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planning in
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Science and Technology for Development:

Planning in the STPI Countries

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10. The Interactions between Socioeconomic Policy and Scientific and Technological Planning in Venezuela

Luis Matos Azocar

Analysis of an S&T policy separate from a socioeconomic policy can only be justified to facilitate a study of the more important elements of cause and effect. The interactions of the two types of policy are so complex that S&T development is an objective of the socioeconomic development policy, yet it accounts for restrictions in that policy.

The planning of unified development requires simultaneous and coordinated analysis of all factors that contribute to a country's progress. Yet assessing the contribution of S&T to that progress has involved such methodological difficulties that even the most advanced countries have postponed the explicit consideration of S&T in defining their economic and social policies.

In technologically dependent countries, where accelerated economic expansion is the central concern of the development plans, the lack of technology is seen exclusively as a restriction to be overcome through massive importation, and an S&T policy is regarded as external to the socioeconomic policy and a separate consideration in the definition of national plans.

This attitude of the planners in underdeveloped countries encounters a favourable climate in the liberal philosophy of the main groups directing investigation, and thus a barrier is created between the bodies defining economic and social policies and the newly established organs of S&T policy. For this reason national S&T councils in Latin America appear and die out in barely 5 years. This was the atmosphere in Venezuela when the fifth national development plan began to be formed.

The Place of S&T in the Venezuelan National Development Plan

The national development plan is the instrument with which the state tries to redirect the economic and social activities of Venezuela. It establishes objectives and requirements for the S&T system, and the S&T infrastructure must offer solutions that permit the selection of one or other type of economic and social development. Because of the incipient S&T development of underdeveloped countries, it is difficult to imagine that they might offer solutions that would effectively direct the national development, but it is certainly true that if investigation is to be coupled to production, the broad outlines of S&T development must be planned

according to the socioeconomic orientation. In countries whose economy is not planned, the main factor producing this coupling is the market, which imposes the need for innovation to maintain competitiveness.

This relation is fostered by the state through a variety of mechanisms designed to stimulate research into activities such as the movement of personnel between companies, antimonopoly laws, the reduction of research costs, and managerial training.

Research that falls outside the competitive framework of business, generally that carried out in universities, is controlled by the availability of funds from the state, which depends on whether the proposed research reflects the main concerns of the nation.

For underdeveloped countries the need to plan S&T activities is rooted in political and economic factors. From the political point of view it is clear that there tend to be triangles of coexistence between countries rich in technology and wielding political power, countries producing raw materials, and countries offering financial and energy resources.

The principle of S&T interdependence is relevant only to countries that have sufficient capacity to initiate the flow of technology in both directions, wide local participation in the absorption and modification of the imported knowledge, and sufficient determination to define the conditions of transfer. With underdeveloped countries, which tend to be disorganized in this respect and to have little capacity for negotiation, the sale of technology by advanced countries is monopolistic, so as to permit maximum profits for the sellers. There is also a trend toward unequal distribution of income as a result of the commercialization of technology, and toward the use of technological power to reduce the political power of underdeveloped countries.

From the economic point of view it is impossible for a developing country to allow market forces to define the status of S&T research, because the priorities would be determined not by realistic social needs but rather by the interests of higher income groups or the multinational companies that dominate the economies of these parts of the world. There is, besides, a risk that the companies operating in captive markets might not assign funds to research, or that when they did, they might neglect research that would not yield short-term gains.

On the other hand, because in underdeveloped countries researchers and creators of technology are scarce there is a tendency to concentrate research — and its system of promotion and stimulus — on energy, defence, space, and nuclear problems. How is it possible to justify the use of state resources to support this type of research when there are other problems that, for political and social reasons, ought to take first priority?

The intervention of the state by means of planning is indispensable, both to obtain better distribution of scarce resources, and to effect the structural changes necessary to eliminate attitudes that hinder the action of S&T in relation to the needs of most of the people.

The Fifth National Venezuelan Development Plan

The fifth national plan envisaged the enhanced well-being of the population through accelerated growth in the areas of nutrition, education, technical assistance, housing, production, ecology, and investment,

with the following medium-term objectives: diversification of the economy, full employment, supply of essential input for the large groups with poor economic resources, deconcentration of economic activity, exportation of nontraditional goods, protection of natural resources, and reduction of the economy's vulnerability to external forces.

These objectives necessitated the following demands upon the local S&T infrastructure:

- Generation of new methods to increase agricultural and industrial productivity, with emphasis on full employment.
- Production of technology that would permit the rational use of nonrenewable natural resources and an increase in the local aggregate value of the basic products.
- Changes in the nutritional composition of mass-consumption food products without a reduction in the purchasing capacity of the low-income groups.
- Rational selection of technologies and creation of the capacity to use imported technology to induce the development of local technology.
- Development of design engineering capabilities and of the technology of capital goods production as indispensable links between laboratory activity and commercialization of the results.
- Evaluation of technology in view of the goals of generating full employment and preserving the ecological balance.
- Production of technology to permit the construction of housing adapted to the climate and culture of each region.
- Production of teaching systems that are better adapted to the nature of Venezuelan students and would permit greater access to education and improvements in its quality.
- Increase in basic research in universities to guarantee a better calibre of higher education and to accelerate by means of better qualified personnel the innovative capacity of the production sector.

The objectives of the fifth plan, in which the state, controlling more than 50% of the investments, played an important part, offered excellent prospects for the S&T development of the country. However, it remained necessary to establish an institutional structure that would permit systematic and continuous consultation with the main decision-making centres — those making the policies or consuming large amounts of technology. In addition, research centres would have to change their attitude and organization toward effective management of technology to permit not only the solution of day-to-day problems but also the capitalization of opportunities presented by the new dimensions of public and private investment.

Proposals for S&T Development

The fifth plan, because of the accelerated investment involved, carried the risk of strengthening rather than reducing the country's technological dependence. The investment plan was made without taking into account the savings that can result if the time sequence is adjusted so as to permit greater participation of local technology or its production; such savings are

sometimes greater than those resulting from accelerated investment to avoid the increasing costs due to world inflation.

In addition to the national S&T provisions that linked the fifth plan to the plan elaborated by the National Council for Scientific and Technological Research, there were S&T provisions for each economic sector that, though they did not define a precise strategy, reflected the desire to consider S&T development as an explicit objective.

On the other hand, the guidelines governing the acquisition of technology by state companies should have stimulated the demand for technological development as well. The fact that state companies were obliged to seek to diversify their sources of technology, with emphasis on local sources rather than the traditional foreign sources, represented a potential demand for engineering and research that would stimulate interrelations, lead to efforts to redirect activities, and increase the research potential.

A permanent source of finances for R&D activities was guaranteed by the provision that companies owned or partly financed by the state would have to create a fund destined exclusively to cover S&T expenses. These companies were to contribute each year between 1% and 2%, at a minimum, of their sales income. Although the R&D activities would fundamentally be directed toward the specific problems of the companies, they would also increase the flow of resources to such an extent that other institutions would be able to devote their efforts to the high-risk research areas traditionally neglected by the production sector. The decision to centralize the government's funds allocated to S&T development revealed the desire for more effective coordination between the bodies that promote, direct, finance, and carry out S&T research. This centralization of funding was also likely to stimulate research in the private sector, either through direct action by companies or through the financing of research centres.

Another new feature of the fifth plan was the linking of state incentives (credit and protection) to the use of domestically produced technology. This constituted the first explicit manifestation of a technology import substitution policy. Similarly, protective and credit schemes were designed to stimulate capital goods production in Venezuela. These schemes included protection barriers without time limitation, subsidized capital, and use of the state enterprises' purchasing power. They reflected the will to base economic growth upon improvement in the technological level of the country.

Another aspect of importance in the development of the country's S&T capacity, and contemplated in the general policies, was the definition of guidelines governing the acceptance of foreign capital and the transfer of technology. These guidelines restricted the traditional channels whereby technology was imported into the country and had the effect of obtaining the incorporation of national technology through local investors.

The other parts of the plan that explicitly dealt with S&T constituted a link with the S&T strategy elaborated in greater detail by the National Council for Scientific and Technological Research.

The requirements for S&T research were set forth in the first national S&T plan as follows:

- Creation of an S&T planning system within the national planning system, which would permit rationalization of the S&T activities then being carried out. The system would operate within an institutional framework to permit greater differentiation by priority, complementation, and coherence of the S&T activities, and to avoid the bureaucratic aspects that stifle activity. Aims of the system would include the participation of the entire chain of technological innovation and scientific support in the definition of policy, and the centralization of all financial resources to stimulate S&T.

- Development of a critical body of researchers and scientists to harness the creative capacity of the country to social priorities and open options for the medium-term creation of an infrastructure able to generate workable technology.

- Definition of priority research areas in relation to the plans and projects of the production sector. The aim was to reorient the demand for S&T toward local production and real needs.

- Pursuit of an integrated view of all the components of the S&T system. Emphasis would not be placed exclusively on the generation of new knowledge, but would take into account the possibility of incorporating research results, with the contribution of design engineering, into the machinery of production. The system would also incorporate aspects of quality control and other technical support services, such as information and technical assistance, which should develop harmoniously along with the capacity for generation of new knowledge.

- Pursuit of a double policy of, first, increasing the internal infrastructure in sectors that, because of the specific characteristics of the country, need to solve their problems by generating their own technology, and, second, defining the desirability of relegating the importation of technology to the local research centres, with the aim of having the elements required for innovation absorbed in the medium term. Hence, provision was made to dismember technological packages and to oblige state companies to break turn-key contracts.

- Creation of research or technological development groups within state enterprises to make the plan more workable in view of the characteristics of the national economy, with the state enterprises controlling the main goods-producing units and the most dynamic sectors of the economy.

- Creation of technology closely associated with problems falling within the area of influence of the different research centres, in the hope that their development would generate centres for the promotion of small- and medium-sized industry.

- Creation and support of special programs to popularize the principles of science and thus increase the national awareness of S&T matters. These programs would be aimed at improving the teaching of science. Likewise, a program would be created to promote the main values and principles of S&T in all the social strata of the country.

- A guaranteed flow of funds for basic research that would be free of all priorities and restrictions except those related to quality. Directed basic research would be stimulated to maintain harmony and close contact with applied and technological research projects. The aim would be to locate the projects in universities.

- Modification of the education system to meet the requirements of the new phase of development.

Institutional Structure

Development of the national S&T system would require a number of substantial modifications in the institutional framework. These modifications would have the following fundamental aims:

- To insert the S&T policy into the general development strategy, which would require compatibility of the S&T policy with the various sectorial policies.
- To coordinate all bodies concerned with the elaboration and execution of the S&T policy.
- To create conditions whereby the S&T policy might generate the obligation of the Venezuelan state to the public sector.

These aims, to be put into practice, would require the adoption of the following measures:

- The creation of an institutional network integrated by the National Council for Scientific and Technological Research, the Superintendency of Foreign Investment, the Evaluation Office, the Industrial Projects Register, the Industrial Property Register Office, the Technology Bank, Comision Venezolana de Normas Industriales, R&D institutions, and others that would need to be created, such as a coordinating office of Venezuelan state negotiations and a national engineering office. It would be possible through this network to coordinate the action of these institutions, whose part in the promotion and regulation of S&T activities is decisive.

- Modification in both the location and the legal attributes of the national council. This modification should ratify this body's role in the planning and coordination of the S&T activities undertaken in the country, situate it in the axis of the institutional network, and grant it the ability to establish permanent links with the bodies that contribute indirectly to determining the S&T behaviour of the country (organs of fiscal policy, of financial policy, and so forth), and to establish channels of communication with the private sector and with the research centres.

- The creation of a national register of R&D projects, in which should be recorded all such projects generated in the public sector and those generated in the private sector that make claim to any form of public help. The aim of the register would be to permit the national council to coordinate and plan for the creation of knowledge and to contribute to the observation of established priorities and the more rational use of available resources.

- The creation within state companies and sectorial bodies of technological and research policy nuclei that could receive resources once they had become compatible with the national S&T plan.

The main components of the national S&T planning system should function within the following broad outlines:

- The national council should be the axis organ of the institutional network.
- The Superintendency of Foreign Investment and the Industrial Projects Register should be merged, and the General Projects Office and the Industrial Property Register Office should be obligated to maintain close communication with the superintendency, with which they might even merge.
- The national council, the superintendency, the General Evaluation Office, the Industrial Projects Register, the Industrial Property Register Office, the Comision Venezolana de Normas Industriales, and the R&D institutions should be obliged to maintain permanent relations with a series of auxiliary bodies that fulfill special functions in the control of technology transfer: a national engineering office, essential for the technical evaluation of projects and for adapting, improving, and negotiating for foreign technology; a coordinating office of Venezuelan state negotiations, which would tend to centralize the acquisition of technology on behalf of the public sector; and a national information network.
- The specific function of the Technology Bank would be to provide risk capital required in the development of local technology that is used by the local production system. This body would serve as a link with the private sector.
- The sectorial planning and promotion bodies would make and promote plans and programs in their respective sectors that would fall within the provisions of the S&T development strategy.
- The action centres would work on multi-institutional R&D projects and programs, avoiding the dispersion of resources, and coordinating efforts within the objectives established by the S&T development strategy.

Notes on the Development of the First National S&T Plan

A number of key decisions were taken in the definition of the plan.

First, the plan had to be operative: in other words, it had to be implemented sufficiently to permit the mobilization of resources toward specific objectives. This decision was restricted by the fact that the National Council for Scientific and Technological Research lacked the instruments required for a correct appreciation of reality and the institutional channels that would allow for the precise assessment of the different parts of the system. Nor could it be accepted as valid, given the separation between the production sector and the research centres, that groups of council scientists and technicians should, in an isolated fashion, define the image pursued by the S&T system.

Second, internal support for the planning process would be provided by several projects, on instruments and technology transfer, for example.

The partial reports on the instruments project provided means of assessing institutional aspects of the S&T policy and the interactions between economy policy and S&T policy that revealed the weight of the implicit policy. The pilot project, which lasted 2 years, concentrated basically on operative aspects of technology transfer (internal and external), revealing that among the main obstacles to redirecting the local

production of technology toward the requirements of the production system was the user's inability to identify his needs and the lack of managerial training of the local operator. These projects gave sufficient information on external aspects of the S&T system to demonstrate that any plan that does not have the support of the economic and political decision-making centres will be converted into a simple academic exercise.

In view of this, a promotional strategy was organized to give to the planning process a technical-political nature. It sought the participation of the highest political authorities of the country, who were given the responsibility of coordinating each working group during the first S&T congress.

To overcome these restrictions the third key decision was made: to mobilize principal sectors of the economy by means of regional meetings of impresarios, researchers, science promoters, planners, and government leaders. Each event was like an open forum, with the national council employees acting as technical secretaries, with the most flexible work-guides possible, to harvest expectations and recommendations. Fifteen sectorial meetings were held in areas such as metallurgy, health, food, technology, and agriculture. These events had three aims: to define objectives that, though they might not be ideal, would emerge from the decisions made in consensus by the participants of each panel; to broaden the base of support for the plan; and to obtain information²⁰ as to the real requirements of the production sector and on socioeconomic matters, the last being possible because the development of the national S&T plan began a year after the establishment of the socioeconomic plans, on which the S&T plan was thus able to draw. After each meeting the participants were grouped to prepare documents for presentation at the first S&T congress.

All these activities created the climate required to convert the planning process into a great national project overrun by values that were at times in conflict and at times in perfect harmony: technology as a foundation for the autonomous political position to which Venezuela aspired, technological policy defined by market forces or directed by the state toward the solution of high-priority social problems, the definition of a political hierarchy in S&T planning, the definition of specific areas of research, and so forth.

This aspect of planning, which consists in defining the hierarchy of preferences, was effected at the first S&T congress, which was attended by 2 000 participants, 60% of them from the research sector. The congress confirmed the national council as the guiding organ of S&T policy, discarded the possibility of liberal S&T development, and accepted the need to reorganize S&T in relation to the objectives of development. The national council saw that in order to act as the guiding organ of the system it had to turn toward political decision-making and understand not only research promotion problems but all the aspects of a balanced development system.

The first S&T congress ratified the following: the need to invert the proportion of effort devoted to basic research, applied research, and

²⁰ The cost of not doing so with surveys was compensated by the quality of the data spontaneously put forward.

experimental development research; the high political status of S&T planning; and the priority of research areas. The last were grouped as regards their contribution to the stimulation of social variables (nutrition, housing, and health), the modernization of the economy, the raising of the value of nonrenewable resources, and the domination of technology. A collective aspiration was to define a coherent body of provisions to cover the system's behaviour over the next 5 years.

The president of the republic and his ministers committed themselves, at the opening and the closing of the congress, to executing the recommendations defined at the plenary session.

The national council, as the axis of implementation of the recommendations and in relation to the main objectives of the congress, had to assume a new organizational structure based on its new responsibility to make a coordinated plan, and it began its activities with the elaboration of the plan. Relying on its new weight in decision-making bodies, the national council obtained a reformulation of the S&T aspects of the socioeconomic plan and introduced elements of policy, such as the obligation of state companies to open technological packages and the guarantee of financial support for research activities within these companies.

The most important characteristics of this process were the following:

- Mobilization of resources was begun even before the plan was elaborated, which made the process dynamic.
- From the start the process was identified as a technical–political action, which eliminated the possibility of generation of negative results.
- The plan was participatory, for at each meeting the basic document presented was transformed and enriched by the opinions of the participants.
- A support basis was obtained; each participant played a part in activities after the congress.
- The plan emerged as a requirement of the community, not something imposed by a group of intellectuals. Besides, it had political support even before it was launched.
- The institution entrusted with the definition and supervision of the plan was to be supported informally as well as legally and institutionally.
- The dispersed decision-making centres were to seek coordination in order to fulfill the congress's directions and provide a certain coherence to the system.

In summary, the most important aspect from an internal point of view is that this process constituted experience in “learning on the job” and in the planning of technological independence. Its main fault lay in the fact that the close attention paid to external planning aspects implied the neglect of internal methodological aspects, such as the consideration of objectives and diminished distribution of resources. Throughout the plan, efforts were systematically made to adjust this phase of the process.