

U.S.-Mexico Climate Change Agenda Working Group

Briefing Paper – Short Lived Climate Pollutants for Discussion on Wednesday, May 12, 3:00 pm EDT

Introduction

The United States is the world's largest natural gas producer and Mexico is the largest importer of U.S. natural gas. Natural gas consists primarily of methane, which is a potent greenhouse gas when it is released directly to the atmosphere. Significant advances have been made in recent years in methane leak detection using satellite technology, advanced mathematics, and geospatial data analysis. Many oil and gas operators employ technologies to reduce methane emissions during well drilling, completion, and operation. Further, a group of private companies, non-governmental organizations, and academics have also entered into a rich debate around the merits of these new technologies and analytical methodologies for leak detection and monitoring. Mexico and the United States could evaluate these technologies and analytical methodologies with the goal of developing and implementing an effective, low-cost strategy to reduce methane emissions in oil and gas production and existing natural gas infrastructure.

Black carbon is pure carbon in fine particulate form, a product of incomplete combustion of fossil fuels or other materials. In the atmosphere it is a significant contributor to climate change and is also harmful to human health. Black carbon's warming effect occurs as it absorbs sunlight and heats the atmosphere and as it reduces reflectivity when deposited on snow and ice. It is a very short-lived climate pollutant, staying in the atmosphere for only several days to weeks, although its effect when deposited on land can last much longer. Mexico's NDC focuses on reducing black carbon emissions, with a goal of 70% reduction in emissions by 2030 compared to a business as usual scenario, conditional on Mexico receiving technical and financial support. Efforts to use cleaner fuels can help Mexico achieve this goal, with co-benefits for human health and the local environment. Efforts to control black carbon in the United States focus on human health; black carbon is not specifically included in the U.S. NDC.

The Kigali Amendment to the Montreal Protocol aims to phase out the production and use of hydrofluorocarbons (HFCs), potent greenhouse gases used as refrigerants. Mexico ratified the Amendment in 2018 and the Biden Administration is currently assembling a package to submit to the Senate for ratification. The two countries could work together on the phase-out and replacement of these useful, but destructive, chemicals.

Methane

Understanding the Global Warming Potential (GWP) for Methane

A global warming potential (GWP) is a quantified measure of the globally averaged heating impact of a particular greenhouse gas relative to that of CO₂. The GWP over a 100-year period (GWP₁₀₀) for methane is 25, according to the IPCC Fourth Assessment Report (AR4). This means that one metric ton (MT) of methane would have the same climate heating impact as 25 MT of CO₂, measured over 100 years. GWP₁₀₀ under AR4 constitutes the measure that is required to be used for GHG inventory reports under the

UNFCCC.¹ Accordingly, both the U.S. and Mexico follow this guideline in their GHG inventories under the UNFCCC.

This is not the full story, however. The IPCC Fifth Assessment Report (AR5), based on new calculations, found that GWP₁₀₀ for methane is 28, or 34 with carbon-climate feedbacks added in.² Further, measured over a shorter period, methane has a much higher GWP. The GWP for methane calculated over a 20-year period (GWP₂₀) is 84 without carbon-climate feedbacks, and 86 with carbon-climate feedbacks.³ The higher number is because the short lifetime of methane – 12.4 years – takes up greater portion of the measurement period. It is important to remember that where GWP₁₀₀ is used to measure the impact of methane on global warming – as in the inventory tables below -- the impact of methane would be much higher were it evaluated over a shorter period, i.e. using GWP₂₀. For the same reason, reduction of methane emissions has a particularly strong impact on reducing near-term warming, a useful quality as the world works to eliminate CO₂ emissions over the coming decades.

Amounts and Sources of Methane (CH₄) - Mexico 2015 (major categories)

Source	Amount (MMTCO ₂ e, GWP = 25)	% of total CH ₄ Emissions*	% of total Emissions*
Energy	31.7	22.3%	5.8%
Fugitive Emissions	28.9	20.3	5.2
Oil and Gas	21.1	14.9	3.8
Underground mining (coal)	7.7	5.4	1.4
Burning of Fuels	2.8	2.0	0.6
Agriculture and Forestry	67.2	47.2%	12.2%
Enteric Fermentation (cattle)	52.4	36.9	9.5
Manure management	12.7	8.9	2.3
Waste	43.1	30.3%	7.8%
Solid Waste	21.9	15.4	4.0
Managed landfills	17.0	12.0	3.1
Uncontrolled disposition sites	2.5	1.7	0.4
Open dumps	2.5	1.7	0.4
Wastewater treatment	20.4	14.4	3.7
Residential	3.7	2.6	0.7
Industrial	16.7	11.8	3.0
Total Methane	142.1	100%	25.8%
Total Net Mexico GHG Emissions (net of GHGs absorbed by land)	551.2		100%

Source: Sexta Comunicación Nacional y Segundo Informe Bial de Actualización ante la Convención Marco de las Naciones Unidas sobre el Cambio Climático (2018), Anexo A, Tabla 2A.1.

http://cambioclimatico.gob.mx:8080/xmlui/bitstream/handle/publicaciones/117/832_6a_Comunicacion_Nacional.pdf?sequence=6&isAllowed=y.

* Only major categories of sources are included in the table, so percentages for categories shown do not add up to 100% of total CH₄ emissions, and percentages for subcategories shown do not necessarily add up to the percentage shown for the

¹ <https://unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf>.

² https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter08_FINAL.pdf (Table 8.7).

³ *Id.*

respective major categories of sources. Percentages for subcategories may also fail to add up to the percentages shown for major categories due to rounding.

Amounts and Sources of Methane (CH₄) – U.S. 2019 (major categories) [formatted to compare with Mexican methane figures]

Source	Amount (MMTCO ₂ e, GWP = 25)	% of total CH ₄ Emissions*	% of total Emissions*
Energy†	267.7	40.6%	4.1%
Oil and Gas^	203.3	30.8	3.1
Natural Gas Systems	157.6	23.9	2.4
Petroleum Systems	39.1	5.9	0.6
Abandoned oil and gas wells	6.6	1.0	0.1
Coal mining^	53.3	8.1	0.8
Underground coal mines	47.4	7.2	0.7
Abandoned u.g. mines	5.9	0.9	0.1
Burning of Fuels	11.1	1.7	0.2
Agriculture and Forestry†	256.1	38.8%	3.9%
Enteric Fermentation (cattle)	178.6	27.1	2.7
Manure management	62.4	9.5	1.0
Rice farming	15.1	2.3	0.2
Waste†	132.9	20.1%	2.0%
Landfills	114.5	17.4	1.7
Wastewater treatment	18.4	2.8	0.3
Total Methane	659.7	100%	10.1%
Total Net U.S. GHG Emissions (net of GHGs absorbed by land)	6,558.3		100.0%

Source: EPA, U.S. Inventory of Greenhouse Gas Emissions and Sinks, 1990-2019.

<https://www.epa.gov/sites/production/files/2021-04/documents/us-ghg-inventory-2021-main-text.pdf>.

† The figures for the summary categories of energy, agriculture and forestry, and waste reflect the sum of the major categories of sources shown below those summary categories.

^ The figures for the major categories of oil and gas, and coal mining, reflect the sum of the sub-categories of sources shown below those major categories.

* Only major categories of sources are included in the table, so percentages for categories shown do not add up to 100% of total CH₄ emissions.

Methane Reporting and Regulation – Mexico

As indicated in the chart above, Methane in 2019 made up 25.8% of Mexican greenhouse gas emissions, on a CO₂-equivalent basis. Of this total, 23.2% of emissions came from the energy sector, 47.2% from agriculture and forestry, and 30.3% from waste management, including both solid waste management and wastewater treatment.

Reporting. Mexico has a National Registry of Emissions, established under the General Law of Climate Change (LGCC)⁴ and implementing regulations (RLGCC).⁵ The Ministry of the Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales*, or “SEMARNAT”) is responsible for administration of the Registry. The law and regulations provide that specified fixed and mobile sources within the major industries of Mexico – including energy, transport, industry, agriculture and livestock, waste management, and commerce and services -- will report annually to the Registry on their direct and indirect emissions of specified GHGs, including methane. The regulations specify in broad terms the methodologies and procedures to be used for the measurement, calculation, or estimation of GHGs. SEMARNAT, by means of administrative action in the form of “*Acuerdos*,” can provide technical details and formulae to carry out the specified methodologies, as well as the GWPs to be used for reporting purposes.

Regulation. Mexico has a regime for regulation of emissions into the atmosphere under the General Law of Ecological Balance and Environmental Protection (LGEEPA),⁶ and related regulations pertaining to prevention and control of atmospheric contamination (RLGEEPA).⁷ Contamination is defined very broadly, so that methane released into the atmosphere is subject to regulation. LGEEPA, Art. 3, VI-VII. Under the law and regulations, SEMARNAT will issue official Mexican standards (NOMs) to establish maximum permissible emission levels, by pollutant and by source of contamination, for odors, gases, and particles, solid and liquid released into the atmosphere from fixed and mobile sources. LGEEPA, Art. 111, III. SEMARNAT by this mechanism can establish limits on methane emissions.

Fixed sources of emissions from certain sectors -- including hydrocarbons and various types of heavy industry – are specified as within federal jurisdiction, and those fixed sources must obtain prior authorization from SEMARNAT for their operations. LGEEPA, Art. 111 Bis. The authorization, in the form of a license, will include conditions, which may include requirements for specific equipment as well as specific maximum emission levels if the nature of the construction or processes used do not fit within the standard NOMs. RLGEEPA, Art. 20. SEMARNAT can also change the maximum emission levels when (1) the local area suffers high concentrations of contaminants, (2) there is an improvement in control technology, or (3) there is a change in the production processes used at the fixed source. RLGEEPA, Art. 22.

State and local governments will enforce maximum permissible emission limits of pollutants against fixed sources within their respective jurisdictions, in accordance with the provisions of the RLGEEPA and the respective NOMs. LGEEPA, Art. 112 III. Fixed sources within local jurisdiction would include such high emission sources as cattle ranches (enteric fermentation and manure); pig farms (manure); landfills and other solid waste disposal sites; and wastewater treatment plants. Notwithstanding the responsibilities of state and local governments, to the extent that state or municipal legislative bodies have not put in place the necessary state or local laws and government capacity, then the federal government can apply

⁴ Ley General de Cambio Climático. http://www.diputados.gob.mx/LeyesBiblio/pdf/LGCC_061120.pdf.

⁵ Reglamento de la Ley General de Cambio Climático en Materia del Registro Nacional de Emisiones, http://www.diputados.gob.mx/LeyesBiblio/regley/Reg_LGCC_MRNE_281014.pdf.

⁶⁶ Ley General del Equilibrio Ecológico y la Protección al Ambiente, http://www.diputados.gob.mx/LeyesBiblio/pdf/148_180121.pdf.

⁷ Reglamento de la Ley General Del Equilibrio Ecológico y la Protección al Ambiente en Materia de Prevención y Control de la Contaminación de la Atmósfera, http://www.diputados.gob.mx/LeyesBiblio/regley/Reg_LGEEPA_MPCCA_311014.pdf.

the applicable laws at the state and municipal level, while coordinating with local authorities. RLGEIPA, Transitory Article Sixth.

Apart from the foregoing provisions of the LGEEPA and implementing regulations, there is a special regime for reduction of methane emissions in the hydrocarbons sector, pursuant to regulatory provisions promulgated by the National Agency for Industrial Safety and Environmental Protection of the Hydrocarbons Sector (*Agencia Nacional de Seguridad Industrial y de Protección al Medio Ambiente del Sector Hidrocarburos*, or "ASEA").⁸

ASEA was established on December 20th, 2013, in order to create a decentralized administrative body of SEMARNAT, with technical and managerial autonomy.⁹ ASEA was granted power to regulate and supervise Industrial Safety, Operational Safety and Environmental Protection in the hydrocarbons sector, with respect to the Facilities (the entire complex where hydrocarbon activity takes place) and activities of that sector. Then, in October 31st, 2014, the ASEA Internal Regulations were published, which gave ASEA, among its other faculties, comprehensive control over emissions by the hydrocarbons sector into the atmosphere.

On August 11th, 2014, the Hydrocarbon Law was published.¹⁰ Article 95 of that law establishes that the hydrocarbon industry is of exclusive federal jurisdiction. Article 129 provides that ASEA has responsibility to issue the applicable regulations and other regulatory provisions regarding industrial and operational safety and protection of the environment in the hydrocarbons sector.

Derived from the need to minimize the adverse effects generated by methane emissions from the hydrocarbon sector and to contribute to the fulfillment of Mexico's international and regional commitments, the Mexican government decided it was necessary to issue a regulatory instrument that would allow collection of accurate data per hydrocarbon facility, as well as having a mechanism to monitor its continuous improvement, in order to attain prevention and comprehensive control of methane emissions from the hydrocarbons sector.

For this reason, on November 6, 2018, ASEA published in the Official Gazette of the Federation (*Diario Oficial de la Federación*, or "DOF"), the "ADMINISTRATIVE PROVISIONS OF GENERAL CHARACTER THAT ESTABLISH GUIDELINES FOR PREVENTION AND CONTROL OF METHANE EMISSIONS FROM THE HYDROCARBON SECTOR" (hereinafter Provisions),¹¹ whose objective is to establish the actions and mechanisms to be adopted by the Regulated Parties for the prevention and control of methane emissions in the Hydrocarbons Sector (Art.2).

⁸ *Disposiciones Administrativas de carácter general que establecen los Lineamientos para la prevención y el control integral de las emisiones de metano del Sector Hidrocarburos*, 6 de noviembre de 2018, https://www.dof.gob.mx/nota_detalle.php?codigo=5543033&fecha=06/11/2018.

⁹ http://www.diputados.gob.mx/LeyesBiblio/pdf/LANSI_110814.pdf.

¹⁰ http://www.diputados.gob.mx/LeyesBiblio/pdf/LHidro_040521.pdf.

¹¹ *Disposiciones Administrativas de carácter general que establecen los Lineamientos para la prevención y el control integral de las emisiones de metano del Sector Hidrocarburos*, 6 de noviembre de 2018, https://www.dof.gob.mx/nota_detalle.php?codigo=5543033&fecha=06/11/2018.

The Provisions are mandatory and apply to new Facilities¹² and existing Facilities¹³ of all projects in the hydrocarbon sector that carry out the following activities:

- I. The exploration and extraction of hydrocarbons;
- II. The treatment, refining and storage of oil, and
- III. The processing, compression, liquefaction, decompression and regasification, as well as the pipeline transportation, storage and distribution of natural gas.

Among the most relevant provisions on methane emissions from the hydrocarbon sector are:

- Regulated Parties must prepare a diagnosis of the methane emissions that occur in the equipment, including its components, as well as in the operations of wells, and of Facilities, in order to identify, classify and quantify the methane emissions of the project and / or facility. These should be done on equipment, well operations, and leaks caused by unscheduled actions. Once the sources have been identified, they must be classified according to three types:
 - I. From “destruction equipment” (i.e. for burning methane that cannot otherwise be used);
 - II. Leakage in well operations, equipment and components, and
 - III. Hydrocarbon Venting.
- To quantify emissions, the Regulated Parties must consider Coverage (include all emission sources), Consistency (use of methodologies to monitor and compare emissions in different scenarios), Relevance (identification and quantification of emissions in equipment), and Transparency (disclose the relevant documentation of the information corresponding to the quantification of emissions, the methodologies and their sources) (Art. 17).
- Methane emissions will be quantified annually, using some of the 7 quantification methodologies listed in the Provisions:
 - I. Balance of matter;
 - II. Mathematical models;
 - III. Engineering calculations;
 - IV. Equipment emission factors, established by the manufacturer;
 - V. Emission factors established by the Intergovernmental Panel on Climate Change (IPCC);
 - VI. “AP-42: Compilation of Air Pollutant Emission Factors”, from the Environmental Protection Agency of the United States of America, or the one that modifies or replaces it, and
 - VII. Emission factors for the country or specific to the equipment and / or Components.
- All Regulated Parties must prepare a Program for the Prevention and Comprehensive Control of Methane Emissions from the Hydrocarbons Sector (PROGRAM), where they will report the total quantified methane emissions will be called Base Year emissions, which will serve as a reference for the comparison and evaluation of the continuous improvement of the prevention and comprehensive control of said emissions for subsequent years.

¹² New Facilities are those that are built after the entry into force of these Provisions.

¹³ The existing Facilities are those that, prior to the entry into force of these Provisions, have been built; as well as those for which, without having been built yet, the Regulated have a permit granted by the Ministry of Energy or the Energy Regulatory Commission.

Methane Reporting and Regulation – United States

In 2019, methane made up 10% of U.S. greenhouse gas emissions, on a CO₂-equivalent basis, and is the second most prevalent greenhouse gas after CO₂.¹⁴ Of this total, 40% of emissions come from the energy and industrial sectors, with an additional 40% from agriculture and the remaining 20% from waste management (mostly landfill gas).¹⁵

Studies suggest that methane emissions in the United States are under-reported. The Environmental Defense Fund has conducted extensive studies of U.S. methane emissions, examining different parts of the natural gas value chain, specific production basins, and U.S. cities. Overall, they estimate that emissions are 60% higher than government estimates.¹⁶

The U.S. Supreme Court in *State of Massachusetts v. EPA*, 549 U.S. 497 (2007) held that GHGs constitute “air pollutants” under section 202(a)(1) of the Clean Air Act (CAA). They are therefore subject to regulation if the EPA administrator determines that such gases “in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare” pursuant to CAA section 111(1)(1)(A). The EPA made this “endangerment finding” for six GHGs, including methane, in 2009.¹⁷ The DC Circuit of the United States Court of Appeals upheld the ruling in 2012.

Later, the Supreme Court in *Utility Air Regulatory Group v. EPA*, 573 U.S. 302 (2014), considered the issue of how GHGs fit within the CAA Prevention of Significant Deterioration (PSD) preconstruction permit program and the CAA Title V operating permit program. The Court held that the EPA may not treat GHGs as an air pollutant for purposes of determining whether a source of emissions is subject to the PSD preconstruction permit program. However, the Court also said that the EPA could continue to require that PSD permits, otherwise required based on emissions of pollutants other than GHGs, contain limitations on GHG emissions based on the application of “Best Available Control Technology (BACT)”. The Supreme Court decision effectively upheld PSD permitting requirements for GHG emissions.

The Obama administration focused on regulating methane emissions as a key part of its climate efforts. The Trump administration attempted to reverse these regulations but was generally unsuccessful. Many companies and some industry associations in the United States support federal regulation of methane, including the American Petroleum Institute (API)¹⁸ and the Interstate Natural Gas Association of

¹⁴ U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks 2019*, <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks>.

¹⁵ Richard K. Lattanzio, *Methane Emissions: A Primer*, U.S. Congressional Research Service, 11 December 2020, <https://fas.org/sgp/crs/misc/IF10752.pdf>.

¹⁶ Environmental Defense Fund, Methane research series: 16 studies, <https://www.edf.org/climate/methane-research-series-16-studies>.

¹⁷ These six greenhouse gases are: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆). U.S. Environmental Protection Agency, *Endangerment and Cause or Contribute Findings for Greenhouse Gases under the Section 202(a) of the Clean Air Act*, <https://www.epa.gov/ghgemissions/endangerment-and-cause-or-contribute-findings-greenhouse-gases-under-section-202a-clean>.

¹⁸ Mike Sommers, *API Stands Ready To Work With Biden Administration On Methane Regulation*, American Petroleum Institute, 21 January 2021, <https://www.api.org/news-policy-and-issues/blog/2021/01/21/api-stands-ready-to-work-with-biden-administration-on-methane-regulation>.

America.¹⁹ The Environmental Partnership, a large group of companies organized by API, has programs designed to improve processes and equipment that emit methane, including liquids unloading, pipeline blowdown, pneumatic controls, and compressors, as well as a program to improve leak detection and repair programs.²⁰ Additionally, the U.S. Department of Energy has announced \$35 million in funding to develop new technologies to reduce methane emissions.²¹

EPA established regulation of new and modified oil and gas equipment under its New Source Performance Standards in 2016.²² The Trump administration rolled back these provisions in 2020, but the Senate voted on April 28, 2021 to use the Congressional Review Act to restore them.²³ The House will almost certainly follow suit and these regulations will remain in place. Annex I to this Briefing Paper presents a summary of the emissions standards.

The Department of Interior (DOI) also issued standards to reduce the waste of natural gas from venting, flaring, and leaks during oil and natural gas production activities on federal and Indian lands.²⁴ The Trump administration also tried to roll back these standards. However, on July 15, 2020, the U.S. District Court for the Northern District of California blocked the rollback, stating that DOI ignored its statutory mandate and failed to take science into account.²⁵ These standards also remain in place.

Finally, in 2016 the EPA established regulations for methane emissions from new and existing solid waste landfills. The Trump administration moved to delay implementation of these regulations, but in April 2021 the DC Circuit of the United States Court of Appeals threw out the Trump era regulation, leaving a clean slate for the Biden administration to create new regulations for landfill methane emissions.²⁶

Black Carbon

Black carbon regulation in Mexico

Black carbon is a tropospheric pollutant that affects human health due to the pollutants associated with its emission.²⁷ According to the General Law on Climate Change (LGCC),²⁸ black carbon is particulate material (PM) produced by the incomplete combustion of fossil fuels or biomass, and which contributes to global warming as a short-lived climate pollutant (Art. 3, Frac. XII).

¹⁹ Interstate Natural Gas Association of America, *INGAA Statement on Introduction of CRA Resolution to Reinstate NSPS OOOOa Methane Rule*, 26 March 2021, <https://www.ingaa.org/News/PressReleases/38660.aspx>.

²⁰ The Environmental Partnership, *Taking Action*, <https://theenvironmentalpartnership.org/what-were-doing/taking-action/>.

²¹ U.S. Department of Energy, *DOE Announces \$35 Million for Technologies to Reduce Methane Emissions*, 8 April 2021, <https://www.energy.gov/articles/doe-announces-35-million-technologies-reduce-methane-emissions>

²² 40 CFR § 60.0000a, https://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=7ff74d656b17ddc20ccda095a8b7f70e&mc=true&r=SUBPART&n=sp40.8.60.0000_0a

²³ <https://www.washingtonpost.com/climate-environment/2021/04/28/methane-congressional-review-act/>.

²⁴ 43 CFR 3160, 43 CFR 3170,

²⁵ https://earthjustice.org/sites/default/files/files/ygr_summary_judgment_order.pdf.

²⁶ <https://aboutblaw.com/WFI>.

²⁷ Sexta Comunicación Nacional y Segundo Informe Bial de Actualización ante la Convención Marco de las Naciones Unidas sobre el Cambio Climático (2018), http://cambioclimatico.gob.mx:8080/xmlui/bitstream/handle/publicaciones/117/832_6a_Comunicacion_Nacional.pdf?sequence=6&isAllowed=y.

²⁸ . http://www.diputados.gob.mx/LeyesBiblio/pdf/LGCC_061120.pdf.

In Mexico, 131.56 Gg of black carbon were recorded in 2015, the main sources of emissions being the following sectors: [1] Energy that contributes 125.97 Gg of black carbon (95.75%), followed by the sector [2] Agriculture, forestry and others land use, which contributes 4.44 Gg of black carbon (3.38%), and the sector [3] Waste, which contributes 1.15 Gg of black carbon (0.88%).²⁹

In the Energy sector, carbon emissions are due to (a) Fuel combustion and (b) Fugitive emissions from flare fuel combustion in the oil and gas sector.

Black carbon emissions are regulated by the General Law on Climate Change (LGCC) and its Regulations. Under the LGCC, Mexico commits, without conditions, to reduce its black carbon by 51% by 2030 and its GHGs by 22% against a baseline case (business as usual). LGCC Transitory Article Second. The commitment to reduce black carbon and GHGs may be increased conditionally if a global agreement is adopted that includes such matters as an international carbon price, adjustments to tariffs for carbon content, technical cooperation, access to resources. low-cost financing and technology transfer, all on a scale equivalent to the challenge of global climate change; under these conditions, National reductions of black carbon may increase to 70% and GHG reductions may reach 36% by 2030.³⁰ By this means, Mexico could reach a path consistent with the route outlined in the LGCC that seeks to reduce by 2050 50% of the volume of emissions compared to those registered in the year 2000.³¹

Black Carbon Regulation – United States

Unlike methane, black carbon is not a gas and is not included in the list of greenhouse gases regulated under the Clean Air Act, nor is it included in the U.S. NDC. Black carbon is not the direct target of regulation, but is regulated under the Clean Air Act's provisions to reduce small particulate pollution, known as PM2.5. These tiny particles, of 2.5 micrometers or smaller in diameter, can be inhaled deeply into the lungs and even enter the bloodstream, causing lung and heart disease. Combustion emissions are the primary source of PM2.5, but not all is black carbon. Sulfate, nitrate, and ammonium ions are other important components.³²

Emissions of black carbon are treated differently than other climate pollutants since their lifespan in the environment is very short. Under the Clean Air Act, EPA sets and reviews national air quality standards for PM2.5. Air quality monitors measure its concentration throughout the country. EPA, state, tribal, and local agencies use that data to ensure that PM2.5 is at levels that protect public health and the environment.³³ The annual ambient air quality standard for PM2.5 is 12 micrograms per cubic meter, established based

²⁹ *Id.*

³⁰ SEMRNAT (2015). Compromisos de Mitigación y Adaptación ante el Cambio Climático para el periodo 2020-2030. https://www.gob.mx/cms/uploads/attachment/file/162974/2015_indc_esp.pdf.

³¹ *Id.*

³² Zhang HH, Li Z, Liu Y, Xinag P, Cui XY, Ye H, Hu BL, Lou LP. *Physical and chemical characteristics of PM2.5 and its toxicity to human bronchial cells BEAS-2B in the winter and summer*. J Zhejiang Univ Sci B. 2018 Apr.;19(4):317-326. doi: 10.1631/jzus.B1700123. PMID: 29616507; PMCID: PMC5964345. <https://pubmed.ncbi.nlm.nih.gov/29616507/>.

³³ *Id.*

on human health protection.³⁴ Black carbon emissions are generally declining as tighter emissions standards on new and existing diesel engines take hold.³⁵ Overall PM2.5 emissions are also declining.³⁶

Hydrofluorocarbons

Hydrofluorocarbons (HFCs) are potent GHGs intentionally developed as replacements for ozone-depleting substances (ODS) in the refrigeration, air conditioning, aerosols, fire suppression, and foam blowing sectors. They have GWPs that can be hundreds to thousands of times greater than carbon dioxide (CO₂). HFC use is growing worldwide due to the phaseout of ODS and increasing use of refrigeration and air-conditioning equipment globally.³⁷

Mexico regulatory regime

Mexico has demonstrated its leadership in the area of climate change by establishing synergies for the efficient use of energy and the protection of the ozone layer, as well as by fulfilling its commitments with the Montreal Protocol in a timely manner. As proof of this, in 2010 the consumption of chlorofluorocarbons (CFCs), substances used in refrigeration, air conditioning, aerosols and polyurethane foams, was totally eliminated in the country.

To completely eliminate the use of chlorofluorocarbon gases and comply with the commitments under the Montreal Protocol, Mexico implemented the "National Plan for the Elimination of HCFC Hydrochlorofluorocarbons", which aimed to eliminate 30 percent of HCFC consumption by 2018. The main HCFCs used in Mexico, in the refrigeration and air conditioning sector, are HCFC-22, as a refrigerant gas, and HCFC-141b, as a cleaning agent.

In order to eliminate the total consumption of some HCFCs, SEMARNAT has developed manuals of Good Practices in the Use of Alternative Substances to Hydrochlorofluorocarbons that contain the techniques and procedures for cleaning equipment using substances that do not damage the ozone layer. and with no or low global warming potential.³⁸

Recently, SEMARNAT (2020) published a "ROADMAP TO IMPLEMENT THE KIGALI AMENDMENT IN MEXICO", through which the consumption of hydrofluorocarbons (HFCs), powerful gases with high GWPs, will be reduced. The implementation of the amendment will be aligned with the actions that Mexico undertakes to counteract climate change. The reduction of HFCs will contribute to meeting the mitigation goals established as Nationally Determined Contributions in the Paris Agreement.

The Kigali Amendment entered into force globally on January 1, 2019, and Mexico ratified it on September 25, 2018, and its decree was published in the Official Gazette of the Federation (DOF) on November 30, 2018.

³⁴ U.S. Environmental Protection Agency, What are the Air Quality Standards for PM?
<https://www3.epa.gov/region1/airquality/pm-aq-standards.html>.

³⁵ Climate and Clean Air Coalition, *U.S. National Black Carbon and Methane Emissions*, August 2015,
<https://www.ccacoalition.org/en/file/876/download?token=DsKwqCjs>.

³⁶ U.S. Environmental Protection Agency, Particulate Matter (PM_{2.5}) Trends, <https://www.epa.gov/air-trends/particulate-matter-pm25-trends>.

³⁷ <https://www.epa.gov/climate-hfcs-reduction>.

³⁸ SEMARNAT (2014). Buenas Prácticas en el Uso de Sustancias Alternativas a los Hidroclorofluorocarbonos. México

The Kigali Amendment (KE)³⁹ notes that all countries have committed to achieving legally binding targets that call for gradual reductions in HFC consumption and production. For developing countries, such as Mexico, the agreement specifies that licensing systems for the import and export of HFCs must enter into force no later than January 1, 2021.

The HFC reduction schedule for Mexico establishes that it must freeze its consumption in 2024, taking as a baseline the average HFC consumption in the period from 2020 to 2022, adding 65% of the HCFC baseline. Additionally, a goal has been established for the reduction of HCFC emissions, that for Mexico in 2045 it reduces 80% of these emissions.

Mexico has the following obligations as part of the Kigali Amendment:

- Establish a baseline of annual consumption, expressed in tons of CO₂ equivalent (consumption is equal to the sum of domestic production plus imports minus exports made in a calendar year).
- Meet the HFC consumption reduction goals established in the Kigali Amendment schedule.
- Create a "quota system" or "maximum annual quotas", which will be the maximum number of tons of CO₂ equivalent of HFCs that will be allowed to be imported during a calendar year.⁴⁰
- Impose as a regulation to the individual obtaining a permit to import HFCs as part of the quota that has been assigned at the beginning of the calendar year.

To date, the HFC emission reduction quotas have been met in Mexico, in accordance with the provisions of the internal regulations of SEMARNAT (RISEMARNAT), the "CICOPLAFEST⁴¹-COFEPRIS⁴² Agreement".

U.S. regulatory regime.

In the U.S., the American Innovation and Manufacturing (AIM) Act was enacted by Congress on December 27, 2020. The AIM Act directs EPA to address the environmental impact of hydrofluorocarbons (HFCs) by: phasing down production and consumption, maximizing reclamation and minimizing releases from equipment, and facilitating the transition to next-generation technologies through sector-based restrictions.⁴³

In accordance with the AIM, the EPA on May 3, 2021 announced that it is proposing its first rule to phase down the production and consumption of HFCs. According to the EPA news release, the "phasedown will decrease the production and import of HFCs in the United States by 85% over the next 15 years. A global HFC phasedown is expected to avoid up to 0.5 °C of global warming by 2100."⁴⁴ The proposed rule is presented at "Proposed Rule - Phasedown of Hydrofluorocarbons: Establishing the Allowance Allocation

³⁹ Ratified at the XXVIII Meeting of the Parties to the Montreal Protocol (MOP), held in the city of Kigali, Rwanda, in October 2016.

⁴⁰ The level of HFC consumption must be expressed in terms of CO₂e, which is determined from the consumption of each HFC in metric tons of substance and its multiplication by the corresponding global warming potential (GWP).

⁴¹ *Comisión Intersecretarial para el Control del Proceso y Uso de Plaguicidas, Fertilizantes y Sustancias Tóxicas / Intersecretarial Commission for the Control of the Process and Use of Pesticides, Fertilizers and Toxic Substances.*

⁴² *Comisión Federal para la Protección contra Riesgos Sanitarios / Federal Commission for the Protection against Sanitary Risks.*

⁴³ *Id.*

⁴⁴ [EPA Moves Forward with Phase Down of Climate-Damaging Hydrofluorocarbons | U.S. EPA News Releases | US EPA.](#)

and Trading Program under the AIM Act”.⁴⁵ U.S. industry generally favors the rule because it has made significant progress in developing climate-friendly replacements for HFCs.⁴⁶

Previously, the EPA in April 2021 “finalized a rulemaking under the Significant New Alternatives Policy (SNAP) program that listed new refrigerant options for use in retail food refrigeration, residential and light commercial air conditioning, and heat pump equipment. These additional options have lower global warming potentials and provide additional flexibility for industry, supporting the transition to alternatives needed to meet the AIM Act’s HFC phasedown reduction steps.”⁴⁷

Establishment of a Mexico-U.S. Bilateral Group on Technical and Financial issues to support National Determined Contributions

Last December, México presented to the United Nations its National Determined Contributions updated to 2020. It reiterated its unconditional commitment of a 22% reduction of greenhouse gas emissions (GHG), and 51% of black carbon emissions by the year 2030 as compared to the baseline business as usual scenario (BUA). It also reiterated a conditional reduction of up to 36% of GHG emissions and 70% of black carbon emissions, that depend “on the establishment of technology transfer mechanisms, an international price for carbon trading, adjustment of tariffs for carbon content, and technical cooperation and access to low-cost financial resources.”

The two governments could establish a Mexico-U.S. Group of Experts on Technical and Financial issues to support National Determined Contributions, to analyze the possibility that the U.S. may support some of Mexico’s technical and financial needs in this regard. Mexico urgently needs appropriate technologies to reduce both GHG and black carbon emissions. Until now, Mexico relies mostly on its own domestic resources to finance its needs in this area. According to a recent study, during the period 2014-2018, Mexico’s external financing related to climate change totalized \$61,165,646,524 Mexican Pesos, loans that added to Mexico’s external debt, which came mainly from two sources: the Interamerican Development Bank (IDB) with 53% and the German Development Bank (KfW) with 31%.⁴⁸

This Group should be coordinated by the State Department and the *Secretaría de Relaciones Exteriores*, with the participation of all relevant departments and agencies of both governments.

⁴⁵ [Proposed Rule - Phasedown of Hydrofluorocarbons: Establishing the Allowance Allocation and Trading Program under the AIM Act | Protecting Our Climate by Reducing Use of HFCs | US EPA.](#)

⁴⁶William C. Schillaci, *Most Industry Stakeholders Support HFC Reduction Bill*, EHS Daily Advisor, 5 February 2021, <https://ehsdailyadvisor.blr.com/2020/02/most-industry-stakeholders-support-hfc-reduction-bill/>.

⁴⁷ [EPA Moves Forward with Phase Down of Climate-Damaging Hydrofluorocarbons | U.S. EPA News Releases | US EPA.](#) More information on the new refrigerant options is at <https://www.epa.gov/snap>.

⁴⁸ GFLAC, *Análisis de Presupuesto Internacional y Nacional Público para Cambio Climático*, Alianza Mexicana Alemana de Cambio Climático, México, Noviembre 2018.