PUBLIC
SIMULTANEOUS DISCLOSURE

DOCUMENT OF THE INTER-AMERICAN DEVELOPMENT BANK

PANAMA

INNOVATION PROGRAM FOR SOCIAL INCLUSION AND PRODUCTIVITY

(PN-L1117)

LOAN PROPOSAL

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ELECTRONIC LINKS

REQUIRED

1. Multiyear execution plan
2. Annual work plan (AWP)
3. Monitoring and evaluation plan
4. Procurement plan

OPTIONAL

1. Economic analysis of the program
2. Itemized budget
3. Institutional analysis
4. Sector analysis
5. Government Strategic Plan
6. Policy and Strategic Plan for Science, Technology, and Innovation
7. Program Operations Manual
8. Safeguard policy filter (SPF) and safeguard screening form (SSF) for classification of projects

ABBREVIATIONS	
AWP	Annual work plan
CRF	Corporate Results Framework 2016-2019
IDB	Inter-American Development Bank.
INEC	Instituto Nacional de Estadística y Censo [National Statistics and Census Institute]
MEDUCA	Ministry of Education
MEF	Ministry of Economy and Finance
NGO	Nongovernmental organization
NPV	Net present value
OECD	Organization for Economic Cooperation and Development
PEG	Plan Estratégico del Gobierno [Government Strategic Plan]
PENCYT	Plan Estratégico de Ciencia, Tecnología e Innovación [Strategic Plan for Science, Technology, and Innovation]
PEU	Program execution unit
PISA	Programme for International Student Assessment
R&D	Research and Development
SENACYT	Secretaría Nacional de Ciencia, Tecnología e Innovación [National Department of Science, Technology, and Innovation]
SERCE	Segundo Estudio Regional Comparativo y Explicativo de logro de aprendizaje [Second Regional Comparative and Explanatory Study on learning achievement]
SNI	Sistema Nacional de Innovación [National Innovation System]
STI	Science, technology, and innovation
TERCE	Tercer Estudio Regional Comparativo y Explicativo de logro de aprendizaje [Third Regional Comparative and Explanatory Study on learning achievement]
TFP	Total factor productivity
UIS	Update to the Institutional Strategy
WBES	World Bank Enterprise Survey
WEF	World Economic Forum

PROJECT SUMMARY

PANAMA
INNOVATION PROGRAM FOR SOCIAL INCLUSION AND PRODUCTIVITY
(PN-L1117)

<table>
<tr><th colspan="6">Financial Terms and Conditions</th></tr>
<tr><td colspan="3" rowspan="4">Borrower: Republic of Panama

Executing agency: National Department of Science, Technology, and Innovation (SENACYT)</td><td colspan="2">Flexible Financing Facility[a]</td></tr>
<tr><td>Amortization period:</td><td>20 years</td></tr>
<tr><td>Original WAL:</td><td>13 years</td></tr>
<tr><td>Disbursement period:</td><td>5 years</td></tr>
<tr><td>Source</td><td>Amount (US$)</td><td>%</td><td>Grace period:</td><td>6 years</td></tr>
<tr><td>IDB (Ordinary Capital)</td><td>30 million</td><td>66.67%</td><td>Inspection and supervision fee:</td><td>[b]</td></tr>
<tr><td>Local</td><td>15 million</td><td>33.33%</td><td>Interest rate:</td><td>LIBOR-based</td></tr>
<tr><td>Total</td><td>45 million</td><td>100.00%</td><td>Credit fee:</td><td>[b]</td></tr>
<tr><td colspan="3"></td><td>Currency of approval:</td><td>U.S. dollars from the Ordinary Capital (OC)</td></tr>
<tr><th colspan="6">Project at a Glance</th></tr>
<tr><td colspan="6">Project objective/description: The program’s general objective is to contribute to improved social inclusion and productivity by promoting investment in innovation and research. The specific objectives are to: (i) build the planning, execution, coordination, and evaluation capacity of the National Innovation System (SNI); (ii) build the innovation and research capacity of the productive sector in the priority areas of the Strategic Plan for Science, Technology, and Innovation (PENCYT); (iii) promote social innovation through greater involvement of excluded groups in the innovation process; and (iv) build innovation and research capacity in the social sector.</td></tr>
<tr><td colspan="6">Special contractual conditions precedent to the first disbursement of the loan proceeds: (i) signature of an interagency agreement between the Ministry of Economy and Finance (MEF) and SENACYT transferring the execution responsibilities under the loan contract to SENACYT; (ii) approval and entry into force of the program Operations Manual; (iii) selection of staff of the program coordination unit (at least a general coordinator, financial specialist, procurement specialist, and monitoring and evaluation specialist); and (iv) appointment of a coordinator for economic and policy studies, a coordinator for mission-oriented research, a coordinator for science and health, a coordinator for social innovation, and a coordinator for the teaching of science and mathematics in the line offices (see paragraph 3.4).</td></tr>
<tr><td colspan="6">Exceptions to Bank policy: None.</td></tr>
<tr><th colspan="6">Strategic alignment</th></tr>
<tr><td colspan="2">Challenges:[c]</td><td colspan="2">SI [x]</td><td colspan="2">PI [x]</td><td>EI [ ]</td></tr>
<tr><td colspan="2">Crosscutting themes:[d]</td><td colspan="2">GD [ ]</td><td colspan="2">CC [ ]</td><td>IC [x]</td></tr>
</table>

[a] Under the terms of the Flexible Financing Facility (document FN-655-1), the borrower has the option of requesting changes to the amortization schedule, as well as currency and interest rate conversions. The Bank will take operational and risk management considerations into account when reviewing such requests.

[b] The credit fee and inspection and supervision fee will be established periodically by the Board of Executive Directors as part of its review of the Bank’s lending charges, in accordance with the applicable policies.

[c] SI (Social Inclusion and Equality); PI (Productivity and Innovation); and EI (Economic Integration).

[d] GD (Gender Equality and Diversity); CC (Climate Change and Environmental Sustainability); and IC (Institutional Capacity and Rule of Law).

I. DESCRIPTION AND RESULTS MONITORING

A. Background, problem to be addressed, and rationale

1.1 In the past 10 years Panama's economy posted annual average growth of 8.3%, and the GDP per capita rose from US$4,594 to US$11,770.[1] Such growth is the result of reforms launched in the 1990s to attract foreign investment, enact fiscal reforms, privatize public enterprises, and, especially, fully assume operation of the Panama Canal in 1999.

1.2 Yet this economic growth poses at least two challenges. First, its benefits have not reached the entire population, and, second, insufficient productivity has been observed in recent years. The Government Strategic Plan (PEG) shares this assessment and acknowledges that the priorities of greater social inclusion and competitiveness need to be addressed. The recent National Policy for Science, Technology, and Innovation 2015-2040 likewise proposes a set of responses to this agenda based on: (i) use of research, innovation, and technology to contribute to sustainable development; (ii) support for social inclusion and the development of innovation for competitiveness; and (iii) strengthening of the National Innovation System (SNI).

1.3 The evidence shows the positive impact of the adoption of new knowledge[2] and equity[3] on economic growth. Yet despite this, in Panama the development of such knowledge has not necessarily been geared toward meeting the productive or social needs of the population.

1.4 **Insufficient levels of productivity.** The growth model presented by the Panamanian economy has been driven by the accumulation of production factors (capital and labor).[4] Leveraging this accumulation of factors by increasing productivity levels could contribute to greater sustainability of growth. Productivity's contribution to economic growth in Panama in 2010 reached levels similar to those in the United States in the early 1980s, which has adversely affected industry and trade.[5] Looking at a more recent period, from 2009 to 2014, total factor productivity (TFP) has been contributing less and less to Panama's growth accounting. TFP contributed a little less than half of economic growth in 2011 and 2012, declining in 2014 to contribute just one fifth.[6] This trend indicates insufficient TFP levels as an important component contributing to sustain growth in the longer term.

1.5 The productivity of Panama's business community is mixed. The productive structure has a large share of small-scale activities and significant specialization in trade and service activities, which account for over 92% of all establishments (only 7% of establishments are engaged in industrial activities)[7] and 75.3% of GDP (the

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1 National Statistics and Census Institute (INEC) (2014).

2 Hall and Jones (1999) and Haussmann (2009).

3 Ostry (2014) shows that a three-point decline in the Gini coefficient can raise economic growth by approximately one half of one percent.

4 For the period 2009-2014, cumulative capital investment of the nonfinancial public sector was US$18.095 billion. In 2014 alone it was US$4.167 billion, equivalent to 8.8% of GDP.

5 According to data from Fernández-Arias (2014), Panama's productivity was equivalent to 84% of U.S. productivity in 1980, and 80% in 2010.

6 Fernandez-Arias (2014).

7 INEC. Directorio de Empresas y Locales [Directory of Businesses and Establishments], 2009.

primary and secondary sectors represent 5.6% and 19.1%, respectively). Although the productivity problem varies from one productive sector to the next, the features of Panama's business community reflect insufficient levels of productivity in much of the economy. Small businesses are less productive given the type of goods and services they produce, usually with less value-added, sophistication, and innovation, as frequently seen in the trade and services sectors. Additionally, the constraints on their ability to modernize and grow include limited access to finance for innovation activities[8] and lack of specialized labor.

1.6 A profile of the size distribution of businesses by sales and their labor productivity shows that small and medium-sized enterprises, which employ 93% of workers, have mean productivity levels below the national average. These are the very businesses that must pay special attention to productivity challenges.

1.7 The difficulties faced by high-growth innovative firms also have an impact on productivity. Panama ranks eighth in the region on the Index of Systemic Conditions for Dynamic Entrepreneurship (ProDem, 2015), trailing Costa Rica in fourth place and Uruguay in sixth. The main causes of this lag are the absence of an entrepreneurial culture, lack of entrepreneurial human capital, and a weak science, technology, and innovation (STI) platform. In particular, women are poorly represented in entrepreneurship. Indeed, data from the World Bank Enterprise Survey (WBES, 2010) reveal that just 20% of high-growth businesses in Panama are run by women.[9] Lastly, a country's innovation capacity is one factor that can affect productivity and the ability of businesses to more efficiently utilize the productive factors and resources at their disposal. In 2010, the private sector was the smallest contributor to the financing of research and development (R&D) activities. Since investment in R&D gives rise to productivity growth,[10] this low investment effort is an obstacle to firms having a higher potential levels of productivity from improvement of their ability to innovate.

1.8 In terms of the sectors associated with productive infrastructure and identified as priorities under the PEG and the Bank's country strategy with Panama for 2015-2019 (document GN-2838), the logistics and transportation sectors and the energy sector face challenges to improving their productivity. In logistics and transportation, goods transiting the country have little or no value-added. Much of freight transit is breakbulk that does not leave the cargo terminal, and an even larger percentage is just passing through the Panama Canal and never goes through the national port system. Specifically, 66% of freight transits through the Canal without stopping in a Panamanian port, and 28% is transshipped at Panamanian ports, for a total of 94% of goods transiting or transshipped that do not undergo foreign trade processes such as import, export, or temporary entry for value-added services and/or transformation, as of 2012.[11] Innovation in the value

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8 The limited access to finance for innovation activities at businesses of any size is related to information asymmetry, the high risk and uncertainty associated with such activities, high levels of informality, and a small number of lending institutions with insufficient resources allocated to these activities.

9 According to data from the SENACYT seed capital competitions, just 30% of 2015 proposals were from women, and the same percentage received financing.

10 Rouvinen (2002).

11 Advanced Logistics Group (2013). Consulting engagement for mapping and diagnostic assessment of Panama's foreign trade processes. Scope A. Mapping of foreign trade flows.

chain requires not only that the different links collaborate, but that they learn, generate, and apply knowledge together. According to a recent study by the Georgia Tech-Panama Logistics Innovation and Research Center, Panama's logistics services have no managed knowledge networks for innovation among actors (operators of logistics assets, their partners, clients, suppliers, and competitors), and innovation in the value chain requires not only that these actors collaborate, but that they learn, generate, and apply knowledge together.[12]

1.9 In the energy sector, there is limited ability to apply knowledge and adopt technologies, which hampers potential productivity enhancements. Both public and private entities have weaknesses in their ability to design, implement, and put solutions into operation that utilize renewable energy sources and contribute to diversification of the electricity matrix, energy efficiency, and limiting dependence on petroleum products. These limitations are highlighted by the delays of more than 24 months in some cases in the entry into service of projects commissioned for generation, as well as by the strong growth in demand in recent years.

1.10 **Lack of equity.** Despite the decline in poverty in recent years from 38.3% (2006) to 23% (2015), the impact of economic growth has been uneven. Panama has a dual economy,[13] where even though the Gini coefficient has declined from 0.56 (2002) to 0.49 (2014), the top quintile controls 78% of wealth, and the bottom quintile, just 1%.[14] As a consequence, much of the population faces challenges in education, health, housing, and other areas that need solutions requiring human, financial, and social capital concentrated among a minority. Addressing many of these social problems[15] will mean making the groups that face them part of the process of innovation and developing the solutions.

1.11 Social innovation[16] adds value through new products, services, and business models to address social problems not being solved by the market. However, implementation of the social innovation process is hindered by market failures: (i) on the demand side, coordination failures make it difficult for excluded communities to express their preferences (social problems) in a structured manner and so form a critical mass that attracts the attention of markets and governments, making many of their needs invisible; and (ii) on the supply side, those able to address such problems (businesses, universities, or technology centers) with cost-efficient solutions have no incentives to do so, given the lack of early-stage

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12 Georgia Tech-Panama Logistics Innovation for the Republic of Panama (2015).

13 World Bank (1990), Cárdenas and Salazar (2009), Fernández (2011).

14 World Bank (2012).

15 These are complex problems, where the beneficiaries have firsthand information about the phenomenon that needs to be understood by the potential providers of solutions (universities, businesses, institutions, and NGOs). These providers have the human and financial resources to address the problems and receive appropriate incentives to mitigate the failures keeping the market itself from providing the solutions.

16 Social innovation is a novel methodology for developing a new process, product, service, or model with quantifiable social impact that is more efficient, sustainable, or fair than the existing solutions or addresses a problem in the public interest that has not responded to traditional methods. Social innovation, in the context of this program (see paragraph 1.23), takes the form of an inclusive process involving the communities affected by the problems and utilizing solution providers to develop the solutions, such that the value created is spread across society without taking away from the generation of private benefit.

financing and the high degree of technical and business uncertainty.[17] In Panama, the National Department of Science, Technology, and Innovation (SENACYT) has the experience and capability to manage these innovative processes and currently coordinates the National Network of Social Innovation Managers, which promotes innovations with high social impact.

1.12 Access to health services demands special attention, in order to contribute to improved quality of life for the most vulnerable populations. The health challenges to be addressed include the prevalence of communicable diseases in younger, rural, and poor populations coexisting with the chronic degenerative illnesses typical of older adult populations with a rising trend toward urbanization and notable lifestyle changes.

1.13 In terms of innovation in the health sector, even though there has historically been local capacity for health research and innovation since the Panama Canal was built, limitations persist in specialized human capital and infrastructure to address sector challenges. There are few medical science publications in Panama. In 2008-2014, these accounted for just 9.6% of scientific papers published in the country, compared with 18.8% in Costa Rica and 18.7% in Chile, for this discipline.[18] The Gorgas Memorial Institute for Health Studies (GMI) and the Institute of Advanced Scientific Research and High Technology Services (INDICASAT) conduct research which they finance themselves or with funding from international organizations or through SENACYT public competitions. Yet there is not enough coordination to direct research efforts toward sector needs and challenges (see paragraph 1.14.a). Consequently, these two institutions have difficulty aligning the course of their research with the country's economic and social priorities, since shortfalls in the equipment and instrumentation available limit research and the identification of new areas[19] to improve the quality of services received by the population.

1.14 Adding to these challenges is the diagnostic assessment of the Organization for Economic Cooperation and Development (OECD),[20] which suggests at least two more hurdles to the successful incorporation of more targeted knowledge into the different productive and social structures:

a. **Institutional weakness.** SENACYT is the government institution responsible for coordinating the SNI through execution of the Strategic Plan for Science, Technology, and Innovation (PENCYT). Institutional weakness in the support of these activities was identified in the recent assessment of SENACYT activities (OECD, 2015), based on a process of peer review and interviews with government, private sector, and academic stakeholders. The report points out that, even though coordination among the different actors of the SNI is mandated by law, in practice this is not fully the case. Moreover, the analysis capacity of the policy to select objectives, sectors, activities, and beneficiaries is low, resulting in a lack of prioritization and focus. It also noted insufficient capacity to evaluate the policies executed for evidence of their

17 Schwab Foundation (2013).

18 UNESCO (2015), Science Report.

19 Gorgas Memorial Institute for Health Studies (GMI) (2015), Annual Business Plan.

20 Organization for Economic Cooperation and Development (OECD) (2015), Innovation Policy in Panama.

effectiveness. As far as the capacity to diversify the territorial impact of innovation activities, the study noted that most programs were concentrated in the capital city and more inclusive development was needed in rural areas and indigenous communities, recommending the use of territorial funds as an option. Lastly, the document recommends separating the roles of policy design and implementation, which are at the same organization (SENACYT). It also concluded that the commitment of the private sector should focus on increasing its investment in innovation and engagement as a SENACYT partner in diverse activities that improve the perception within society that such activities are important for the country's economic development.

b. **Deficit of skilled human capital.** Both the OECD and the World Economic Forum indicators (WEF, 2014) similarly suggest a human capital deficit in the country. Specifically, they emphasize that Panamanian students have low skill levels. The Second Regional Comparative and Explanatory Study (SERCE) and Third Regional Comparative and Explanatory Study (TERCE) on learning achievement, as well as the Programme for International Student Assessment (PISA), reveal weaknesses especially in mathematics and sciences. The SERCE and TERCE outcomes for Panama in reading, math, and science for third and sixth grade were consistently below the regional average, and well below the outcomes achieved by Costa Rica, Chile, and Colombia. Panama scored 360 and 376 on the PISA 2009 mathematics and sciences scales, respectively, compared with 427 on both scales for Uruguay, and 421 and 447 for Chile. Panama did not participate in the PISA 2012 and 2015 testing but has begun the process to participate in 2018. Panama ranked 114 out of 140 countries on the quality of math and science education indicator of the WEF's 2015 Global Competitiveness Index. In conclusion, the country's capacity in human capital is low, due mainly to poor teaching practices and limited teacher skills. This keeps it from reaching the critical mass to harness the potential of knowledge-intensive innovation activities as drivers of national development.

1.15 A recent analysis of more than 15 STI sector programs in Latin America[21] indicates that these have been effective in producing the desired results in terms of business innovation, science and technology capacity-building, and accumulation of advanced human capital. The analysis also notes that the continuity of such programs and their periodic evaluation were key factors in their success.[22]

1.16 The government has sought a Bank program that will enable the SNI to address the challenges of improving social inclusion and insufficient productivity. The program will contribute to social inclusion through a combination of mission-oriented research in social sectors, particularly health, and the introduction of new social innovation policy instruments. The contribution to productivity growth will come mainly from instruments to support research for productivity and support for business innovation projects. Following the PEG guidelines, the government is

[21] Notably: Argentine Technology Fund (Argentina), National Fund for Technological and Productive Development (Chile), Fund for Business Technological Modernization (Panama), National Fund for Scientific and Technological Development (Brazil), Administrative Department of Science, Technology, and Innovation (COLCIENCIAS) (Colombia), and Technological Modernization Program (Uruguay).

[22] IDB (2014), Innovation, Science and Technology Sector Framework Document.

interested in prioritizing high-value-added sectors of the economy such as health, logistics, transportation, and energy. The program is flexible enough to adapt to these priorities through multisector activities. While working in these two areas, the program also includes institutional strengthening investments contributing to effective coordination among SNI actors, in order to make the gains of the program more sustainable in the medium and long term.

1.17 The Bank and the Government of Panama have been working as partners in the STI sector since 1998, and this program's design reflects the lessons learned from those experiences. The Program to Support the Competitiveness of the Producing Sectors (loan 1108/OC-PN) for US$14.2 million supported: (i) creation of the Fund for Technology and Business Modernization (FOMOTEC), which provided nonreimbursable cofinancing to 180 businesses, achieving a productivity gain with significant impact;[23] (ii) creation and initial installation of equipment for Panama's Institute of Advanced Scientific Research and High Technology Services (INDICASAT), which is a regional resource laboratory for research in biology, chemistry, pharmacology, and neurosciences; (iii) creation and initial installation of equipment for the National Metrology Center, which is the nation's primary/resource laboratory; and (iv) equipment for the first 10 information centers ("infoplazas"), of the over 300 in existence. The Project to Support the Implementation of a Science, Technology, and Innovation Center of Excellence in Panama (loan 1273/OC-PN) for US$3.3 million supported creating an enabling environment for the sustainable development of the newly established City of Knowledge on the former Fort Clayton. This project supported the initial conversion of 120 hectares of land into a sustainable investment for knowledge generation and dissemination that, as of 2009, is a self-sustaining organization. Lastly, the Multiphase Technological Transformation Program (loan 1987/OC-PN) for US$19.7 million concluded execution in September 2015. It helped to build on the work begun in 2004 by SENACYT with creation of the first generation of instruments to support business innovation, R&D, scholarships to build human capital, and innovation in education. The program's important outcomes were to increase investment in business innovation and the quantity of new products or services, and creation of a talent scouting and tracking system. The main lessons learned from these operations and built into the design of this program are: (i) execution unit coordinators should be incorporated as part of the operational units of the executing agency; (ii) the competitions conducted by SENACYT enjoy a high level of credibility and transparency; (iii) outcomes need to be determined following the investments of financed projects, so activities to evaluate specific projects and programs have been included as part of this program's Component I; and (iv) scientific community and private sector buy-in and ownership of the project kept deviations with the government changeover to a minimum. As far as social innovation processes, the initiatives financed with nonreimbursable technical cooperation funding and loans in Colombia (Project to Strengthen the National Science Technology and Innovation System (loan CO-L1092)) and Uruguay (Innovation Program for Productive Development

[23] The FOMOTEC program was evaluated along with other funds to support the region's technological development, with positive findings in terms of FOMOTEC's ability to foster innovative behaviors at the beneficiary firms through their relationships with technological entities and evidence of improvements in performance variables at the firms, including a significant impact on productivity (Hall and Maffioli, 2008).

(loan UR-L1096)) provide experience of how to implement instruments that: (i) make it easier for excluded communities to structure their demand; and (ii) involved the business and scientific community in meeting that demand. (For more information on these experiences, see the iLab Brochure.)

1.18 **Strategic alignment.** The program is aligned with the country strategy with Panama 2015-2019 (document GN-2838), and specifically the strategic objective to strengthen the educational profile of the population, establishing the need for an SNI that promotes social inclusion and productivity through an increase in the number of researchers working full- or part-time on innovation. It is also aligned in seeking to enhance competitiveness and promote social inclusion, and is included in the 2016 Operational Program Report (document GN-2849). It is consistent with the Update to the Institutional Strategy 2010-2020 (document GN-2788-5) and aligned with the development challenges of: (i) social inclusion and equality; and (ii) productivity and innovation through the following regional context indicators of the 2016-2019 Corporate Results Framework (CRF) (document GN-2727-4): (i) Social Progress Index; (ii) Global Innovation Index; and (iii) R&D expenditure as a percentage of GDP. The program is also aligned with the crosscutting area of institutions and rule of law through the following CRF country development results indicators: (i) number of government agencies benefited by projects that strengthen technological and managerial tools to improve public service delivery; and (ii) number of micro/small/medium-sized enterprises provided with nonfinancial support. Lastly, the program fits into the priority dimensions of: (i) the Innovation, Science and Technology Sector Framework Document (document GN-2791-3) as it relates to improving STI investment in the public and private sector; (ii) the Sector Strategy on Institutions for Growth and Social Welfare (document GN-2587-2), particularly in the area of improving innovation and productivity for growth and social welfare; and (iii) the Strategy on Social Policy for Equity and Productivity (document GN-2588-4) in the priority areas of improving school quality, addressing the double burden of the health transition, and fostering social inclusion.

B. Objectives, components, and cost

1.19 The program's general objective is to contribute to improved social inclusion and productivity by promoting investment in innovation and research. The specific objectives are to: (i) build the planning, execution, coordination, and evaluation capacity of the National Innovation System (SNI); (ii) build the innovation and research capacity of the productive sector in the priority areas of the Strategic Plan for Science, Technology, and Innovation (PENCYT); (iii) promote social innovation through greater involvement of excluded groups in the innovation process;[24] and (iv) build innovation and research capacity in the social sector.

1.20 **Component I. Strengthening of the innovation, science, and technology system (US$3.2 million).** This component will finance activities to build SNI capacity of the in the direction of social inclusion and productivity solutions. Activities executed by SENACYT will contribute to closer coordination and linkage

[24] Segments that do not participate in the social, economic, and cultural life of the population.

among SNI actors and components[25] and improved policy and program planning, execution, and evaluation capabilities. Specifically, activities will be financed for effective coordination and interface among SNI actors; regional innovation systems will be developed with the involvement of actors in those regions (business associations, regional development organizations, and public agencies active at the regional level), to diversify the impact of local innovation activities; studies, development of indicators, and workshops to improve SENACYT's analytical capabilities will be financed for the effective prioritization and targeting of policies and programs and evidence-based decision-making. This will build capacity at SENACYT for planning and strategic intelligence, evaluation, and design of the building blocks of the institutional structure for financing STI. It will also support the National Statistics and Census Institute (INEC) in its ability to gather and analyze data on STI activities, including the fourth and fifth innovation surveys.

1.21 **Component II. Mission-oriented research for productivity[26] (US$15 million).** This component will build the innovation and research capacity of public and private engineering and science research centers through transparent, peer-reviewed public competitions. These activities will support the productive sectors in the PEG and PENCYT priority areas with emphasis on logistics, transportation, and energy, which will be top priorities in the solicitations for public competitions. Projects will therefore be financed for mission-oriented research and upgrading of scientific equipment and infrastructure at specialized research centers, including works to improve the premises used to conduct the research. To be eligible, a person or corporation may be nonprofit or for-profit, researchers or groups of researchers individually or affiliated with public entities, private enterprises, universities, nongovernmental organizations, and laboratories, and the proposed project must relate to the priorities described in the PENCYT. Business innovation projects will also be supported, to contribute to enhanced business productivity. To be eligible, the businesses must be for-profit corporations registered in Panama with a minimum of two years in operation, and the proposed projects must include a product and/or service innovation component.[27] Innovation projects will also be financed for early-stage entrepreneurs with potential for international growth. To be eligible, the entrepreneurs must be adult individuals residing in Panama with or without a business license and with sales not to exceed under any circumstances US$200,000 in the last full year of operation. Workshops will be held as part of the

[25] The National Innovation System (SNI) encompasses all contributors to the development, introduction, dissemination, and use of innovations (Lundvall, 1992), including businesses, the educational system (universities and technical institutes), public and private research centers and laboratories, the financing system, and public institutions that promote innovation.

[26] Mission-oriented research is applied research financed by public agencies based on sector needs and challenges. Externalities can be maximized when priority is put on knowledge development and engineering useful for innovation in different sectors (IDB, 2014). The missions for this component and for Subcomponent 3.2, specifically on health, will be identified through a participatory process led by SENACYT that will be described in the program Operations Manual and involve actors in the public, private, and academic sectors, basing the decision on the PEG, PENCYT, and the outcomes of the SENACYT sector coordination forms under the PENCYT.

[27] The applicant businesses will be classified according to sales: type A, with annual sales up to US$1 million; type B, more than US$1 million up to US$30 million; and type C, over US$30 million. Type C businesses may receive grants only if the innovative project shows that it will have a global impact, multiplier and spillover effects such as support to outside parties in the country, e.g., firms within its supply chain.

component activities to facilitate the participation of women-run enterprises, contributing additionality to the gender equality dimension. The winning projects under this component will receive partial grants in the case of business innovation (up to 75% depending on the risk associated with the project) or full grants for innovation projects of new entrepreneurs (including seed capital) and engineering/science research projects, acting in close coordination with the apex agencies of each sector through SENACYT sector coordination forums. The executing agency has extensive experience in the project selection, award, and monitoring process, which will include at least the following steps: launch of the public competition, proposal intent letters, proposal preparation clinic, submission of proposals, proposal evaluation, publication of prioritized list of projects, announcement of winning proposals, negotiation, contract signature, execution, and monitoring. The details of the process will be described in the program Operations Manual.

1.22 **Component III. Innovation for social inclusion (US$9.4 million).** Activities will be financed that build innovation capacity to address social problems, contributing to meet the challenges of inequity, in coordination with the corresponding ministries and through the SENCYT sector coordination forms.

1.23 **Subcomponent 3.1. Social innovation (US$1 million).** This subcomponent will identify social needs that can be addressed from the STI sector. The groups of beneficiaries and problem areas to be addressed in each competition will be based on an identified lack of access to services and markets for these populations and selected on the recommendation of the innovation forum for social inclusion coordinated by SENACYT, which will make the final decision. The process will follow a two-phase methodology tested by the Bank:[28]

a. Competition to identify problems. Using several different platforms,[29] excluded groups will identify and prioritize their needs in areas identified by the government (acting through SENACYT) as socially important (including education, health, access to services, etc.). Excluded groups are those with a lack of participation in social, cultural, and economic life because they are, for example, poor, disabled, or geographically isolated. These groups will therefore not be limited to being beneficiaries but will participate in the innovation process, turning their problems into ideas that will spur the development of innovations in the second phase.

b. Competition to identify solutions. Through a transparent and participatory process, research centers, universities, NGOs, and businesses will be invited to propose solutions to the problems identified as priorities in the first phase Solutions will be selected to receive full grant financing on the following criteria: (i) degree of innovation; (ii) potential for scalability; (iii) expected social return; and (iv) technical viability.

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[28] This methodology has been implemented in several different sectors by the Innovation Laboratory (iLab). For examples, see: Social Innovation Brochure and Guaipatín, Carlos (2014).

[29] For purposes of this program, a platform is an avenue that may be virtual, through the use of crowdsourcing, or may involve personal interaction through surveys, focus groups, or participatory processes (e.g., www.ideasparaelcambio.gov.co and www.innovacionsocialaysen.cl).

1.24 **Subcomponent 3.2. Mission-oriented research in health (US$5.3 million).** This subcomponent will contribute to building innovation and research capacity to address health problems, including access to services, through transparent, peer-reviewed public competitions. Full grants will be provided for mission-oriented research through the financing of projects and upgrading of scientific equipment and infrastructure, including works to improve the premises used to conduct the research. To be eligible, a person or corporation may be nonprofit or for-profit, researchers or groups of researchers individually or affiliated with public entities, private enterprises, universities, nongovernmental organizations, and laboratories, and the proposed project must relate to the priorities described in the PENCYT. The executing agency has extensive experience in the project selection, award, and monitoring process, which will include at least the following steps: launch of the public competition, submission of proposals, proposal evaluation, presentation of prioritized list of projects, announcement of winning proposals, negotiation, contract signature, execution, and monitoring The details of the competition process and how the missions to be prioritized are to be identified will be described in the program Operations Manual.

1.25 **Subcomponent 3.3. Strengthening of the teaching of science and mathematics (US$3.1 million).** With the objective of building human capital for innovation and improving access to quality education programs, support will be provided for the joint work of SENACYT and the Ministry of Education (MEDUCA) under the Hagamos Ciencias program for innovation in the teaching of science for primary and secondary school students and other actions to strengthen the teaching of science and mathematics for primary and secondary school students. This component will finance the procurement of consulting services, goods, and other services to establish a proposed curriculum for the natural sciences, evaluate the Hagamos Ciencias program, and create a professional development and learning community for physics teachers, a specialized program for chemistry teachers, and a postgraduate degree in teaching mathematics.

1.26 **Administration (US$2.4 million).** Consulting services will be financed for operation of the program execution unit (PEU), financial audits, and the midterm and final evaluations, as well as the impact evaluations established in the monitoring and evaluation plan. The services of a trustee may also be engaged to administer the project resources, including for payment of the grants.

1.27 **Cost and financing.** The program will have a total cost of US$45 million. Of that amount, US$30 million will be financed by the Bank with Ordinary Capital resources, and US$15 million will be the local counterpart contribution (Table 1).

Table 1. Program Costs (US$000)

Components	IDB	Local	Total	%
I. Strengthening of the innovation, science, and technology system	3,200	2,500	5,700	12.7%
II. Mission-oriented research for productivity	15,000	7,500	22,500	50.0%
III. Innovation for social inclusion	9,400	5,000	14,400	32.0%
Administration	2,400	0	2,400	5.3%
TOTAL	**30,000**	**15,000**	**45,000**	**100%**

C. Key results indicators

1.28 The Results Matrix for the operation (see Annex II) contains impact, outcome, and output indicators. The expected impacts include an increase in the country's productivity and a decrease in inequity. The expected outcomes include an increase in the institutional capacity index of SENACYT, number of businesses introducing product and process innovations, publications in indexed journals by supported researchers, and improved student scores on tests of knowledge of science, mathematics, and reading. The outputs include economic studies for decision-making, research projects for productivity implemented, solution projects using social innovation processes implemented, research projects in health implemented, and number of teachers trained in science teaching methods.

1.29 **Economic analysis.** The social net present value (NPV) at the overall project level is US$38 million. The cost-benefit analysis was conducted for two program components accounting for approximately 90% of the investment. The NPV of Component II was US$27 million, and the NPV of Component III was US$25 million. The internal rate of return (IRR) of Component II was 27%, and the IRR of Component III was 37%. The analysis was based on the following assumptions: favorable economic growth in the next few years and an increase in mean labor productivity as a result of innovation activities. Based on the evidence of similar programs, public financing is not expected to displace private investment. Meanwhile, potential positive externalities related to specialized human capital are expected to be seen. A social rate of return on innovation of 50% was used, along with a social discount rate of 12% and an evaluation horizon of 10 years. A sensitivity analysis was also done, to determine the elasticities associated with the parameters. For details, see the economic analysis of the program.

II. Financing Structure and Main Risks

A. Financing instruments

2.1 The operation will be a specific investment loan with a disbursement period of five years (Table 2).

Table2. Projected Annual Disbursements (US$000)

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Total	6,439	10,821	7,389	4,342	1,009	30,000
%	21.47%	36.07%	24.63%	14.47%	3.36%	100%

B. Environmental and social safeguard risks

2.2 This project will finance activities to support innovation, which are therefore not expected to have adverse direct social or environmental consequences. The operation is classified as category "C" under the Environment and Safeguards Compliance Policy (Operational Policy OP-703).

C. Fiduciary risks

2.3 The procurement risk is low since SENACYT staff gained experience in Bank policies and procedures during the Multiphase Technological Transformation

Program, Phase I (loan 1987/OC-PN). The financial risk is low since there is little likelihood of any significant failures in the financial management of the program that could affect disbursements. There is a risk that insufficient funds will be allocated in the budget. Once the IDB has approved the operation, SENACYT will make arrangements with the Ministry of Economy and Finance (MEF) to allocate funds to the program. To mitigate this risk, SENACYT will have the PEU staff and planning tools to properly arrange the budget allocations with the MEF. The complexity of the steps required for the Office of the Comptroller General of the Republic (CGR) to exercise prior control could delay the signing of contracts and processing of payments. To mitigate this risk, consideration will be given to hiring a trustee to administer project resources.

D. Other project risks

2.4 The following medium risks and mitigation measures have been identified: (i) insufficient budget allocation to execute the operation, to be mitigated by keeping the MEF fully informed of the progress of execution; and (ii) insufficient demand of potential beneficiaries and insufficient supply of solutions under the social innovation component, to be mitigated by involving intermediary organizations that employ proven methodologies to identify and channel community problems. A low risk of difficulties in interagency coordination with the different actors involved in execution of the components was also identified.

2.5 Sustainability of the outcomes of this program is expected to be supported through: (i) incorporation of the experience and lessons learned from projects previously financed by the executing agency into the design and execution of this program;[30] (ii) the return demonstrated by the evaluations designed under this program; and (iii) acceptance and buy-in of Panama's private sector for the financing opportunities offered by SENACYT, which it has described as relevant and transparent processes. Additionally, the use of instruments to support the private sector has been shown to have a significant impact on productivity.[31] The investments to support entrepreneurship under this program may in some cases evolve to the point of receiving venture capital financing.

III. Implementation and Management Plan

A. Summary of implementation arrangements

3.1 **Borrower and executing agency.** The borrower will be the Republic of Panama, and the program executing agency will be the National Department of Science, Technology, and Innovation (SENACYT). The following structure will be used: (i) SENACYT national offices will have technical responsibility for supporting the program's technical execution; (ii) a program execution unit (PEU) will be

[30] An assessment of SENACYT support for business innovation (Crespi, Solís and Tacsir, 2011) found that investments in innovation by the beneficiary firms were four times greater than those of the neighboring firms in the control group.

[31] Between 1995 and 2007, the financing of businesses by COLCIENCIAS in Colombia had a 12% impact on the introduction of new products, and a 15% impact on labor productivity, on average. This impact was most pronounced between three and five years after the companies had received the contributions (Crespi et al., 2011).

established, responsible for coordinating the program and conducting fiduciary processes.

3.2 Implementation of the social inclusion component will be coordinated through the innovation forum for social inclusion, to be formed by SENACYT. This advisory body will support SENACYT in setting priorities and remain active with the participation of the ministries of Education, Health, and Social Development, as well as the National Department of Disability and others. Additionally, an agreement will be signed with the Ministry of Education (MEDUCA) establishing the mechanism whereby SENACYT will serve as technical coordinator for the program to support the teaching of science and mathematics in the official schools of Subcomponent 3.3.

3.3 **Program Operations Manual.** The rules governing execution will be described in the program Operations Manual, to be approved by the executing agency and agreed upon with the Bank. The program Operations Manual will describe the procedures for execution of the different components, procurement and financing procedures, the detailed eligibility criteria for program beneficiaries, and the mechanisms for interagency coordination in the execution of program activities, as well as other areas. For the execution of funds awarded by competition, subject to the Bank's no objection to the selection process described in the program Operations Manual, the beneficiary will sign a contract with the executing agency clearly establishing the amount to be financed by the program and, in the case of firms, describing the counterpart financing provided by the beneficiary.

3.4 **Special contractual conditions precedent to the first disbursement of the loan proceeds: (i) signature of an interagency agreement between the Ministry of Economy and Finance (MEF) and SENACYT transferring the execution responsibilities under the loan contract to SENACYT; (ii) approval and entry into force of the program Operations Manual; (iii) selection of staff of the program coordination unit (at least a general coordinator, financial specialist, procurement specialist, and monitoring and evaluation specialist); and (iv) appointment of a coordinator for economic and policy studies, a coordinator for mission-oriented research, a coordinator for science and health, a coordinator for social innovation, and a coordinator for the teaching of science and mathematics in the line offices.** As a condition precedent to the first disbursement of resources for execution of the Subcomponent 3.3 activities, an agreement will be signed and in effect between SENACYT and MEDUCA establishing how the activities are to be conducted to support the teaching of science and mathematics at public education centers. The program Operations Manual will establish the technical fiduciary processes between SENACYT and the Bank.

3.5 **Procurement.** The procurement of works and goods and the selection of consulting services will be conducted in accordance with the Policies for the Procurement of Goods and Works Financed by the IDB (document GN-2349-9) and the Policies for the Selection and Contracting of Consultants Financed by the IDB (document GN-2350-9), both approved in March 2011. Funds will be delivered under Components II and III in the form of grants allocated through public competitions. The selection criteria and requirements for the competitions will be indicated in the program Operations Manual. The procedures for allocation of the

grants through public competitions will have to comply with the principles of competition, transparency, and equal opportunity established in Bank policies. The Bank will verify the appropriateness of expenditure for each project to be financed. The Bank's Board of Executive Directors approved (document GN-2538-11) use of the framework agreement subsystems up to the national competitive bidding (NCB) threshold of US$250,000, as well as the small procurements mechanism up to US$50,000. This may vary as the Bank approves higher levels of use. The procurement plan itemizes the procurements to be implemented during execution.

3.6 **Retroactive financing.** The Bank may retroactively finance against the loan proceeds up to US$1 million (3.33% of the proposed loan amount) in eligible expenditures incurred by the borrower prior to the loan approval date for economic and policy studies, workshops, and financing of research and development projects, business innovation, entrepreneurs, and activities to support the teaching of science and mathematics, provided that requirements substantially similar to those of the loan contract have been met. Such expenditures must have been made on or after 11 February 2016 (the project profile approval date), but in no case will they include expenditures made more than 18 months prior to the loan approval date.

3.7 **Single-source selection.** The Universidad de Panamá will be contracted by single-source selection for an estimated amount of US$880,000 for execution of the diploma course in the teaching of science and mathematics, and for an estimated amount of US$250,000 for execution of the postgraduate course in the teaching of chemistry, both under Subcomponent 3.3. The Universidad de Panamá is the only university with technical expertise that has national reach, meaning that it has exceptional worth as indicated in paragraph 3.10(d) of the Policies for the Selection and Contracting of Consultants Financed by the IDB (document GN-2350-9) as grounds for single-source selection. The agreements for execution of these activities will be subject to the Bank's no objection. To ensure the academic quality and standard of the programs, instructors from established international programs in modern teaching methodologies must be involved, and at least 40% of instructors must have doctoral degrees.

3.8 **Disbursement flow.** The IDB will transfer the resources to an exclusive account for the program at a financial institution, to be opened by SENACYT or the trustee, if the decision is made to utilize this mechanism.[32] Disbursements will be made in the form of advances of funds[33] to cover liquidity needs according to the respective financial plan for a period of up to 180 days. A new advance may be requested when 80% of the cumulative resources pending justification have been accounted for. Payments may also be reimbursed, or direct payments may be made to providers.

3.9 **Financial statements and external audit.** Audited financial statements for the project prepared on an annual basis by a firm of independent auditors acceptable to the Bank will be requested within 120 days after the closing date of each fiscal year or the date of last disbursement.

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[32] If the trustee is not used and/or the evaluation of the general treasury account to be conducted in 2016 is satisfactory, the resources will be transferred to an account designated by the MEF.

[33] As established in document OP-273-6.

B. Summary of arrangements for monitoring results

3.10 **Annual work plan.** The annual work plan (AWP) will be prepared by the PEU and subject to the Bank's no objection. The AWP will be delivered along with the six-monthly report at the end of the year preceding the plan year, and will include a schedule of activities, project disbursements, and the updated procurement plan.

3.11 **Six-monthly reports on execution.** Within 90 days after the close of each calendar six-month period, the PEU will deliver a report on the progress of program execution, including a breakdown of outputs completed and in process according to the program Results Matrix indicators, the monitoring and evaluation report based on the layout designed by the project team, an analysis of problems encountered and corrective measures taken, deviations from the planned execution of activities, and the calculation of the program performance indexes.

3.12 **Program monitoring and evaluations.** Monitoring will be the responsibility of SENACYT, which will deliver six-monthly reports with the AWP activities completed. This work will be supported by the SENACYT Planning Department, the PEU monitoring and evaluation specialist, specialized training in project evaluation provided to the executing agency by the Bank, and its experience in the execution of Bank programs.

3.13 The monitoring and evaluation plan includes the indicators for monitoring results, establishing whether they are to be measured every year, every two years, or at the end of the program. Difference-in-differences with matching will be used to measure the Component II impact and outcome indicators, and the before-and-after methodology will be used for Components I and III.

Development Effectiveness Matrix			
Summary			
I. Strategic Alignment			
1. IDB Strategic Development Objectives	Aligned		
Development Challenges & Cross-cutting Themes	-Social Inclusion and Equality -Productivity and Innovation -Institutional Capacity and the Rule of Law		
Regional Context Indicators	-Social Progress Index -Global Innovation Index (LAC average) -Research and development expenditure as a percentage of GDP (%)		
Country Development Results Indicators	-Micro / small / medium enterprises provided with non-financial support (#) -Government agencies benefited by projects that strengthen technological and managerial tools to improve public service delivery (#)		
2. Country Strategy Development Objectives	Aligned		
Country Strategy Results Matrix	GN-2838	Strengthen the educational profile of the population.	
Country Program Results Matrix	GN-2849	The intervention is included in the 2016 Operational Program.	
Relevance of this project to country development challenges (If not aligned to country strategy or country program)			
II. Development Outcomes - Evaluability	Highly Evaluable	Weight	Maximum Score
	9.3		10
3. Evidence-based Assessment & Solution	9.0	33.33%	10
3.1 Program Diagnosis	2.4		
3.2 Proposed Interventions or Solutions	3.6		
3.3 Results Matrix Quality	3.0		
4. Ex ante Economic Analysis	10.0	33.33%	10
4.1 The program has an ERR/NPV, a Cost-Effectiveness Analysis or a General Economic Analysis	4.0		
4.2 Identified and Quantified Benefits	1.5		
4.3 Identified and Quantified Costs	1.5		
4.4 Reasonable Assumptions	1.5		
4.5 Sensitivity Analysis	1.5		
5. Monitoring and Evaluation	8.8	33.33%	10
5.1 Monitoring Mechanisms	2.5		
5.2 Evaluation Plan	6.3		
III. Risks & Mitigation Monitoring Matrix			
Overall risks rate = magnitude of risks*likelihood	Low		
Identified risks have been rated for magnitude and likelihood	Yes		
Mitigation measures have been identified for major risks	Yes		
Mitigation measures have indicators for tracking their implementation	Yes		
Environmental & social risk classification	C		
IV. IDB´s Role - Additionality			
The project relies on the use of country systems			
Fiduciary (VPC/FMP Criteria)	Yes	Financial Management: Budget. Procurement: Information System, Shopping Method.	
Non-Fiduciary	Yes	Monitoring and Evaluation National System.	
The IDB's involvement promotes additional improvements of the intended beneficiaries and/or public sector entity in the following dimensions:			
Gender Equality	Yes	The program will carry out workshops to promote women's participation in calls for entreprenurial projects.	
Labor			
Environment			
Additional (to project preparation) technical assistance was provided to the public sector entity prior to approval to increase the likelihood of success of the project			
The ex-post impact evaluation of the project will produce evidence to close knowledge gaps in the sector that were identified in the project document and/or in the evaluation plan	Yes	It will measure the impact of the intervention in terms of the scientific production and innovation performance of researchers and companies associated with projects.	

Note: (*) Indicates contribution to the corresponding CRF's Country Development Results Indicator.

The innovation program for social inclusion and productivity (PN-L1117) aims to improve social inclusion and productivity by increasing the investment in innovation and research. The specific objectives of the program are : (i) increase the capacities of planning, implementation, coordination and evaluation of the National System of Science, Technology and Innovation; (ii) increase the research and innovation capacities of the productive sector in the main areas of the Strategic Plan for Science , Technology and Innovation 2015-2019 ; (iii) promote social innovation by increasing the participation of excluded groups in the innovation process ; and (iv) increase the capabilities of innovation and research in the social sector.

The diagnosis establishes that the main problems are the low productivity (especially in small and medium size firms); institutional weakness; lack of social equity; and lack of qualified human capital in the country. Additionally, the analysis properly identified market failures which justify the intervention of the program. It explains that the country experiences low investment in innovation; lack of knowledge generation; lack of coordination between firms and centers for research and development; low incentives to create solutions to social problems; teachers with low levels of training; and weak educational curricula. The vertical logic of the program is clearly stated and the activities and products are articulated with the proposed interventions.

The economic analysis suggests net positive benefits through improvements in productivity, increases in consumer surplus, an increase in salaries due to training and social returns. The sensitivity analysis shows a high probability of maintaining positive social returns. The project has adequate monitoring mechanisms and plans to assess the impact on key performance indicators using quasi -experimental methodologies, such as differences in differences with matching. The risk profile of the project is low.

RESULTS MATRIX

Program objective:	The program's general objective is to contribute to improved social inclusion and productivity by promoting investment in innovation and research. The specific objectives are to: (i) build the planning, execution, coordination, and evaluation capacity of the National Innovation System (SNI); (ii) build the innovation and research capacity of the productive sector in the priority areas of the Strategic Plan for Science, Technology, and Innovation (PENCYT); (iii) promote social innovation through greater involvement of excluded groups in the innovation process; and (iv) build innovation and research capacity in the social sector.

IMPACT INDICATORS

Impacts	Unit of measure	Baseline 2016	Target 2021	Means of verification/Comments
Increase in social inclusion	Social progress index (SPI)	71.79	73	Impact indicator aligned with the general objective of the program and with the 2016-2019 Corporate Results Framework (CRF) (document GN-2727-4) of the IDB. The SPI measures the social development of societies and encompasses three dimensions: basic human needs, foundations of well-being, and opportunity. Baseline for Panama: 71.79 (2015). Source: Social Progress Imperative.
Increase in national investment in research and development (R&D)	Percent of GDP	0.18	0.25	Impact indicator aligned with the general objective of the program and with the CRF. The indicator refers to gross R&D expenditure financed and executed by the public and private sectors and nongovernmental organizations (NGOs) as a percent of GDP. Baseline for Panama: 0.18% (2011). Source: Ibero-American and Inter-American Network of Science and Technology Indicators.
Increase in innovation capacities	Global Innovation Index	0.56	0.6	Impact indicator aligned with the general objective of the program and with the CRF. The Global Innovation Index evaluates the innovation capabilities of countries based on the facets of their economies. Baseline for Panama: 0.56 (2015). Source: INSEAD Business School/World Intellectual Property Organization/Cornell University.
Growth of labor productivity	Index	1.00	1.15	Impact indicator aligned with the general objective of the program. Calculated as the relative index of labor productivity of the beneficiary firms relative to the control group. $\overline{\left(\frac{Y_t^B}{L_y^B}\right)} / \overline{\left(\frac{Y_t^{NB}}{L_t^{NB}}\right)}$ Where t=2016 in the baseline and t=2021 in the target. An index of 1 means that the beneficiary group and the control group have the same labor productivity in the baseline.

Impacts	Unit of measure	Baseline 2016	Target 2021	Means of verification/Comments
				Source: Fifth Innovation Survey of Panama (2021). Baseline: Third Innovation Survey of Panama (2013).

OUTCOME INDICATORS

Outcomes	Unit of measure	Baseline 2016	Target 2021	Means of verification/Comments
Component I. Strengthening of the innovation, science, and technology system				
Increase in the Matrix of Institutional Capacity Indicators (MICA) index of institutional learning of the National Department of Science, Technology, and Innovation (SENACYT)	Score	3	4	Source: MICA. IDB (2016). Weighted average of stability indicators of SENACYT network executive, knowledge management, and active management personnel.
Component II. Mission-oriented research for productivity				
Increase in publications by supported researchers vs. the control group	Index	1.00	1.30	Calculated as the ratio between the number of scientific papers in indexed international journals published by beneficiary researchers and those of the control group. The control group is nonbeneficiary researchers with the same scientific output in the base year. Source: SENACYT.
Increase in the number of researchers engaged in R&D activities	R&D researchers per million inhabitants	142	175	Encompasses the total number of researchers, both full- and part-time. Indicator aligned with the country strategy. Baseline: Strategic Plan for Science, Technology, and Innovation 2015-2019 (PENCYT) Source: SENACYT.
Increase in investment in productive sector innovation	%	0	0.4	Calculated as the investment in innovation (I) by the beneficiary firms as a percent of sales (Y), minus the investment in innovation by the control firms as a percent of sales: $\left[\overline{\left(\frac{I^{B}_{t}}{Y^{B}_{t}}\right)} - \overline{\left(\frac{I^{NB}_{t}}{Y^{NB}_{t}}\right)}\right]$ Where t=0 corresponds to 2016 in the baseline and t=2021 in the target. Baseline: The Third Innovation Survey of Panama (2013) reports a 0.59% investment in innovation as a percent of sales at firms.

Outcomes	Unit of measure	Baseline 2016	Target 2021	Means of verification/Comments
				Source: Fifth Innovation Survey of Panama (2021).
Percentage of successful new businesses created and supported by the program	Percent	0	15%	The businesses considered successful are those supported by the program that reach at least four employees and annual sales of over US$30,000, and make expenditures on innovation one year after support ends. Source: Database of supported businesses/SENACYT.
Component III. Innovation for social inclusion				
Improvement in economic conditions in communities supported by the program vs. the control group	Index	1	1.1	Calculated as the ratio between the relative index of multidimensional poverty (IMP) of the control group and the beneficiary communities. The structure of the control group will depend on the beneficiaries and the need identified by the competition to identify problems. The average IMP nationwide is: 14.1% (UNDP, 2010) Source: SENACYT/National Statistics and Census Institute (INEC).
Increase in publications in the health field by support researchers vs. the control group	Index	1	1.5	Calculated as the ratio between the number of scientific papers in indexed international journals published in the health field by beneficiary researchers and those of the control group. The control group is nonbeneficiary researchers with the same scientific output in the base year. Source: SENACYT. Publications in medical sciences between 2008 and 2014 are calculated as an annual average of 24 (UNESCO, Science Report 2015).
Improvement in performance in science and mathematics of students at schools participating in the program vs. the control group	Index	1	1.2	Calculated as the ratio between outcomes in science and mathematics for students at participating schools and those for the control group schools. The control group is nonparticipating schools with the same student performance in science and mathematics in the base year. These outcomes will be captured with a new test being designed by the Ministry of Education (MEDUCA), to be administered before program start and at program end. Source: MEDUCA.

OUTPUT INDICATORS

Outputs	Cost (US$)	Baseline 2016	Year 1 2017	Year 2 2018	Year 3 2019	Year 4 2020	Year 5 2021	Total	Unit of measure	Means of verification/Comments
Component I. Strengthening of the innovation, science, and technology system										
Output indicator: Coordination and linkage among SNI actors and components										
Foresight Panama 2040 prospective studies conducted	210,000	0	14	0	0	0	0	14	Number of studies conducted	Planning Department report (PDR)
Human resource capacity building of INEC	80,000	0	1	1	1	1	1	5	Number of institutions strengthened (annual)	PDR
Reports on evaluated programs	455,000	0	5	2	2	2	2	13	Number of reports	PDR
Project case studies	650,000	0	15	15	10	15	10	65	Number of studies	PDR
Profile studies conducted on regional innovation systems	375,000	0	1	1	1	0	0	3	Number of profile studies	PDR
Financing analysis and alternatives studies for innovation, science, and technology	100,000	0	1	0	0	0	0	1	Number of analysis studies	PDR
Studies conducted to strengthen SENACYT management technological tools and capabilities	320,000	0	0	2	1	1	0	4	Number of studies	Output indicator aligned with the CRF indicator, “Government agencies benefited by projects that strengthen technological and managerial tools to improve public service delivery.” PDR
National think tanks supported	90,000	0	1	0	1	1	0	3	Number of think tanks supported	PDR
Internships held for SENACYT capacity-building	110,000	0	6	6	7	6	6	31	Number of internships held	PDR

Outputs	Cost (US$)	Baseline 2016	Year 1 2017	Year 2 2018	Year 3 2019	Year 4 2020	Year 5 2021	Total	Unit of measure	Means of verification/Comments
Foresight Panama 2040 surveys and reports published	160,000	0	2	2	2	2	2	10	Number of publications	PDR
Process automation system up and running	650,000	0	0	1	0	0	0	1	Number of systems running	PDR
Counterpart										
Foresight Panama 2040 surveys and workshops held	710,000	0	7	7	7	7	7	35	Number of workshops and surveys	PDR
Annual dues to international networks	150,000	1	1	1	1	1	1	5	Number of fees paid	International Cooperation Department report
National plan and policy evaluation and studies	790,000	0	2	2	2	2	2	10	Number of evaluations and studies	PDR
Dialogue reports on regional coordination on innovation policies	580,000	0	2	2	2	2	2	10	Number of dialogue reports	PDR
Internal dialogue and change management events for implementation of new management processes at SENACYT	270,000	0	2	2	2	2	2	10	Number of events	PDR
Component II. Mission-oriented research for productivity										
Output indicator: Support for business innovation and research										
R&D projects awarded for strengthening of centers	4,250,000	0	5	15	15	15	0	50	Number of R&D projects	SENACYT annual report
Scientific infrastructure projects awarded for R&D centers of excellence	5,500,000	0	2	5	3	1	0	11	Number of R&D projects	SENACYT annual report

Outputs	Cost (US$)	Baseline 2016	Year 1 2017	Year 2 2018	Year 3 2019	Year 4 2020	Year 5 2021	Total	Unit of measure	Means of verification/Comments
Business innovation projects awarded to micro, small, and medium-sized enterprises	3,400,000	0	4	5	4	4	0	17	Number of business innovation projects	Output indicator aligned with the CRF indicator "Micro/small/medium enterprises provided with nonfinancial support" SENACYT annual report
Business innovation projects awarded to large enterprises with spillover effect	800,000	0	1	1	1	1	0	4	Number of business innovation projects	SENACYT annual report
Innovative entrepreneurship projects awarded	1,050,000	0	10	10	11	11	0	42	Number of entrepreneurship projects	SENACYT annual report
Counterpart										
Training workshop on innovative entrepreneurship for women	75,000	0	1	1	1	1	1	5	Number of workshops	SENACYT annual report
Scientific bibliography access platform commissioned	5,000,000	1	1	1	1	1	1	5	Number of platforms commissioned	SENACYT annual report
Project launch, evaluation, monitoring, and dissemination of outcomes	905,000	1	3	3	3	3	3	15	Number of competitions launched	SENACYT annual report
Regional diagnostic assessment of R&D and innovation opportunities	375,000	0	1	1	1	0	0	3	Number of diagnostic assessments	R&D Office report
Awards for excellence in R&D and business innovation	525,000	1	1	2	1	2	1	7	Number of awards	R&D Office report
Training workshops to support innovation and R&D projects	120,000	1	2	2	2	2	2	10	Number of workshops	R&D Office report

Outputs	Cost (US$)	Baseline 2016	Year 1 2017	Year 2 2018	Year 3 2019	Year 4 2020	Year 5 2021	Total	Unit of measure	Means of verification/Comments
Promotion of Intellectual Property Registry	500,000	0	5	10	15	15	5	50	Number of intellectual property registries supported	R&D Office report
Component III. Innovation for social inclusion										
Output 1 indicators: Social innovation										
Social innovation projects awarded	1,000,000	0	3	6	6	5	0	20	Number of social innovation projects	SENACYT annual report
Counterpart										
Competition launch, evaluation, and dissemination of outcomes	256,000	0	1	1	1	1	1	5	Number of competitions	SENACYT annual report
Output 2 indicators: Research in health										
R&D projects awarded for strengthening of centers	2,800,000	0	3	6	5	0	0	14	Number of health R&D projects	SENACYT annual report
Scientific infrastructure projects awarded for R&D centers of excellence	2,500.000	0	2	2	1	0	0	5	Number of health R&D projects	SENACYT annual report
Counterpart										
Health specialists trained in advanced R&D courses	3,000,000	0	30	30	30	30	30	150	Number of specialists trained	SENACYT annual report
Competition launch, evaluation, and dissemination of outcomes	1,409,000	0	3	3	3	3	3	15	Number of competitions	SENACYT annual report
Output 3 indicators: Strengthening of teaching of science and mathematics										
Design of the natural sciences curriculum	70,000	0	0	1	0	0	0	1	Number of curricula	MEDUCA/SENACYT agreement report

Outputs	Cost (US$)	Baseline 2016	Year 1 2017	Year 2 2018	Year 3 2019	Year 4 2020	Year 5 2021	Total	Unit of measure	Means of verification/Comments
Materials developed and tested	454,000	0	0	0	11	10	10	31	Number of materials	MEDUCA/SENACYT agreement report
Materials development projects executed	160,000	0	0	8	8	0	0	16	Number of projects	MEDUCA/SENACYT agreement report
Diploma courses in the teaching of science and mathematics	880,000	0	0	4	4	4	4	16	Number of diploma courses	MEDUCA/SENACYT agreement report
Science and mathematics evaluation program designed	60,000	0	1	1	1	0	0	3	Number of programs	MEDUCA/SENACYT agreement report
Videos of classes produced and edited	83,000	0	0	40	0	0	0	40	Number of videos	MEDUCA/SENACYT agreement report
Tests designed and administered for students at 80 schools	50,000	0	0	5	5	0	0	10	Number of tests	MEDUCA/SENACYT agreement report
Diploma courses in evaluation with international collaboration	220,000	0	0	1	0	0	0	1	Number of diploma courses	MEDUCA/SENACYT agreement report
Physics teachers trained via postgraduate courses	203,000	0	0	20	20	0	0	40	Number of teachers	MEDUCA/SENACYT agreement report
Chemistry teachers trained via postgraduate courses	290,000	0	0	20	20	0	0	40	Number of teachers	MEDUCA/SENACYT agreement report
Postgraduate and Master's in teaching of mathematics	630,000	0	0	15	20	0	0	35	Number of teachers	MEDUCA/SENACYT agreement report
Counterpart										
Curriculum development workshops	90,000	0	5	10	0	0	0	15	Number of workshops	Learning Innovation Office report
Consulting engagement for evaluation and technology platform	245,000	0	1	1	1	1	1	5	Number of consulting engagements	Learning Innovation Office report

FIDUCIARY AGREEMENTS AND REQUIREMENTS

COUNTRY:	Panama
PROJECT NUMBER:	PN-L1117
PROJECT NAME:	Innovation Program for Social Inclusion and Productivity
EXECUTING AGENCY:	National Department of Science, Technology, and Innovation (SENACYT)
PREPARED BY:	Ezequiel Cambiasso and Juan Carlos Dugand (FMP/CPN)

I. FIDUCIARY CONTEXT OF THE EXECUTING AGENCY

1.1 The borrower will be the Republic of Panama, and the program executing agency will be the National Department of Science, Technology, and Innovation (SENACYT). SENACYT is an autonomous institution created by Law 13 of 15 April 1997, as subsequently amended by Law 50 of 21 December 2005 to grant it autonomy in its administrative functions.

1.2 The following structure will be used: (i) SENACYT national offices will have technical responsibility for supporting the program's technical execution with support from experts engaged by the program; (ii) a program execution unit (PEU) will be created, responsible for coordinating the program and conducting fiduciary processes, with a program coordination unit (a director, financial specialist, procurement specialist, and monitoring and evaluation specialist)

1.3 SENACYT has been the executing agency for the Program to Support the Competitiveness of the Producing Sectors (loan 1108/OC-PN) and the Multiphase Technological Transformation Program, Phase I (loan 1987/OC-PN), so it has the necessary experience to execute this program.

II. FIDUCIARY RISK ASSESSMENT AND MITIGATION MEASURES

2.1 The procurement risk is low, since SENACYT staff have experience with Bank policies and procedures.

2.2 The financial risk is low since there is little likelihood of any significant failures in the financial management of the program that could affect disbursements.

2.3 There is a risk that insufficient funds will be allocated in the budget. Once the IDB has approved the operation, SENACYT will make arrangements with the Ministry of Economy and Finance (MEF) to allocate funds to the project. To mitigate this risk, SENACYT will have the PEU staff and planning tools to properly arrange the budget allocations with the MEF.

2.4 The complexity of the steps required for the Office of the Comptroller General of the Republic (CGR) to exercise prior control could delay the signing of contracts and processing of payments. To mitigate this risk, consideration will be given to hiring a trustee to administer project resources, including payment of the grants.

III. CONSIDERATIONS FOR THE SPECIAL PROVISIONS OF THE CONTRACTS

3.1 The agreements and requirements to be considered in the Special Provisions are as follows:

a. The Financial Management Guidelines for IDB-financed Projects (document OP-273-6) will apply, in accordance with which: (i) audited financial statements for the project prepared on an annual basis by a firm of independent auditors acceptable to the Bank will be requested within 120 days after the closing date of each fiscal year or the date of last disbursement; (ii) advances will be requested for financial plans of up to 180 days; and (iii) a new advance of funds may be requested only when 80% of the cumulative resources pending justification have been accounted for.

b. The Panamanian balboa is pegged to the U.S. dollar, so the borrower may opt for any of the exchange rate options provided in the General Conditions of the loan contracts, according to its preference.

IV. AGREEMENTS AND REQUIREMENTS FOR PROCUREMENT EXECUTION

A. Procurement execution

4.1 The Policies for the Procurement of Goods and Works Financed by the IDB (document GN-2349-9) and the Policies for the Selection and Contracting of Consultants Financed by the IDB (document GN‑2350‑9) will be applicable. The program execution mechanism calls for use of a trustee. The trustee will be selected by price comparison among entities authorized and legally registered in the country to provide trust services.

4.2 **Procurement of works, goods, and nonconsulting services**. Procurements subject to international competitive bidding (ICB) will be executed using the standard bidding documents issued by the Bank. Procurements subject to national competitive bidding (NCB) and the shopping method will be executed using the models identified for this operation by the Bank. The project sector specialist will be responsible for reviewing the technical specifications for procurements during the preparation of selection processes.

4.3 **Selection and contracting of consultants.** Contracts for consulting services generated under the project will be executed using the standard request for proposals issued by the Bank. The project sector specialist will be responsible for reviewing the terms of reference for the contracting of consulting services.

4.4 **Selection of individual consultants.** Individual consultants will be selected according to their qualifications to perform the work, based on a comparison of qualifications of at least three candidates.

4.5 **Use of country procurement system.** The Bank's Board of Executive Directors approved (document GN-2538-11) use of the framework agreement subsystems up to the NCB threshold of US$250,000, as well as the small procurements mechanism up to US$50,000. This may vary as the Bank approves higher levels of use. The procurement plan for the operation and its updates will indicate which

procurements are to be executed through the approved country procurement systems.

4.6 **Grants.** Funding under Components II and III will be in the form of grants awarded through public competitions. The selection criteria and requirements for the competitions will be indicated in the program Operations Manual. The procedures for allocation of the grants through public competitions will have to comply with the principles of competition, transparency, and equal opportunity established in Bank policies. The Bank will verify the appropriateness of expenditure under the projects.

4.7 **Retroactive financing.** The Bank may retroactively finance against the loan proceeds up to US$1 million (3.33% of the proposed loan amount) in eligible expenditures incurred by the borrower prior to the loan approval date for economic and policy studies, workshops, and financing of research and development projects, business innovation, entrepreneurs, and activities to support the teaching of science and mathematics, provided that requirements substantially similar to those of the loan contract have been met. Such expenditures must have been made on or after 11 February 2016 (the project profile approval date), but in no case will they include expenditures made more than 18 months prior to the loan approval date.

4.8 **Single-source selection.** The Universidad de Panamá will be contracted by single-source selection for an estimated amount of US$880,000 for execution of the diploma course in the teaching of science and mathematics, and for an estimated amount of US$250,000 for execution of the postgraduate course in the teaching of chemistry, both under Subcomponent 3.3. The Universidad de Panamá is the only university with technical expertise that has national reach, meaning that it has exceptional worth as indicated in paragraph 3.10(d) of the Policies for the Selection and Contracting of Consultants Financed by the IDB (document GN-2350-9) as grounds for single-source selection. The agreements for execution of these activities will be subject to the Bank's no objection. To ensure the academic quality and standard of the programs, instructors from established international programs in modern teaching methodologies must be involved, and at least 40% of instructors must have doctoral degrees.

4.9 **Domestic preference.** Not applicable.

4.10 **Procurement plan.** The Procurement Plan Execution System (SEPA) or the upgraded version that succeeds it as electronic system for tracking procurements.

B. Table of threshold amounts (US$)

Works			Goods			Consulting services	
ICB	**NCB/Shopping**	**Shopping for complex works**	**ICB**	**NCB/Shopping**	**Shopping for complex works**	**International**	**National**
3,000,000 or more	More than 250,000 and less than 3,000,000	Less than 250,000	250,000 or more	More than 50,000 and less than 250,000	Less than 50,000	More than 200,000	200,000 or less

C. Main procurements

Activity	Type of process	Estimated amount US$
Goods		
INEC technological equipment for science, technology, and innovation activities	Country systems	50,000
Accounting software for program management	Shopping	40,000
Nonconsulting services		
Process optimization system	ICB	600,000
Diploma course in the teaching of science and mathematics	SSS	880,000
Training program on evaluation of science programs	NCB	220,000
Diploma course in teaching for chemistry teachers	SSS	250,000
Postgraduate course in the teaching of mathematics	ICB	500,000
Fiduciary administrator	Shopping	525,000
Consulting services		
Evaluation of projects supported by SENACYT	QCBS	210,000
Evaluation of projects supported by SENACYT	QCBS	650,000
Public competitions		
R&D projects for strengthening of centers of excellence	Competition	4,250,000
Support for scientific infrastructure of R&D centers of excellence	Competition	5,500,000
Business innovation projects	Competition	4,200,000
Seed capital projects (innovative entrepreneurship)	Competition	1,050,000
Social innovation solutions projects	Competition	1,000,000
R&D projects for strengthening of centers of excellence in health	Competition	2,800,000
Support for scientific infrastructure of R&D centers of excellence in health	Competition	2,500,000
Projects to support development of materials for science curriculum proposal	Competition	160,000

D. Procurement supervision

4.11 All ICBs and direct contracting of goods, works, and nonconsulting services will be subject to prior review. The selection of consulting firms for amounts greater than US$200,000 and single-source selections will be subject to prior review. For all other contracts, the type of review will be determined case by case in the procurement plan.

E. Special provisions

4.12 None planned.

F. Records and files

4.13 The executing agency will keep records up to date and files orderly such that they can be reviewed by the Bank in accordance with the following guidelines:

a. Procurement documentation will be kept in a single file or folder clearly distinguishable from processes financed with local contribution resources or financed with resources outside the program.

b. Documents will be paginated, numbered, and kept in an orderly manner such that they can be clearly and immediately located and identified and are available at any time for Bank review and audit purposes.

V. FINANCIAL MANAGEMENT

A. Programming and budget

5.1 The Ministry of Economy and Finance (MEF) is responsible for budget formulation and control. Each year by 31 July, the MEF submits a proposal to the National Assembly, which is responsible for its approval, as well as for authorizing any increase. The budget is prepared annually and includes all investments, revenue, and expenditures of the public sector. The 2016 Budget Law did not include resources for this program, so SENACYT will have to make the corresponding arrangements to add them.

B. Accounting and information systems

5.2 In January 2015 the government began to phase in the new financial information system known as ISTMO,[1] which was developed on the SAP platform and replaces Panama's Integrated Financial Administration System (SIAFPA). This system requires a break-in period to resolve initial issues, so it has not yet been evaluated[2] for use in IDB-financed projects, and a parallel system must be used.

5.3 SENACYT has SIAFPA and has not yet been fully incorporated into the ISTMO system, which is used solely for budget amendments.

5.4 Project accounting will be governed by CGR rules, which do not fully conform to International Public Sector Accounting Standards (IPSAS).

C. Disbursements and cash flow

5.5 In the second half of 2013, legislation was enacted in Panama establishing use of a general treasury account. Implementation began in late 2014 with the accounts of the MEF and in 2015 at several ministries. An evaluation of the general treasury account and its relationship with implementation of the ISTMO system will be done in 2016, to determine whether it can be used in IDB-financed projects.

5.6 The IDB will transfer the resources to an exclusive account for the program at a financial institution, to be opened by SENACYT or the trustee, if the decision is made to utilize this mechanism.[3] Disbursements will be made in the form of advances of funds[4] to cover liquidity needs according to the respective financial

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1 Integración y Soluciones Tecnológicas del Modelo de Gestión Operativa [Technology Solutions and Integration of the Operational Management Model] (ISTMO).

2 In 2011, the budget, cash management, and accounting and reports systems were evaluated, and the SIAFPA was only accepted for financial management of IDB-financed projects if done through the SIAFPA-PRO projects module. With the changeover to ISTMO, that module is no longer in operation. A preliminary evaluation of ISTMO will be done in 2016, to determine its implementation status.

3 If the trustee is not used and/or the evaluation of the general treasury account described in the preceding paragraph is satisfactory, the resources will be transferred to an account designated by the MEF.

4 As established in document OP-273-6.

plan for a period of up to 180 days. A new advance may be requested when 80% of the cumulative resources pending justification have been accounted for. Payments may also be reimbursed, or direct payments may be made to providers.

5.7 For payments associated with public competitions (Components II and III), the nonreimbursable contributions to the projects will be justified with the transfer of funds[5] to the project beneficiaries.

5.8 The initial financial plan indicates that US$6.4 million in disbursements from the IDB loan will be needed during the first year of execution.

D. Internal control and internal audit

5.9 Owing to the prior control exercised by the CGR, government institutions in Panama have weak internal control and internal audit systems inasmuch as they rely on the CGR's control activities instead of putting effective processes and controls in place. As a result, these systems are not considered adequate to the control function required for projects.

E. External control and reports

5.10 The CGR has focused its efforts on prior control of disposal of government assets, since its audit function is weak. In addition, because it participates in administrative processes through prior control, it lacks the necessary independence to conduct audits, so the determination is that it lacks the capacity to exercise external control of the program.

5.11 Audited financial statements for the project prepared on an annual basis by a firm of independent auditors acceptable to the Bank will be requested within 120 days after the closing date of each fiscal year or the date of last disbursement.

F. Financial supervision plan

5.12 Financial supervision will focus on the audit reports mentioned in the previous paragraph, and the supporting documentation for disbursements will be subject to post review by the auditors at the time of the audits or during their financial inspection visits.

[5] In 2015 just 0.67% of the funds transferred to the beneficiaries were refunded to SENACYT because they went unused.

DOCUMENT OF THE INTER-AMERICAN DEVELOPMENT BANK

PROPOSED RESOLUTION DE-__/16

Panama. Loan ____/OC-PN to the Republic of Panama
Innovation Program for Social Inclusion
and Productivity

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 Republic of Panama, as Borrower, for the purpose of granting it a financing to cooperate in the execution of an innovation program for social inclusion and productivity. Such financing will be for the amount of up to US$30,000,000, from the resources of the Bank's Ordinary Capital, and will be subject to the Financial Terms and Conditions and the Special Contractual Conditions of the Project Summary of the Loan Proposal.

(Adopted on ___ _____ 2016)

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