

SUMAS K-Net: Energy, Environment and Social Sustainability Knowledge-Network

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In 2018, according with the World Bank and United Nations data, Mexico has the 15th largest nominal Gross Domestic Product (GDP) (WB, 2019) and the 11th largest by purchasing power parity (UN, 2019). Table 1 shows some Mexico's economic and energetic indicators. The energy sector in Mexico is the main driver of the country's economic development. At the same time, it is responsible for the majority of the country's greenhouse gases (GHG) emissions.

Table 1. Mexico's economic and energetic indicators.

Description	Unit	Year		
		2014	2015	2016
Population ^a (10 ⁶ inhabitants)	People	119.71	121.00	122.27
GDP ^b (10 ³ , billion 2010 USD)	\$	1.18	1.22	1.26
Energy production	Mtoe	208.31	189.59	180.46
Total primary energy supply ^b	Mtoe	188.18	184.89	185.16
Electricity consumption ^b	TWh	259.65	269.41	280.62
CO ₂ energy emissions ^b	Mt CO ₂ eq	434.20	442.42	445.47

Sources:

a – SIE, 2019.

b – IEA, 2019.

In 2012 Mexico became the first emerging economy to adopt climate legislation, the General Law on Climate Change. Adoption of the Law has been an important step in advancing Mexico's efforts to address climate change. Significant progress has been made in operationalizing and implementing the Law over the past seven years. Figure 1 shows the evolution of GHG emissions by sector in Mexico from 2000 to 2015 (INEGYCEI, 2018, 58). In particular, the GHG emissions in Mexico in 2015 by economic sector were 71.11% energy, 7.74% industry, 14.59% forestry/agricultural/livestock farming, and 6.56% waste (INEGYCEI, 2018, 31).

The 2012-2018 Federal administration in Mexico placed special emphasis on the energy transition by clean technologies to comply with agreements to reduce GHG. The National Climate Change Strategy (NCCS, 2013, 43-47) guidelines were established to reduce GHG by 50% by 2050, taking as references the amount that was issued in 2000 (640 Mt CO₂e). The base line scenario in the NCCS (NCCS, 2013, 46) considers an average GDP growth of 3.6%. According to this scenario, emissions could reach 960 Mt

CO₂e in 2020, 1,270 Mt CO₂e in 2030 and 2,257 Mt CO₂e in 2050.

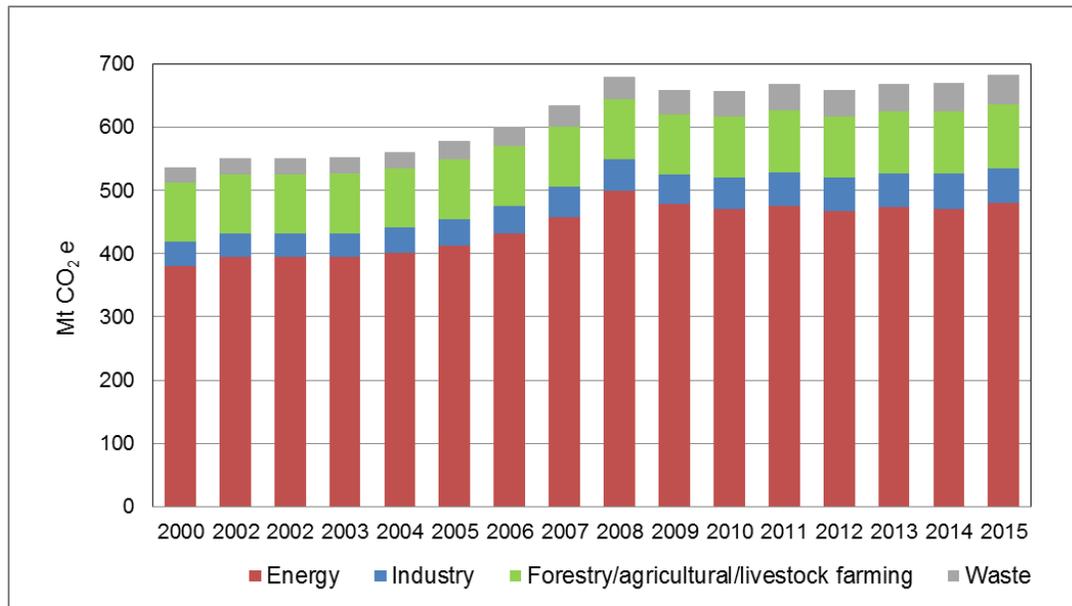


Figure 1. Evolution of GHG emissions in Mexico. Own elaboration with data from INEGYCEI, 2018, 58.

The law was further amended in 2018 by decree 13/07/2018 (DOF, 2018), notably to initiate a national market of GHG and to precise the contribution of Mexico within the scope of the United Nations agreements. The emended establish the bases for Mexico to contribute to the compliance of the Paris Agreement, which has among its objectives to maintain the increase of the global average temperature below 2 C, with respect to pre-industrial levels, recognizing that this would considerably reduce the risks and effects of climate change. This includes an unconditional commitment to reduce GHG emissions by 22% and black carbon emissions by 51% below base line scenario by 2030, implying that emissions would peak by 2026 and that the intensity of GHG emissions per unit of gross domestic product (GDP) will be reduced by about 40% between 2013 and 2030. There is a conditional target to further reduce GHG emissions by 36% and black carbon by 70% below base line scenario by 2030, subject to international support. The decree also introduced sectoral emission reduction targets and included provisions for new and strengthened existing policy mechanisms, including provisions for the National Adaptation Plan, emissions trading, and a transparency framework for the National Determinates Contributions (NDC). The reduction of 22% of GHG emissions will be achieved through the commitment of the different participating sectors, in accordance with the following goals: transport - 18%; power generation -31%; residential and commercial – 18%; oil and gas – 14%; industry - 5%; agriculture and livestock – 8% and waste – 28%.

Therefore, to find a balance between economic development, sustainable energy management and minimum impact on the environment and society has become a huge challenge for scientific communities, civil society groups and policy-makers.

In 2016, the Energy, Environment and Social Sustainability Knowledge-Network (SUMAS K-Net), funded by CONACYT (National Council of Science and Technology,

Mexico) was established by researchers from Institutions of Higher Education (IHE) and Research Centres (RC) in Mexico and Europe. The Universidad Autónoma del Estado de Morelos (UAEM, Mexico) and the Centro de Investigaciones Energéticas, Medio Ambientales y Tecnológicas (CIEMAT, Spain) were the founding institutions of the SUMAS Network. However, the beginning and conception of the SUMAS K-Net was born in 2015, far from Mexico. The begin of the SUMAS K-Net was developed during the 34th International Energy Workshop (IEW) in Abu Dhabi, on June 03–05, 2015, with colleagues Helena Cabal (CIEMAT, Spain), Georgios Giannakidis (The Technology Systems Analysis Program, ETSAP), Marisse Labriet (Environment Energy Consultants, ENERIS, Spain) and Ariel Macaspac (Fraunhofer Institut, Germany). During work sessions and breaks at IEW, lines of common interest were established for possible collaborations between the different institutions.

In February 2016, the call for the formation and continuity of CONACYT thematic networks was published. Through virtual and face-to-face meetings, a project proposal was initially formulated, where the main justification was that the energy sector in Mexico was the engine of the country's economic development and responsible for the emission of most gases of greenhouse effect.

Based on the above, the general objective of the SUMAS K-Net was the analysis of the implications of public and prospective policies of the Mexican energy system towards sustainable development.

In this first proposal, the specific objectives were:

- Form a knowledge network for the analysis of the implications of public and prospective policies of the Mexican energy system towards sustainable development.
- Train human resources through courses or workshops related to the topics of energy sustainability, the environment and society.
- Integrate Federative Entities, as well as public and private, national or international organizations, through open days, interested in the topic of energy sustainability, environment and society.
- Create a Database of Human Resources of IHE, RC, public and private organizations, national or international, related to energy sustainability, environment and society.

The working group in the 2016 proposal was composed of 35 members, of which 15 were researchers, 7 students and 13 external. The members were from 6 IHE of Mexico and 3 from abroad, 2 RC in Mexico and 4 from abroad, as well as 2 Mexican companies and 1 from abroad.

At the end of 2016, two international meeting were held, in which 3 strategic SUMAR K-Net objectives were defined:

1. To evaluate the economic, environmental and social impact of clean energy resources in Mexico through tools and energy models.
2. To evaluate the economic, environmental and social dimensions in Mexico of the energy-water-land-food nexus.
3. Apply technological development for the practical application of sustainable energy solutions.

It is important to mention that the objectives defined in 2016 are still valid and have allowed research and links between members of the SUMAS K-Net during the last three years.

Based on the work and results of the grouping of researchers, students and civil society, in 2017 and 2018, the SUMAS K-Net was supported by CONACYT to continue with the analysis of the implications of the public and prospective policies of the Mexican energy system towards sustainable development.

In the last 3 years it has not been easy to coordinate a multidisciplinary group of 215 members technically and administratively. At present, SUMAS K-Net has 215 members (106 students, 76 researchers and 33 no-academic) from 22 IHE/RC in Mexico and 8 from Europe, 1 from Canada and 1 from Colombia. This has been possible thanks to the selfless and collaborative work of each of the members.

The challenge of consolidating the thematic networks is difficult today, mainly due to the lack of funding from CONACYT or other organizations. Organizing workshops, seminars, conferences, congresses and meetings between the members of the networks requires economic support that allows its members mobility between the different IHE and RC. Figure 2 shows the history of CONACYT's support in the thematic network program in thousands of Mexican pesos (MXP).

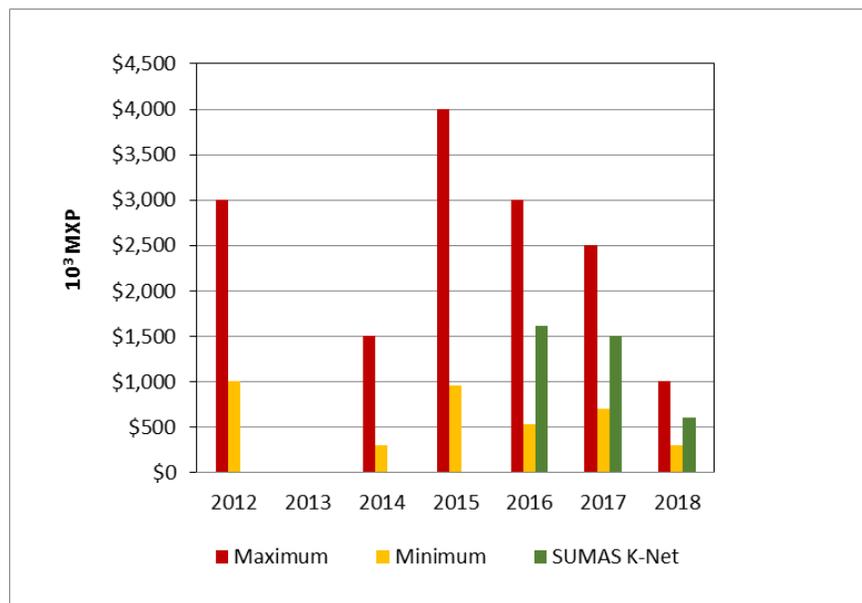


Figure 2. Evolution of CONACYT's support to thematic networks in Mexico.

As can be seen in Figure 2, the support to the thematic network program suffered from the year 2015 a gradual decrease in terms of authorized amounts. In the case of the SUMAS K-Net, the budget reduction in 2018 was 62% with respect to 2016 and 58% with respect to 2017.

To face the challenge of reducing the budget and consolidating the SUMAS K-Net, an international congress was organized from 11 to 15 September 2017, in which most of the speakers were national members. Something new in this congress was the

implementation of round tables where issues of society, environment, energy and sustainability were touched.

In 2018 in collaboration with the bioenergy network, the solar energy network, the energy storage network, the network of women in energy and energy efficiency and the Mexican network of bioenergy, the SUMAS K-Net organized the meeting of energy networks (RRE, acronym in Spanish). The RRE was held from September 24 to 28, 2018 in Cuernavaca, Morelos, Mexico. In addition to the conferences, round tables and poster sessions, 4 pre-congress workshops were organized for the members of the 6 thematic networks. 275 members of the 6 networks from 103 IHE/RC participated at RRE.

The previous administration of Mexico prioritized renewables and clean energies technologies development, promoted the interchange between academic and industry as well as implemented energy and environment politics in order to ensure compliance of Mexico mitigation commitments. The current government's energy policy focuses on increasing energy security through increased national production and reduction of hydrocarbon theft and corruption; however, GHG emission reduction goals are maintained. To achieve this, an energy policy is established that promotes clean energies from a social, sovereign and efficient development point of view to guarantee accessibility, quality and energy security (PND, 2019, 163-167)

Headline issues on Mexico Climate Change

The General Law on Climate Change (DOF, 2018) have 3 main objectives:

1. **Low-carbon development.** To achieve a competitive, sustainable, and low-carbon emissions economy.
2. **Resilient Mexico.** To reduce vulnerability of people, ecosystems, and infrastructure to the adverse effects of climate change.
3. **Inclusive policy.** To ensure coordination among all levels of government with transparency and participation of all sectors of society.

The National Climate Change Policy philosophies are transparency, access to information and social participation. The structure is composed by 6 pillars:

1. National System on Climate Change.
2. Inspections and surveillance.
3. Evaluation.
4. Instruments.
5. Financing.
6. Planning.

The Law has contributed to the low-carbon transition in the energy sector by providing guidance on long-term climate change and clean energy objectives for energy reform.

Political leadership and commitment to climate action need to be revived through the development and adoption of concrete plans and policies and improving coordination among and within sectors and different levels of governance. The Knowledge-Networks financing is a very important Federal government task to allow continuous assessment of social-energy-environment nexus and guarantee the sustainability.

The key challenge now is to close the gap between what is set out in the Law and the reality of climate policy arrangements, processes and practices including actors as academy, researchers and society. The new administration has chosen a more social approach, which represents a great opportunity and relevance to increase the presence of SUMAS K-Net in the Mexico development plans.

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