

## PROGRAM OF SUPPORT FOR TECHNOLOGICAL INNOVATION

(GU-0135)

### EXECUTIVE SUMMARY

<b>Borrower and guarantor:</b>	Republic of Guatemala	
<b>Executing agency:</b>	National Science and Technology Council (CONCYT), by way of its National Science and Technology Secretariat (SENACYT)	
<b>Amount and source:</b>	IDB: (OC Single Currency Facility)	US\$10.7 million, up to US\$5 million of which will receive Intermediate Financing Facility resources for the payment of interest
	Government:	US\$ 3.2 million*
	Total:	US\$13.9 million
<b>Financial terms and conditions:</b>	Amortization period:	25 years
	Grace period:	3.5 years
	Disbursement period:	3 years
	Interest rate:	variable
	Inspection and supervision:	1% of the loan amount
	Credit fee:	0.75% per annum on the undisbursed balance
	Currency:	U.S. dollars
<b>Objectives:</b>	<p>The primary objective of the program is to enhance the productivity and competitiveness of small and medium-sized enterprises (SMEs), by: (i) providing funding for technological innovation; (ii) implementing a technology extension and information service; and (iii) consolidating a medium- and long-term policy framework for the sector.</p> <p>By the end of the program, businesses, universities, specialized technology centers and similar institutions will have enhanced their know-how and capacity to generate, adopt, and/or transfer innovative technologies.</p>	

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\* This amount includes beneficiaries' contributions of up to US\$2.2 million.

**Description:** The program has been structured into three components plus the establishment of a new administrative department in SENACYT. The main features of these components are as follows:

**Component 1: Financing technological innovation**

This component will provide cofinancing (matching grants) to: (i) meet the demand for technological innovation on the part of small and medium-sized enterprises; (ii) improve the supply and availability of technological services by strengthening institutions specializing in such services; and (iii) create technology management centers to promote and facilitate commercial dealings between businesses and specialized centers.

**Component 2: Technology information service**

The objective of this component is to facilitate the gathering, organization and dissemination of technological information required by SMEs. The component will finance: (i) creation of a network of technology extension agents; (ii) a pilot project to expand electronic information services that are useful to SMEs; and (iii) a pilot project to equip community information centers with technology so they can offer SMEs access to the Internet and other modern information and communications services.

**Component 3: Support for an enabling framework to foster innovation**

This component will help expand and update the policy framework and fund institutional support to improve science education and the dissemination of scientific knowledge and technological know-how. It includes two subcomponents: (i) financing for a second stage of the National Science, Technology and Innovation Plan (2001-2005) and the associated dissemination and promotion campaign for the National Plan and the program; and (ii) a program to improve secondary-school science, mathematics and technology education.

In addition, the program will fund the establishment of a new Technological Innovation Department (DITEC) to strengthen administrative management in CONCYT.

**The program's relationship to the Bank's sector and country strategy:**

The Bank's strategy agreed upon with the Government of Guatemala includes support for economic growth, modernization of the State, and competitiveness. The support that this program will provide to SMEs will build on the potential of the small and medium-sized enterprise sector as an engine of economic growth, by promoting practical applications of science and technology in their production methods,

thereby making them more competitive and enhancing their export capacity and thus boosting their earnings.

**Environmental  
and social  
review:**

There is no provision in the proposed program for financing physical infrastructure. Execution of the operation is not expected to have any negative environmental impact. The program's Operating Regulations will include specific criteria to ensure that no adverse environmental impacts are generated in the subprojects financed. Technology extension agents will receive, as part of their training, instruction in identifying environmental impacts that could be produced by the enterprises they assist. In addition, the Technology Information Node and the Community Information and Technology Centers will have available information on clean technologies and basic procedures for recognizing possible harmful effects on the environment and for mitigating the most common negative impacts.

**Benefits:**

At the end of the program, the technological capacity of small and medium-sized enterprises in terms of production and exports will be considerably stronger. That improvement in turn will have a favorable impact on national economic growth and improve SMEs' global competitiveness.

The following are the expected program outputs and outcomes: (i) a policy framework that will facilitate technological innovation generally; (ii) a foundation for sustainable operation of a funding mechanism for technological innovation; (iii) adoption by at least 250 SMEs of high-technology practices and procedures that will enhance their productivity and competitiveness in the medium term; and (iv) at least 10 science and technology service providers offering competitive, higher quality services.

In addition, new opportunities for financing innovation and technical support will allow for collective learning about the uses and benefits of science and technology. In particular, these opportunities will help bring the academic world and producing sectors into closer touch, whereupon researchers will have more input into efforts to resolve national development problems.

**Risks:**

From an institutional standpoint the program could encounter two main risks: (i) CONCYT might be unable to develop a productive, effective and efficient relationship with SMEs; and (ii) the institutional backup required for CONCYT to sustain the activities initiated under this program might not be developed.

With respect to the first risk, program funds have been earmarked for hiring a consulting firm or institution specializing in cofinancing technological innovation, similar to that proposed in this program. As well, to support management of the technology extension service, CONCYT will engage an international consultant with a solid track record in operating successful extension services.

As for the second risk, the financing and technical assistance facilities are expected to spur recipients (on the supply and demand side) to increase their support for the sector's advancement – both at the individual level and by leveraging other funds. The midterm evaluation will verify this assumption, seeking evidence of the program's viability and financial sustainability, including the government's intention to support this sector in future.

In terms of the supply of science and technology services, there is a risk that universities and other technology service providers might not adapt their structures and regulations so as to permit effective linkages with businesses that seek to buy their services. To expedite such changes the program will create management centers which will, through competition, facilitate marketing and lower transaction costs of obtaining technology services. Furthermore, the current political and economic climate in Guatemala holds out a unique opportunity: with the civil war at an end the universities have undertaken to strengthen their links with the productive sector.

**Special  
contractual  
clauses:**

**Conditions precedent to the first loan disbursement:**

1. Upon fulfillment of the Bank's standard conditions precedent to disbursement, and presentation of the agreement for transferring program resources from the borrower to CONCYT, up to US\$200,000 of the loan proceeds may be disbursed, as part of the sum budgeted for DITEC (paragraph 3.10).
2. **Conditions precedent to disbursement of the balance of the loan proceeds:**
  - a. Entry into force of the program's Operating Regulations (paragraphs 3.11, 3.22).
  - b. Hiring of consulting services for component 1 (paragraph 3.14).
  - c. Startup of the Technological Innovation Department, with the necessary personnel (paragraph 3.9).

In addition, the following special conditions must be fulfilled prior to disbursement of the following specific components:

**3. Conditions precedent to disbursement of component 2:** Hiring of a consultant with expertise in technology extension services management for the technology extension network subcomponent (paragraph 3.18).

**4. Conditions precedent to disbursement of component 3:** Entry into force of the agreement between CONCYT and the Ministry of Education for execution of the subcomponent for improving secondary-school science, mathematics and technology education (paragraph 3.21).

**Conditions to be fulfilled during program execution:** (i) within nine months after the effective date of the loan contract, evidence must be submitted that the duration of the Administration Trusteeship Agreement with FONACYT has been extended (paragraph 3.8); and (ii) the borrower undertakes that in order to gain access to resources under subcomponent 3.2, the Secondary Education Extension and Improvement Program institutes (PEMEMs) must be in compliance with the requirements established in paragraph 3.21.

The loan contract will also include standard Bank conditions relating to audits, reports, inspections, evaluations, maintenance, the hiring of consultants, and procurement of goods.

**Poverty-targeting and social sector classification:**

Because the primary beneficiaries of the program will be small and mid-sized enterprises and such businesses do not necessarily include low-income persons, the program is not classified as poverty targeted nor as a social equity enhancing and poverty reduction project as provided in the Eighth Replenishment document (paragraph 4.12).

**Exceptions to Bank policy:**

None.

**Procurement:**

For public sector institutions participating in the program, (a) international competitive bidding will be mandatory for purchases of goods for this program costing US\$250,000 or more; and (b) international calls for proposals will be required for the hiring of consultants on contracts valued at US\$200,000 or more. International calls for proposals also will be required in cases where consultants are needed with specialties that are difficult to find in Guatemala. The procurement of goods and hiring of consultants by these institutions will be subject to standard Bank procedures. There are no plans for

civil works to be funded out of the loan proceeds or the local counterpart contribution (paragraph 3.27).

Small and medium-sized enterprises taking part in the program will purchase goods or related services and hire consultants following Bank rules for the private sector, as described in paragraph 3.28.

## I. BACKGROUND

### A. The economic setting of the program

- 1.1 The central issue of concern to the Guatemalan government in the science and technology area is the need to rise to demands for productivity and competitiveness that are ensuing from the recent opening of the economy and still-low levels of income in Guatemala. Without a more thorough incorporation of technology into Guatemalan industrial practices, the economic growth rate of recent years could be compromised. It is particularly critical that small and medium-sized enterprises (SMEs) be enlisted as an engine of growth.<sup>1</sup>
- 1.2 In recent years a series of initiatives have been undertaken, both by the private and the public sector, that have served as the basis for designing this program. Of special interest are the initiatives taken by the following institutions: (i) the Guatemalan Chamber of Industry (CIG), which has provided technical support to SMEs through extension agents and has also developed a "Subcontractor Exchange" to identify potential exporters; (ii) the Nontraditional Exporters' Association, which provides information on markets and quality requirements for exports of nontraditional products; (iii) the National Science and Technology Council (CONCYT), which has been financing universities and researchers engaged in research and development projects; (iv) the Central American Institute for Industrial Research and Technology (ICAITI), which for many years until its recent closing provided support at the international level in terms of education, equipment and professional training, and (v) the Ministry of Education, which has adopted the improvement of science and technology education as one of its key targets for reform. Despite these experiments and the lessons learned, there remain a number of obstacles.

### B. Principal obstacles to the incorporation of technology

- 1.3 **Inadequate financing.** While microenterprises benefit from the support of nongovernmental organizations, and large businesses can obtain commercial bank loans, SMEs have virtually no access to financing, particularly for technological innovation. For commercial banks, financing new technologies implies high risks. Their lack of familiarity with methods for evaluating technological risks means that they frequently overestimate the risk of failure. For their part, entrepreneurs face constraints in their access to credit, such as high interest rates and short repayment terms that are inconsistent with the expected life of the project, and there is no

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<sup>1</sup> The potential of SMEs lies in their significant contribution to the national economy. Small enterprises are those that employ between 5 and 20 workers and have a capitalization of between Q20,000 and Q1 million. Medium-sized enterprises employ between 21 and 60 workers and have a capitalization of between Q1million and Q5 million. The total number of SMEs in Guatemala is estimated at some 12,800, registered in various associations. These account for at least 80% of the country's productive units, and employ at least 25% of the economically active population, while generating 55% of national output.

workable system for providing guarantees. Moreover, entrepreneurs find that, since technology is changing so swiftly, it is extremely difficult and expensive to identify and evaluate technological alternatives.

- 1.4 Consultations and studies done of SMEs' interest in technological innovation revealed the existence of an excess demand for innovations. Of a total universe of 12,752 SMEs, 53% claim to have technological needs and of these, 60% are planning to undertake new investments related to technology. Considering that at least half of these enterprises lack the capacity to identify their technology needs, that a very low number (3%) have any real capacity to innovate promptly, and that many of them (70%) face serious problems of access to credit, it was conservatively estimated that the unmet demand for technology will amount to between US\$8 million and US\$10.5 million over the next five years.

#### **Problems facing SMEs**

SMEs face difficulties that go far beyond the lack of financing and technical assistance for incorporating better technologies. Their needs may be classified under five headings: (i) financial (from working capital to risk capital); (ii) market information; (iii) administrative skills (including the management of technological change); (iv) training (especially to help them understand shifting market demands) and (v) access to best-practice technologies.

The financial needs of Guatemala's SMEs are gradually being attended to by the commercial banking system, thanks to the involvement of lending agencies such as the NGO Génesis Empresarial, Banco Empresarial, Banco Privado para el Desarrollo (BANCASOL) and Banco de Occidente, entities that have recently opened SME departments. These opportunities, however, do not include financing for technological innovation.

Information on local and international market supply and demand, quality requirements etc. is improving, with the emergence of the Nontraditional Exporters' Association and the services of the National Competitiveness Program (PRONACOM). In terms of strengthening business management, the Technology Unit for Support to Small and Medium-sized Industry (UTEPYMI) and Génesis Empresarial offer a variety of short training courses in administration. Some institutions, such as the University of San Carlos, are preparing to introduce new programs of continuing education. To respond to the problem of a business culture that is little inclined to training, the UTEPYMI will be improved through a project supported by the MIF. Discussions are also under way for possible reforms to vocational education that would include the Technical Training and Productivity Institute (INTECAP).

Once these obstacles have been overcome, the capacity to effect technological change will come to be seen as a new bottleneck. In addition to propagating new and better practices and technologies, the national strategy for disseminating technology for SMEs will have to deal with each of the five basic needs listed, within the framework of the rules to be established by the World Trade Organization (WTO), which in turn will require a different business culture.



- 1.5 **Shortage of information on appropriate technologies.** Guatemala currently offers inadequate access to information on the availability and applicability of technologies that could translate into business opportunities for SMEs.
- 1.6 The basic challenge for technological innovation consists in familiarizing SMEs with the benefits, savings and profits to be derived from technological innovation. To do so will require the provision of specialized, timely support at reasonable cost. Many countries, in particular industrialized countries, have achieved impressive results through systems of technology extension services. (See box.)

#### **Technology extension services**

The Industrial Research Assistance Program administered by Canada's National Research Council includes a technology extension component. It offers SMEs a network of contacts and services to help them find potential clients, identify their technological weaknesses, and take steps to resolve them. It operates in 110 cities, distributed across all of Canada's provinces. A third of its personnel belong to provincial research organizations and 40% are consulting engineers and other specialists with links to universities, private technology centers and industrial associations; the rest are employees of the National Research Council. Since the program is seen to generate positive externalities, the government does not charge for its extension services.

The role of extension agents is considered very important in Canada. From the viewpoint of SMEs, their services afford high value-added. In one survey, 84% of firms interviewed replied that the advice and information supplied by extension officers were pertinent to their needs. In Manitoba, it was found that provincial GDP had increased by Can. \$17 million, and 328 new jobs were created, through an investment of Can. \$1.1 million in projects supported by extension agents. The Canadian extension model has been replicated in Colombia, Malaysia, Singapore, Thailand, South Africa and several European countries.

In the United States, extension services are a central feature of the Manufacturing Extension Partnership Program (MEP), which has set up a series of centers through a process of public bidding. The centers are staffed by experienced engineers and business experts and are supported with funding from public and private organizations, as well as a contribution from the federal government in the form of matching grants. The centers offer services and products to meet the needs of local industrial enterprises undertaking innovative and experimental projects.

- 1.7 **Universities and schools are not meeting demand.** The country's universities have only a minimal installed capacity in terms of quality testing, research and technical services. Several faculties have signed contracts with the productive sector, but the universities are not organized to attract business or to respond effectively to potential market demands. Their administrative structures are centralized and in many cases they lack the necessary equipment and laboratories.
- 1.8 Universities have shown an interest in strengthening their ties to the private sector, and in particular with SMEs. Some have engaged in dialogue with businesses and

have offered to conduct studies to determine the real demand for their products and their possibilities of meeting that demand. They also recognize that if they are to provide the services expected of them they will have to undertake institutional and administrative changes. Such changes are a difficult and complex matter, since they involve both legal and organizational restructuring.

- 1.9 At the same time, the basic education system (from preschool to grade 12) will have to be thoroughly revamped over the longer term. For the medium term, Guatemala's capacity to cope with the technological challenges of the global economy will be increasingly limited by the quality shortcomings of education in science, mathematics and technology. The Labor-Management Commission for Education Reform has targeted science and technology education upgrading as a pivotal feature of education reform.
- 1.10 In order to develop a human resource base to meet the needs of SMEs, the Ministry of Education intends to strengthen teaching in PEMEM (Secondary Education Extension and Improvement Program) institutes. The mandate of these institutions is to produce a high-quality labor force for industry, including SMEs, but the quality of instruction they are delivering is not up to the technological demands of the marketplace.
- 1.11 **Needed adjustments to the enabling framework.** Taken together, the limitations noted above have produced an imbalance between the supply of and demand for technology services. On the demand side, many SMEs are ready to acquire equipment and technology services in order to upgrade their operations and make them more competitive, but they find that the risks of innovation and the transaction costs of identifying, purchasing and servicing new technologies are beyond their capacity. They remain thus unaware of their technological shortcomings and they have little contact either with specialists and universities or with the commercial banking system. To date, it is the suppliers of machinery and equipment who have been their only source of information and financing.
- 1.12 This imbalance has inspired the government to create intermediary institutions to balance supply and demand. As part of this approach, steps have been taken recently to improve the enabling framework for technological change by creating two new institutions that will serve as catalysts and provide guidance in the use of technology to enhance business productivity and competitiveness: (i) the National Science and Technology Council (CONCYT), created in 1991 with a mandate to manage the National Science, Technology and Innovation Plan, and (ii) the National Competitiveness Program (PRONACOM), created in 1997 under the Ministry of Economic Affairs. The following table provides further details on these and other institutions.

<b>Principal institutions involved</b>	
CONCYT	National Science and Technology Council, an autonomous entity chaired by the Vice President of the Republic. Responsible for national science and technology policy and for promoting institutions, policies and stakeholders associated with innovation.
FONACYT	National Science and Technology Fund. CONCYT financing facility to manage financial resources, coordinate and fund national scientific and technological development. By law, it has an annual budget of Q15 million, which may be increased upon application by CONCYT to the Executive Branch. FONACYT has a number of specific financing lines for funding and promoting science and technology development in the country.
PRONACOM	National Competitiveness Program of the Ministry of Economic Affairs. Concentrates primarily on investment and export policies, with an emphasis on promoting "clusters".
CIG	Guatemalan Chamber of Industry. Provides support to SMEs via UTEPYMI and serves as an intermediary with foreign exporters seeking to subcontract a portion of their production to local firms. Its "Subcontractor Exchange" provides a link between local firms and international companies.
UTEPYMI	The Technology Unit for Support to Small and Medium-sized Industry, which has provided technical assistance in the form of extension services to SMEs. UTEPYMI will now abandon these direct responsibilities to become a second-tier institution for facilitating the exchange of consulting services among SMEs and promoting training and skills upgrading (MIF project).
FEPYME	Guatemalan Federation of Small and Medium-sized Enterprises. Represents the interests of a large group of SMEs. Not all its members belong to the CIG.
MayaNet	Electronic communication network operated by CONCYT: provides Internet services and linkages to academic institutions and government offices.
MINEDUC	The Ministry of Education has formal and informal education programs in science, mathematics and technology, aimed at preparing future employees and entrepreneurs for the SME sector.
PEMEM	Secondary Education Extension and Improvement Program, a network of 46 secondary-level training institutions offering a vocational and technical program useful for SMEs.

### **C. CONCYT as the key vehicle for facilitating technological change**

- 1.13 **Functions and capacities of CONCYT.** Decree-Law 63-91 entrusted CONCYT with formulating a national policy for scientific and technological development, coordinating the preparation and execution of the National Science, Technology

and Innovation Plan and associated sector programs, and approving the budget of and overseeing the National Science and Technology Fund (FONACYT).

- 1.14 Guatemala's first Science and Technology Plan originally covered the period 1992-1996. This was extended to cover the years 1997-2000, with no change to its content. The Plan has provided the sector with a broad and flexible roadmap for science and technology activities, but CONCYT will now have to prepare a new plan for the period 2001-2005.
- 1.15 The country's productive sector is represented in CONCYT by the Chamber of Industry, the Small Business Chamber [*Cámara Empresarial*] and the Chamber of Agriculture. However, the bulk of CONCYT's management experience relates to the analysis, evaluation, financing and monitoring of projects submitted by universities and other academic and science and technology research institutions. For managing projects and other activities aimed at promoting business innovation and technological modernization, CONCYT intends to contract specialized personnel and establish new procedures that will allow it to provide more efficient and timely services to SMEs.

**D. The government's strategy**

- 1.16 The government intends to promote the use of science and technology to help producing firms bolster their international competitiveness. With this aim in mind, CONCYT has asked for Bank support in consolidating the government's incipient efforts to enhance the productivity and competitiveness of Guatemalan industry.

**E. Bank experience with similar projects in Guatemala**

- 1.17 The Bank's aim is to support economic growth, modernization of the State, and the competitiveness of Guatemalan business. The program proposed here will help SMEs achieve their potential as an engine of sustainable growth, by putting science and technology to work.
- 1.18 The program will also complement activities planned under other loans. For example, the project to support restructuring of food and agricultural production funded by loan 1153/OC-GU has a component called Competitive Technology Development Fund for Food and Agriculture, to be implemented by CONCYT through the AGROCYT line on a competitive basis. It is expected that the results of that project will complement the purposes of the present program, since they will lay the foundation on which SMEs can apply for financing to improve the quality and variety of their products through technological innovation.
- 1.19 For its part, the MIF strategy is aimed at supporting managerial and labor force training in Guatemala, and this will also complement the present program. With MIF support, UTEPYMI is being transformed into a second-tier institution, and

will shift its focus from providing services to promoting consulting and training activities among SMEs. Instead of providing extension services directly, as it has done to date, UTEPYMI will administer vouchers which industries can use to obtain training for their employees and/or to assess their plants and production methods.

- 1.20 The MIF is also financing a program of institutional and policy development in support of micro, small and medium-sized enterprises (MIPYMES). This will assess supply and demand in the sector and produce an inventory of institutional and legal obstacles that now inhibit the sector's development, with a view to devising policy guidelines. In this way, some of the technological weaknesses identified could be remedied through the present program.

## **II. PROGRAM DESCRIPTION, COST AND FINANCING**

### **A. Introduction**

- 2.1 The objectives of the program have been conceived as a direct response to the assessment presented in chapter I. The program will provide the SME market and the suppliers of technology services with the following set of key elements for their development: (i) timely financing under favorable terms and conditions in support of technological innovation; (ii) guidance in diagnosing technological problems, and information and assistance on contacts for resolving them; (iii) a policy framework that will set clear priorities for a sustainable and coherent approach to technology and science, consistent with economic development policies; and (iv) instruments for upgrading the teaching of science, mathematics and technology to the levels of knowledge and quality demanded by modern production technologies.
- 2.2 The program consists of three investment components plus the creation and equipping of a new Technological Innovation Department (DITEC) within the National Secretariat of CONCYT, in order to strengthen its management. Component 1 is aimed at stimulating the demand for and supply of technological innovations. Component 2 will help foster closer and more frequent interaction between demand and supply. Component 3 will support preparation of a National Science, Technology and Innovation Plan, as well as improvements in the teaching of science, mathematics and technology.
- 2.3 The program is expected to produce a better-coordinated national system of innovation and a broader and more dynamic market for technological services. As well, FONACYT's regular government budget allocation will now be used to greater economic effect within a solidly structured National Science, Technology and Innovation Plan. At the same time, businesses will have instituted new work routines and will have increased their understanding of ways to obtain technical support for introducing new technologies or improving their productive practices. Universities and other technology service providers will have identified and begun to introduce flexible and effective mechanisms and procedures for receiving, analyzing and responding promptly to business requests for technological support.
- 2.4 On the institutional front, CONCYT will expand its technical and managerial capacity to administer a greater volume of financial resources and to respond efficiently to SME clients. There will also be closer and more frequent interaction between entities (business, institutional, academic, local and international) that have roles to play within the national innovation system.

**B. Program objective**

- 2.5 The primary objective is to enhance the productivity and competitiveness of SMEs, specifically by addressing two structural problems: a shortage of financing and a lack of information about technological innovation. To this end, the medium- and long-range policy framework will be improved to build in technological innovation and improvements to secondary-school science, mathematics, and technology education.<sup>2</sup>

**C. Cost and duration of the program**

- 2.6 The cost of the Technological Innovation Support Program is estimated at US\$13.9 million (US\$10.7 million of which will come from Bank financing). The execution period will be three years. Based on its assessment of performance under each of the three components at the conclusion of the program, the Bank will consider financing subsequent phases of those components that are found to have been successful.

**D. Program structure**

- 2.7 The program contains three components: (1) financing for technological innovation; (2) a technology information service, and (3) support for an enabling framework to foster innovation. A new Technological Innovation Department (DITEC) will be created within the CONCYT National Secretariat, to administer and supervise the program proposed here. Activities and estimates for the various elements of the program are as follows.

**1. Component 1: Financing for technological innovation (US\$6.2 million)**

- 2.8 The objective of this component is to facilitate financing for: (i) stimulating and meeting the demand for technological innovation among small and mid-sized Guatemalan enterprises; (ii) improving the supply of technology services; and (iii) creating technology management centers, especially in universities, to expedite commercial dealings between SMEs and specialized centers.
- 2.9 This component will provide resources to fund projects undertaken by enterprises and technology service providers, by means of a financing line under the

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<sup>2</sup> The program's objectives will only be verifiable over the long term. This is the only way that fundamental changes can be brought about in productivity growth and that improvements to societal well-being can be verified. The indicators of progress will be those obtainable in the short run, associated with the determinants of productivity. In technical terms, the concept of productivity used in this program is that of "total factor productivity". This takes account not only of labor force productivity but the productivity of all factors that contribute to production (including physical capital and organizational capacity, among others). Total factor productivity is an index that can be used to calculate the rate of growth of a company's (or an economy's) capacity, beyond simply measuring increases in inputs or factors of production.

Technological Innovation Support Program (PROINTEC line) created within FONACYT to administer the program resources.

**a. Subcomponent 1.1: Funding support for technology demand (US\$3.4 million)**

- 2.10 With a focus on SMEs, CONCYT will use the PROINTEC financing line to provide cofinancing (matching grants), on a nonreimbursable basis, for technological innovation or modernization projects submitted by businesses that are prepared to contribute 50% of the cost. Eligible projects will include the introduction, development or improvement of products and processes, with a view to achieving greater productivity and competitiveness; the adoption of clean technologies; adaptation of imported technologies that are not yet in use in the country; technical assistance for improving the quality of productive processes; design of strategies for reaching new markets with new or improved products; quality certification for goods and services, including International Standards Office (ISO) certification; and the installation, equipping or upgrading of development or quality control laboratories associated directly with innovation. This line will not finance investments in capital goods such as new plant or equipment, nor will it pay for the construction of civil works.
- 2.11 In assessing applications for financing, attention will be paid to the technological and economic feasibility of the project, its self-financing potential and its social and environmental impact. The program's Operating Regulations will describe methods and procedures of evaluation to determine the quality and relevance of the projects selected, and to ensure that decisions are taken transparently and that the funds are used efficiently.

**b. Subcomponent 1.2: Funding support for technology supply (US\$2.5 million)**

- 2.12 This subcomponent will finance "supply adjustment" projects, including the analysis of SME objectives and preferences, customer services, purchases of key equipment, incorporation of incremental technology and new imported technologies for improving services or products. The PROINTEC financing line will be used for these purposes. Annual competitions will be held for funding under this line, following rules that will include on-site inspection of conditions in the applicant institutions.



- 2.13 Funding will be targeted primarily at: (i) supporting the creation or strengthening of technology management centers<sup>3</sup> that operate according to market incentives; (ii) institutional strengthening of specialized technology centers offering services to SMEs, with special attention to services that will enhance quality; (iii) institution-strengthening and personnel training and upgrading, depending on the institutional stage of development (level of maturity) of the applicant institution, and (iv) purchase of specialized scientific or technological equipment by those centers that demonstrate a suitable capacity for management and maintenance. Eligible types of equipment will be those that meet critical needs, as clearly identified by the entrepreneurial sector, and that are consistent with the comparative advantages, in terms of personnel and other complementary equipment, of the competing institutions.
- 2.14 Grants for activities under this subcomponent will cover up to 80% of the cost and will be provided on a competitive basis, according to assessments by national and international evaluators. Applicant institutions must provide evidence that they offer commercial services at market prices and that their personnel and facilities are appropriate for making maximum use of the new equipment; these factors must be reflected in a business plan.
- 2.15 To support the execution of component 1 (financing technological innovation), the services of an institution or consulting firm will be hired, using program resources, to assist in establishing and managing the processing of funding applications during the life of the program.

## **2. Component 2: Technology Information Service (US\$3 million)**

- 2.16 Given the imbalance between the supply of and demand for services, the objective of this component is to help close the gap by reducing the high transaction cost of collecting, organizing and disseminating technology information for SMEs. To this end, the program will finance the creation of a national network of technology extension services, and two pilot projects to assess the feasibility of circulating information on innovations electronically to SMEs and individual entrepreneurs in remote regions.

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<sup>3</sup> A technology management center is an agency for facilitating business operators' access to science and technology services and for promoting business transactions between producing firms and science and technology service providers associated with a specific institution. According to this plan, each university may have a single management center for promoting the services of its faculties and laboratories to the private sector.

**a. Subcomponent 2.1: Creation of a technology extension services network (US\$2.4 million)**

- 2.17 The objective of the technology extension network is to stimulate and promote technical change among small and medium-sized enterprises, to help them rise to the growing challenge of being competitive in ever more globalized markets. The program will establish the foundations and begin implementation of a decentralized national technology extension service for SMEs.
- 2.18 The extension network will be made up of technology extension agents (EAs) based in various institutions engaged in technology development or business information services. EAs will assist SMEs in assessing their problems and seeking solutions, and will help develop a market for technology services that will provide a link between the supply of and demand for such services. They will not compete with consultants or institutions that now offer these services.
- 2.19 The work of the EAs is expected to help resolve the problem of the dearth of information sources and enhance the productivity and competitiveness of SMEs, thereby benefiting society at large. Under these premises, and consistent with international practice in this area, technology extension services will be provided free of charge.<sup>4</sup>
- 2.20 The typical tasks of an EA will include: (i) helping businesses to diagnose technology needs and providing guidance in seeking solutions; (ii) steering SMEs toward funding sources and helping them prepare applications for funding; and (iii) publicizing the availability of sources of technological know-how and facilitating access to them. Their work will be limited to providing guidance; they will not be involved in the actual preparation of assessments or detailed business plans.
- 2.21 EAs will be assigned to specialized centers or other institutions on the basis of competition. The contracting, training and allocation of EAs will be done in accordance with rules to be set out in the program's Operating Regulations. The midterm review of this subcomponent will focus both on the process and its results, and will examine the costs and benefits of relocating responsibility for institutional coordination of this network to an organization other than CONCYT. This mid-program assessment will serve as the basis for deciding on the timeline for

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<sup>4</sup> International experience in countries such as Canada and the United States suggests that SME extension services would not normally be offered by the market. If they were, they would not exist in sufficient quantity because their returns are low, given the fact that the professional profile of an extension agent (as in other support services) entails costs that are beyond the reach of most SMEs. The delivery of extension services with public money is therefore regarded as being a public good.

relocation, organization structure, and definitive implementation of the national technology extension services network.

**b. Subcomponent 2.2: Technology Information Node for SMEs (US\$300,000)**

- 2.22 The Technology Information Node (NIT) is an electronic information service designed to facilitate SME access to national and international information about technology. The NIT will seek out information, compile and process it and present it to SMEs in user-friendly form. Program resources will be used to design a pilot NIT project.

**c. Subcomponent 2.3: Community Information and Technology Centers (US\$300,000)**

- 2.23 The Community Information and Technology Centers (CCITs) will provide technological information to segments of the population that currently do not have ready access to such information. The CCITs will be equipped with computers and telecommunications infrastructure for offering local Internet access to SMEs that are engaged in clearly defined productive activities in rural or suburban regions. These centers will benefit SMEs directly by giving them access to the same kind of information available to larger businesses.

**3. Component 3: Strengthening the enabling framework to foster innovation (US\$2.9 million)**

- 2.24 This component directly pursues the objective of fostering and facilitating technological innovation. It includes two subcomponents: (a) financing of a multi-year strategy for the National Science, Technology and Innovation Plan and (b) a pilot program to design and implement a new academic program for secondary-school mathematics, science and technology education.

**a. Subcomponent 3.1: Enabling framework for developing technological know-how (US\$1.1 million)**

- 2.25 The objective of this subcomponent is to develop a strategy for broadening, deepening and disseminating the existing national policy framework for promoting and regulating the use of technology, as defined in the 1992-1996 National Science, Technology and Innovation Plan, which was extended without change for the period 1997-2000.
- 2.26 The first phase of the strategy will begin with the present program, which will serve to accelerate collective learning about technology and innovation on the part of entrepreneurs and technology service providers, through components 1 (financing) and 2 (technology extension services).

- 2.27 This subcomponent will finance: (i) the compiling and analysis of outputs and outcomes of the program described here; (ii) the design of science, technology and innovation policy proposals in line with the country's medium- and long-range economic priorities; and (iii) preparation and implementation of a program to publicize the policy framework and market the new services offered by CONCYT and other innovation-system stakeholders.
- 2.28 To ensure successful implementation of the policy framework, the program will fund the hiring and training of a team of in-house professionals for SENACYT (including an expert in statistics and indicators) in the area of technology policy. This training will include short courses at Guatemalan and/or foreign universities and internships in other institutions with expertise in science and technology, as well as the hiring of international experts to deliver short courses in Guatemala.
- 2.29 The program will assess and classify lessons learned from its initial activities, as a guide for preparing and adapting the new 2001-2005 Science, Technology and Innovation Plan. This plan will be opened to national debate and consensus, and program resources will be allocated for workshops and communications to this end.

**b. Subcomponent 3.2: Improving science, mathematics and technology education at the secondary-school level (US\$1.8 million)**

- 2.30 The aim of this subcomponent is to strengthen the teaching and learning of science and technology, as one of the key elements of the Ministry of Education's education reform initiatives. Under this subcomponent, SENACYT will support the Ministry so it can enlist the scientific and academic community in the task of improving the quality of teaching in these areas.
- 2.31 Based on the premise that one crucial requirement for strengthening the demand for technology in Guatemala is to educate future users and suppliers of technology in the areas of science and mathematics, this subcomponent will have two objectives: (i) support the Ministry of Education in devising a plan to improve the teaching of science, mathematics and technology at the secondary-school level, and (ii) on the basis of that plan, design a pilot program in PEMEMs (Secondary Education Extension and Improvement Program institutes). The pilot program will emphasize the use of educational technologies in the teaching of applied science and technology (through simulated experimentation) and mathematics
- 2.32 The PEMEM institutes were selected on the grounds that their mandate, in part, is to provide the country's industry, including its SMEs, with a high-quality labor force.
- 2.33 To achieve this objective, the PEMEMs will adopt the new upgrading plan. They will be endowed with Technology Resource Centers (CRTs) equipped with

computers and Internet access, television and video facilities. The CRTs will serve as the basis for introducing a new form of teaching science and mathematics that takes an integrated approach to teaching through the use of technology and is backed by an overhaul of the academic curriculum and improved teacher training.

- 2.34 Financing will be provided at this stage for preparation of a plan to improve instruction and setting up of CRTs in at least 20 PEMEM institutions that have suitable infrastructure.

### E. Program costs and financing

- 2.35 The total cost of the program is estimated at US\$13.9 million, as shown in Table 1. The program will receive US\$10.7 million in financing from the Bank (Ordinary Capital), US\$5 million of which will receive Intermediate Financing Facility resources. The local counterpart contribution will be US\$3.2 million.<sup>5</sup>

**Table 1. Cost and financing**  
(US\$ million)

	IDB			Local	Total	%
	IFF	OC	Subtotal			
<b>Components and subcomponents</b>						
<b>1. Financing technological innovation</b>	<b>1.70</b>	<b>2.30</b>	<b>4.00</b>	<b>2.2</b>	<b>6.20</b>	<b>45</b>
1.1 Financing demand	1.70	-	1.70	1.7	3.40	
1.2 Financing supply	-	2.00	2.00	0.5	2.50	
1.3 Consultant support	-	0.30	0.30	-	0.30	
<b>2. Technology information service</b>	<b>0.60</b>	<b>1.90</b>	<b>2.50</b>	<b>0.5</b>	<b>3.00</b>	<b>22</b>
2.1 Technology extension services network	0.60	1.30	1.90	0.5	2.40	
2.2 Pilot programs (NIT, CCITs)	-	0.60	0.60	-	0.60	
<b>3. Support for an enabling framework to foster innovation</b>	<b>1.90</b>	<b>0.80</b>	<b>2.70</b>	<b>0.2</b>	<b>2.90</b>	<b>21</b>
3.1 Framework for developing technological know-how	1.10	-	1.10	-	1.10	
3.2 Improvement of secondary-school science, mathematics and technology education	0.80	0.80	1.60	0.2	1.80	
<b>4. Technological Innovation Department</b>	<b>0.70</b>	<b>-</b>	<b>0.70</b>	<b>0.2</b>	<b>0.90</b>	<b>6</b>
<b>5. Unallocated</b>	<b>0.70</b>	<b>-</b>	<b>0.70</b>	<b>-</b>	<b>0.70</b>	<b>5</b>
<b>6. Financing costs</b>	<b>0.10</b>	<b>-</b>	<b>0.10</b>	<b>0.1</b>	<b>0.20</b>	<b>1</b>
6.1 Credit fee	-	-	-	0.1	0.10	
6.2 Inspection and supervision	0.10	-	0.10	-	0.10	
<b>TOTAL</b>	<b>5.70</b>	<b>5.00</b>	<b>10.70</b>	<b>3.20</b>	<b>13.90</b>	
<b>Percentage</b>			<b>77%</b>	<b>23%</b>		<b>100%</b>

<sup>5</sup> This amount includes up to US\$2.2 million in beneficiary contributions.

**F. Sources and conditions of the Bank's financing**

2.36 The loan will carry the following terms and conditions:

Amortization period:	25 years
Grace period:	3.5 years
Disbursement period:	3 years
Interest rate:	variable
Currency:	US\$10.7 million from the OC Single Currency Facility, up to US\$5 million of which will receive Intermediate Financing Facility resources for payment of interest
Inspection and supervision:	1% of the loan amount
Credit fee:	0.75% per annum on the undisbursed balance

### **III. INSTITUTIONAL FRAMEWORK AND PROGRAM EXECUTION**

#### **A. Institutional framework**

- 3.1 The borrower will be the Republic of Guatemala and the executing agency will be the National Science and Technology Council (CONCYT), through the National Science and Technology Secretariat (SENACYT). The Ministry of Education (MINEDUC) will take part in executing the secondary-school science, mathematics and technology education subcomponent.
- 3.2 CONCYT is a government agency created by Law 63-91 enacted by the Guatemalan Congress. It is the senior national agency for directing and coordinating science and technology development at the highest decision-making levels in the public, private and academic sectors in Guatemala. It is responsible for preparing, promoting and coordinating activities associated with the National Science, Technology and Innovation Plan and for the work program through which that plan is to be executed.
- 3.3 CONCYT is an appropriate agency for fostering technological innovation. It was created by the Government of Guatemala for this specific purpose, and its legal framework will enable it to undertake the kind of financing and projects included in the proposed program. It has experience in financing scientific and technological development projects, although to date it has been involved primarily with nonprofit institutions such as universities and business associations.
- 3.4 CONCYT is headed by the Vice President of the Republic. Its membership includes the Minister of Economic Affairs, the President of the Chamber of Industry, the President of the Small Business Chamber, the President of the Chamber of Agriculture, the President of the Congressional Committee on Education, Science and Technology, Culture and Sports, the Rector of the University of San Carlos, the President of the Academy of Medical, Physical and Natural Sciences and a representative of Guatemala's private universities.
- 3.5 CONCYT is assisted in its decision-making by an Advisory Committee, made up of representatives of the nine institutions represented on the Council. The National Science and Technology Secretariat (SENACYT) of CONCYT is responsible for execution and follow-up of CONCYT decisions and serves as the coordinating link between the Council and the National Science and Technology System.<sup>6</sup>

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<sup>6</sup> The National Science and Technology System embraces all the institutions and organs of the public, private and academic sectors, individuals and corporations that are registered with CONCYT as engaged in science and technology activities.

- 3.6 SENACYT, an administrative and financial adjunct of the Office of the Vice President of the Republic, is directed by a National Coordinator elected by the Council; its functions are set out in Government Resolution 34-94.
- 3.7 SENACYT is responsible for coordinating, executing and monitoring a broad range of programs and projects defined in the National Plan, including, *inter alia*: (i) strengthening the National Science and Technology System; (ii) financing scientific and technological activities; (iii) promoting the science, technology and innovation information system; and (iv) supporting electronic communications through MayaNet (an Internet interconnection project). SENACYT has five Departments [*Direcciones*]: (i) FONACYT; (ii) Administration and Finance; (iii) International Cooperation; (iv) Technical and Information Area; and (v) Informatics.

**B. Organization for execution purposes**

- 3.8 **Financial administration.** To handle the program funds CONCYT will approve a new line of financing – PROINTEC - within its FONACYT trust agreement, as well as the account and subaccounts necessary to this end. **Within nine months after the effective date of the loan contract it must be demonstrated that the duration of the FONACYT administrative trust agreement has been extended.**
- 3.9 **Technological Innovation Department.** CONCYT will establish a Technological Innovation Department (DITEC) within its National Science and Technology Secretariat to help execute the program. This new department will report to the National Coordinator of SENACYT. DITEC will administer, supervise, monitor and evaluate the program, and will also coordinate activities with MINEDUC for the science, mathematics and technology education subcomponent. DITEC will coordinate its work with other SENACYT divisions in pursuit of the program's objectives. **As a condition precedent to disbursement of the remaining program funds, CONCYT will create and start up DITEC.**
- 3.10 Bank funds will be used to hire DITEC staff, including the director, a financial assistant, an internal auditor and two account executives. At the end of the program the government is to absorb DITEC costs. The loan will pay per diems of DITEC employees. Other expenses, such as those for offices, equipment and work materials, will be covered by local counterpart funding. **Upon fulfillment of the standard Bank conditions precedent to the first disbursement and presentation of the agreement for transferring program resources between the borrower and CONCYT, up to US\$200,000 may be disbursed against the funds budgeted for DITEC.**



## **1. Component 1: Financing technological innovation**

- 3.11 This component will be managed by a Director of Technology Funding (DFT), who will verify the eligibility and relevance of requests submitted by SMEs and by specialized science, technology and innovation service centers. Those that qualify will undergo a technical, economic, financial and environmental analysis and assessment, following the criteria described in chapter II and in the program's Operating Regulations. **Entry into force of the program's Operating Regulations will be a condition precedent to disbursement of the remaining resources under the program.** Candidates must demonstrate their commitment to technological innovation by submitting a business plan for putting the proposed innovation to use. The DFT will make use of external specialists for assessing projects and business plans, as described in the Operating Regulations.
- 3.12 Resources of component 1 will be channeled through the PROINTEC line, for both the demand and supply subcomponents.
- 3.13 Financing proposals that pass the above-mentioned screening will be forwarded to the National Coordinator for review. The Coordinator in turn will present them to an Executive Committee made up of four members appointed by CONCYT's Advisory Committee.
- 3.14 To ensure timely and efficient implementation of the component, CONCYT will engage a consulting firm or institution specializing in cofinancing operations of the type proposed here. **The contracting of these consulting services will be a condition precedent to disbursement of the rest of the loan proceeds.** Moreover, in carrying out activities for this component SENACYT will be able to draw on loan funds to pay for short-term consulting services.

## **2. Component 2: Technology information service**

- 3.15 This component will be managed by a Director of Technology Services (DST), who will make proposals for the hiring of professional engineers or scientists in allied fields with private sector experience, who then will receive specialized training in order to serve as technology extension agents (EAs). The principal functions of the EAs were described in chapter II.
- 3.16 To ensure that they are able to upgrade their skills on a continuous basis, EAs will have unrestricted access to university research centers and to all the facilities available through MayaNet. As well, they will be given periodic training by specialized consultants.
- 3.17 EAs will work out of offices in universities, industry associations or other organizations, under special agreements that will specify the physical and logistical facilities that must be provided to them for the proper performance of their duties.

As compensation, the program will pay for professional fees, per diems, and the equipping of small offices.

- 3.18 Using program funds, CONCYT will hire a consultant with experience in managing technology extension services, to assist in starting up this component. **The hiring of this consultant, following standard Bank procedures, is a condition precedent to the first disbursement under this component.**

### **3. Component 3: Support for an enabling framework**

- 3.19 Execution of this component will be the responsibility of an Enabling Framework Director (DMF) who will: (i) identify current and potential difficulties of an institutional, legal and operational nature that might affect execution of the program; (ii) identify institutional strengthening needs in CONCYT and other institutions involved, and prepare and execute a training plan by hiring qualified consultants or consulting firms; (iii) draw up terms of reference for consulting services to help produce the National Science, Technology and Innovation Plan; (iv) prepare terms of reference for contracting consulting services so that, on the basis of the results of the program described here, a proposal can be drawn up for a second stage of the program; (v) coordinate dissemination activities; (vi) in coordination with the Information and Informatics Department, manage the information and data required for measuring progress towards objectives on the basis of indicators previously agreed on with the Bank and set out in the program's logical framework; and (vii) serve as liaison between DITEC and MINEDUC, which will be responsible for executing the subcomponent for improving secondary-school science, mathematics and technology education.
- 3.20 CONCYT will hire technical-support consultants to assist, *inter alia*, with the design of a plan for curriculum development and updating and technological improvements in PEMEM institutes.
- 3.21 **As a condition precedent to the first disbursement of component 3 resources, CONCYT must have signed an agreement with MINEDUC** for execution of the science, mathematics and technology education improvement component. The text of this agreement must first have been submitted to the Bank for its nonobjection. During the life of the program the borrower undertakes that, in order to qualify for funding under the subcomponent for improving secondary-level education in science, mathematics and technology, the PEMEM institutes must submit a plan for maintaining and updating CRTs' equipment, to include planned contributions from the education community, and evidence that the PEMEMs selected have the necessary minimum infrastructure in place.

### C. Operating Regulations

- 3.22 Execution of the program will be governed by a set of Operating Regulations that will stipulate, *inter alia*, the functions of DITEC, terms of reference for its personnel, and specific provisions for executing each of the components. These regulations will emphasize the criteria for funding-proposal evaluation provided for in component 1. **Entry into force of the Operating Regulations will be a condition precedent to disbursement of the rest of the loan proceeds. The regulations must include model contracts to be used for channeling funds to program beneficiaries.**
- 3.23 **Midterm review.** When 40% of the subcomponent 1.1 funds have been disbursed (financing in support of demand for technological innovations) has been disbursed, a review meeting will be held between the Bank and CONCYT to consider the midterm evaluation, which is to be prepared by external consultants following terms of reference agreed upon in advance with the Bank. This evaluation will include an analysis of DITEC's functionality in terms of costs, coordination, and management, and progress made toward the indicators outlined below.
- 3.24 The following indicators are indicative of those expected to be achieved:
- 50% of the SMEs that are implementing projects with support from the program say they are satisfied with the support, and at least half of these are achieving 30% of the anticipated outcomes.
  - Technology extension agents have provided advisory assistance to at least 500 SMEs, and at least 75% of these say they are satisfied with the services received.
  - CONCYT has approved a new National Science, Technology and Innovation Plan for 2001-2005.
  - 150 PEMEM teachers have been trained in the use of the new technology and are applying it appropriately. 90% of the teachers are supportive of the new teaching system. The 20 PEMEMs selected for this upgrading have successfully implemented the Maintenance and Re-equipment Plan. At least 10 PEMEMs have built computer use into their curriculum.
- 3.25 This evaluation also will serve as a basis for adjustments to achieve the program's objectives and for consideration of future Bank support. If, as a result of its administration missions, the Bank finds progress on the program to be unsatisfactory, it will recommend to the borrower and CONCYT the measures that need to be taken to remedy the situation. If such measures are not adopted within the timeframe agreed on in advance between the borrower, CONCYT and the Bank, the Bank may recommend suspension of disbursements of the financing.

**D. Disbursement schedule**

3.26 Program resources will be disbursed over three years:

**Program disbursements, Phase I (US\$000)**

Origin and source	Year 1	Year 2	Year 3	Total
Bank	4,602	3,016	2,988	10,700
Government contribution	200	400	500	1,100
Beneficiary contributions	300	800	1,000	2,100
<b>Total</b>	<b>5,102</b>	<b>4,216</b>	<b>4,488</b>	<b>13,900</b>

**E. Procedures for procurement of goods and contracting of consulting services**

3.27 For public sector institutions participating in the program, (i) international competitive bidding will be required for the procurement of goods under this program costing US\$250,000 or more; and (ii) international calls for proposals will be required for the hiring of consultants on contracts of US\$200,000 or more. As well, international calls for proposals will be required in cases where consultants are needed with specialties that are difficult to find in Guatemala. The procurement of goods and consultant hiring by these institutions will be subject to standard Bank procedures. There are no plans to finance civil works with the loan proceeds or the local counterpart contribution. Goods and related services will be purchased and consultants hired in accordance with Annex II to this document.

3.28 Small and mid-sized enterprises taking part in the program will purchase goods and related services and hire consultants in accordance with Bank rules for the private sector. In the case of procurement of goods or related services, the procedures followed are to include standards pertaining to the appropriate, efficient and economical use of the loan funds, and the eligibility of goods. To this end, goods and related services must be acquired through competition, at market prices. Consulting services must be contracted through a competitive process, at fair and reasonable prices, with due regard to the qualifications of the prospective service providers. Similarly, consultant-hiring procedures must include rules governing the appropriate use of loan resources and the eligibility of consultants.

**F. Accounting and audits**

3.29 DITEC will maintain a suitable system of administrative controls and will keep accounts for the program in accordance with a chart of accounts. Financial statements and supporting documentation submitted by DITEC pursuant to conditions in the loan contract must be audited by an independent auditing firm

satisfactory to the Bank. These audit services will be paid for out of the loan proceeds.

**G. Bank monitoring and supervision during program execution**

- 3.30 Progress on the program will be evaluated by means of semiannual progress reports, to be submitted to the Bank within two months after the end of each calendar half-year. They are to contain sufficient information so that the Bank and the borrower can draw conclusions about the achievement of the program's development objectives, using the indicators found in the logical framework. CONCYT will inform the Bank of the name of the DITEC officer who will be responsible for compiling and maintaining the requisite information on the program monitoring indicators.
- 3.31 The Bank will supervise execution of the program through its Country Office in Guatemala and by means of administration missions, in which activities CONCYT and the Guatemalan government are to collaborate fully. An administration mission, with participation of the project team, will visit CONCYT to review the midterm evaluation (prepared by external consultants) and discuss any corrective measures needed.

## **IV. FEASIBILITY, BENEFITS AND RISKS**

### **A. Program feasibility**

- 4.1 There are two factors in particular that render the program feasible. First, the peace accords have fostered a social setting conducive to private investment and international trade. Second, the program has the support of the Vice President of the Republic, the Ministry of Economic Affairs, major business associations (including the CIG and FEPYME), the largest universities and lending institutions for SMEs. These stakeholders recognize that Guatemala's lag in terms of technological innovation requires a solidly coordinated effort such as the one offered by this program.

### **B. Socioeconomic feasibility and sustainability of the program**

- 4.2 **Socioeconomic feasibility.** The following changes are expected to become evident in the medium term as the financing and information gaps identified are filled: (i) entrepreneurs will be better aware of the local potential for obtaining science and technology services; (ii) the supply of and demand for technological know-how will converge systematically; (iii) superior production alternatives and technical assistance sources can be explored more widely and frequently at reasonable cost; (iv) dialogue and encounters between stakeholders and national and international institutions involved in the introduction or adaptation of technologies, goods or services will serve to accelerate economic growth.
- 4.3 These activities will help small and medium-scale entrepreneurs who currently have little familiarity or experience with issues of technological change to articulate their technology needs. At the same time, sources of technical support will become better known and more accessible, so that transactions between supply and demand are less complex, costly and time-consuming. These activities will entail a learning process that will allow business, government and academic circles to achieve sustainable business productivity increases, so that Guatemalan products will become more competitive at home and abroad.
- 4.4 **Program sustainability.** The financial feasibility of the program is underpinned by the growing priority that the government has assigned to CONCYT, as evidenced in rising budget allocations to FONACYT and the introduction and equipping of the MayaNet telecommunications center. In addition, surveys conducted during preparation of this program demonstrate a clear willingness on the part of small and medium-scale entrepreneurs to contribute their own funds to exploring new and better production practices. Indeed, the program calls for this business sector to contribute 50% to the innovation-financing components, and for service providers to contribute 20%.

- 4.5 The national budget allocates an annual amount of Q15 million (approximately US\$2 million) to FONACYT. That figure can be increased upon request by CONCYT to the Executive Branch, to the extent that real demand can be demonstrated. The program will open up new opportunities for FONACYT to make better use of its funds and to obtain additional funding from the budget or from external sources for CONCYT to effectively direct, coordinate and fund science and technology development in Guatemala. The government, through the Ministry of Finance, has confirmed its interest in maintaining its contribution to the funding of activities that are found to be successful.
- 4.6 Thanks to the creation of the Technological Innovation Department within SENACYT, responsible for administering the program's resources, institutional capacity will be built and progressively more, permanent human and financial resources will be allocated for managing the new activities. In addition, design of an experimental model for coordinating the extension service system within CONCYT includes mechanisms for identifying possible alternatives for handing responsibility for this coordination, and other related activities, over to another institution (possibly nongovernmental) that is better suited to such a task.
- 4.7 Moreover, an exhaustive midterm evaluation will be conducted to confirm or adjust the assumptions used to determine the program's financial feasibility and sustainability, including a statement as to the government's intention to support this sector in future.

#### **C. Institutional feasibility**

- 4.8 CONCYT's experience in managing, promoting, and financing science and technology affairs will serve it well in implementing and carrying through the program proposed here. Nonetheless, it has to date acquired little expertise in meeting the innovation needs of SMEs. Its policy has been oriented toward boosting the supply of technology services in Guatemala's academic and research sectors by way of funding for applied research. The institution-strengthening planned in the program will improve the mechanisms now in place and make it easier to respond to the producing sectors' demands. These moves also are expected to create a dynamic market for technology services.
- 4.9 The program also will strengthen institutional viability by providing for broad dissemination of CONCYT procedures, so SMEs can gain access to the program's benefits. The aim will be for SMEs to see CONCYT as an effective support facility. The new administrative procedures for funding technological innovation will be more agile, distinct from the procedures in place for academic institutions, which are lengthy and at odds with an entrepreneurial mentality. To this end, the program will support creation of a new Technological Innovation Department and the transfer of technology from a specialized firm or institution engaged for that purpose.

- 4.10 Like CONCYT, Guatemala's SMEs have institutional weaknesses. One of these is an absence of investment planning; hence the emphasis in chapter II on the requirement, to qualify for the program, that companies present a business plan detailing the proposed use, relevance and expected return (direct or indirect) of the innovations proposed for financing by CONCYT. The technology extension services will also address the obstacles now faced by small and medium-sized enterprises in seeking and gaining access to information.

**D. Environmental feasibility**

- 4.11 The proposed program will not finance the construction of new physical infrastructure, and its execution is not expected to have any negative environmental impacts. The program's Operating Regulations include specific criteria for ensuring that the subprojects it finances will have no adverse environmental impacts. In addition, the technology extension agents, as part of their training, will receive instruction in identifying potential environmental impacts of the companies they are assisting. As well, the Technology Information Node and the Community Information and Technology Centers will have electronic information available on clean technologies and other basic procedures for recognizing possible harmful effects on the environment and for mitigating the most common negative impacts.

**E. Social equity and poverty reduction classification**

- 4.12 Because the program's primary beneficiaries will be small and medium-sized enterprises and these businesses do not necessarily include low-income persons, the program is not classified as poverty targeted nor does it qualify as a social equity enhancing and poverty reduction operation as provided in the Eighth Replenishment document.

**F. Program benefits**

- 4.13 One important achievement of the program will be to create and set up a new Technological Innovation Department within CONCYT, which will develop capacity to operate, in Guatemala, an agile mechanism to fund technological innovation and set in place a network of technology extension agents. This will lay the foundation for overcoming three major bottlenecks that could in the near future constrain the productivity, competitiveness, and potential of SMEs: funding, information, and timely technical support for technological innovation. As a result, the program will help to promote and develop the capacity of Guatemala's SMEs to innovate and make use of modern technologies. This modernization in turn will contribute over the longer term to economic growth, employment creation, and better income distribution.
- 4.14 The program will also help to develop more effective linkages between specialized technology centers and their potential users, thereby taking advantage of the



capacity of these centers for the benefit of Guatemala's industrial base and fostering the expansion of its market for technology services.

- 4.15 In addition, the program will foster collective learning about the uses and benefits of science and technology. Such experience will lead to better articulation of interests and greater economic interaction among the various stakeholders in the national innovation system.

#### **G. Program risks**

- 4.16 From an institutional standpoint the program could encounter two major risks: (i) CONCYT might be unable to develop an effective and efficient relationship with SMEs; and (ii) the institutional backup CONCYT will need to be able to continue the activities started under this program in a sustained manner might not be developed.
- 4.17 With respect to the first risk, program resources have been earmarked for hiring long-term advisory services from experts in technological innovation funds and technology extension services. As for the second risk, the facilities for funding, promoting SMEs and bringing them closer will gain them new stakeholders to help with the development and institutional growth of CONCYT. Furthermore, after the midterm evaluation has been done, the Bank is to receive assurances as to the Guatemalan government's undertaking to continue and/or increase financial support to the sector.
- 4.18 In terms of the supply of science and technology services, there is a potential risk that universities and other technology service providers may not adapt their structures and regulations so as to permit effective commercial linkages with businesses that seek to buy their services. This risk derives from the universities' lack of experience in "selling" their services to the productive sector. To mitigate this risk, the program will impose strict eligibility criteria on applications (competitions) for funding, including the institutional adjustments needed to serve and attend to SMEs. It also calls for the creation of technology management centers with market incentives, and for strengthening of both the specialized technology centers and the pertinent human resources.

**LOGICAL FRAMEWORK**  
**(AGREED WITH THE EXECUTING AGENCY AND INCORPORATED IN THE ISPD)**  
**PROGRAM OF SUPPORT FOR TECHNOLOGICAL INNOVATION – GU-0135**

Objective summary	Indicators	Means of verification	Assumptions
Activity of participating SMEs	250 SMEs raise their productivity by 20% over base year	DITEC records Specialized survey (triggers)	The government maintains its support for SMEs and CONCYT
<b>COMPONENTS/SUBCOMPONENTS</b>			
Technological innovation,			
Demand financing support,	250 SMEs receive funding through matching grants (50:50) 50% of SMEs who executed projects raise their productivity/quality by 20%	DITEC records Specialized survey (staff turnover rate; sales volume; quality control indices)	Market conditions remain the same for the products of SMEs receiving financing
Supply financing support,	10 service providers and/or Management Centers funded through matching grants (80:20) are operating	DITEC records Inspection visits	Technology Management Centers and service providers continue to participate efficiently
Information service, operating			
Technology Extension Service,	100 SMEs contract services recommended by the EAs EAs contact 1,200 SMEs in three years 75% of SMEs assisted rate service as excellent	DITEC records DITEC records Specialized surveys (triggers)	
Information Node (pilot),	Design approved by the Bank	DITEC files	There is an interest in installing new technology
Information and Technology Center designed	Design approved by the Bank	DITEC files	There is an interest in implementing community centers

Brief summary	Indicators	Means of verification	Assumptions
<p>Work to foster technological development and implemented</p> <p>Work designed and</p> <p>to secondary-school science, and technology education,</p>	<p>National S&amp;T Plan presented to the Bank</p> <p>5 CONCYT officials trained in technology policy, statistics and indicators</p> <p>20 PEMEMs implement pilot program and are operating the Maintenance and Re-equipment Plan</p> <p>300 teachers are trained in use of the technology are applying their new knowledge</p> <p>90% of teachers are supportive of the new teaching system</p>	<p>DITEC and Bank files</p> <p>DITEC records</p> <p>Inspection visits</p> <p>DITEC records</p>	<p>The government maintains its interest in implementing the Plan</p> <p>Officials keep proper records after</p> <p>MINEDUC maintains its interest in</p> <p>Graduates apply the knowledge th</p>
<p>personnel</p> <p>ory services</p> <p>resources</p> <p>ting Regulations</p> <p>ze and evaluate applications</p> <p>ze and evaluate applications</p> <p>ment Centers</p> <p>ing applications</p>	<p>COMPONENT 1 TOTAL: US\$6.2 million</p> <p>Demand-support subcomponent: US\$3.4 million</p> <p>Supply-support subcomponent: US\$2.5 million</p> <p>Consulting support: US\$300,000</p>	<p>Project accounts</p> <p>External and internal audits</p> <p>IDB records</p>	<p>SMEs participate actively in the p</p> <p>Banking system funds SME invest</p> <p>requirements</p> <p>National Metrology Laboratory op</p> <p>efficiently</p> <p>MINECO Patents Office provides</p> <p>timely information</p> <p>Universities are modernized and p</p> <p>actively</p> <p>Other Guatemalan and foreign ser</p> <p>providers participate actively</p>

ative summary	Indicators	Means of verification	Assumptions
<p>activities)</p> <p>technology extension agent</p> <p>eight extension agents</p> <p>consulting services</p> <p>a agents and assign them to</p> <p>ment and furnishings for</p> <p>ts</p> <p>Technology Information Node</p> <p>ode</p> <p>ers</p> <p>to Node</p> <p>mentation plan for Phase II</p> <p>Community Information and</p> <p>ers, pilot</p> <p>udies</p> <p>nter</p> <p>activities)</p> <p>Enabling framework for</p> <p>of technological know-how</p> <p>el</p> <p>g services</p> <p>lting work</p>	<p>COMPONENT 2 TOTAL: US\$3 million</p> <p>Technology extension agent network subcomponent: US\$2.4 million</p> <p>Technology Information Node subcomponent: US\$300,000</p> <p>Community Information and Technology Centers subcomponent: US\$300,000</p> <p>COMPONENT 3 TOTAL: US\$2.9 million</p> <p>Enabling framework for development of technological know-how subcomponent: US\$1.1 million</p>	<p>Project accounts</p> <p>DITEC records</p> <p>IDB records</p>	<p>SMEs are satisfied with the service</p>

Objective summary	Indicators	Means of verification	Assumptions
<p>Improvement of secondary-mathematics and technology education</p> <p>Contract with MINEDUC (agency)</p> <p>Employ technical advisors</p> <p>Identify and train personnel</p> <p>Develop a manual</p> <p>Implement pilot projects</p>	<p>Improvement of secondary-school science, mathematics and technology education subcomponent: US\$1.8 million</p> <p>Other expenditures:</p> <p>Technological Innovation Department: US\$900,000</p> <p>Unallocated: US\$700,000</p> <p>Financing costs: US\$200,000</p> <p><b>TOTAL COST: US\$13.9 million</b></p> <p><b>IDB contribution: US\$10.7 million</b></p> <p><b>Local contribution: US\$ 3.2 million</b></p>		<p>Contracting proceeds normally</p>

Indicators are for the end of the program (three years). Baseline information will be established at the start of the program.

The following indicators will be assessed during the **midterm evaluation**: 50% of SMEs that are executing projects are satisfied, and at least half of them are achieving their objectives; the EAs have advised at least 500 SMEs, and 75% of these are satisfied with the services received; CONCYT has approved the new Science, Technology and Innovation Policy; 90% of PEMEM instructors are applying new technologies; 90% of teachers trained are supportive of the new teaching system; 20 PEMEMs have implemented major innovations; 10 PEMEMs have built computer use into their curriculum.

**TECHNOLOGICAL INNOVATION SUPPORT PROGRAM (GU-0135)  
PROCUREMENT SCHEDULE**

MAIN PROCUREMENT ITEMS FOR THE PROJECT	Financing (%)		Method	Prequalification (Yes/No)	Estimated date of SPN publication
	IDB	Local			Half/Year
<b>A. Procurement of goods</b>					
1. Laboratory equipment 3 lots US\$850,000 max. each	80	20	ICB	No	I/00
2. Miscellaneous materials 10 lots US\$20,000 max. each	80	20	CB	No	I/00
3. Computer hardware/software 3 lots US\$200,000	100		CB	No	I/00
<b>B. Consultants</b>					
Component 1: Technological innovation: Consulting firm: US\$240,000	100		ICB	Yes	I/00
Component 2: 10 individual consultants, studies and designs, average: US\$27,000	100		CB	Yes	I/00
Component 3: 12 individual consultants, studies and designs, average: US\$10,600	100		CB	Yes	I/00
Consulting firm for evaluation: US\$50,000	100		CB	Yes	I/00

Notes:

CB = competitive bidding

ICB = international competitive bidding

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GU-0135  
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PROPOSED RESOLUTION

GUATEMALA. LOAN \_\_\_/OC-GU TO THE REPUBLICA DE GUATEMALA  
(Technological Innovation Support Program)

The Board of Executive Directors

RESOLVES:

That the President of the Bank, or such representative as he shall designate, is authorized, in the name and on behalf of the Bank, to enter into such contract or contracts as may be necessary with the República de Guatemala, as Borrower, for the purpose of granting it a financing to cooperate in the execution of a Technological Innovation Support Program. Such financing will be for the amount of up to US\$10,700,000, from the resources of the Single Currency Facility of the Bank's Ordinary Capital, and will be subject to the "Terms and Financial Conditions" and to the "Special Contractual Conditions" of the Executive Summary of the Loan Proposal.

PROPOSED RESOLUTION

GUATEMALA. PARTIAL PAYMENT OF INTEREST ON  
LOAN No. \_\_\_\_/OC-GU TO THE REPUBLICA DE GUATEMALA

(Technological Innovation Support Program)

The Board of Executive Directors

RESOLVES:

That the President of the Bank, or such representative as he shall designate, is authorized, in the name and on behalf of the Bank, as administrator of the Intermediate Financing Facility Account, hereinafter referred to as the "account", to enter into such contract or contracts as may be necessary with the República de Guatemala, as Borrower, and to adopt such other measures as may be necessary to utilize the resources of the account to pay a part of the interest due by the Borrower on outstanding balances of up to US\$5,000,000 of the loan authorized by Resolution DE-\_\_\_\_/\_\_, in accordance with applicable Bank policy.