a new pattern of technology-development directed at solving the issues of real needs of the vast majority of people on this planet. It must begin with the concerns of the rural poor in the developing world, and hence with using technology appropriate for meeting their needs.

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