ANNEX 5 Assessment of the Sources and Sinks of Greenhouse Gas Emissions Not Included

Although this report is intended to be a comprehensive assessment of anthropogenic[127] sources and sinks of greenhouse gas emissions for the United States, certain sources have been identified but not included in the estimates presented for various reasons. Before discussing these sources and sinks, it is important to note that processes or activities that are not *anthropogenic in origin* or do not result in a *net source or sink* of greenhouse gas emissions are intentionally excluded from a national inventory of anthropogenic greenhouse gas emissions, in line with guidance from the IPCC in their guidelines for national inventories.

The anthropogenic source and sink category of greenhouse gas emissions described in this annex are not included in the U.S. national inventory estimates. The reasons for not including that source in the national greenhouse gas Inventory include one or more of the following:

- Emissions are not likely to occur within the United States.
- A methodology for estimating emissions from a source does not currently exist.
- Though an estimating method has been developed, adequate data are not currently available to estimate emissions.
- Emissions are determined to be insignificant in terms of overall national emissions, as defined per UNFCCC reporting guidelines, based on available data or a preliminary assessment of significance. Further, data collection to estimate emissions would require disproportionate amount of effort (e.g., dependent on additional resources and impacting improvements to key categories, etc.).

In general, data availability remains the primary constraint for estimating and including the emissions and removals from source and sink categories that do occur within the United States and are not estimated, as discussed further below. Methods to estimate emissions and removals from these categories are available in the *2006 IPCC Guidelines*. Many of these categories are insignificant in terms of overall national emissions based on available proxy information, qualitative information on activity levels per national circumstances, and/or expert judgment, and not including them introduces a very minor bias.

Reporting of inventories to the UNFCCC under Decision 24/CP.19 states that "Where methodological or data gaps in inventories exist, information on these gaps should be presented in a transparent manner." Furthermore, these reporting guidelines allow a country to indicate if a disproportionate amount of effort would be required to collect data for a gas from a specific category that would be insignificant in terms of the overall level and trend in national emissions.[128] Specifically, where the notation key "NE," meaning not estimated, is used in the Common Reporting Format (CRF)[129] tables that accompany this Inventory report submission to the UNFCCC, countries are required to further describe why such emissions or removals have not been estimated (UNFCCC 2013).

Based on the latest UNFCCC reporting guidance, the United States is providing more information on the significance of these excluded categories below and aims to update information on the significance to the extent feasible during each annual compilation cycle. Data availability may impact the feasibility of undertaking a quantitative significance assessment. The United States is continually working to improve the understanding of such sources or sinks and seeking to find the data required to estimate related emissions, prioritizing efforts and resources for significant categories. As such improvements are implemented, new emission and removal categories will be quantified and included in the Inventory to enhance completeness of the Inventory.

[127] The term "anthropogenic," in this context, refers to greenhouse gas emissions and removals that are a direct result of human activities or are the result of natural processes that have been affected by human activities (*2006 IPCC Guidelines for National Greenhouse Gas Inventories*).

[128] Paragraph 37(b) of Decision 24/CP.19 "Revision of the UNFCCC reporting guidelines on annual inventories for Parties included in Annex I to the Convention." See <http://unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf>.

[129] See <http://unfccc.int/national_reports/annex_i_ghg_inventories/reporting_requirements/items/2759.php>.

The full list of sources and sink categories not estimated, along with explanations for their exclusion, is provided in Table 9 of the CRF submission. Information on coverage of activities within the United States and its territories is provided within the sectoral chapters and category-specific estimate discussions and will be updated further in this Annex in the next Inventory and future submissions as part of ongoing improvement efforts.

Source and Sink Categories Not Estimated

The following section is arranged by sector and source or sink category, providing additional information on the reasons the category was not estimated. Per 37(b) of the UNFCCC Reporting Guidelines Decision 24/CP.19, considering overall level and trend of U.S. emissions, the threshold for significance for estimating emissions from a specific category is 500 kt CO_2 Eq. Estimates for the insignificant sources have not been provided in prior inventory submissions.

Energy

CRF Category 1.A.3: CH_4 and N_2O Emissions from Transport and Mobile Fuel Combustion—Biomass

Nitrous oxide emissions from biomass fuel use in domestic aviation (1.A.3.a) and N_2O and CH_4 emissions from biomass fuel use in motorcycles (1.A.3.b.iv), railways (1.A.3.c), domestic navigation (1.A.3.d) and other transportation - non-transportation mobile (1.A.3.e.ii) sources are not currently estimated.

Prior to 2011, no biobased jet fuel was assumed to be used for domestic aviation. Between 2011 and 2015, 22 airlines have performed over 2,500 commercial passenger flights with blends of up to 50 percent biojet fuel. Furthermore, several airlines have concluded long-term offtake agreements with biofuel suppliers.[130] An analysis was conducted based on the total annual volumes of fuels specified in the long-term agreements. Emissions of N_2O were estimated based on the factors for jet fuel combustion, and as for jet fuel use in commercial aircraft, contributions of methane (CH_4) emissions are reported as zero. It was determined that annual non-CO_2 greenhouse gas emissions from the volume of fuel used would be 16.4 kt CO_2 Eq. per year, so considered insignificant for the purposes of inventory reporting under the UNFCCC.

There are no readily available data sources to estimate the use of biofuel in rail, navigation and non-transportation mobile sources. These sources represent about 30 percent of all diesel fuel use and about 5 percent of all gasoline fuel use. An assumption can be made that these sources consume that same percentage of biofuels (30 percent of all biodiesel and 5 percent of all ethanol use). Based on that assumption for biofuel use and fossil fuel N_2O and CH_4 factors results in 287 kt CO_2 Eq. emissions per year, so considered insignificant for the purposes of inventory reporting under the UNFCCC.

CRF Category 1.A.3.d: CO_2 Emissions from Domestic Navigation—Gaseous Fuels

Emissions from gaseous fuels use in domestic navigation are not currently estimated. Gaseous fuels are used in liquid natural gas (LNG) tankers and are being demonstrated in a small number of other ships. Data are not available to characterize these uses currently.

CRF Category 1.A.3.e.i: CO_2, CH_4, and N_2O Emissions from Liquid Fuels and CH_4 and N_2O Emissions from Gaseous Fuels in Other Transportation—Pipeline Transport

Use of liquid fuels to power pipeline pumps is uncommon, but has occurred. Data for fuel used in various activities including pipelines are based on survey data conducted by the U.S. Energy Information Association (EIA). From January 1983 through December 2009, EIA Survey data including information on liquid fuel used to power pipelines, it was reported in terms of crude oil product supplied. Reporting of crude oil used for this purpose was discontinued after December 2009. Beginning with data for January 2010, product supplied for pipeline fuel is assumed to equal zero. 1997 was the last year of data reported on pipeline fuel. Taking the data reported for 1997 of 797,000 barrels of crude oil and using conversion factors of 5.8 MMBtu/bbl and 20.21 MMT C/Qbtu results in emissions of 342.6 kt CO_2.

CO_2 emissions from gaseous fuels used as pipeline transport fuel are estimated in the Inventory, however CH_4 and N_2O emissions from gaseous pipeline fuel use have not been estimated. The CO_2 / non-CO_2 emissions split for other natural gas combustion can be used to estimate emissions. Based on that analysis, non-CO_2 emissions represent

[130] See <https://www.iata.org/pressroom/facts_figures/fact_sheets/Documents/fact-sheet-alternative-fuels.pdf>.

approximately 0.43 percent of CO_2 emissions from natural gas combustion. If that percentage is applied to CO_2 emissions from natural gas use as pipeline fuel, it results in an emissions estimate of 179.6 kt CO_2 Eq. in 2017.

CRF Category 1.A.5.a: CO_2 Emissions from Medical Waste Incineration

The category 1.A.5.a Other Stationary sources not specified elsewhere includes emissions from waste incineration of the municipal waste stream and waste tires. The category also includes emissions from non-energy uses of fuels which includes an energy recovery component that includes emissions from waste gas; waste oils, tars, and related materials from the industrial sector. While this is not a comprehensive inclusion of hazardous industrial waste, it does capture a subset.

A portion of hazardous industrial waste not captured is from medical waste. However, a conservative analysis was conducted based on a study of hospital/medical/infectious waste incinerator (HMIWI) facilities in the United States[131] showing that medical waste incineration emissions could be considered insignificant. The analysis was based on assuming the total amount of annual waste throughput was of fossil origin and an assumption of 68.9 percent carbon composition of the waste. It was determined that annual greenhouse gas emissions for medical waste incineration are approximately 333 kt CO_2 Eq. per year, so considered insignificant for the purposes of inventory reporting under the UNFCCC.[132]

CRF Category 1.A.5.a: CH_4 and N_2O Emissions from Stationary Fuel Combustion—Biomass in U.S. Territories

Data are not available to estimate emissions from biomass in U.S. Territories. However, biomass consumption is likely small in comparison with other fuel types. An estimate of non-CO_2 emissions from biomass fuels used in Territories can be made based on assuming the same ratio of domestic biomass non-CO_2 emissions to fossil fuel CO_2 emissions. Non-Territories data indicate that biomass non-CO_2 emissions represents 0.2 percent of fossil fuel combustion CO_2 emissions. Appling this same percentage to U.S. Territories fossil fuel combustion CO_2 emissions results in 74.8 kt CO_2 Eq. emissions from biomass in U.S. Territories.

CRF Category 1.B.1.a.1.i and 1.B.1.a.1.ii: CO_2 from Fugitive Emissions from Underground Coal Mining Activities and Post-Mining Activities

A preliminary analysis by EPA determined that CO_2 emissions for active underground coal mining activities are negligible. The analysis was based on gas composition data from three active underground mines in three different states.[133] An average ratio of CO_2 to CH_4 composition in mine gas was derived for active underground mines. This ratio was applied as a percentage (0.4 percent) to CH_4 emission estimates to derive an estimate of CO_2 emissions for active underground mines (including post-mining activities). Applying a CO_2 emission rate as a percentage of CH_4 emissions for active coal mines results in a national emission estimate of 177 kt CO_2 Eq. per year, which is considered insignificant for the purposes of inventory reporting under the UNFCCC. Future inventories may quantify these emissions, if it is deemed it will not require a disproportionate amount of effort.

CRF Category 1.B.1.a.1.iii: CO_2 from Fugitive Emissions from Abandoned Underground Coal Mines

A preliminary analysis by EPA determined that CO_2 emissions for abandoned underground coal mining activities are negligible. The analysis was based on gas composition data from two abandoned underground mines in two different states.[134] An average ratio of CO_2 to CH_4 composition in mine gas was derived for abandoned mines. This ratio was applied as a percentage (1.5 percent) to CH_4 emission estimates to derive an estimate of CO_2 emissions for abandoned mines. Applying a CO_2 emission rate as a percentage of CH_4 emissions for abandoned coal mines results in a national emission estimate below 93 kt CO_2 Eq. per year, which is considered insignificant for the purposes of inventory reporting

[131] RTI 2009. Updated Hospital/Medical/Infectious Waste Incinerator (HMIWI) Inventory Database.
[132] Paragraph 37(b) of Decision 24/CP.19 "Revision of the UNFCCC reporting guidelines on annual inventories for Parties included in Annex I to the Convention." See <http://unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf>.
[133] Ruby Canyon Engineering 2008. "Accounting for Carbon Dioxide Emissions in the Coal Emissions Inventory". Memorandum from Ruby Canyon Engineering to EPA.
[134] Ibid.

under the UNFCCC. Future inventories may quantify these emissions, if it is deemed it will not require a disproportionate amount of effort.

CRF Category 1.B.1.a.2.i and 1.B.1.a.2.ii: CO_2 from Fugitive Emissions from Surface Coal Mining Activities and Post-Mining Activities

A preliminary analysis by EPA determined that CO_2 emissions for active surface coal mining activities are negligible. The analysis was based on gas composition data from three active underground mines in three different states.[135] An average ratio of CO_2 to CH_4 composition in mine gas was derived for surface mines (including post-mining activities). This estimate for CO_2 is considered conservative, as surface mining fugitive emissions of CH_4 are significantly lower than those from underground coal mines. This ratio was applied as a percentage (0.4 percent) to CH_4 emission estimates to derive an estimate of CO_2 emissions for surface mines (including post-mining activities). Applying a CO_2 emission rate as a percentage of CH_4 emissions for surface coal mines results in a national emission estimate of 34 kt CO_2 Eq. per year, which is considered insignificant for the purposes of inventory reporting under the UNFCCC. Future inventories may quantify these emissions, if it is deemed it will not require a disproportionate amount of effort.

CRF Category 1.B.2.a.5: CO_2 and CH_4 from Fugitive Emissions from the Distribution of Oil

Emissions from the distribution of oil products are not currently estimated due to lack of available emission factors.

Industrial Processes and Product Use

CRF Category 2.A.4.a: CO_2 Emissions from Process Uses of Carbonates–Ceramics

Data are not currently available to estimate emissions from this source. During the Expert Review process for compilation of the current inventory, EPA sought expert solicitation on data for carbonate consumption in the ceramics industry but has yet to identify data sources to apply Tier 1 methods to proxy emissions and assess significance.

CRF Category 2.A.4.c: CO_2 Emissions from Process Uses of Carbonates–Non-metallurgical Magnesium Production

Data are not currently available to estimate emissions from this source. During the Expert Review process for compilation of the current inventory, EPA sought expert solicitation on data for non-metallurgical magnesium production but has yet to identify data sources to apply Tier 1 methods to proxy emissions and assess significance.

CRF Category 2.B.4.b: CO_2 and N_2O Emissions from Glyoxal Production

Glyoxal production data are not readily available to estimate emissions from this source to apply Tier 1 methods. EPA continues to conduct basic outreach to relevant trade associations and reviewing potential databases that can be purchased and contain the necessary data. Outreach this year did not identify potential data sources. Any further progress on outreach will be included in next (i.e., 1990 through 2019) Inventory report.

CRF Category 2.B.4.c: CO_2 and N_2O Emissions from Glyoxylic Acid Production

Data on national glyoxylic acid production data are currently not available to estimate emissions from this source using Tier 1 methods and then assess significance. EPA is conducting basic outreach to relevant trade associations reviewing potential databases that can be purchased and contain the necessary data. Outreach this year did not identify potential data sources. Any further progress on outreach will be included in next (i.e., 1990 through 2019) Inventory report.

CRF Category 2.B.5.b CH_4 Emissions from Calcium Carbide

Data are not currently available to estimate CH_4 emissions from this source. It is difficult to obtain production data from trade associations and trade publications. This information is not collected by USGS, the agency that collects information on silicon carbide. EPA has initiated some research to obtain data from the limited production facilities in

[135] Ibid.

the United States (less than 5). In addition, during the Expert Review process for compilation of the current inventory, EPA sought expert solicitation on production data for this source, but has yet to identify data sources to apply Tier 1 methods to proxy emissions and assess significance. Carbon dioxide emissions from calcium carbide are implicitly accounted for in the storage factor calculation for the non-energy use of petroleum coke in the Energy chapter.

CRF Category 2.B.8.d: CO_2 recovered from Petrochemical and Carbon Black Production

GHGRP has preliminary data for reporting years 2010 through 2016 on the amount of CO_2 recovery occurring at petrochemical facilities from ethylene oxide processes. Due to schedule and resource constraints, data have not been compiled and need to be reviewed to better understand available data to estimate these recovered emissions.

CRF Category 2.C.1.c: CH_4 Emissions from Direct Reduced Iron (DRI) Production

Data on fuel consumption used in the production of DRI are not readily available to apply the IPCC default Tier 1 CH_4 emission factor or develop any proxy analysis. The emissions are assumed to be insignificant but this analysis will be updated in future Inventory submissions to quantitatively justify emissions reporting as "not estimated." Neither the emissions nor underlying activity data are reported to EPA through its facility-level mandatory Greenhouse Gas Reporting Program (GHGRP).

CRF Category 2.E.2: Fluorinated Gas Emissions from Electronics Industry—TFT Flat Panel Displays

In addition to requiring reporting of emissions from semiconductor manufacturing, micro-electro-mechanical systems (MEMs), and photovoltaic cells, EPA's GHGRP requires the reporting of emissions from the manufacture of flat panel displays. However, no flat panel displays manufacturing facilities have ever reported to EPA's GHGRP, indicating that there are no facilities in the United States that have exceeded the GHGRP's applicability threshold for display manufacturers since 2010. The available information on this sector indicate these emissions are well below the significance threshold.[136] Per this published literature, the United States has never been significant display manufacturer aside from a small amount of manufacturing in the 1990s, but not mass production.

CRF Category 2.G: SF_6 and PFC Emissions from Other Product Use

Emissions of SF_6 occur from particle accelerators and military applications, and emissions of PFCs and other F-GHGs occur from military applications such as use of fluorinated heat transfer fluids (HTFs). Emissions from some particle accelerators and from military applications are reported by the U.S. government to the Federal Energy Management Program along with emissions of other fluorinated greenhouse gases (e.g., HFCs from mobile and stationary air conditioning) under the categories "Fugitive Fluorinated Gases and Other Fugitive Emissions" and "Industrial Process Emissions." Analysis of the underlying data for 2018 indicated "fugitive" emissions of SF_6 of approximately 600 kt CO_2 Eq. from the U.S. government as a whole, and "process" emissions of SF_6 of approximately 100 kt CO_2 Eq. (Emissions of SF_6 that are known to be accounted for elsewhere, such as under Electrical Transmission and Distribution, have been excluded from these totals.) The sources of the "fugitive" emissions of SF_6 were not identified, but the source of the vast majority of "process" emissions of SF_6 was particle accelerators. Fugitive emissions of approximately 200 kt CO_2 Eq. of compounds that are commonly used as fluorinated HTFs (HFEs and fully fluorinated compounds) were also reported. EPA plans to contact reporting agencies to better understand the sources of the emissions and the estimation methods used by reporters, which may equate emissions to consumption and therefore over- or underestimate some emissions, depending on the circumstances. This step will help EPA improve its assessment of significance and prioritize incorporating estimates in future Inventory submissions.

Agriculture

CRF Category 3.A.4: CH_4 Emissions from Enteric Fermentation—Camels

Enteric fermentation emissions from camels are not estimated because there is no significant population of camels in the United States. Due to limited data availability (no population data are available from the Agricultural

[136] The Display Industry: Fast to Grow, Slow to Change Article in Information Display 28(5):18-21 · May 2012 with 4. DOI: 10.1002/j.2637-496X.2012.tb00504.x The Display Industry: Fast to Grow, Slow to Change. Available online at: <http://archive.informationdisplay.org/id-archive/2012/may-june/display-marketplace-the-display-industry-fast-to>.

Census), the estimates are based on use of IPCC defaults and population data from Baum, Doug (2010).[137] Based on this paper, a Tier 1 estimate of enteric fermentation CH_4 emissions from camels results in a value of approximately 2.8 kt CO_2 Eq. per year from 1990 to 2018. Given insignificance of these emissions in terms of the overall level and trend in national emissions, there are no immediate improvement plans to include this emission category.

CRF Category 3.A.4: CH_4 Emissions from Enteric Fermentation—Poultry

No IPCC method has been developed for determining enteric fermentation CH_4 emissions from poultry. Based on expert input, developing of a country-specific method would require a disproportionate amount of resources given the magnitude of this source category.

CRF Category 3.B.1.4 and 3.B.2: CH_4 and N_2O Emissions from Manure Management—Camels

Manure management emissions from camels are not estimated because there is no significant population of camels in the United States.[138] Due to limited data availability and disproportionate effort to collect [time-series] data (i.e., no population data is available from the Agricultural Census), this estimate is based on population data from Baum, Doug (2010).[139] Based on this paper, a Tier 1 estimate of manure management CH_4 and N_2O emissions from camels results in values between approximately 0.14 kt CO_2 Eq. per year from 1990 to 2016. Given insignificance of these emissions in terms of the overall level and trend in national emissions, there are no immediate improvement plans to include this emission category.

CRF Category 3.F.1.4 and 3.F.4: CH_4 and N_2O Emissions from Field Burning of Agricultural Residues—Sugarcane

Remote sensing data were used in combination with a resource survey to estimate non-CO_2 emissions from agricultural residue burning. These data did not allow identification of burning of sugarcane. This potential gap in the activity data will be re-evaluated in a future inventory using other datasets.

Land Use, Land-Use Change, and Forestry

CRF Category 4.A(II): CO_2 and CH_4 Emissions from Rewetted Organic and Mineral Soils in Forest Land

Emissions from this source may be estimated in future Inventories when data necessary for classifying the area of rewetted organic and mineral soils become available.

CRF Category 4.A(III): Direct N_2O Emissions from N mineralization/immobilization in *Forest Land Remaining Forest Land*

Direct N_2O emissions from N mineralization/immobilization associated with loss or gain of soil organic matter resulting from change of land use or management of mineral soils will be estimated in a future Inventory. They are not estimated currently because resources have limited EPA's ability to use the available data on soil carbon stock changes on forest lands to estimate these emissions.

CRF Category 4.B(II): CO_2 and CH_4 Emissions and Removals from Drainage and Rewetting of Organic and Mineral Soils in Cropland

Emissions of CO_2 and CH_4 from rewetting on mineral or organic cropland soils are not currently estimated due to lack of activity data on rewetting, except for CH_4 emissions from drainage and rewetting for rice cultivation.

[137] *The status of the camel in the United States and America*. Available online at: <https://www.soas.ac.uk/camelconference2011/file84331.pdf>.
[138] Paragraph 37(b) of Decision 24/CP.19 "Revision of the UNFCCC reporting guidelines on annual inventories for Parties included in Annex I to the Convention." See <http://unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf>.
[139] *The status of the camel in the United States and America*. Available online at: <https://www.soas.ac.uk/camelconference2011/file84331.pdf>.

CRF Category 4.B.1 and 4.B.2: Carbon Stock Change in Perennial Living Biomass and Dead Organic Matter in *Cropland Remaining Cropland* and *Land Converted to Cropland*

Carbon stock change in living biomass and dead organic matter are not estimated, other than for forest land converted to cropland, because data are currently not available. The impact of management on perennial biomass C is currently under investigation for agroforestry management and will be included in a future Inventory if stock changes are significant and activity data can be compiled for this source.

CRF Category 4.B.1(V) and 4.B.2(V): CO_2 Emissions from Perennial Biomass Burning in *Cropland Remaining Cropland* and *Land Converted to Cropland*— Wildfires and Controlled Burning

The CO_2 emissions from controlled burning of crop biomass are not estimated as they are part of the annual cycle of C and not considered net emissions. Methane and N_2O emissions are included under 3.F Field Burning of Agricultural Residues. Emissions from wildfires are not estimated because the activity data on fire area and fuel load, particularly for perennial vegetation, are not available.

CRF Category 4.C.2: Carbon Stock Change in Living Biomass and Dead Organic Matter in *Land Converted to Grassland*

Carbon stock change in living biomass and dead organic matter are not estimated, other than for forest land converted to grassland, because data are currently not available. The impact of management on perennial biomass C is currently under investigation for agroforestry management and will be included in a future Inventory if stock changes are significant and activity data can be compiled for this source.

CRF Category 4.C(II): CO_2 and CH_4 Emissions and Removals from Drainage and Rewetting of Organic and Mineral Soils in Grassland

Emissions of CH_4 from drainage and CO_2 and CH_4 from rewetting on mineral or organic Grassland soils are not currently estimated due to lack of activity data.

CRF Category 4.D(II): CO_2, CH_4, and N_2O Emissions and Removals from Drainage and Rewetting and Other Management of Organic and Mineral Soils in Wetlands—Flooded Lands and Peat Extraction Lands

Data are currently not available to estimate emissions from rewetting of peat extraction lands and flooded lands.

CRF Category 4.D.1(V) and 4.D.2(V): CO_2, CH_4, and N_2O Emissions from Biomass Burning in Wetlands— Wildfires and Controlled Burning

Data are not currently available to estimate emissions from biomass burning in Wetlands.

CRF Category 4.D.1.2: Carbon Stock Change in *Flooded Land Remaining Flooded Land*

Carbon stock changes in flooded land remaining flooded land are not estimated due to lack of activity data, other than for peatlands and coastal wetlands. See the Wetlands chapter in the Inventory report.

CRF Category 4.E: CO_2, CH_4, and N_2O Emissions from Biomass Burning in Settlements

Data are currently not available to estimate emissions from biomass burning in Settlements.

CRF Category 4.E.1(II) and 4.E.2(II): Direct N_2O Emissions from Nitrogen Mineralization/Immobilization in *Settlements Remaining Settlements* and *Land Converted to Settlements*

Activity data are not available on N_2O emissions from nitrogen mineralization/immobilization in *Settlements Remaining Settlements* and *Land Converted to Settlements* as a result of soil organic carbon stock losses from land use conversion and management.

Waste

CRF Category 5.A.1.a: CH_4 and N_2O Emissions from Solid Waste Disposal/Managed Waste Disposal Sites-Anaerobic

The amount of CH_4 flared and the amount of CH_4 for energy recovery is not estimated for the years 2005 through 2018 in the time series. The amount of CH_4 flared and recovered for 2005 and each subsequent Inventory year, i.e., through 2018, is included in the net CH_4 emissions estimates. A methodological change was made for 2005 to the current Inventory year to use the directly reported net CH_4 emissions from the EPA's GHGRP versus estimate CH_4 generation and recovery. See the Methodology explanation in Section 7.1.

CRF Category 5.B.1.a: CH_4 and N_2O Emissions from Biological Treatment of Solid Waste/Composting – Municipal Solid Waste

The amount of CH_4 flared at composting sites is not estimated due to a lack of activity data.

CRF Category 5.B.2.a: CH_4 and N_2O Emissions from Biological Treatment of Solid Waste – Anaerobic Digestion at Biogas Facilities – Municipal Solid Waste and Other

Methane and N_2O emissions from anaerobic digestion of municipal solid waste at biogas facilities are not currently estimated. Basic research was initiated that indicate some activity for this category is occurring in the United States, but EPA needs to conduct further research on available multi-year activity data to create a time series. Initial data for 2015 indicates emissions of 7.8 kt of CH_4. Pending additional resources, EPA will continue researching availability of activity data and feasibility to report these emissions and report on progress in future Inventory submissions.

CRF Category 5.D.2: N_2O Emissions from Wastewater Treatment and Discharge—Industrial Wastewater

Nitrous oxide emissions from stand-alone industrial wastewater treatment are not currently estimated. Per section 6.3.4 of *2006 IPCC Guidelines*: "The methodology does not include N_2O emissions from industrial sources, except for industrial wastewater that is co-discharged with domestic wastewater into the sewer system. The N_2O emissions from industrial sources are believed to be insignificant compared to emissions from domestic wastewater." EPA may undertake voluntary efforts to review the *2019 Refinement to the 2006 IPCC Guidelines* which contain a methodology for estimating N_2O emissions from Industrial Wastewater for incorporation in a future submissions. This improvement will be prioritized with other improvements to make best use of available data and resources.

Assessment of Aggregated Not Estimated Emission Sources and Sinks

A summary of these exclusions, including the estimated level of emissions where feasible, is included in Table A-251. Collectively, per paragraph 37(b) of the UNFCCC Reporting Guidelines noted above, it is likely that these exclusions should not exceed 0.1 percent of gross emissions, or 6.7 MMT CO_2 Eq. (6,676.7 kt CO_2 Eq.).

Table A-251: Summary of Sources and Sinks Not Included in the Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2018

CRF Category Number	Source/Sink Category	Sub-Category	Gas(es)	Estimated 2018 Emissions (kt CO_2 Eq.)	Reason for Exclusion
Energy					
1.A Fossil Fuel Combustion					
1.A.3.a	Transport	Domestic Aviation-Biomass	N_2O	16.4	Data availability
1.A.3.b.iv	Transport	Motorcycles-Biomass	CH_4 and N_2O	NQ	Data availability
1.A.3.c	Transport	Railways-Biomass	CH_4 and N_2O	NQ	Data availability
1.A.3.d	Transport	Domestic Navigation-Biomass	CH_4 and N_2O	NQ	Data availability
1.A.3.d	Transport	Domestic Navigation—Gaseous Fuels	CO_2	NQ	Data availability
1.A.3.e.i	Other Transportation	Pipeline Transport—Liquid Fuels	CO_2, CH_4 and N_2O	343	Data availability
1.A.3.e.i	Other Transportation	Pipeline Transport—Gaseous Fuels	CO_2, CH_4 and N_2O	180	Data availability
1.A.3.e.ii	Other Transportation	Non-Transportation Mobile-Biomass	CH_4 and N_2O	NQ	Data availability
1.A.5.a	Incineration of Waste	Medical Waste Incineration	CO_2	333	Data availability
1.A.5.a	Stationary Fuel Combustion	Biomass in U.S. Territories	CH_4 and N_2O	75	Data availability
1.B Fugitive Emissions from Fuels					
1.B.1.a.1.i, 1.B.1.a.1.ii	Underground Mines	Fugitive Emissions from Underground Coal Mining Activities and Post-Mining Activities	CO_2	177	Emissions negligible
1.B.1.a.1.iii	Abandoned Underground Coal Mines	Fugitive Emissions from Abandoned Underground Coal Mines	CO_2	94	Emissions negligible
1.B.1.a.2	Surface Mines	Fugitive Emissions from Surface Coal Mining Activities and Post-Mining Activities	CO_2	34	Emissions negligible
1.B.2.a.5	Oil	Distribution of Oil Products	CO_2 and CH_4	NQ	Lack of emission factor data
Industrial Processes and Product Use					
2.A Mineral Industry					
2.A.4.a	Other Process Uses of Carbonates	Ceramics	CO_2	NQ	Data availability
2.A.4.c	Other Process Uses of Carbonates	Non-metallurgical Magnesium Production	CO_2	NQ	Data availability
2.B. Chemical Industry					
2.B.4.b	Glyoxal Production		CO_2 and N_2O	NQ	Data availability
2.B.4.c	Glyoxylic Acid Production		CO_2 and N_2O	NQ	Data availability
2.B.5.b	Calcium Carbide		CH_4	NQ	Data availability
2.C. Metal Industry					
2.C.1.c	Iron and Steel Production	Direct Reduced Iron (DRI) Production	CH_4	NQ	Data availability
2.E Electronics Industry					

2.E.2	Fluorinated Gas Emissions from Electronics Industry	TFT Flat Panel Displays	HFCs, PFCs, SF_6, and NF_3	NQ	Data availability
2.G Other					
2.G.2	Other Product Manufacture and Use	SF_6 and PFCs from Other Product Use	SF_6	900	Data availability
Agriculture					
3.A Livestock					
3.A.4	Enteric Fermentation	Camels	CH_4	3	No significant camel population in U.S.
3.A.4	Enteric Fermentation	Poultry	CH_4	No method	*2006 IPCC Guidelines do not provide a method.*
3.B.1.4, 3.B.2	Manure Management	Camels	CH_4 and N_2O	+	No significant camel population in U.S.
3.F Field Burning of Agricultural Residues					
3.F.1.4, 3.F.4	Field Burning of Agricultural Residues	Sugarcane	CH_4 and N_2O	NQ	Data availability
Land Use, Land-Use Change, and Forestry					
4.A Forest Land					
4.A(II)	Forest Land	Emissions and Removals from Rewetting of Organic and Mineral Soils	CO_2 and CH_4	NQ	Data availability
4.A.1	Forest Land Remaining Forest Land	N mineralization/immobilization	N_2O	NQ	Data availability
4.B Cropland					
4.B(II)	Cropland	Emissions and Removals from Rewetting of Organic and Mineral Soils	CO_2 and CH_4	NQ	Data availability
4.B.1	Cropland Remaining Cropland	Carbon Stock Change in Living Biomass and Dead Organic Matter	CO_2	NQ	Data availability
4.B.1(V)	Cropland Remaining Cropland	Biomass Burning—Controlled Burning	CO_2	NQ	Data availability
4.B.1(V)	Cropland Remaining Cropland	Biomass Burning—Wildfires	CO_2, CH_4, and N_2O		Data availability
4.B.2	Land Converted to Cropland	Carbon Stock Change in Perennial Living Biomass and Dead Organic Matter	CO_2	NQ	Data availability
4.B.2(V)	Land Converted to Cropland	Biomass Burning—Wildfires and Controlled Burning	CO_2	NQ	Data availability
4.C Grassland					
4.C(II)	Grassland	Emissions and Removals from Rewetting of Organic and Mineral Soils	CO_2 and CH_4	NQ	Data availability

4.C.2	Grassland	Carbon Stock Change in Living Biomass and Dead Organic Matter in *Land Converted to Grassland*	CO_2	NQ	Data availabilty
4.D Wetlands					
4.D(II)	Wetlands—Flooded Lands and Peat Extraction Lands	Emissions and Removals from Drainage and Rewetting and Other Management of Organic and Mineral Soils	CO_2, CH_4, and N_2O	NQ	Data availability
4.D.1(V)	Wetlands Remaining Wetlands	Biomass Burning: Controlled Burning, Wildfires	CO_2, CH_4, and N_2O	NQ	Data availability
4.D.1.2	Flooded Land Remaining Flooded Land	Carbon Stock Change	CO_2	NQ	Data availability
4.D.2(V)	Land Converted to Wetlands	Biomass Burning: Controlled Burning, Wildfires	CO_2, CH_4, and N_2O	NQ	Data availability
4.E Settlements					
4.E(V)	Settlements	Biomass Burning Settlements	CO_2, CH_4, and N_2O	NQ	Data availability
4.E.1	Settlements	Settlements Remaining Settlements	CH_4	NQ	Data availability
4.E.1	Settlements Remaining Settlements	Direct N_2O Emissions from N Mineralization/Immobilization (Mineral Soils)	N_2O	NQ	Data availability
4.E.2	Land Converted to Settlements	Direct N_2O Emissions from N Mineralization/Immobilization	N_2O	NQ	Data availability
4.F Other Land					
4.F(V)	Biomass Burning	Other Land	CO_2, CH_4, and N_2O	NQ	Data availability
Waste					
5.D Wastewater Treatment					
5.B.2.a and b	Biological Treatment of Solid Waste	Anaerobic Digestion at Biogas Facilities—Municipal Solid Waste and Other	CH_4 and N_2O	8	Data availability
5.D.2	Wastewater Treatment and Discharge	Industrial Wastewater	N_2O	No method	*2006 IPCC Guidelines* do not provide a method.

NQ (Quantified estimate not available due to insufficient data)

+ Less than 0.5 kt CO_2 Eq.