National Science Technology And Innovation Index 2015

#INCTI-CAIINNO2015

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CENTRO DE ANÁLISIS PARA LA INVESTIGACIÓN EN INNOVACIÓN

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Preface

The 2015 National Index for Science Technology and Innovation or #INCTI-CAIINNO, presented by the Center of Analysis for Research in Innovation. (CAIINNO), This is the result of several moths of effort. We considered it necessary as no other indexes have been made for 2015. We hope it can be useful for decision making, the development of public policies and both, institutional and legal reforms.

"Innovation" has become such a common term that it can sometimes be difficult to distinguish between something new and something innovative. Regardless of its correct definition, what matters is that innovation has become relevant for almost all areas. From world leaders to public officials of all kinds. They all consider innovation, science and technology in their list of priorities for the country. Therefore, #INCTI-CAIINNO is a useful tool for employing these three concepts.

A big problem faced by these indexes; is how they present the information. As a result, only people with specialized knowledge in areas like economy can interpret it. Which is why, CAIINNO made sure that the index was easy to comprehend, so that more people could access this information. This said, the design does not take away from the rigor and effort put into #INCTI-CAIINNO 2015.

Mexico has tried not to fall behind when it comes to science, technology and innovation (CTI for its initials in Spanish). In this respect, the labor done by the State is critical. Especially when it comes to two activities: 1. The State's independent labor and 2. The collaboration between each State and the Federal Government. Both determine the final ranking of each State in the #INCTI-CAIINNO 2015. It is also important to mention that the index also considers the labor of non-governmental agents such business associations. They are relevant as they are also socially responsible for the improvement of conditions for CTI in the country.

The objective of #INCTI-CAIINNO 2015 is very straightforward: Contribute to informed decision-making. Uninformed decisions even when well-intended, sometimes do more damage than good. We believe that good intentions combined with data and information can lead to better decisions, or at least ones that are less likely to fail.

This document was brought about by people looking to encourage the country's development. People who have a different perspective on the current context due to their studies and professional experience abroad. This document is also a contribution that aims to strengthen the work done by other think tanks or organizations in the areas of science, technology and innovation. Additionally, it presents a new approach as it seeks to establish a link between CTI and social welfare in Mexico.

Scope and Limitations.

#INCTI-CAIINNO2015 like many others, uses the most current information available for the 82 indicators. However, some numbers and data are not from 2015 but from previous years because when the project was in development these figures were not yet available.

In order to decide which indicators to use, #INCTI-CAIINNO analyzed and chose the most relevant elements that were also available. In CAIINNO, we believe that innovation should not be thought of as an isolated phenomenon, in which the Public Sector has the primary role favoring only people with higher studies.

Therefore, participation of the Private Sector was given utmost importance, because increasing innovation in Mexico requires for all parties to take responsibility. Additionally, we must consider how political speech reflects the investment on CTI (science, technology and Innovation) made by the public sector.

Description of the Pillars

#INCTI-CAIINNO is constituted by 12 Pillars which according to our analysis, serve as a base to determine the state of science, technology and innovation in the country. To do this we employed the same methodology described above but to each pillar to obtain the national ranking.

First Pillar: General Context

This pillar is comprised 10 indicators:

The country's legal framework for CTI.

The population living in poverty.

The rate of unemployed youth.

The specialization index of the primary and the industry sectors.

Gross Domestic Product per capita of the primary and industry sectors and the State's public services.

Two very important issues for Mexico are considered: poverty (CONEVAL, 2014) and unemployment (Objetivos de desarrollo del milenio, 2015). Usually, profit is seen as the main objective of innovation. However, it is fundamental to consider the use of CTI to deal with such issues, which affect all States.

Second Pillar: Private and Public Investment on Science, Technology and Innovation (CTI)

For this pillar 8 indicators were established

- Average expenditure on research and technology made by corporations in each State.
- Average expenditure on innovation made by corporations in each state.
- Corporate participation in research and technological development in relation to the State's CTI budget.
- Funding for human resources issued by CONACYT (Consejo Nacional de Ciencia y Tecnología or National Council for Science and Technology) in relation to the state's annual budget.
- Government issued budget for CTI in relation to the GDP.
- CTI project funding issued by CONACYT in the state
- Government issued CTI budget in relation to the total amount of CONACYT state funds

Public and private investment are fundamental and lead to general improvements for the States and the country in CTI by comparison to other countries.

Third Pillar: Higher Education.

In order to provide context for the issue, a direct relationship between the economically active population and higher education was established. This pillar contains 9 general indicators:

- Number of admissions to an undergraduate program per state.
- Number of admissions to a graduate program per state.
- Number of graduates per state (from 2013-2014).
- Number of undergraduates per state (from 2013-2014)
- Coverage for quality graduate programs in 2015
- Coverage for certified undergraduate programs in 2015
- Number of CONACYT scholarships per State.
- Relation between the state's economically active population and the number of graduates.

- Relation between the state's economically active population and the number of undergraduates.

This indicator was used to evaluate the efficacy of education through graduation rates. As the number of CONACYT scholarships awarded by each state allow many the opportunity to join a graduate program, they are a very important factor to consider.

Fourth Pillar: Basic education.

Primary education plays a decisive role in determining the current and future context of CTI. Which is why this pillar which contains the following 7 indicators was implemented:

- Enrollment to primary school (6 to 11 years old).
- Primary school completion rates.
- Net rate of secondary school enrolment (12 to 14 years old).
- Secondary school completion rates.
- Net rate of high school enrolments.
- High school completion rates.
- Net rate of preschool enrolments (3 to 5 years old).

Considering completion rates for the three levels of education allowed for the discovery of interesting data regarding the percentage of high school graduates which are in some cases is close to 50%.

Fifth Pillar: Inclusivity.

This pillar includes 4 indicators:

- Number of people with disabilities who joined a graduate program from 2013-2014.
- Number of graduates with disabilities from 2013-2014.
- Number of people with disabilities who joined an undergraduate or technical education program from 2013-2014.
- Number of people with disabilities who finished and undergraduate or technical education program from2013-2014.

At the three basic levels, the percentage of students with disabilities receiving education was only between 0.73%, 0.53% and 0.98% respectively (OMS-World Bank, 2011). Not surprisingly, this reflects on higher education. Some states did not register a single enrolment to higher education made by a disabled person which affected their ranking.

Sixth Pillar: Scientific output.

This pillar considers the productivity of the National Researchers` System (SNI) and its contribution to each State as well as its relationship with the private sector. This pillar includes 7 indicators:

- SNI members in relation to the economically active population.
- Scientific output of SNI members.
- State-level impact of the scientific output in accordance to each member's place of residence.
- Rate of scientific productive specialization for the economic sub-sector.
- Categorical rate of productive scientific specialization.
- Revitalization in accordance to the number specialized economic sub-sectors.
- Private sector researchers per 100,000 citizens.

The rates were determined in accordance to the economically active population. Otherwise states with more population would inevitably, have a higher rate of SNI members. In order to maintain the uniformity between states, a rate of SNI members per 100,000 citizens was used.

Seventh Pillar: Innovative Companies

This pillar combines the following 11 indicators:

- Number of National Registry of Scientific and Technological Institutions and Companies (RENIECYT) members in each State.
- Maturity of the companies' technological advancements.
- Innovative companies in relation to preexisting companies.
- Companies with incremental product innovation.
- Companies with product innovation considered to have national outreach.

- Companies with product innovation considered to have international outreach.
- Companies that innovated without business links
- Companies that achieved innovation through business links.
- Innovation achieved through business links with other companies.
- Innovation achieved through business links between companies and institutions.
- Rate of existing business groups in each State.

#INCTI-CAIINNO aims to become a tool for the empowerment of the private sector in the betterment of the domestic CTI environment, which is why this pillar is particularly important.

Eighth Pillar: Business and Entrepreneurship.

In this pillar, 5 indicators were considered:

- Encouragements for business opening.
- Existing business incubators in relation to the State's Economically Active Population total.
- Each States' rate of workers with graduate studies involved in the research and technological development process in relation to the business' total personnel.
- Total sales for new products in the market per State businesses.
- Total sales of the business' new products in the State.

The total sales, as well as the difficulty to open a business provide an insight not just into innovation in the market but into successful market innovation.

Ninth Pillar: Infrastructure and Intellectual Matters

Constituted by 5 indicators:

- Public and private research centers.

- State infrastructure for graduate-level education in 2014.
- State infrastructure for undergraduate and technological education in 2014.
- Rate of graduate-level teaching faculty members (2013-2014).
- Rate of undergraduate-level faculty members (2013-2014).

In order to improve the State's CTI environment, it is fundamental to have a good relation between infrastructural and intellectual matters. As the success of one, determines the success of the other.

Tenth Pillar: Industrial Property

This Pillar aims to measure not just the number of trademark applications but the effectiveness of said applications. Seven indicators were applied:

- Trademark applications in 2014
- Trademarks registered in 2014
- First Holder patent applications per State.
- Published First Holder patent applications per State.
- Granted First Holder patents per State.
- First holder utility model applications per State.
- First holder industrial design applications per State.

It is fundamental for the country to know how many patent applications are successful. Some States did not register a single granted patent in 2014 and many did not have more than ten applications that same year. Which is why, part of the research revolved around classifying the number of applications made by natural persons and by gender. When it comes to the latter, most of the patents are granted to men.

Eleventh Pillar: Gender

This pillar measures the participation of each gender on several CTI related areas. This pillar includes 5 indicators:

- CONACYT scholarships awarded to each gender.

- Number of SNI researchers of each gender in every State.
- Women legislators in the 2014 CTI State commissions.
- Women in charge of State CTI organizations.
- Women legislators in charge of CTI committees per State in 2014.

The available information is a representation of the place women hold in CTI. In 17 States, the number of scholarships for men was larger than the one for women.

In 2014, the number of male researchers in SNI was almost double to that of women (13,354) versus (7,174). Some States did not report a single woman in their CTI committees. In sum, it was important for #INCTI-CAIINNO to be able to obtain this information in order to gauge the future when it comes to equal gender representation in CTI.

Twelfth Pillar: Communication Technology

This pillar employs 4 general indicators which consider information that can be found in international CTI indexes.

- Computer users per each 1,000 of the State's economically active population.
- Daily internet users.
- Density of landlines per State.
- Rate of mobile phone subscriptions.

Communication is directly related to these indicators. Landlines and mobile lines act carriers of information useful for innovation. In addition to this, they are fundamental for business, human relations and projects. This is why they are taken into consideration.

General Ranking

The following table illustrates the ranking of each State according to each pillar:

	P.1. General Context	P.2. Public and private investment on CTI	P.3. Higher Education	P.4. Basic Education	P.5. Inclusivity	P.6. Scientific output	P.7. Innovative Companies	P.8. Business and Entrepreneurship	P.9. Infrastructure and Intellectual Matters	P.10. Industrial property	P.11. Gender	P.12. Communication Technology
Aguascalientes	9	19	12	8	32	27	9	29	5	9	13	5
Baja California	5	10	4	17	4	8	2	22	16	20	27	3
Baja California Sur	4	1	5	11	24	5	26	16	13	17	24	14
Campeche	32	27	28	28	12	30	31	19	6	23	30	18
Chiapas	31	31	32	30	29	26	30	26	24	25	21	32
Chihuahua	6	4	10	23	21	4	20	4	19	14	22	9
Coahuila	17	5	7	10	5	23	6	7	11	13	31	10
Colima	16	23	9	3	18	13	28	32	1	12	16	13
Mexico City	1	2	1	1	16	1	3	2	2	1	7	1
Durango	11	32	21	26	11	15	14	21	8	24	14	27
Estado de México	12	13	14	19	1	19	19	5	31	19	9	16
Guanajuato	18	15	25	24	30	18	8	30	23	7	29	28
Guerrero	29	29	31	31	23	25	32	25	32	32	4	25
Hidalgo	22	18	19	6	8	28	12	13	20	15	12	7
Jalisco	13	20	8	25	19	12	4	23	29	4	15	6
Michoacán	24	21	22	29	6	7	23	24	21	28	23	30

	P.1. General Context	P.2. Public and private investment on CTI	P.3. Higher Education	P.4. Basic Education	P.5. Inclusivity	P.6. Scientific output	P.7. Innovative Companies	P.8. Business and Entrepreneurship	P.9. Infrastructure and Intellectual Matters	P.10. Industrial property	P.11. Gender	P.12. Communication Technology
Morelos	20	9	17	4	13	2	10	15	3	5	3	8
Nayarit	7	24	29	2	27	24	29	6	22	29	8	19
Nuevo León	2	7	3	12	3	9	1	8	10	2	25	2
Oaxaca	30	28	30	32	31	32	22	28	28	31	5	31
Puebla	26	3	11	16	28	11	18	1	9	11	19	24
Querétaro	15	6	13	9	15	3	5	11	4	3	10	12
Quintana Roo	3	25	27	13	22	17	27	12	27	22	1	15
San Luis Potosí	25	8	15	21	25	10	11	17	25	21	18	23
Sinaloa	10	30	6	18	17	14	17	18	26	16	28	17
Sonora	14	11	2	5	26	16	7	20	14	6	6	4
Tabasco	27	26	24	15	20	31	25	27	30	27	26	20
Tamaulipas	8	12	16	20	7	29	21	10	17	18	17	11
Tlaxcala	19	22	23	7	10	20	16	9	12	26	2	29
Veracruz	28	14	20	14	14	21	24	3	18	30	11	26
Yucatán	23	17	18	27	9	6	15	14	7	8	20	21
Zacatecas	21	16	26	22	2	22	13	31	15	10	32	22

References

Aregional (2010a). Índice de Innovación Estatal (I2E). Serie Innovación Regional, Año 10, Número 31/2010.
_____(2010b). Índice de Competitividad Sistémica de las Entidades Federativas

CONEVAL (2014). Medición de la pobreza. Recuperado de http://www.coneval.gob.mx/Medicion/EDP/Paginas/Evolucion-de-las-dimensiones-de-la-pobreza-1990-2014-.aspx

Economic Insight (2015). What is the relationship between public and private investment in R&D? Recuperado de https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/438763/bis-15-340-relationship-between-public-and-private-investment-in-R-D.pdf

Foro Consultivo Científico y Tecnológico FCCYT (2011). Ranking Nacional de Ciencia, Tecnología e Innovación. Recuperado de http://www.foroconsultivo.org.mx/home/index.php/libros-publicados/estadisticas-en-cti
_____(2013).Ranking Nacional de Ciencia, Tecnología e Innovación 2013. Recuperado de http://www.foroconsultivo.org.mx/home/index.php/libros-publicados/estadisticas-en-cti/1991-ranking-nacional-de-ciencia-tecnologia-e-innovacion-2013
Fundación Este País (2005). México ante el reto de la economía del conocimiento. Recuperado de http://estepais.com/inicio/historicos/174/20_suplemento_mexico%20ante%20el%20reto.pdf
_____(2007). Índice de Economía del Conocimiento. Recuperado de http://www.econocimiento.mx/
Gobierno de Nueva Zelanda (2015).Recuperado de https://www.newzealandnow.govt.nz/living-in-nz/education

INEGI (2004). Las personas con discapacidad en México: una visión censal. Recuperado de http://www.inegi.org.mx/prod_serv/contenidos/espanol/bvinegi/productos/censos/poblacion/2000/discapacidad/discapacidad2004.pdf

Los Objetivos de Desarrollo del Milenio en México (2015) Informe de Avances. Recuperado de http://www.objetivosdedesarrollodelmilenio.org.mx/odm/Doctos/InfMex2015.pdf

Ministerio de Asuntos exteriores de Japón (MOFA) (2014).BEGIN: Basic Education for Growth Initiative. Recuperado de http://www.mofa.go.jp/region/africa/education3.html

OECD (2005). Manual de Oslo, 3 *ed*. Recuperado de http://www.uis.unesco.org/Library/Documents/OECDOsloManual05_spa.pdf

____ (2015). *Starting Strong IV: Monitoring Quality in Early Childhood Education and Care*, OECD Publishing, Paris. Recuperado de http://www.oecd.org/publications/starting-strong-iv-9789264233515-en.htm

OMS-Banco Mundial (2011). Informe Mundial sobre la discapacidad. Recuperado de http://www.who.int/disabilities/world_report/2011/summary_es.pdf?ua=1

Ruiz D.C. (2008). México: Geografía Económica de la Innovación, *Comercio Exterior*, 58 (11), 756-768.

Sánchez Carlos y Ríos Humberto (2011). La economía del Conocimiento como base del crecimiento económico de México, *Revista Venezolana de Información, tecnología y Conocimiento*, 8 (2),43-60.

The Consultative Group on Early Childhood Care and Development (CGECCD) (2015).The Importance of Early Childhood Development to Education. Recuperado de http://www.beyond2015.org/sites/default/files/ECD-Education-Post-2015.pdf

UNESCO (2015) Replantear la educación. Hacia un bien común mundial? Recuperado de http://unesdoc.unesco.org/images/0023/002326/232697s.pdf

United Nations Conference on Trade and Development UNCTAD (2010). The Creative Economy Report 2010. Recuperado de http://unctad.org/en/Docs/ditctab20103_en.pdf

United Nations Global Compact (2011).The Women's Empowerment Principles — Equality Means Business initiative. Recuperado de http://www2.unwomen.org/~/media/headquarters/attachments/sections/partnerships/businesses%20and%20foundations/women-s-empowerment-principles_en%20pdf.pdf?v=1&d=20141013T121445

Venture Institute (2013). Índice Nacional de Innovación. Recuperado de http://index.institute.vc/

World Economic Forum (2015). Global Agenda Council on the Creative Economy. Recuperado de http://www3.weforum.org/docs/WEF_Creative_Economy_council_flyer_Davos.pdf

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