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TOWARDS A VISION 20/25 IN SCIENCE, TECHNOLOGY AND INNOVATION FOR THE AMERICAS: HEMISPHERIC COOPERATION FOR COMPETITIVENESS AND PROSPERITY IN A KNOWLEDGE ECONOMY

(Discussion Paper prepared by the Government of Panama and the OAS Office of Science, Technology and Innovation)

Table of Contents

I. Introduction

Science, Technology and Innovation (STI) are critical areas for productivity and competitiveness, and have subsequent positive impact on job creation, poverty reduction and prosperity[1].

Towards a Vision 20/25 in STI is intended to provide a regional road map to foster hemispheric cooperation, strengthen partnerships and apply STI knowledge to solve basic needs and promote socio-economic development and prosperity. It builds on the Plan of Action of the Second Meeting of Ministers and High Authorities held in Mexico in 2008, specifically on the third line of action, "Science, Technology, Engineering and Innovation as Tools for Productivity", by focusing on four pillars that are mainstays for prosperity in the Americas: Innovation; Human Resources Training and Education; National Quality Infrastructure; and, Technological Development.

This document is an instrument to help develop a long-term Inter-American Program on Science and Technology with measurable goals and objectives, as recommended at the VI Meeting of the Inter-American Committee on Science and Technology (COMCYT) (2010). It is also in line with the theme of the VI Summit of the Americas "Connecting the Americas: Partners for Prosperity", to be held in Cartagena, Colombia in April 2012.

The Government of Panama is pleased to present this discussion paper in the framework of the III Meeting of Ministers and High Authorities of Science, Technology and Innovation to foster and strengthen political dialogue and hemispheric collaboration in STI towards achieving sustainable economic growth and a better quality of life for the citizens of the Americas by 2025.

[1] Based on the conclusions of the Second Meeting of Ministers and High Authorities on Science and Technology (Mexico City, 2008)

II. Vision Statement

To achieve prosperity for the Americas in a Knowledge Economy through the use of applied science, technology and innovation (STI) and a more effective hemispheric cooperation.

Vision 20/25 is based on the third line of action of the Plan of Action of Mexico (2008), "Science, Technology, Engineering, and Innovation as Tools for Increasing Productivity". It is comprised of four pillars that are fundamental for prosperity in the Americas:

- **Innovation,** *to create a culture of continuous improvement and innovation to help boost productivity and competitiveness in the Hemisphere*
- **Human Resources Training and Education,** *more and better prepared human resources in science, engineering and technical fields for increased national and regional productivity and competitiveness*
- **National Quality Infrastructure,** *to improve productivity and competitiveness of Micro, Small and Medium Enterprises (MSMEs), increased trade and consumer protection*
- **Technological Development,** *to leverage scientific and technological progress for prosperity in strategic sectors by strengthening inter-American cooperation*

2.1. Pillar 1. Innovation

"I define (innovation) as the ability of individuals, companies, and entire nations to continuously create their desired future… It is about new ways of seeing and doing things as much as it is about the breakthrough idea"[2] *– John Kao, Innovation Nation*

Innovation is a central driver of economic growth

[2] Kao, J. (2007). Innovation Nation. Free Press. P.

and development. It is crucial to support integral development, to create more and better jobs[3] and to achieve prosperity. It is essential for advancement in technical fields such as health, energy, food, agriculture and manufacturing. Many governments of the Hemisphere have already incorporated innovation as the core of their economic growth strategies. However, much remains to be done to develop a culture of innovation in Latin America and the Caribbean (LAC)

Goal for 2025

To develop a culture of technology-based innovation in the Americas that fosters inclusiveness, entrepreneurship and creative thinking in academia, the private and public sectors and society in general

Targets

By 2025, OAS member states should work towards reaching the following targets:[4]

1. **Define key national innovation indicators and monitor their development and impact on society**[5] and encourage the private sector to develop their own innovation baselines based on existing indicators.[6]

2. **Establish national policies and regulatory frameworks that promote innovation,** among them: creating national innovation systems (NIS); developing strategies to incentivize national talent and attract diasporas; facilitating academia-public-private partnerships; enforcing intellectual property legislation; and, streamlining governmental processes to promote innovation initiatives.

3. **Develop solid financing structures to support technology-based innovation,** including: promoting foreign direct investment and/or angel, seed, incubation and venture capital funding; making funds accessible to innovative MSMEs, communities and individuals through microfinance and bank loan guarantees; and, at hemispheric level, assigning governmental matching funds for joint research and development (R&D) programs and promoting loans for innovation and applied science and technology (S&T) activities from international organizations.

4. **Raise awareness on the importance of a technology-based innovation culture for competitiveness and motivate creative thinking** among decision-makers in government, industry, non-profit organizations and academia.

5. **Disseminate and popularize scientific and technological developments and promote innovation efforts nationwide** through the media and the deployment of national and regional innovation contests.

6. **Foster the use of applied STI** by promoting the development of special economic zones (SEZ's), clusters, logistics hubs, technology parks, knowledge transfer organizations, incubators and spin-offs for technology-based MSMEs.

7. **Encourage inclusive innovation** by promoting the participation of marginalized groups (base of the pyramid) and women in innovation programs; fostering talent among neglected populations; and, establishing specific educational programs to introduce them to core innovation processes.

2.2 Pillar 2. Human Resources Training and Education

In today's knowledge economy, more and better prepared professionals and technicians in the fields of science, technology and engineering (STE) are required to boost competitiveness and achieve self-sustaining socio-economic growth. Building STE capacities provides the broadest possible opportunities to improve the region's

[3] Rosenberg, N. & Birdzell, L. E. Jr. cited in: García Hamilton, J. I. (2006). Por Qué Crecen los Paises. Editorial Suramericana

[4] Amstel, Jaime. Private communication

[5] Gault, F. 2008. Science, Technology and Innovation Indicators: Opportunities for Africa. The African Statistical Journal, Volume 6, May

[6] See Appendix II

economic vitality and security, mitigate poverty, foster community health and improve the long-term quality of life.[7]
Universities and other institutions of higher education must have a strong practical orientation to respond to the changing needs of industry and communities. Modern STE study programs should emphasize curriculum flexibility, academia-public-private sector collaboration, entrepreneurship and management skills, and, help develop a culture of inclusive innovation.

Goal for 2025
To increase by at least 50% the number of female and male graduates in STE and technical education, and to substantially improve study programs in these areas to respond to the changing needs of industry, especially MSMEs, and specific communities.

Targets
By 2025, OAS member states should work towards reaching the following targets:

1. **Increase inter-American cooperation in STE education** by: promoting academy-public–private partnerships; sharing best practices; exchanging faculty and students and developing programs of excellence such as dual degrees among universities; and, strengthening the OAS hemispheric initiative Engineering for the Americas (EftA)[8]

2. **Promote technical education to create a critical mass of qualified technicians for strategic industries** by fostering the creation of technical specializations; upgrading study programs with the use of information and communication technologies (ICTs); and, promoting local and regional partnerships with universities and the public and private sectors.

3. **Upgrade STE study programs and seek their international recognition** by incorporating entrepreneurial, innovation and sustainability components; creating academia-public–private partnerships (cooperatives and internship programs); and promoting, at local and international levels, the exchange of best practices, applied research and the use of ICTs and advanced networks.

4. **Provide opportunities for faculty to continue professional development** such as graduate and post-doctoral degrees, and sabbaticals.

5. **Attract the best students towards STE careers, especially women and minority groups**, by increasing awareness on the importance of STE, establishing scholarship funds, and, making loans and other financial assistance options available to them.

6. **Create and/or strengthen extension services for the community and industry (MSMEs),** including technology parks, incubators, and, advisory, consulting and access to national quality infrastructure services.

2.3 Pillar 3. National Quality Infrastructure

National Quality Infrastructure (NQI) refers to the set of country institutions that, supported by a national regulatory framework, provides the services to guarantee the quality and safety of products and services for local and international consumers [metrology -the foundation of NQI- , standardization, accreditation and conformity assessment (inspection, testing and certification)][9]. A sound NQI fosters innovation, competitiveness, consumer protection, promotes market transparency and the elimination of technical barriers to trade (TBT) which, in turn, promote access to new markets, job creation, encourage investment and a more careful use of natural resources.

[7] Speech delivered by José Miguel Insulza (Secretary General of the Organization of American States), at the 11th MIT Sloan Latin Conference. The topic of the speech was "Innovation & Growth – opportunities and challenges for Latin America"
[8] See Appendix III

[9] Definition taken from international standard ISO/IEC 17000:2004 Conformity assessment – Vocabulary and general principles

Goal for 2025
To ensure that all OAS member states have access to internationally recognized quality infrastructure services to foster competitiveness, innovation, trade and consumer safety.

Targets
By 2025, member states should have and rely on a solid NQI that can: [10]

1. **Guarantee a minimum set of metrology services, traceable and recognized internationally,** that satisfy local demand by supporting their national metrology institutes (NMIs); help to consolidate the Inter-American Metrology System (SIM)[11] and make metrology services available through NMIs, laboratory networks or, for smaller economies, peer NMIs in the region.

2. **Ensure availability of a sufficient number of accredited laboratories that provide services to major economic activities** by guaranteeing international recognition of the national accreditation body and its participation in the Inter-American Accreditation Cooperation (IAAC); and by promoting mutual recognition among specialized institutions and laboratories.

3. **Promote improved quality in products, processes and services** by establishing and fostering the use of national standards, especially by MSMEs; supporting the national standardization body; following guidelines of the International Standards Organization (ISO) and the Pan-American Standards Commission (COPANT); and, raising awareness on the importance of using standards.

4. **Build or strengthen the competencies of the technical bodies' personnel** through training, academic upgrading and the international exchange of experiences.

5. **Promote sound NQI policies that build capacities especially for MSMEs** such as awareness campaigns and programs that foster the creation of laboratories for calibration, testing and analysis and certification services.

6. **Foster a culture of quality** by disseminating information and promoting NQI concepts and technical programs in schools, technical institutes, universities and industry.

7. **Establish public-private financial mechanisms to develop NQI bodies**, including infrastructure investment and funding and the offering of technical services such as training and consulting .

2.4 Pillar 4. Technological Development

Technological development is multidisciplinary and requires national and regional collaboration among ministries and technical agencies. Countries have different national priorities as well as levels of development. Inter-American cooperation can help create and optimize synergies and encourage sharing of best practices, knowledge and expertise in common technical areas. Vision 20/25 centers on six strategic areas that, due to their impact on socio-economic development and prosperity, have been recognized by OAS member states as priorities:

Biotechnology and food security help to implement innovative methods, products and processes in agro-foods and pharmaceutics while securing the availability, access and quality of food and water.

Efficient transport and supply chain logistics are needed to help lower product costs and improve delivery time. ***Humanitarian logistics*** improves a country's response capacity for natural disasters.

Clean technologies and renewable energy harness renewable materials and energy sources,

[10] Sanetra, C. and Marbán, R. 2007. The Answer to the Global Quality Challenge: A National Quality Infrastructure. http://portal.oas.org/LinkClick.aspx?fileticket=irws1FMfl6Q%3d&tabid=584&language=en-US
[11] See Appendix III

dramatically reduce the use of natural resources, and cut or eliminate emissions and wastes.[12]

Nanotechnology and material science are important since competitiveness also depends on countries' capacity to create and use advanced materials.

Advanced Networks and Information and Communication Technologies – ICTs, such as cloud computing, supercomputing systems, applications, telecommunications and connectivity, enhance regional collaboration and build national human capacities, driving solutions for global challenges. [13]

Popularization and Dissemination of STI are fundamental for knowledge transfer and the appropriation of STI information by society. They also empower society to participate in the political process by making informed decisions about relevant STI topics.

Goal for 2025

To strengthen Inter-American cooperation in science, technology and innovation in selected priority areas to achieve more effective and faster technological development in the region.

Targets

By 2025, member states should show significant advances in priority areas:

1. **Promote the creation of cooperation programs for MSMEs in biotechnology and food security** in specific value chains that foster bio-safety, innovation, and the sustainable use of biodiversity.

2. **Build institutional capabilities in supply chain management (SCM) and transport and humanitarian logistics**, by increasing the use of specialized software, networks and other ICTs**.**

3. **Collaborate in regional clean technology, renewable energy and energy efficiency programs, especially for rural and remote areas,** that foster applied research in strategic areas such as: building design, alternative energy sources, transport, manufacturing, food and agricultural practices, and, health care. Build NQI capacities to satisfy the increasing demand for renewable energy and energy efficient appliances.

4. **Promote the establishment of nanotechnology and material science regional research centers and incubators** with shared facilities for fabrication, characterization, modeling, and applications development.

5. **Create and/or strengthen national programs for the popularization of S&T and support regional initiatives**, such as the OAS Inter-American Scientific Journalism Program,[14] establishing coordination mechanisms for social inclusion with mass media stakeholders (newspapers, television, radio, internet).

6. **Promote access to advanced networks and ICTs** by promoting the creation of specialized networks and observatories, and encouraging the use of advanced ICTs in education (cloud computing, information, logistics and financial systems).

7. **Create and/or strengthen financial mechanisms** to upgrade MSMEs' value chains such as microfinance and suppliers loans, lines of credit and investment funds.

8. **Strengthen national and international communities of practice**[15] in each of the priority areas, to include academia, research

[12] Firestein, J. and Evans. D. .2010. Investing in Cleantech. Wells Fargo

[13] The Royal Society. 2011. Knowledge, Networks and Nations. Global scientific collaboration in the 21st century (royalsociety.org)

[14] See Appendix III

[15] Can be defined, in part, as a process of social learning that occurs when people who have a common interest in a subject or area collaborate over an extended period of time, sharing ideas and strategies, determine solutions, and build innovations. http://www.learning-theories.com/communities-of-practice-lave-and-wenger.html

centers, nonprofit organizations, public and private sectors.

9. **Create and/or reinforce policies to promote** technology transfer and applied research.

APPENDIX I. Background for Vision 20/25

The First Meeting of Ministers and High Authorities on Science and Technology in the framework of the Inter-American Integral Development Council (CIDI) (Lima, 2004), highlighted the importance of science, technology, engineering and innovation (STEI) as major driving forces for the economic and social development in the countries of the Hemisphere. These conclusions were endorsed by the Heads of State and Government at the Fourth Summit of the Americas (Mar de Plata, 2005).

Four years later, the Second Meeting of Ministers and High Authorities on Science and Technology (Mexico City, 2008), entitled "Science, Technology, Engineering and Innovation as Tools for Human Prosperity," focused on the importance of STEI for socio-economic development, emphasizing three priority areas: 1) STEI and public policies for integral development; 2) STEI as tools for sustainable natural resource management; and 3) STEI as tools for increasing productivity. The Heads of State and Government at the Fifth Summit of the Americas (Port of Spain, 2009), supported the outcomes of this Ministerial, by committing to create conditions for increasing public investment in STEI and to encourage academia-private-public sector partnerships.

During its Sixth Regular Meeting in September 2010, the Inter-American Committee on Science and Technology (COMCYT) representatives reiterated the importance of applied STEI to promote growth and prosperity. They recommended the definition of Vision 20/25, a long-term Inter-American Program on Science and Technology with measurable goals and objectives and the development of monitoring and supporting mechanisms, such as a COMCYT portal[16], to promote policy dialogue and hemispheric cooperation.

In response to the VI COMCYT meeting, the Government of Panama will present for discussion the document "Towards a Vision 20/25 in Science, Technology and Innovation for the Americas: Hemispheric Cooperation for Competitiveness and Prosperity in a Knowledge Economy" during the Third Meeting of Ministers and High Authorities on Science and Technology to be held in Panama in November 2011.

This document, prepared by the Government of Panama and the OAS Office of Science, Technology and Innovation as the Technical Secretariat for the COMCYT and the Ministerial Meetings, is intended to promote political dialogue in order to achieve a common vision by providing a road map that builds on Member States' capacities and fosters hemispheric cooperation to solve basic needs and promote competitiveness, socio-economic development and prosperity. It expands on the third line of action of Mexico's Plan of Action "STEI as tools for increasing productivity" and supports the hemispheric agenda of the Sixth Summit of the Americas *Connecting the Americas: Partners for Prosperity*, to be held in Colombia in April 2012, in its three sub-themes: poverty and inequality, citizen security, natural disasters and access to technology.

APPENDIX II. Proposed National and Regional Indicators

While certainly not the only ones, the proposed indicators are intended to facilitate progress measurement by Pillar for Vision 20/25 in both regional and national settings. These indicators were selected from the United Nations Educational, Scientific and Cultural Organization (UNESCO), Ibero-American and Inter-American Network for Science and Technology Indicators (RICYT), World Economic Forum, World Bank, Inter-American Development Bank (BID) and Economic Commission for LAC (CEPAL). Indicators for Pillar 3 are based on *The Answer to the Global Quality Challenge: A National Quality Infrastructure*[17]. To build comparable measurements, and establish baselines and benchmarks in the region, countries may use the proposed indicators:

<u>Pillar 1. Innovation</u> [18]

[16] See Appendix III

[17] See footnote 8.

[18] The European Commission has developed the European Community Innovation Survey to measure innovation in industry. Some of these indicators can be adjusted for

- Global Competitiveness Index
- High-technology exports (% of manufactured exports)
- Patent applications (non-residents and residents)
- Trademark applications (non-residents and residents)
- Scientific publications per capita and per 1,000 inhabitants

Pillar 2. Human Resources Training and Education [19]

- University students by scientific fields
- University graduates, master's graduates and doctorates by scientific field
- Researchers per thousand labor force
- S&T personnel (technicians, R&D scholars/doctorates, researchers, S&T services personnel, technicians and equivalent staff)
- Researchers by sector of employment (higher education, enterprises, government, non profit/private organizations)
- Researchers by scientific field (agricultural science, engineering and technology, medical sciences, natural and exact sciences)
- Researchers by graduation level (doctorates, basic university degree, master and other post-secondary diploma)

Pillar 3. National Quality Infrastructure

- Number of internationally recognized metrology services
- Definition of a minimum set of metrology services (inventory by magnitude)
- Existence of national accreditation body
- Number of accredited laboratories by major economic activity
- Number of national standards by major economic activity / technical committees
- Existing NQI legislation and policies
- Number, type and countries participation of capacity building activities in SIM, IAAC and COPANT
- Number and type of awareness events to promote NQI and a culture of quality

Pillar 4. Technological Development

- Total-Factor Productivity (TFP)
- Expenditure on Science & Technology S&T by funding source (higher education, enterprises, foreign, government and non profit/private organizations)
- Expenditure on (S&T) by type of activity (applied, basic and experimental research)
- R&D intensity (R&D investment as % of Gross Domestic Product [GDP])
- Logistics Performance Index
- R&D investment by socio-economic area (% of GDP - agricultural technology, environment, energy, industrial technology, infrastructure, human-health)

APPENDIX III. Advancing towards Vision 20/25: Current Hemispheric Cooperation Initiatives under the OAS Framework

The OAS is the world's first regional organization established to achieve among its member states "an order of peace and justice, to promote their solidarity, to strengthen their collaboration, and to defend their sovereignty, their territorial integrity, and their independence."[20] The OAS, through the Office of Science, Technology and Innovation (OSTI), serves as a political forum and Technical Secretariat for Ministerial Meetings and the Inter-American Commission of Science and Technology (COMCYT). OSTI, as part of the OAS Executive Secretariat for Integral Development and the Department of Economic Development, Trade and Tourism, plays a key role in the preparatory political process and, responding to specific Ministerial mandates, catalyzes hemisphere cooperation by coordinating projects and initiatives that synergize on member states' efforts:

1. **The Inter-American Metrology System (SIM)** is a network of all OAS member states which major objectives are to increase national metrology institutes (NMIs)' standards

application in LAC countries.
http://statind.jrc.ec.europa.eu/Innovation/CIS_S&W-13Feb2007.pdf

[19] All of these indicators should be disaggregated by sex

20 Article 1 of the OAS Charter

knowledge, integrate metrology infrastructure for international recognition and encourage quality in MSMEs. NMIs of Brazil, Canada, the United States (U.S.), Mexico, Germany and many others have been supporting less developed SIM members. Some on-going hemispheric cooperation projects are: the SIM capacity building project funded under the OAS Special Multilateral Fund of the Inter-American Council for Integral Development (FEMCIDI); and the Triangular Cooperation for Metrology in Natural Gas, Challenges for Quality Infrastructure Institutions in Latin America and the Caribbean (LAC) in Renewable Energies and Energy Efficiency and the Regional Plan of Action to Strengthen Basic Capabilities in Metrological Services in Central America and the Dominican Republic, in partnership with the U.S., Germany and the Inter-American Development Bank (BID) respectively. (http://www.sim-metrologia.org.br)

2. **The "Engineering for the Americas" (EftA)** is a Hemispheric initiative launched in the First Ministerial Meeting (Lima, 2004) and supported by the region's highest authorities in following summits of the Americas. It strives to develop more and better engineers to foster innovation and competitiveness through three main objectives: engineering education improvement, quality assurance in education and job creation. EftA has taken on the challenge of improving engineering study programs through its flagship Engineering Education for Competitiveness program (EEC) and EEC's Pilot Projects and Web Portal. (http://www.efta.oas.org)

3. **The Inter-American Scientific Journalism Program** contributes to the strengthening of scientific journalism capacities in LAC for improved dissemination and appropriation of STI topics by society. It will also empower society by supporting a culture of knowledge and increasing democratic participation of society in STI issues. (http://www.scientificjournalism.org)

4. **The Inter-American Committee of Science and Technology Network (COMCYTnet)** aims to strengthen the institutional capacities of National S&T Agencies of member states by creating a network and web portal that promote policy dialogue, hemispheric cooperation and the exchange of best practices in STI for improved innovation, competitiveness and prosperity. COMCYTnet is a project proposal that responds to the recommendations of the VI COMCYT meeting concerning the development of effective monitoring and supporting mechanisms to promote policy dialogue and hemispheric cooperation.

5. **The Inter-American Network on Innovation for Quality in Agro-foods for MSMEs (*InnovaCalidad*)** will contribute to the competitiveness of agro-foods MSMEs in LAC by creating a network and web portal in which knowledge–based institutions will cluster technical expertise and partner with key stakeholders to develop innovative quality and safety solutions for specific agro-foods value chains that benefit MSMEs and women participation. InnovaCalidad will be launched in March 2012 in partnership with the Governments of Mexico and Canada.

APPENDIX IV. STI Collaboration in Multidisciplinary Areas

STI leverage several other areas that are also essential for socio-economic development and prosperity such economic empowerment and poverty reduction; employment generation; gender equality; education; access to technology and more inclusive democracies. STI are also essential for the provision of basic needs (water, food-nutrition, sanitation, energy, environment, and health-health care) both at the regional and national levels. As we have seen throughout this document, STI are tools for:

1. **Increasing competitiveness in the Americas** by improving quality in education; building institutional technical capacities; developing

MSMEs technical capacities; promoting social entrepreneurship and social responsibility for community development; boosting trade, integration and productivity; and providing STI solutions for energy efficiency and environmental sustainability, among others

2. **Integrating the gender and social inclusion perspectives in policies and programs** as a cross-cutting theme and provide incentives encouraging greater participation by women and minorities in scientific-technological and engineering careers and a greater use of STEI benefits by women and minority groups.

3. **Improving the quality of education in elementary and high-school study programs** and supporting professional development for teachers and faculty

4. **Solving environmental problems and supporting sustainable development** through R&D and the improvement of institutional technical capacities in biodiversity, agribusiness, energy, water, climate change, transport, natural resources management and environmental protection

5. **Increasing tourism capacities** through ICTs and observatories; and by developing the technical capacities of MSMEs for agro-tourism

6. **Fostering labor and employment** through the creation of technology-based MSMEs and building technical human capacities

7. **Promoting a culture of innovation for economic development**[21], that includes the scientific community in the design and application of programs to meet the challenges of economic empowerment and poverty reduction programs; takes into account the contribution of technology, promotes dialogue among the sectors for the solution of problems; and

8. **Strengthening multilateral and multinational collaborative mechanisms** and provide appropriate funding, by creating multisectoral partnerships between the academia-public-private sectors and multilateral agencies[22] for effective sharing of best practices in the region. To this end, facilitate the participation of civil society to enrich the process

[21] See also Pillar 1. Innovation

[22] Such as the OAS, United Nations Educational, Scientific and Cultural Organization (UNESCO), Inter-American Development Bank (BID), World Bank, Economic Commission for LAC (ECLAC), Development Bank of Latin America (CAF) among others