



Panama

SCIENCE, TECHNOLOGY AND INNOVATION POLICY REVIEW



OVERVIEW





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PREFACE

The Science, Technology and Innovation Policy Reviews prepared by the United Nations Conference on Trade and Development (UNCTAD) aim to contribute to the development of national capacities in this area so that national science, technology and innovation (STI) plans and programmes effectively support inclusive and sustainable development strategies by spurring growth, productive diversification and competitiveness and also respond to priority social and environmental problems. Thus, action on STI will lend impetus to strategies which contribute not only to economic growth and productive diversification, but also to sustainable and inclusive development.

This review is intended to be a tool for learning and reflection – not a rating mechanism, but an external and neutral assessment that enables all participants in the STI system to better understand the system's strengths and weaknesses and to identify its strategic priorities. This document has three fundamental goals: first, to provide to the Government of Panama and Panamanian society with an updated diagnosis of the effectiveness of STI policies, programmes and instruments; second, to strengthen such policies and measures by integrating them into the national development process; and third, to increase national innovation capacity and appreciation of innovation as a driver of the country's sustainable development strategy.

The Science, Technology and Innovation Policy Review of Panama was produced by UNCTAD in response to a request made in November 2018 by the National Secretariat for Science, Technology and Innovation of Panama (SENACYT). It was prepared with the support of the Secretariat and the United Nations Development Programme country office in Panama.

The review was prepared under the leadership of Shamika N. Sirimanne, Director of the Division on Technology and Logistics of UNCTAD and the supervision of Angel Gonzalez Sanz, Chief of the Science, Technology and ICT Branch. The team of experts included Claudia Contreras, UNCTAD (project coordination and chapter II) Jose Luis Solleiro, Senior Research Fellow at the Institute of Applied Sciences and Technology of the National Autonomous University of Mexico (chapters III and IV) and Isabel Bortagaray, Senior Lecturer at the University of the Republic, Uruguay (chapters IV and V).

The analysis drew on information from national and international economic and social reports, institutional documents and interviews with 69 SENACYT professionals and other actors and beneficiaries of the national STI system. Interviews were conducted during the course of a formal working visit to

Panama City between 4 and 15 February 2019. Several group meetings were held with entrepreneurs and researchers who are beneficiaries of SENACYT programmes. A series of virtual interviews took place between 18 February and 15 March 2019, since it was not possible to conduct all interviews during the visit. On 12 June 2019, a workshop to present the preliminary findings of the review was held in Panama City and was attended by more than 65 experts and national actors in the STI sphere. During the workshop, a first draft of the document was presented and a wide variety of comments and suggestions was received. This document sets out the analysis and the main conclusions and recommendations of the review.

This review would not have been possible without the cooperation of SENACYT, in particular that of the National Secretary, Dr. Jorge Motta, and the Chief of Planning, Ms. Diana Candanedo, and her team: Doris Quiel, Giancarlo Roach Rivas, Milva Samudio and Anthea Villanueva. The UNCTAD secretariat thanks them for their commitment to the project's success. Gratitude is also extended to all participants in the national workshop and to the persons and entities that generously gave their time and ideas.

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Over the past 20 years, Panama has achieved significant progress in developing its national science, technology and innovation (STI) system. Thus, an institutional framework has been established that underpins STI policy and governance mechanisms and, under the leadership of the National Secretariat for Science, Technology and Innovation (SENACYT), a system has taken shape with a clearly defined structure that envisages action at different levels and provides the basis for the development and implementation of strategic plans.

In the last decade, the STI system has made important gains in terms of public investment in research and development, human resources training and access to information and communications technology. Scientific publications and patent applications have multiplied. In 2015, for the first time, a 25-year STI policy was adopted, together with a National Science, Technology and Innovation Strategic Plan (PENCIYT) for the period 2015–2019. Also for the first time, the Government of Panama is beginning to take into account the importance of innovation in its strategic planning. During this period, SENACYT has begun conducting specific mission-oriented research programmes in strategic areas, including water, energy and health. It is also in the early stages of implementing inclusive human capital formation programmes.

The analysis also highlights the country's capacity to design and organize STI plans. PENCIYT builds on a long tradition of STI planning and its programmes demonstrate a significant degree of structural coordination and coherence. It is an ambitious plan that addresses important aspects of research and development, attempts to push boundaries in different areas and seeks a balance between an open, cross-cutting approach and a focus on specific problems.

Nonetheless, Panama continues to perform poorly in STI in comparison with other economies in the region and more developed economies. In particular, spending on research and development remains inadequate and efforts are State-led with very little participation by enterprises. The STI system lacks a critical mass of researchers, while those who do engage in research operate in a context of limited resources. There are few linkages between academia and productive sectors, or with social actors who might benefit from the knowledge generated. Additionally, the STI system still lacks effective coordination mechanisms and is largely concentrated in the public sector, while little importance is attached to knowledge and innovation.

It is also observed that Panama lacks a broader and deeper vision of endogenous development in various policy domains. Panama is a trade-

based economy in which social and economic actors do not recognize knowledge as contributing to competitiveness and development. STI is confined to a few actors and is more closely linked to science than to innovation. Furthermore, the country's innovation model – based on the acquisition of technologies from abroad – facilitates short-term change but reduces the potential for strengthening innovation systems through inter-institutional coordination. The system must be strengthened and allowed to further mature if it is to drive changes in production patterns so that a knowledge economy emerges in which strong learning linkages are generated between different actors.

In addition to the need to reinforce the systemic dynamics of innovation, it is equally important to align innovation objectives with environmental and social challenges. Worsening inequity, poverty, climate change and pollution have been transformed into major challenges and opportunities for STI policy. Meeting those growing and ambitious challenges (as expressed in the Sustainable Development Goals) will require innovation to be directed towards transformative policies that allow for a transition to more sustainable and inclusive systems.¹

The objective proposed in PENCYT that Panama should move from a “transit” economy to a services economy and from there to a knowledge economy will require a reorientation and intensification of change. Competitive performance depends on intellectual capital formation and society's ability to innovate; accordingly, knowledge-based competitive strategies must encourage collective innovation processes involving multiple actors. It is also necessary to recognize that business is the key actor in innovation and that innovating requires macroeconomic conditions conducive to the creation of a set of favourable externalities, regional specificity – responding to the needs and socioeconomic conditions of different population groups and regions – and incentives to stimulate relevant processes and activities.

Growth in international trade and the increasing share of products with higher technological content do not necessarily imply a globalization of technological knowledge and capabilities. It would be a mistake to assume that economic globalization is also technological globalization, since the latter occurs in a geographically limited and sectorally differentiated manner. In addition to an STI policy, there is a need for a strategic, competitive and technologically dynamic trade and industrial policy to allow the country to play a greater role in global trade. Local capacity-building, domestic

1 Johan Schot and W. Edward Steinmueller, Three frames for innovation policy: R&D, systems of innovation and transformative change, *Research Policy* 47 (2018) 1554–1567.

market strengthening and sophistication and coordination between national institutions are essential for enhancing the global competitiveness of the Panamanian economy and its potential to better distribute the rewards of trade success.

Analysis of the STI system reveals a number of specific problems that will require attention in future planning exercises for the national STI policy, including:

- A critical lack of STI funding, particularly investment by the business sector. Efforts to use public investment to leverage private resources have been unsuccessful, demonstrating that economic and social actors attach little importance to STI as part of the country's development strategy. Lack of resources is the most serious bottleneck affecting the entire STI system. It limits programme coverage, resulting in efficiency losses in project administration; it hampers the State's progress in human capital formation for STI; and it contributes to the STI infrastructure deficit, particularly in regions outside the capital.
- Even though the law provides for a national STI system, SENACYT is perceived by other actors as having sole responsibility for the country's progress in STI. The fact that the Interministerial Council for Science, Technology and Innovation (CICYT) does not exercise its coordinating role and the lack of a coordination and implementation forum at the highest political level severely weaken the governance of the STI system and, in practice, have allowed other actors to shift the responsibility for implementing PENCYT onto SENACYT alone. A major collective effort is required to generate commitments and synergies towards the construction of a robust STI system that balances the objectives, activities, resources and responsibilities of PENCYT, and towards the implementation of sector-specific STI programmes.
- A shortage of research, development and innovation capacity. Despite the Government's efforts to strengthen these areas, Panama still lacks a critical mass of resources to spur systemic change and advances in this field. Universities' capacities to conduct research and to train professionals in the necessary research and innovation skills are insufficient and fragile. There is a need for both public and private universities to boost their role in research and knowledge transfer. This will require the recognition and appreciation that such activities form part of their mission; changes to the higher education planning and evaluation system; a more effective accreditation process for institutions and programmes; and, in general, the

creation of an environment conducive to STI activities. In parallel and of equal importance, it is crucial to strengthen businesses' innovation capacity and introduce incentives for them to place greater emphasis on innovation in their competitive strategies.

The types of actions that are necessary or have the potential to improve the STI system vary greatly and will require strategies, policies and implementation that will likewise be very different in their intensity and duration.

Based on the analysis set out in this document, the recommendations below are presented in summary form with a view to: (a) strengthening the innovation system,² (b) improving the design and implementation of PENCYT, and (c) enhancing the capacity of SENACYT.

(a) To strengthen and develop the STI system:

(i) Increase the resources allocated to STI

- It is imperative to increase investment in STI activities, not only by drawing on public resources, but also by aggressively encouraging private-sector involvement. Due to the system's incipient development and the low level of resources mobilized, volatility in the resources available for research and innovation undermines the consolidation of the system and may erode the progress achieved in capacity-building. Unless investment in STI reaches a scale commensurate with the objectives and duration of PENCYT – comparable to that of countries with similar income levels or at least to the average of Latin American and Caribbean countries – there is a risk that not even the modest efforts undertaken so far will yield noticeable results. More resources will not only allow for the addition of more beneficiaries and the emergence of new actors, but will also increase the system's territorial coverage and its inclusivity. For these reasons, it is also necessary to ensure the long-term financial sustainability of the system, particularly through strategic initiatives such as specific mission-oriented research supported by various public- and private-sector actors.
- There is a need to work on the design of more efficient procedures for the allocation of resources to the various STI programmes. The Office of the Comptroller General currently imposes prior and subsequent control procedures that translate into lengthy periods

² The terms "STI system" and "innovation system" are used interchangeably in this document.

for execution of resources, which inhibits administrative efficiency and ultimately reduces the response capacity of the STI system.

(ii) Develop more comprehensive policies and increase resources to stimulate business innovation and recognition of these efforts as part of development strategies

- Increase funding for innovation and entrepreneurship programmes, particularly those with shared financing and risk. Funds must be allocated in accordance with strategic and sectoral priorities. Concentrating on a smaller number of thematic areas could increase the impact of the resources earmarked for these programmes.
- Use public procurement as an instrument to increase demand for innovation and to build capacity in enterprises.
- Launch technology extension programmes to promote knowledge dissemination and technological capacity-building in enterprises, especially small ones. To strengthen these programmes, promote a network of technical service providers supporting innovation with sectoral specialization and promote business training on quality certification, regulatory compliance and supply chain integration. The network could be coordinated by the Ministry of Trade and Industry.
- Study the feasibility of establishing technology and research centres to offer specialized services to companies in various sectors (for example, information technology, transport, energy and food processing). Such centres might be located in existing institutions such as universities, which would receive funds to strengthen their infrastructure and capacity, provided that they made contracting and income generation commitments based on projects funded by the private sector. The experience of other Latin American countries shows that this type of technology service centre works well when companies and industry associations participate in and commit to their financing.
- Further develop the professionalization of STI management in institutions and companies so as to increase the dissemination and impact of public instruments to support innovation. Progress in this area may be achieved by enlisting international cooperation mechanisms, given that several United Nations agencies and other multilateral bodies have established capacity-building programmes and initiatives.
- Promote cooperation between academia and business to facilitate knowledge transfer. Strengthen incubation capacity through the

establishment of a well-coordinated national system, leading to the adoption of best practices.

(iii) Strengthen the governance of the system by empowering CICYT and improving coordination between institutions

- Empower CICYT at the highest political level so that it may fulfil its role as the coordinating body of the STI system. In practice, interaction between CICYT members will require that the Executive exercise leadership in a way that recognizes the urgency of making innovation an essential component in the country's productive and social transformation. The National Commission of Science, Technology and Innovation and sectoral councils must translate the dialogue established in the discussion forums convened by SENACYT into specific programmes in which resources are committed and actions taken.
- Modernize and consolidate STI institutions, regulations and management programmes within the various ministries represented in CICYT so that they use their resources more effectively to have an impact on the entire STI system. As the experience of the Ministry of Health shows, this can be achieved by drawing up a research and development agenda that provides direction and by designating an organization responsible for promoting it (in the case of health, the Gorgas Memorial Institute of Health Studies). CICYT must design mechanisms for coordination between the ministries and SENACYT on STI issues and for coordination of STI programmes with other areas of the economy.

(iv) Increase human resources and infrastructure capacity for research, development and innovation

- Build universities' research and human resource training capacities. For this to happen, profound changes must be made to the regulatory framework of universities and incentives must be introduced to encourage universities to mobilize their resources to achieve the objectives of PENCYT. Furthermore, the involvement of the Panama Council of Rectors is required to take the steps needed to transform higher education, by directing universities to comprehensively fulfil their three missions with a greater sense of the role they must play in socioeconomic development and in the generation, transfer and dissemination of relevant knowledge. One crucial aspect in this regard will be the review of university and programme accreditation processes and the empowerment of autonomous collegial bodies responsible for the accreditation of institutions and degree courses, reviewing and removing potential sources of conflicts of interest.

- Strengthen institutions that train skilled technical personnel, since companies in the productive sector require staff with certified competencies in order to integrate into national and international supply chains.
 - Expand research and development infrastructure in universities and at new centres. It may be possible to draw on previous experience, such as the setting up of the Institute for Scientific Research and High Technology Services, but it would also be worthwhile to consider designing new institutions such as centres of excellence – usually a low-investment option, since they are based on the strengthening of existing facilities – and to ensure that institutions form collaborative networks centred on the country’s strategic concerns.
 - Utilize international cooperation mechanisms as a source of opportunities for STI (resources and knowledge for programmes) and give priority to STI management not only in SENACYT, but in all ministries and secretariats that have STI objectives and in universities and research and development centres. One way of strengthening STI management would be to create an inter-institutional network for training and the sharing of experiences.
- (v) *Make STI an essential engine for the country’s sustainable and inclusive development*
- STI should explicitly cut across and permeate sectoral planning on key national issues such as health, water, environment, transport and logistics and industry. The aim of this would be to enhance the role of STI in overcoming vital challenges and to move towards the consolidation of a stronger, more effective and more sustainable system of governance.
 - Move towards a consistent approach to endogenous STI capacity development that permeates all State actions (including in the areas of industry, agriculture, STI, the environment and trade) and which recognizes the value of knowledge and innovation.
- (vi) *STI efforts must respond to the country’s strategic challenges for sustainable development, inclusiveness and competitiveness*
- Design specialized projects which, by utilizing the capacity of existing institutions, may collectively contribute to the understanding and resolution of the country’s most urgent problems. One option in this regard, which might secure the involvement of other institutional actors, is to design and implement research and development schemes with sectoral funding, which would be consistent with the

concept of specific mission-oriented research, but would rely on contributions from interested sectors.

- Establish regional centres to improve the distribution of research and development capacity, the nature of whose work would be assigned according to the socioeconomic context and the availability of skilled human resources. These centres could be located in universities, thus serving the dual purpose of strengthening institutional capacities and attracting students to projects which in turn would contribute to human capital formation in other regions.

(b) To improve the design and implementation of PENCYT:

- As noted above regarding the overall governance of the STI system, the empowerment of CICYT at the highest political level will be crucial for implementing PENCYT, since CICYT will distribute tasks and responsibilities among national actors. The implementation of the Plan cannot rest with SENACYT alone.
- Support efforts to draw up plans and programmes for the allocation of funds in line with the PENCYT objectives, the mobilization of the private sector and the establishment of a regulatory framework that favours the emergence of innovation environments and systems (for example, by easing restrictions on the recruitment of foreign staff by universities).
- Strengthen the Plan's link with the innovation system and its role in sustainable development. As well as announcing specific mission-oriented research projects, it might be possible to develop other tools to resolve sustainable development problems linked to knowledge and innovation, but within the sphere of certain actors in key sectors of the national economy, such as the Panama Canal Authority or financial institutions.

(c) To enhance the implementation capacity of SENACYT:

(i) Improve the coordination of activities by SENACYT directorates

- Further facilitate complementarity between the activities undertaken by SENACYT directorates in connection with PENCYT. Actively counteract the directorates' tendency to operate in silos and reinforce mechanisms for joint strategic reflection. Better coordination between programmes and between directorates can contribute to the creation of synergies between types of instruments, beneficiaries and capacity-building in order to more effectively achieve the PENCYT objectives. For example, Infoplazas (community Internet access and information centres) might be used to support the development of

digital ventures and e-commerce projects. Instruments intended to complement the efforts of other departments may also help reduce fragmentation among beneficiaries and increase synergies.

- Continue to enhance coordination and complementarity between instruments that have different objectives (such as scientific or academic objectives, objectives related to innovation or entrepreneurship, or to the strengthening of system interactions). The Towards University (“Hacia la U”) programme is identified as having potential in this sense.

(ii) Increase efficiency and reduce bureaucracy in programme administration

- Modify and streamline procedures in order to increase the efficiency and impact of programmes. Possible measures include strengthening the National Fund for Science, Technology and Innovation and, as mentioned, modifying the prior control requirements established by the Office of the Comptroller General. The establishment of public-interest associations associated with strategic programmes may also be considered as a means of speeding up the execution of financial resources.

(iii) Experiment with new instruments that may diversify the available portfolio

- Explore innovation policy instruments and design a broad portfolio that goes beyond the current package focused on supporting new ventures.
- Conclude agreements with private organizations including corporations, angel investors, crowdfunding platforms and providers of fintech (new business models based on digital technologies) to promote the joint financing of long-term innovation projects.
- Develop strategies for the coordination of public procurement (for example, in the health sector), which could play a decisive role in the development of new markets, products and processes.
- Incorporate into sectoral planning efforts a commitment to and vision of STI as an instrument for change and problem-solving. Sectoral plans are important measures, but they must be supported by resources commensurate with the country’s ambition; further, STI must be given an explicit role in these sectors in order to go beyond one-off exercises and set in motion change processes aimed at sustainable development. Actions should take the form of long-term efforts, rather than one-off sectoral projects.
- Continue efforts to decentralize STI capacity. Much of the demand for participation in the calls announced by SENACYT is concentrated

in Panama City – a pattern which is consistent with the general distribution of resources and in particular with the centralization of STI capacity. Correcting this dynamic will require clear, coordinated efforts at all levels. It will also be necessary to appeal to and engage with the primary and secondary education sector, the scientific and academic community and the business sector – through local, regional and national trade unions and associations – to coordinate efforts and to design instruments to remedy some of the country's existing inequities.

- Promote the continuity of policy dialogues and address topics in-depth. Most of the policy dialogues that have been held dealt with different topics within the scope of the programmes implemented under PENCYT, involving a wide range of both subject matter and actors. There have been very few instances in which a policy dialogue has revisited an issue that has already been discussed. This lack of continuity and the failure to address topics in greater depth has significantly limited the construction of systemic dynamics, social capital and sustainable governance. Work will also be needed to improve the mechanisms for following up on and tracking the recommendations that emerge from the discussion forums.

(iv) Study the feasibility of redistributing STI policy design and implementation responsibilities between SENACYT and a new agency

- It is usually considered good practice for STI policy design, implementation and evaluation responsibilities to be entrusted to different bodies. In the case of Panama, all of these functions fall under the remit of SENACYT. While this may be consistent with the current level of advancement of the Panamanian STI system, it is to be expected that dysfunctions and inefficiencies will appear as the system develops. If the feasibility of dividing these functions between SENACYT and a potential new agency is explored, it will be necessary to critically assess the timing of such a reform, taking into account especially the availability of the human and financial resources needed, the financial sustainability of the new agency, the impact on the fragility of the STI system due to potential loss of capacity or synergies, and strategies for assigning and delimiting the tasks and responsibilities of each agency.

(v) Utilize monitoring and evaluation instruments while maintaining the system's development perspective

- Finally, with regard to implementation and monitoring of SENACYT and the STI system, collaborative tools should be developed which include monitoring the STI actions of other actors in the system.

It is also advisable to thoroughly assimilate the qualitative lessons of the STI policy trajectory, which have emerged from evaluations, monitoring and the systematic construction of indicators by SENACYT. These activities have a greater impact when used as the basis for discussion and design of new development strategies, without detracting from their important management control and accountability function. Equally, the quantification of targets must not lead to neglect of the understanding of transformation processes of the system's structures and functioning, or even worse, to the distortion of incentive systems.

