

THE LEGAL FRAMEWORK FOR S&T DEVELOPMENT*

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Constitutional Basis

Mobilizing the factors of production, of which technology is a crucial component, can succeed or fail partly because of flaws in the laws or in the constitution itself, and partly because of problems in implementation. This is because, to a great extent, the constitution and laws provide the mechanisms for the development of natural and human resources.

Researches show that a direct relationship exists between expenditures for science and technology (S&T) and the level of technological development, on the one hand, and economic development, on the other. Science and technology were responsible for propelling industrialized countries to their present status. The rapid economic growth of Korea, for instance, can be attributed to the effective use of S&T, induced by appropriate institutional and legal reforms.¹ Thus, while the presence of natural resources is a significant factor for growth, the legal framework is just as important since it can create a desirable environment for S&T inventions, adaptations, and innovations.

The 1987 Philippine Constitution contains good provisions to foster a science culture and to enable S&T to contribute effectively to productivity and a better quality of life for Filipinos. One of the principles embodied in Article II (Declaration of Principles and State Policies) provides that "The State shall give priority to education, science and technology, arts, culture, and sports to foster patriotism and nationalism, accelerate social progress and promote total human liberation and development."

Article XIV (Education, Science and Technology, Arts, Culture, and Sports) contains these four sections which provides incentives and gives

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1. Dr. Jinjoo Lee and Dr. Seongjae Yu, "The Role of Technology for Economic Development with Special Reference to the Korean Experience," 1989, n.p.

priority to science and technology; technology transfer; and the promotion, adaptation, and protection of intellectual property:

"Sec. 10. Science and technology are essential for national development and progress. The State shall give priority to research and development, invention, innovation, and their utilization; and to science and technology education, training, and services. It shall support indigenous, appropriate, and self-reliant scientific and technological capabilities, and their application to the country's productive systems and national life."

"Sec. 11. The Congress may provide for incentives, including tax deductions, to encourage private participation in programs of basic and applied scientific research. Scholarships, grants-in-aid, or other forms of incentives shall be provided to deserving science students, researchers, scientists, inventors, technologists, and specially gifted citizens."

"Sec. 12. The State shall regulate the transfer and promote the adaptation of technology from all sources for the national benefit. It shall encourage the widest participation of private groups, local governments, and community-based organizations in the generation and utilization of science and technology."

"Sec. 13. The State shall protect and secure the exclusive rights of scientists, inventors, artists, and other gifted citizens to their intellectual property and creations, particularly when beneficial to the people, for such period as may be provided by law."

Sections 5 and 7 Article XIII (Social Justice and Human Rights) also empower the state to provide support to agriculture through appropriate technology and research, while Section 12 mandates the State to "undertake appropriate health manpower development and research, responsive to the country's health needs and problems." As a significant support to human capital, Section 14 of Article XII (National Economy and Patrimony) provides that "the sustained development of a reservoir of national talents consisting of Filipino scientists, entrepreneurs, professionals, managers, high-level technical manpower and skilled workers and craftsmen in all fields shall be promoted by the State. *The State shall encourage appropriate technology and regulate its transfer for the national benefit.*" (underscoring supplied).

From the cited provisions, the Constitution clearly recognizes that the State must encourage research and development, inventions, innovations, and utilization through the following measures:

1. Appropriate incentives to the private sector and deserving science students, researchers, scientists, inventors, tech-

- nologists, gifted citizens;
2. Regulation of the transfer, promotion, and adaptation of technology from all sources;
 3. Support for indigenous, appropriate, and self-reliant scientific and technological methods, and their application to the country's productive system;
 4. Widest participation of private groups, local governments, and community-based organizations in generating and using science and technology; and
 5. Protection of intellectual property rights of scientists, inventors, and other gifted citizens.

Recent Laws and Presidential Issuances

To what extent have recent laws, issuances, and bills responded to the above challenges in the Constitution?

Executive Order No. 128 reorganized the National Science Development Authority into a Department of Science and Technology. Six institutes were retained or renamed, namely, Philippine Nuclear Research Institute (PNRI); Food and Nutrition Research Institute (FNRI); Forest Products Research and Development Institute (FPRDI); Philippine Textile Research Institute (PTRI); Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA); and Philippine Institute of Volcanology and Seismology (PHILVOLCS). Five more were created: Industrial Technology Development Institute (ITDI), Advanced Science and Technology Institute (ASTI), Science Education Institute (SEI), Science and Technology Information Institute (STII), and Technology Application and Promotion Institute (TAPI); at the same time, the following two institutes were abolished: Science Promotion Institute (SPI) and Philippine Inventions Development Institute (PIDI). The following councils under the National Science and Technology Administration (NSTA) were retained: Philippine Council for Health Research and Development (PCHRD) and Philippine Council for Industry and Energy Research and Development (PCIERD); the Philippine Council for Agriculture and Resources Research and Development (PCARRD) was modified by having the planning and coordinating functions for agriculture, aquatic, and marine resources divided between the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCAFRD) and the Philippine Council for Aquatic and Marine Research and Development (PCAMRD). A new council was established called the Philippine Council for Advanced Science and Technology Research and Development (PCASTRD). The Appendix outlines the powers and functions of the various institutes and councils.

Legal Hindrances and Flaws

The councils serve as the sectoral planning and monitoring bodies for each functional area such as health, industry, energy, agriculture, aquatic and marine, and advanced science and technology. Because of the multi-agency nature of the council, it can coordinate the endeavors of various government agencies in research as well as science and technology. Linkages with the private sector also exist because the sector's representative sits in the council as member. Unfortunately, these important aspects of the councils' roles have been left unmonitored and unevaluated. The extent each council effectively coordinates the plans for each sector, for instance, has not been assessed; neither has its influence in crucial decisions been evaluated. Yet, precisely on these aspects hinges the development of the country's S&T. Appropriate legislation should then be proposed to ensure the effectiveness of these bodies in their assigned roles.

In its 27 March 1989 report to the President, the Presidential Task Force on Science and Technology (PTFST), created on 11 August 1988, identified another shortcoming -- the weakness in the technology delivery system of research institutes. This weakness is most apparent in their lack of capability to perform product standardization tests, technology transfer, and commercialization. Ironically, the efforts in these areas are hampered by lack of facilities, rigidities of procedural requirements, and a relatively low salary scale for science positions. One then wonders whether the present structure or mechanism is appropriate for the task of technology transfer or commercialization, or whether a corporate status would be more functional and relevant as in the case of Korea and Thailand.

PTFST also recognized the inhibiting effects of the present structure of the Industrial Technology Development Institute (ITDI) and the Technology Application and Promotion Institute (TAPI). ITDI contracts researchers in various fields such as food processing, housing materials, and chemicals. However, it cannot act with flexibility because of its status as a bureau. The same constraint applies to TAPI thereby restricting the commercialization of technologies. In contrast, the Korean Advanced Institute of Science and Technology (KAIST) is vested with considerable autonomy, and has a project development department that contracts with industry for specific research projects.²

2. It is useful to analyze the phases of Korean S&T development and the roles of structures and policies in accelerating economic growth. The initial phase of Korea's development (1960s) adopted the S&T strategy of strengthening scientific and technical education, building up technological infrastructure, and promoting foreign technology

Even Thailand's law entitled "Thailand Institute of Scientific Technological Research Act" grants the Institute corporate powers because it is recognized as a juridical entity (Sec. 6). This is perhaps one of the factors that has enabled Thailand to undertake S&T innovations with considerable speed and efficiency and to develop itself as a newly industrialized country.

Legal Support for S&T Education

To what extent has science education and training matched the requirements for a strong technological base? The cited PTFST's report identified several important targets for 1989- 1992, including the following:

1. To identify key secondary schools in the different provinces and regions where science honor programs can be initiated, and where laboratory facilities can be upgraded.
2. To include scientists and technologies outside of DOST in an improved and expanded science career system, and to develop incentives for science careers.

President Aquino created the Science and Technology Coordinating Council under Administrative Order No. 123 dated April 4, 1989 as amended by Administrative Order No. 125 dated April 21, 1989 to monitor the implementation of the PTFST recommendations and to recommend appropriate measures. The Council is headed by the DOST Secretary and is composed of the Secretaries of Trade and Industry, Agriculture, Transportation and Communication, Health, Environment and Natural Resources, Foreign Affairs, Education, and National Defense; and two representatives from the private sector one of whom serves as Vice-Chairman. The other Vice-Chairman represents the academic community.

Granting each school a science honor class is now contained in Senate Bill (SB) No. 610 sponsored by Senator Jose Lina. There is, however, a need to harmonize the recommendations of PTFST Senate Bill 610, and other bills promoting S&T to unify these efforts supporting S&T development.

import. The second phase (1970s) focused on the strengthening of technology and engineering in heavy and chemical fields, improving the institutional mechanisms for adopting imported technology, and promoting research for industrial needs. The third phase (1980s) intends to transform the industrial structure to one of comparative advantage to expand technology-intensive industries such as machinery and electronics, to encourage technical manpower development, and to enhance productivity. [Choi, Hyung Sup, "Direction for Technological Self-Reliance Korean Approaches" (Keynote address at the workshop on HRD Policy and Planning for Technology and Development, Seoul, Korea, 19 Oct.-6 Nov. 1987)

Other pending bills promote the following S&T concerns:³

1. Education and manpower development - SB No. 610, SB 630, SB 632, HB 6728, HB 9795
2. Incentives - SB 242, SB 286, HB 6221, HB 15777, HB 16054, HB 18015
3. New Organizations/bodies - SB 404, SB 587, SB 476, HB 603, SB 629, SB 400, HB 590, HB 2487, HB 2996, HB 8239, HB 4657, HB 9143, HB 16570, HB 17172, HB 18540, HB 1168
4. Science fund - SB 596, HB 20616
5. Expansion of powers, duties, functions - HB 17994, HB 19971, BH 19972
6. Others (regulation and conservation - SB 600, SB 939, SB 383

In the same way that the PTFST recommendations and bills have to be rationalized, all legislative proposals need to be examined within the framework of the Constitutional provisions mentioned earlier, to assure that the congressional priorities are within the mandate of the country's fundamental law.

Areas for Research

Many of the bills, plans, and programs for S&T development have been generated by the government sector. The private sector, through the Philippine Chamber of Commerce and Industry (PCCI) and other organizations, have also articulated their expectations and requirements for S&T in various reports and resolutions. From these initiatives, the following areas for future in-depth research were called and identified:

1. Proposals for legislative agenda based on constitutional criteria and priorities.
2. Policies on promotion and transfer of technologies and their relevance to economic growth.
3. Policies on S&T manpower development and their appropriateness in developing a sound technological base for the country.
4. Policies on the involvement of non-governmental organizations (NGOs) and local government units in S&T projects for countryside development.

3. No. of Senate bills = 15; no. of House bills = 20.

Studies on the above areas will enable our national policymakers to formulate practical and workable measures to carry out projects that will contribute to employment opportunities, increase income levels in the rural areas, productivity and national development.

APPENDIX

POWERS AND FUNCTIONS OF DOST COUNCILS AND INSTITUTES

A. Sectoral Planning Councils (Sec. 13 of Executive Order No. 128)

The DOST has five sectoral planning councils:

1. Philippine Council for Industry and Energy Research and Development (PCIERD), for industry, energy, mineral resources;
2. Philippine Council for Health Research and Development (PCHRD), for health;
3. Philippine Council for Aquatic and Marine Research and Development (PCAMRD), for aquatic and marine resources;
4. Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCAFNRD), for agriculture and forestry resources;
5. Philippine Council for Advanced Science and Technology Research and Development (PCASTRD), for advanced science and technology.

Each of the councils shall be responsible to their respective sectors for the formulation of strategies, policies, plans, programs and projects for science and technology development; for programming and allocation of government and external funds for research and development; for monitoring of research and development projects; and for the generation of external funds.

B. Institutes (Sec. 19 of E.O. 128)

The Institutes of the Department are the following:

1. *Industrial Technology Development Institute (ITDI)* has the following functions (Sec. 20 of E.O. 128)
 - undertake applied research and development to develop technologies and technological innovations in the field of industrial manufacturing, mineral processing, and energy;
 - undertake the transfer of research results directly to end-users or preferably via linkage units of other government agencies;
 - undertake technical services such as but not limited to standards, analytical, and calibration services mandated by law or as needed by industry;

- conduct training and provide technical advisory and consultancy services to industry clientele and end-users.
2. *Philippine Nuclear Research Institute (PNRI)* has the following functions (Sec. 21 of E.O. 128):
- conduct research and development on the application and radiation and nuclear materials, processes and techniques in agriculture, food, health, nutrition and medicine and in industrial or commercial enterprises;
 - undertake the transfer of research results to end-users, including technical extension and training services;
 - operate and maintain nuclear research reactors and other radiation facilities.
3. *Food Nutrition Research Institute (FNRI)* has the following functions (Sec. 22 of E.O. No. 128):
- undertake research that defines the citizenry's nutritional status, with reference particularly to the malnutrition problem, its causes and effects, and identify alternative solutions to them;
 - develop and recommend policy options, strategies, programs and projects, which address the malnutrition problem for implementation by the appropriate agencies;
 - disseminate research findings and recommendations to the relevant end-users.
4. *Forest Products Research and Development Institute (FPRDI)* has the following functions (Sec. 23 of E.O. 128):
- conduct applied research and development in secondary and tertiary processing for the forest-based industry to generate information and technology which can improve the utility value of wood and other forest products;
 - undertake the transfer for completed researches directly to the end-users or via linkage units of other government agencies;
 - undertake technical services and provide training programs.
5. *Philippine Textile Research Institute (PTRI)* has the following functions (Sec. 24 of E.O. No. 128):
- conduct applied research and development for the textile industry sector;
 - undertake the transfer of completed researches to end-users or via linkage units of other government agencies;
 - undertake technical services and provide training programs.

6. *Advanced Science and Technology Institute (ASTI)* has the following functions (Sec. 25 of E.O. No. 128):
 - undertake long-term researches to strengthen and modernize science and technology infrastructure;
 - conduct research and development work in the advanced fields of studies including biotechnology and microelectronics;
 - complement the overall endeavor in the scientific field with intensive activities in the computer and Information technologies.
7. *Science Education Institute (SEI)* has the following functions (Sec. 26 of E.O. No. 128):
 - undertake science education and training;
 - administer scholarships, awards and grants;
 - undertake science and technology manpower development;
 - formulate plans and establish programs and projects for the promotion and development of science and technology education and training in coordination with the Ministry of Education, Culture and Sports, and other institutions of learning in the field of science and technology.
8. *Science and Technology Information Institute (SEI)* has the following functions (Sec. 27 of E.O. No. 128):
 - establish a science and technology databank and library;
 - disseminate science and technology information; and
 - undertake training on science and technology information.
9. *Technology Application and Promotion Institute (TAPI)* has the following functions (Sec. 28 of E.O. No. 128):
 - undertake contract research, particularly at the pilot plant and semi-commercial stage;
 - provide technical consultancy including engineering design services, patenting, and licensing services;
 - provide grants and/or venture-financing for new and/or emerging projects.
10. *Philippine Atmospheric, Geophysical and Astronomical Services (PAGASA)* has the following functions (Sec. 29 of E.O. No. 128):
 - maintain a nationwide network pertaining to observation and forecasting of weather and other climatological conditions affecting national safety, welfare, and economy;

- undertake activities relative to observation, collection, assessment, and processing of atmospheric and allied data for the benefit of agriculture, commerce, and industry;
 - engage in studies of geophysical and astronomical phenomena essential to the safety and welfare of the people;
 - undertake researches on the structure, development, and motion of typhoons and formulate measures for their moderation; and
 - maintain effective linkages with scientific organizations here and abroad, and promote exchange of scientific information and cooperation among personnel engaged in atmospheric, geophysical, and astronomical studies.
11. *Philippine Institute of Volcanology and Seismology (PIVS)* has the following functions (Sec. 30 of E.O. No. 128):
- predict the occurrence of volcanic eruptions and earthquakes and their geotectonic phenomena;
 - determine how eruptions and earthquakes shall occur and areas likely to be affected;
 - exploit the positive aspects of volcanoes and volcanic terrain to further the socioeconomic development efforts of the government;
 - generate sufficient data for forecasting volcanic eruptions and earthquakes;
 - formulate appropriate disaster-preparedness plans; and
 - mitigate hazards of volcanic activities through appropriate detection, forecast, and warning systems.

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