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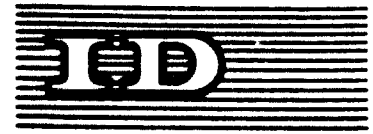
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SOME ISSUES ON TECHNOLOGY PLANNING
FOR SELF-RELIANCE *

by

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During the last 20 years profound and dramatic changes have taken place on the international scene many of which, as we are about to enter the decades of the 80s, have not been fully understood or thoroughly appreciated. On the subject of North-South relations we find, at the same time, the demand for the establishment of a New International Economic Order on the one hand and, on the other, the emergence and increasing recognition of the concept of self-reliance as the basis for the formulation of development strategies in the less developed countries (LDCs).

These two basic ideas, it is important to note, are not contradictory—as has sometimes been proposed—but, rather, one idea reinforces the other. The ideas that led to the call for a New International Economic Order, for example, not only express dissatisfaction at the unequal distribution of the benefits of the world's economic and social development (the richer countries' interpretation) but also express a deep concern at the dependence of a large number of countries on a handful of other countries. It is in this latter sense that it is obvious that the concept of self-reliance complements that of the New International Economic Order, since the degree of dependence of a given country, considered in a wider sense, tends to be greater when the degree of influence of international conditions on the internal conditions of that country is greater. This, however, should not be taken to mean, as indeed has often been remarked, a desire for autarky. Even more, as has been pointed out, self-reliance "does not imply a lessening of interest in international co-operation but rather a desire to make the relations between industrialized and developing countries reflect genuine interdependence and complete international economic justice".

One other aspect further recognized, and more or less generally accepted, is the importance of science and technology within a development strategy for self-reliance; whereby the latter is understood at the national level of each developing country, "as the desire to build up and use a capacity for autonomous decision-making and to implement such decisions at all aspects of the development process including science and technology".

The significance attributed to science and technology within a strategy of this type is justified on several grounds. Firstly, due to the growing realization of the relationship that exists between science and technology and the decision-making capacity in a given country. It would seem a tautology were it not for the fact that, because of the lack of a minimum capacity in science and technology in developing countries, an enormous waste of natural and other types of resources takes place. Secondly, because of the contribution that science and technology can make in defining the possibilities for following a pattern of development more in accordance with the needs of the LDCs themselves and, thus, different from the path historically followed by the more advanced countries, Thirdly, as a means of effectively incorporating into a more technically backward milieu the results of technological progress generated in the industrialized countries. And finally, so as not to make this list too long, there is the recognition of the role played by and the influence exerted by science and technology on the modulation and integration of other sectors equally important to society.

Up to this point, we have two basic elements: the one of self-reliance and the other, the importance of science and technology in the strategy for development. However, it is when these two elements are combined in terms of a plan for technological development towards self-reliance, that the situation becomes much more complex.

Starting with the issue of self-reliance it seems a fact that up to now only a handful of countries have been able to incorporate in a meaningful manner the concept of self-reliance within their strategies of economic development. Perhaps it should be viewed as a step forward that many countries are beginning to turn their minds favourably towards it and that many others are giving it serious consideration as a feasible option. But the fact remains that nowadays the concept is more in the realm of lip service than in the realm of reality. Not many countries have found it easy, or an absolute necessity, to disentangle themselves from the complex webs of commercial, financial and technological relations that link them to the outside world in a sort of "external-reliance". It is easy to explain this state of affairs since in order to do be able to do that one should either have a very drastic change in the integration and

structure of society or, else, one would have to have the capacity for decision-making precognized by self-reliance.

In the area of planning we find a similar situation to a greater or lesser degree. Apart from the centrally planned economies, the truth is that not many people nowadays have the same sort of blind faith in planning that they used to have at the end of the fifties and the beginning of the sixties. Even in centrally planned economies such as the China and the USSR, not to mention Hungary, Poland and Yugoslavia, attempts are being made to correct some of the rigidities in planning and, thus, to liberalize more the operation of the economy. In non-centrally planned economies there are only a handful of countries that have medium-term plans which play a role in the process of allocation of resources. The trend of disfavouring global and all-encompassing plans has continued because of the many difficulties encountered not so much in the formulation phase of such plans but rather in their implementation. The discrepancies between planned and actual figures are an all too common event. Further, planning has been made difficult because, in spite of the calls fostering self-reliance, it is a fact that the economies of most countries have become more instead of less open to the world economy. Also, there have been considerable increases in the flow of financial resources, as shown by the growth of external debt in LDCs, and payments for transfer of technology account for an ever expanding portion of trade in services. Further, sudden fluctuations in the prices of basic inputs and commodities have meant the transfer of inflationary pressures from one country to the other.

All this explains the shift in emphasis in many countries from global and all-encompassing planning towards a more selective and sectoral type of planning. It mainly tends to be restricted to certain activities which are considered fundamental to the development process and for which, it is felt, it is imprudent to leave subject to the vagaries of the overall functioning of the economy. They are sectors in which, presumably, the objectives, the predetermined path, the speed and the utilization of policy instruments should remain very much the same in spite of the existence of variations and changes on other sectors of the economy and society. In other words, these are activities which the country

should embark on with a long-term, rather than a short- or medium-term view. Within this category we find, for example, plans for energy supply and demand, education, health, irrigation and, of course, science and technology.

Too often the criticism levelled against these plans is that they are not integrated within a strategy for development or linked to a global plan. Perhaps as an over-reaction from someone who has had to listen to this criticism on several occasions, let me say that, nevertheless, I think that this sort of criticism is hard to justify. What speaks in its favour is the fact that resources are not, indeed, infinite. But aside from this, I would argue that on no occasion have I found an explicit statement from these critics as to what constitutes a desirable development strategy or their conception of a global plan. Even less is said, of course, on the desirable type of relations that should condition the interactions between one sector and the other. Secondly, some very practical problems are thoroughly ignored. For example, what is one to do if in a country, the sort of Holy Grail that these critics so ardently seem to desire simply does not exist? Should one refrain from planning in the absence of this Holy Grail and patiently wait for its arrival? Also, such criticisms frequently ignore the fact that many of the sectoral plans perforce must have a time horizon much beyond that which is generally required for economic planning formulations and which usually covers a period of at the most six to ten years. These periods are hardly relevant for educational planning, energy or, again, science and technology. In more sophisticated criticism, it is true, reference is made to the concept used by Varsavski and others of the "proyecto nacional" but which, nevertheless, remains very difficult to concretize aside from the fact that, presumably, one could expect it to change gradually.

Turning our attention now to the area of technology planning and policy formulation, one is impressed by at least four phenomena: one, the considerable advances which have been made at the conceptual level of the role of technology in the development process of the least developed countries in the last fifteen years or so and for which the concept of self-reliance has been a significant factor; second, the rise in most countries in the hierarchy of priorities of those for domestic technological development from a relatively low level to a high one; thirdly, the

institutional build-up to favour the process and the accompanying formulation of technology plans and; finally, the mounting criticisms and expressions of scepticism as to the actual manner in which technological policies have been implemented. All of these factors are closely interlinked: however for ease of exposition it is convenient to examine first the second and the fourth of them.

It is a fact that in most countries due to a myriad of factors technological policy and development have gained a place under the sun and that this is not a negligible one. Most politicians nowadays have, at the very least, to pay lip service to science and technology as a factor in the development of their countries. This was not, of course, the case in the past. The proponents of an autonomous technological development were looked upon, with few exceptions, either as unrealistic in the best of circumstances or, as was more often the case, as plain fools. It was pointed out to them that the distribution of world R and D efforts being what it was- the famous 98-2 per cent- it did not make much sense for a LDC to allocate resources into an area, possibly with dubious results, in the face of more basic and urgent needs. It was further argued that technological progress could be better achieved through the payment of small sums for technology transferred from abroad. The argument was also made that the private sector of these economies was uninterested in questions such as the negotiation and adaptation of technology since, for better or for worse, the costs for transfer of technology were being transferred to the final consumer through the system of protection.

These we can consider as a fair statement of the views prevalent in many LDCs at the end of the fifties and the beginning of the sixties. It falls outside the scope of this paper to examine the manner and the reasons whereby a change in this state of affairs took place. Suffice it to say that it was not an easy process and that strange alliances had to be formed to bring it about.

Strange bedfellows or not, one factor common to these groups is that they all emphasized, again and again, that technology development was not a short-, nor even a medium-term undertaking, but rather a long-term one. It was therefore pointed out, and rightly so in my

opinion, that the time horizon should be set, at the very least, to 10-20 years in advance. The other common factor was, of course the very backward position of science and technology in most of the countries concerned.

There have been recently numerous evaluations of the plans and the policies for technological development in LDCs. Perhaps, one is tempted to add, too numerous. Certainly much in excess of the number of plans that have been formulated. Also, one should add, the analytical level of many of these evaluations leaves much to be desired.

The Secretary of UNCTAD, for example, in a brief examination of the technology plans of Brazil, India, Mexico, Pakistan and Venezuela arrived at the following sweeping conclusions:

"All plans have the objective to increase the availability of the technical capacity needed to assure an increased technological autonomy but, in this sense, for the most part they are elaborated in very general terms".

"It is not possible to have a clear idea from the plans as to the manner in which resources are allocated for technological development or as to how it is intended to solve the conflict between demand resources which are inevitably limited".

It might be of interest to point out that this evaluation concerns plans that were elaborated in the case of Brazil in 1976, in India in 1974, in Mexico in December 1976, in Pakistan 1976, and in Venezuela in 1976. In no part of the UNCTAD work is consideration given to the actual implementation of these plans.

Other parallel opinion is that which has been recently expressed by Miguel Wionozek. In some colourful statements it is stated (a) that in many cases the Governments were almost illiterate in questions related to science and technology; (b) that there was not sufficient political support and (c) that there was a subtle but vigorous campaign against state intervention in science and technology under the banner of a free economy. The net result of all this was that "expectations had not been fulfilled".

Nobody, of course, can be against the evaluation of plans, be they science and technology or any other subject. But the least that one can ask of these "evaluations" is that they should be done with a proper perspective and with a minimum of empirical data. Otherwise one may run the very real risk of leading other people - be they illiterate Governments or not- to believe that any resources allocated in favour of science and technology are, indeed, a gross waste of effort. And this in spite of the fact that, as so many of these same critics proclaim, science and technology efforts should be undertaken with a long run perspective in mind.

All this would be the more pitiful because, as I have argued above, there have been considerable advances in the last ten years or so in our understanding of the role of technology in the development process. The list of some of the subjects that have been covered is a most impressive one, starting with the studies on transfer of technology, systems analysis, the role of international co-operation, the distinctions between traditional and modern technology and the question of appropriate technologies, the scientific and technological infrastructure, the effects of policy formulation and instruments in other economic and social areas upon science and technology, the role of public and private enterprises etc. etc. It is true also, that there are still many "black spots" and many of them are also likely to remain so.

There are of course, a certain number of points on which technology planning formulations should be more precise and more informative. For the sake of brevity we shall mention only five of them.

The first one has to do with the size and the level of economic development of LDCs. In the literature on self-reliance and technological policy and planning, not much is said about the influence of this factor which surely is a determinant one. The frequently-used expression that the formulation of objectives and policies for technological development should be made "in accordance with the needs and overall objectives of the country" is not very helpful to overcome the very real practical problems which exist. Further, the literature, for a variety of reasons mainly seems to refer to countries such as Brazil, China, India and

Mexico which hardly could be considered as typical LDCs. All too often recommendations are made on, for example, the "size" of the technological development effort and the institutional build-up without paying sufficient attention to those determinant differences between countries.

A second aspect would cover the questions associated with the implementation of the plans and policies for technological development. A considerable effort has been made in the past in several countries first to formulate and later to evaluate different plans and policies. But not much attention has been paid to the problems of implementation. One feature which is particularly disturbing in this connection is the effects which the utilization of policy formulations and instruments in other areas of the economy have upon technological development. In fact, in many areas, the implicit technological policies which they entail run directly against the explicit technological policies contained in the science and technology plans. It is not, therefore, that "expectations have not been fulfilled" but rather that the efforts are not sufficient per se to change the trends and conditions for technological development as determined by other policy areas. Under this same heading the problem of supply and demand of domestic technological knowledge could also be considered where it has been pointed out by Oldham and others that in the past the emphasis has been placed mainly on the supply side with a sort of belief that there had to exist some sort of Say's law for technology also.

Our third aspect relates to the question of stocks and flows. It is a fact that technology planning has depended to a large extent on systems analysis where the relations of the science and technology sector with other sectors of the economy and society hold, so to say, the centre of the stage. The result of this is that emphasis has been put mainly on the questions of flows of scientific and technical knowledge and scant attention has been given to the questions of stocks. Of paramount importance in this connection are the number of persons associated with scientific and technological activities and the institutional build-up. To a large extent these two factors determine the nature and the speed of the technological developments of the developing countries. The constraints

imposed by them quite often are not sufficiently explained in many of the plans and policy formulations.

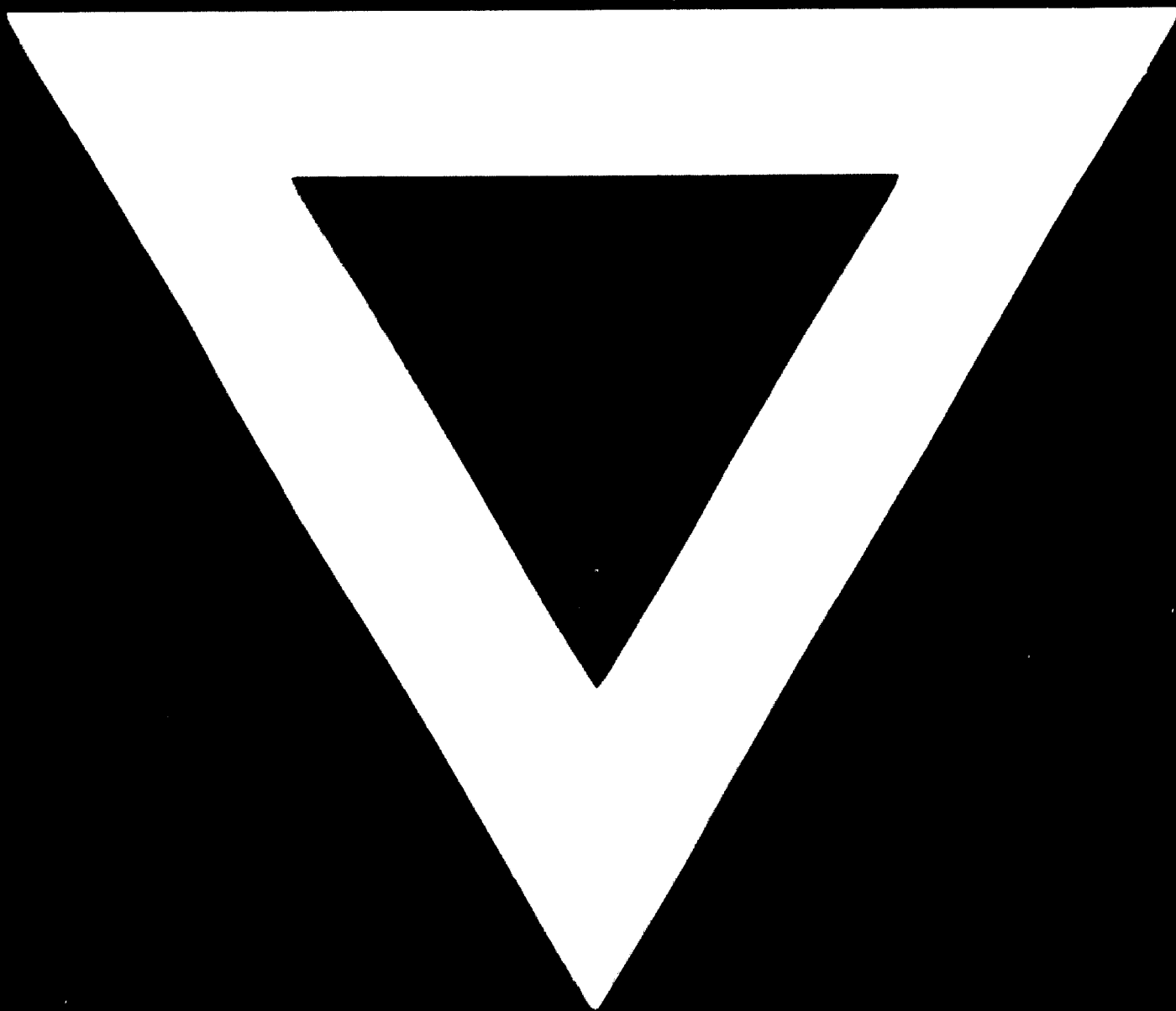
The fourth aspect refers to questions associated with international co-operation in science and technology in both directions: North-South and South-South. In most plans and policy formulations one doesn't even find a chapter covering the subject. And surely it is an important one. The forthcoming UNCSTD conference will presumably make a contribution in this direction. But the fact remains that there is still a considerable gap to be filled. Perhaps one factor explaining this situation is that up to now, international scientific and technical co-operation has not been very significant; certainly it has been below the objectives set by United Nations at the time of the formulation of the World Plan of Action for science and technology. The possibilities for improved co-operation on the other hand, appear to be relatively large. One finds many common areas of interest in the plans and technological policy formulations of several LDCs and certainly the scientific and technological capacities in developed countries can be utilized to solve some of the problems affecting the Third World.

The final aspect which will be briefly mentioned but which is a complex one has to do with the overall problems of evaluation of costs and benefits of technological development. The arguments supporting efforts for technological development in LDCs in the preliminary stages certainly become hard to sustain once a certain threshold, say 0.6 per cent of GNP, is crossed. The problem is a complex one because of the importance of long-term factors and the translation of many of them into quantitative expressions. Also one has to consider that in the case of LDCs the possibilities of significant successes in R and D tend to be lower than in developed countries if the same set of criteria is utilized.

These are some of the issues to be considered. But the list could easily be expanded. The important point to be made, however, is that past exercises in technology planning and policy formulation show at least two things: (a) that the state of the art in these matters is only at a beginning stage and (b) that the number of questions and issues left still unanswered are yet as great or larger than those for which answers have been proposed.



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