# ANNEX 1 Key Category Analysis

The United States has identified national key categories based on the estimates presented in this report. The *2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories* (IPCC 2006) describes a key category as a "[category] that is prioritized within the national inventory system because its estimate has a significant influence on a country's total inventory of greenhouse gases in terms of the absolute level, the trend, or the uncertainty in emissions and removals." By definition, key categories are sources or sinks that have the greatest contribution to the absolute overall level of national emissions in any of the years covered by the time series. In addition, when an entire time series of emission estimates is prepared, a determination of key categories must also account for the influence of the trends of individual categories. Therefore, a trend assessment is conducted to identify source and sink categories for which significant uncertainty in the estimate would have considerable effects on overall emission trends. Finally, a qualitative evaluation of key categories should be performed, in order to capture any key categories that were not identified in either of the quantitative analyses, but can be considered key because of the unique country-specific estimation methods.

The methodology for conducting a key category analysis, as defined by the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (IPCC 2006), includes:

- Approach 1 (including both level and trend assessments);
- Approach 2 (including both level and trend assessments, and incorporating uncertainty analysis); and
- Qualitative approach.

This Annex presents an analysis of key categories, both for sources only and also for sources and sinks (i.e., including Land Use, Land-Use Change and Forestry [LULUCF]); discusses Approach 1, Approach 2, and qualitative approaches to identifying key categories; provides level and trend assessment equations; and provides a brief statistical evaluation of IPCC's quantitative methodologies for defining key categories. Table A-1 presents the key categories for the United States (including and excluding LULUCF categories) using emissions and uncertainty data in this report, and ranked according to their sector and global warming potential (GWP)-weighted emissions in 2017. The table also indicates the criteria used in identifying these categories (i.e., level, trend, Approach 1, Approach 2, and/or qualitative assessments).

## Table A-1: Key Source Categories for the United States (1990-2017)

| IPCC Source/Sink Categories | Greenhouse Gas | Approach 1 | | | | Approach 2 | | | | Qual[a] | 2017 Emissions (MMT $CO_2$ Eq.) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Level Without LULUCF | Trend Without LULUCF | Level With LULUCF | Trend With LULUCF | Level Without LULUCF | Trend Without LULUCF | Level With LULUCF | Trend With LULUCF | | |
| **Energy** | | | | | | | | | | | |
| $CO_2$ Emissions from Mobile Combustion: Road | $CO_2$ | • | • | • | • | • | • | • | • | | 1,493.6 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Electricity Generation | $CO_2$ | • | • | • | • | • | • | • | • | | 1,210.0 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Electricity Generation | $CO_2$ | • | • | • | • | • | • | • | • | | 505.1 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Industrial | $CO_2$ | • | • | • | • | • | • | • | • | | 486.0 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Industrial | $CO_2$ | • | • | • | • | • | • | • | • | | 276.4 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Residential | $CO_2$ | • | | • | | • | | • | | | 242.1 |
| $CO_2$ Emissions from Mobile Combustion: Aviation | $CO_2$ | • | • | • | • | • | | | | | 177.0 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Commercial | $CO_2$ | • | • | • | • | • | • | | | | 173.6 |
| $CO_2$ Emissions from Non-Energy Use of Fuels | $CO_2$ | • | | • | | • | | • | | | 124.6 |
| $CO_2$ Emissions from Mobile Combustion: Other | $CO_2$ | • | • | • | • | | | | | | 83.2 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Commercial | $CO_2$ | • | • | • | • | | | | | | 59.3 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Residential | $CO_2$ | • | • | • | • | • | • | | | | 56.4 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Industrial | $CO_2$ | • | • | • | • | • | • | • | • | | 55.1 |
| $CO_2$ Emissions from Mobile Combustion: Marine | $CO_2$ | • | • | • | • | | | | | | 40.4 |
| $CO_2$ Emissions from Stationary Combustion - Oil - U.S. Territories | $CO_2$ | • | • | • | • | | | | | | 34.3 |
| $CO_2$ Emissions from Natural Gas Systems | $CO_2$ | • | | • | | | | | | | 26.3 |
| $CO_2$ Emissions from Petroleum Systems | $CO_2$ | | • | | • | • | • | | • | | 23.3 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Electricity Generation | $CO_2$ | • | • | • | • | • | • | | • | | 18.5 |
| $CO_2$ Emissions from Stationary Combustion - Gas - U.S. Territories | $CO_2$ | | | | | | • | | | | 3.0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $CO_2$ Emissions from Stationary Combustion - Coal - Commercial | $CO_2$ | | • | | • | | | | | | 2.0 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Residential | $CO_2$ | | | | | | • | | • | | 0.0 |
| $CH_4$ Emissions from Natural Gas Systems | $CH_4$ | • | • | • | • | • | • | • | • | | 166.2 |
| Fugitive Emissions from Coal Mining | $CH_4$ | • | • | • | • | • | • | | • | | 62.6 |
| $CH_4$ Emissions from Petroleum Systems | $CH_4$ | • | | • | | • | • | | | | 37.7 |
| $CH_4$ Emissions from Abandoned Oil and Gas Wells | $CH_4$ | | | | | • | | • | | | 6.9 |
| Non-$CO_2$ Emissions from Stationary Combustion - Residential | $CH_4$ | | | | | • | • | | • | | 3.1 |
| $CH_4$ Emissions from Mobile Combustion: Other | $CH_4$ | | | | | | • | | | | 1.9 |
| Non-$CO_2$ Emissions from Stationary Combustion - Electricity Generation | $N_2O$ | | | | | • | | | | | 24.4 |
| $N_2O$ Emissions from Mobile Combustion: Road | $N_2O$ | • | • | • | • | | • | | • | | 12.1 |
| Non-$CO_2$ Emissions from Stationary Combustion - Industrial | $N_2O$ | | | | | • | | | | | 2.6 |
| International Bunker Fuels[b] | Several | | | | | | | | | • | 2.0 |
| **Industrial Processes and Product Use** | | | | | | | | | | | |
| $CO_2$ Emissions from Iron and Steel Production & Metallurgical Coke Production | $CO_2$ | • | • | • | • | • | • | • | • | | 41.8 |
| $CO_2$ Emissions from Cement Production | $CO_2$ | • | | • | • | | | | | | 39.4 |
| $CO_2$ Emissions from Petrochemical Production | $CO_2$ | • | • | • | • | | | | | | 28.2 |
| $N_2O$ Emissions from Adipic Acid Production | $N_2O$ | | • | | • | | | | | | 7.0 |
| Emissions from Substitutes for Ozone Depleting Substances | HiGWP | • | • | • | • | • | • | • | • | | 152.2 |
| HFC-23 Emissions from HCFC-22 Production | HiGWP | • | • | • | • | | • | | • | | 5.2 |
| $SF_6$ Emissions from Electrical Transmission and Distribution | HiGWP | • | • | | • | | • | | | | 4.3 |
| PFC Emissions from Aluminum Production | HiGWP | | • | | • | | • | | | | 1.1 |
| **Agriculture** | | | | | | | | | | | |
| $CO_2$ Emissions from Liming | $CO_2$ | | | | | | • | | | | 3.2 |
| $CH_4$ Emissions from Enteric Fermentation | $CH_4$ | • | • | • | • | • | | • | | | 175.4 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $CH_4$ Emissions from Manure Management | $CH_4$ | • | • | • | • | • | • | | • | | 61.7 |
| $CH_4$ Emissions from Rice Cultivation | $CH_4$ | | | | | • | • | | | | 11.3 |
| Direct $N_2O$ Emissions from Agricultural Soil Management | $N_2O$ | • | • | • | • | • | • | • | | | 227.7 |
| Indirect $N_2O$ Emissions from Applied Nitrogen | $N_2O$ | • | | • | | • | | • | | | 38.8 |
| **Waste** | | | | | | | | | | | |
| $CH_4$ Emissions from Landfills | $CH_4$ | • | • | • | • | • | • | • | • | | 107.7 |
| $N_2O$ Emissions from Wastewater Treatment | $N_2O$ | | | | | | • | | | | 5.0 |
| **Land Use, Land Use Change, and Forestry** | | | | | | | | | | | |
| Net $CO_2$ Emissions from Land Converted to Settlements | $CO_2$ | | | • | • | | | • | • | | 86.2 |
| Net $CO_2$ Emissions from Land Converted to Cropland | $CO_2$ | | | • | • | | | • | • | | 66.9 |
| Net $CO_2$ Emissions from Land Converted to Grassland | $CO_2$ | | | | | | | • | | | 8.3 |
| Net $CO_2$ Emissions from Grassland Remaining Grassland[c] | $CO_2$ | | | | | | | | | • | (0.1) |
| Net $CO_2$ Emissions from Cropland Remaining Cropland | $CO_2$ | | | • | • | | | • | • | | (10.3) |
| Net $CO_2$ Emissions from Land Converted to Forest Land | $CO_2$ | | | • | | | | | | | (120.6) |
| Net $CO_2$ Emissions from Settlements Remaining Settlements | $CO_2$ | | | • | • | | | • | • | | (134.5) |
| Net $CO_2$ Emissions from Forest Land Remaining Forest Land | $CO_2$ | | | • | • | | | • | • | | (620.3) |
| **Subtotal Without LULUCF** | | | | | | | | | | | 6,317.8 |
| **Total Emissions Without LULUCF** | | | | | | | | | | | 6,472.3 |
| **Percent of Total Without LULUCF** | | | | | | | | | | | 98% |
| **Subtotal With LULUCF** | | | | | | | | | | | 5,542.1 |
| **Total Emissions With LULUCF** | | | | | | | | | | | 5,758.9 |
| **Percent of Total With LULUCF** | | | | | | | | | | | 96% |

[a] Qualitative criteria.
[b] Emissions from this source not included in totals.
[c] This source category was excluded from the analysis and is identified as a key category using qualitative criteria. Emissions from this source are not included in the key categories Subtotal With LULUCF.
Note: Parentheses indicate negative values (or sequestration).

Table A-2 provides a complete listing of source categories by IPCC sector, along with notations on the criteria used in identifying key categories, without LULUCF sources and sinks. Similarly, Table A-3 provides a complete listing of source and sink categories by IPCC sector, along with notations on the criteria used in identifying key categories, including LULUCF sources and sinks. The notations refer specifically to the year(s) in the Inventory time series (i.e., 1990 to 2017) in which each source or sink category reached the threshold for being a key category based on either a Tier 1 or Tier 2 level assessment.

In addition to conducting Approach 1 and 2 level and trend assessments, a qualitative assessment of the source categories, as described in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (IPCC 2006), was conducted to capture any key categories that were not identified by either quantitative method. For this Inventory, no additional categories were identified using criteria recommend by IPCC, but EPA continues to update its qualitative assessment on an annual basis.

**Table A-2: U.S. Greenhouse Gas Inventory Source Categories without LULUCF**

| IPCC Source Categories | Direct Greenhouse Gas | 2017 Emissions (MMT $CO_2$ Eq.) | Key Category? | ID Criteria[a] | Level in which year(s)?[b] |
|---|---|---|---|---|---|
| **Energy** | | | | | |
| $CO_2$ Emissions from Mobile Combustion: Road | $CO_2$ | 1,493.6 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Electricity Generation | $CO_2$ | 1,210.0 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Electricity Generation | $CO_2$ | 505.1 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Industrial | $CO_2$ | 486.0 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Industrial | $CO_2$ | 276.4 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Residential | $CO_2$ | 242.1 | • | $L_1$ $L_2$ | 1990, 2017 |
| $CO_2$ Emissions from Mobile Combustion: Aviation | $CO_2$ | 177.0 | • | $L_1$ $T_1$ $L_2$ | 1990, 2017 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Commercial | $CO_2$ | 173.6 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |
| $CO_2$ Emissions from Non-Energy Use of Fuels | $CO_2$ | 124.6 | • | $L_1$ $L_2$ | 1990, 2017 |
| $CO_2$ Emissions from Mobile Combustion: Other | $CO_2$ | 83.2 | • | $L_1$ $T_1$ | $1990_1$, $2017_1$ |
| $CO_2$ Emissions from Stationary Combustion - Oil - Commercial | $CO_2$ | 59.3 | • | $L_1$ $T_1$ | $1990_1$, $2017_1$ |
| $CO_2$ Emissions from Stationary Combustion - Oil - Residential | $CO_2$ | 56.4 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, $2017_1$ |
| $CO_2$ Emissions from Stationary Combustion - Coal - Industrial | $CO_2$ | 55.1 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |
| $CO_2$ Emissions from Mobile Combustion: Marine | $CO_2$ | 40.4 | • | $L_1$ $T_1$ | $1990_1$, $2017_1$ |
| $CO_2$ Emissions from Stationary Combustion - Oil - U.S. Territories | $CO_2$ | 34.3 | • | $L_1$ $T_1$ | $1990_1$, $2017_1$ |
| $CO_2$ Emissions from Natural Gas Systems | $CO_2$ | 26.3 | • | $L_1$ | $1990_1$ |
| $CO_2$ Emissions from Petroleum Systems | $CO_2$ | 23.3 | • | $T_1$ $L_2$ $T_2$ | $2017_2$ |
| $CO_2$ Emissions from Stationary Combustion - Oil - Electricity Generation | $CO_2$ | 18.5 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990 |
| $CO_2$ Emissions from Incineration of Waste | $CO_2$ | 10.8 | | | |
| $CO_2$ Emissions from Stationary Combustion - Coal - U.S. Territories | $CO_2$ | 4.0 | | | |
| $CO_2$ Emissions from Stationary Combustion - Gas - U.S. Territories | $CO_2$ | 3.0 | • | $T_2$ | |
| $CO_2$ Emissions from Stationary Combustion - Coal - Commercial | $CO_2$ | 2.0 | • | $T_1$ | |
| $CO_2$ Emissions from Stationary Combustion - Geothermal Energy | $CO_2$ | 0.4 | | | |
| $CO_2$ Emissions from Abandoned Oil and Gas Wells | $CO_2$ | + | | | |
| $CO_2$ Emissions from Stationary Combustion - Coal - Residential | $CO_2$ | 0.0 | • | $T_2$ | |
| $CH_4$ Emissions from Natural Gas Systems | $CH_4$ | 166.2 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |

| | | | | | |
|---|---|---|---|---|---|
| Fugitive Emissions from Coal Mining | $CH_4$ | 62.6 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |
| $CH_4$ Emissions from Petroleum Systems | $CH_4$ | 37.7 | • | $L_1$ $L_2$ $T_2$ | 1990, 2017 |
| $CH_4$ Emissions from Abandoned Oil and Gas Wells | $CH_4$ | 6.9 | • | $L_2$ | $1990_2$, $2017_2$ |
| Fugitive Emissions from Abandoned Underground Coal Mines | $CH_4$ | 6.4 | | | |
| Non-$CO_2$ Emissions from Stationary Combustion - Residential | $CH_4$ | 3.1 | • | $L_2$ $T_2$ | $1990_2$, $2017_2$ |
| $CH_4$ Emissions from Mobile Combustion: Other | $CH_4$ | 1.9 | • | $T_2$ | |
| Non-$CO_2$ Emissions from Stationary Combustion - Industrial | $CH_4$ | 1.6 | | | |
| Non-$CO_2$ Emissions from Stationary Combustion - Commercial | $CH_4$ | 1.2 | | | |
| Non-$CO_2$ Emissions from Stationary Combustion - Electricity Generation | $CH_4$ | 1.1 | | | |
| $CH_4$ Emissions from Mobile Combustion: Road | $CH_4$ | 1.0 | | | |
| $CH_4$ Emissions from Mobile Combustion: Marine | $CH_4$ | 0.3 | | | |
| Non-$CO_2$ Emissions from Stationary Combustion - U.S. Territories | $CH_4$ | 0.1 | | | |
| $CH_4$ Emissions from Mobile Combustion: Aviation | $CH_4$ | + | | | |
| $CH_4$ Emissions from Incineration of Waste | $CH_4$ | + | | | |
| Non-$CO_2$ Emissions from Stationary Combustion - Electricity Generation | $N_2O$ | 24.4 | • | $L_2$ | $1990_2$, $2017_2$ |
| $N_2O$ Emissions from Mobile Combustion: Road | $N_2O$ | 12.1 | • | $L_1$ T1 $T_2$ | $1990_1$ |
| $N_2O$ Emissions from Mobile Combustion: Other | $N_2O$ | 2.7 | | | |
| Non-$CO_2$ Emissions from Stationary Combustion - Industrial | $N_2O$ | 2.6 | • | $L_2$ | $1990_2$ |
| $N_2O$ Emissions from Mobile Combustion: Aviation | $N_2O$ | 1.6 | | | |
| Non-$CO_2$ Emissions from Stationary Combustion - Residential | $N_2O$ | 0.7 | | | |
| $N_2O$ Emissions from Mobile Combustion: Marine | $N_2O$ | 0.5 | | | |
| Non-$CO_2$ Emissions from Stationary Combustion - Commercial | $N_2O$ | 0.3 | | | |
| $N_2O$ Emissions from Incineration of Waste | $N_2O$ | 0.3 | | | |
| Non-$CO_2$ Emissions from Stationary Combustion - U.S. Territories | $N_2O$ | 0.1 | | | |
| $N_2O$ Emissions from Petroleum Systems | $N_2O$ | + | | | |
| $N_2O$ Emissions from Natural Gas Systems | $N_2O$ | + | | | |
| International Bunker Fuels[c] | Several | 2.0 | • | | Q |
| **Industrial Processes and Product Use** | | | | | |
| $CO_2$ Emissions from Iron and Steel Production & Metallurgical Coke Production | $CO_2$ | 41.8 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |
| $CO_2$ Emissions from Cement Production | $CO_2$ | 39.4 | • | $L_1$ | $1990_1$, $2017_1$ |
| $CO_2$ Emissions from Petrochemical Production | $CO_2$ | 28.2 | • | $L_1$ $T_1$ | $2017_1$ |
| $CO_2$ Emissions from Ammonia Production | $CO_2$ | 13.8 | | | |
| $CO_2$ Emissions from Lime Production | $CO_2$ | 13.2 | | | |
| $CO_2$ Emissions from Other Process Uses of Carbonates | $CO_2$ | 10.1 | | | |
| $CO_2$ Emissions from Carbon Dioxide Consumption | $CO_2$ | 4.5 | | | |
| $CO_2$ Emissions from Urea Consumption for Non-Ag Purposes | $CO_2$ | 4.3 | | | |
| $CO_2$ Emissions from Ferroalloy Production | $CO_2$ | 2.0 | | | |
| $CO_2$ Emissions from Soda Ash Production | $CO_2$ | 1.8 | | | |
| $CO_2$ Emissions from Titanium Dioxide Production | $CO_2$ | 1.7 | | | |
| $CO_2$ Emissions from Glass Production | $CO_2$ | 1.3 | | | |
| $CO_2$ Emissions from Aluminum Production | $CO_2$ | 1.2 | | | |
| $CO_2$ Emissions from Phosphoric Acid Production | $CO_2$ | 1.0 | | | |
| $CO_2$ Emissions from Zinc Production | $CO_2$ | 1.0 | | | |

| | | | | | |
|---|---|---|---|---|---|
| $CO_2$ Emissions from Lead Production | $CO_2$ | 0.5 | | | |
| $CO_2$ Emissions from Silicon Carbide Production and Consumption | $CO_2$ | 0.2 | | | |
| $CO_2$ Emissions from Magnesium Production and Processing | $CO_2$ | + | | | |
| $CH_4$ Emissions from Petrochemical Production | $CH_4$ | 0.4 | | | |
| $CH_4$ Emissions from Ferroalloy Production | $CH_4$ | + | | | |
| $CH_4$ Emissions from Silicon Carbide Production and Consumption | $CH_4$ | + | | | |
| $CH_4$ Emissions from Iron and Steel Production & Metallurgical Coke Production | $CH_4$ | + | | | |
| $N_2O$ Emissions from Nitric Acid Production | $N_2O$ | 10.1 | | | |
| $N_2O$ Emissions from Adipic Acid Production | $N_2O$ | 7.0 | • | $T_1$ | |
| $N_2O$ Emissions from Product Uses | $N_2O$ | 4.2 | | | |
| $N_2O$ Emissions from Caprolactam, Glyoxal, and Glyoxylic Acid Production | $N_2O$ | 1.4 | | | |
| $N_2O$ Emissions from Semiconductor Manufacture | $N_2O$ | 0.2 | | | |
| Emissions from Substitutes for Ozone Depleting Substances | HiGWP | 152.2 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 2017 |
| HFC-23 Emissions from HCFC-22 Production | HiGWP | 5.2 | • | $L_1$ $T_1$ $T_2$ | $1990_1$ |
| PFC, HFC, $SF_6$, and $NF_3$ Emissions from Semiconductor Manufacture | HiGWP | 4.7 | | | |
| $SF_6$ Emissions from Electrical Transmission and Distribution | HiGWP | 4.3 | • | $L_1$ $T_1$ $T_2$ | $1990_1$ |
| PFC Emissions from Aluminum Production | HiGWP | 1.1 | • | $T_1$ $T_2$ | |
| $SF_6$ Emissions from Magnesium Production and Processing | HiGWP | 1.1 | | | |
| HFC-134a Emissions from Magnesium Production and Processing | HiGWP | 0.1 | | | |
| **Agriculture** | | | | | |
| $CO_2$ Emissions from Urea Fertilization | $CO_2$ | 5.1 | | | |
| $CO_2$ Emissions from Liming | $CO_2$ | 3.2 | • | $T_2$ | |
| $CH_4$ Emissions from Enteric Fermentation | $CH_4$ | 175.4 | • | $L_1$ $T_1$ $L_2$ | 1990, 2017 |
| $CH_4$ Emissions from Manure Management | $CH_4$ | 61.7 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |
| $CH_4$ Emissions from Rice Cultivation | $CH_4$ | 11.3 | • | $L_2$ $T_2$ | $1990_2$, $2017_2$ |
| $CH_4$ Emissions from Field Burning of Agricultural Residues | $CH_4$ | 0.2 | | | |
| Direct $N_2O$ Emissions from Agricultural Soil Management | $N_2O$ | 227.7 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |
| Indirect $N_2O$ Emissions from Applied Nitrogen | $N_2O$ | 38.8 | • | $L_1$ $L_2$ | 1990, 2017 |
| $N_2O$ Emissions from Manure Management | $N_2O$ | 18.7 | | | |
| $N_2O$ Emissions from Field Burning of Agricultural Residues | $N_2O$ | 0.1 | | | |
| **Waste** | | | | | |
| $CH_4$ Emissions from Landfills | $CH_4$ | 107.7 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |
| $CH_4$ Emissions from Wastewater Treatment | $CH_4$ | 14.3 | | | |
| $CH_4$ Emissions from Composting | $CH_4$ | 2.2 | | | |
| $N_2O$ Emissions from Wastewater Treatment | $N_2O$ | 5.0 | • | $T_2$ | |
| $N_2O$ Emissions from Composting | $N_2O$ | 1.9 | | | |

+ Does not exceed 0.05 MMT $CO_2$ Eq.

[a] For the ID criteria, Q refers to "Qualitative", L refers to a key category identified through a level assessment; T refers to a key category identified through a trend assessment and the subscripted number refers to either an Approach 1 or Approach 2 assessment (e.g., $L_2$ designates a source is a key category for an Approach 2 level assessment).

[b] If the source is a key category for both $L_1$ and $L_2$ (as designated in the ID criteria column), it is a key category for both assessments in the years provided unless noted by a subscript, in which case it is a key category for that assessment in that year only (e.g., $1990_2$ designates a source is a key category for the Approach 2 assessment only in 1990).

[c] Emissions from these sources not included in emission totals.

Note: LULUCF sources and sinks are not included in this analysis.

## Table A-3: U.S. Greenhouse Gas Inventory Source Categories with LULUCF

| IPCC Source/Sink Categories | Direct Greenhouse Gas | 2017 Emissions (MMT $CO_2$ Eq.) | Key Category? | ID Criteria[a] | Level in which year(s)?[b] |
|---|---|---|---|---|---|
| **Energy** | | | | | |
| $CO_2$ Emissions from Mobile Combustion: Road | $CO_2$ | 1,493.6 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Electricity Generation | $CO_2$ | 1,210.0 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Electricity Generation | $CO_2$ | 505.1 | • | $L_1$ $T_1$ $L_2$ $T_2$ | $1990_1$, 2017 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Industrial | $CO_2$ | 486.0 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Industrial | $CO_2$ | 276.4 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Residential | $CO_2$ | 242.1 | • | $L_1$ $L_2$ | 1990, 2017 |
| $CO_2$ Emissions from Mobile Combustion: Aviation | $CO_2$ | 177.0 | • | $L_1$ $T_1$ | $1990_1$, $2017_1$ |
| $CO_2$ Emissions from Stationary Combustion - Gas - Commercial | $CO_2$ | 173.6 | • | $L_1$ $T_1$ | $1990_1$, $2017_1$ |
| $CO_2$ Emissions from Non-Energy Use of Fuels | $CO_2$ | 124.6 | • | $L_1$ $L_2$ | 1990, 2017 |
| $CO_2$ Emissions from Mobile Combustion: Other | $CO_2$ | 83.2 | • | $L_1$ $T_1$ | $1990_1$, $2017_1$ |
| $CO_2$ Emissions from Stationary Combustion - Oil - Commercial | $CO_2$ | 59.3 | • | $L_1$ $T_1$ | $1990_1$, $2017_1$ |
| $CO_2$ Emissions from Stationary Combustion - Oil - Residential | $CO_2$ | 56.4 | • | $L_1$ $T_1$ | $1990_1$, $2017_1$ |
| $CO_2$ Emissions from Stationary Combustion - Coal - Industrial | $CO_2$ | 55.1 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, $2017_1$ |
| $CO_2$ Emissions from Mobile Combustion: Marine | $CO_2$ | 40.4 | • | $L_1$ $T_1$ | $1990_1$, $2017_1$ |
| $CO_2$ Emissions from Stationary Combustion - Oil - U.S. Territories | $CO_2$ | 34.3 | • | $L_1$ $T_1$ | $1990_1$, $2017_1$ |
| $CO_2$ Emissions from Natural Gas Systems | $CO_2$ | 26.3 | • | $L_1$ | $1990_1$ |
| $CO_2$ Emissions from Petroleum Systems | $CO_2$ | 23.3 | • | $T_1$ $T_2$ | |
| $CO_2$ Emissions from Stationary Combustion - Oil - Electricity Generation | $CO_2$ | 18.5 | • | $L_1$ $T_1$ $T_2$ | $1990_1$ |
| $CO_2$ Emissions from Incineration of Waste | $CO_2$ | 10.8 | | | |
| $CO_2$ Emissions from Stationary Combustion - Coal - U.S. Territories | $CO_2$ | 4.0 | | | |
| $CO_2$ Emissions from Stationary Combustion - Gas - U.S. Territories | $CO_2$ | 3.0 | | | |
| $CO_2$ Emissions from Stationary Combustion - Coal - Commercial | $CO_2$ | 2.0 | • | $T_1$ | |
| $CO_2$ Emissions from Stationary Combustion - Geothermal Energy | $CO_2$ | 0.4 | | | |
| $CO_2$ Emissions from Abandoned Oil and Gas Wells | $CO_2$ | + | | | |
| $CO_2$ Emissions from Stationary Combustion - Coal - Residential | $CO_2$ | 0.0 | • | $T_2$ | |
| $CH_4$ Emissions from Natural Gas Systems | $CH_4$ | 166.2 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |
| Fugitive Emissions from Coal Mining | $CH_4$ | 62.6 | • | $L_1$ $T_1$ $T_2$ | $1990_1$, $2017_1$ |
| $CH_4$ Emissions from Petroleum Systems | $CH_4$ | 37.7 | • | $L_1$ | $1990_1$, $2017_1$ |
| $CH_4$ Emissions from Abandoned Oil and Gas Wells | $CH_4$ | 6.9 | • | $L_2$ | $2017_2$ |
| Fugitive Emissions from Abandoned Underground Coal Mines | $CH_4$ | 6.4 | | | |
| Non-$CO_2$ Emissions from Stationary Combustion - Residential | $CH_4$ | 3.1 | • | $T_2$ | |
| $CH_4$ Emissions from Mobile Combustion: Other | $CH_4$ | 1.9 | | | |
| Non-$CO_2$ Emissions from Stationary Combustion - Industrial | $CH_4$ | 1.6 | | | |
| Non-$CO_2$ Emissions from Stationary Combustion - Commercial | $CH_4$ | 1.2 | | | |

| | | | | | |
|---|---|---|---|---|---|
| Non-$CO_2$ Emissions from Stationary Combustion - Electricity Generation | $CH_4$ | 1.1 | | | |
| $CH_4$ Emissions from Mobile Combustion: Road | $CH_4$ | 1.0 | | | |
| $CH_4$ Emissions from Mobile Combustion: Marine | $CH_4$ | 0.3 | | | |
| Non-$CO_2$ Emissions from Stationary Combustion - U.S. Territories | $CH_4$ | 0.1 | | | |
| $CH_4$ Emissions from Mobile Combustion: Aviation | $CH_4$ | + | | | |
| $CH_4$ Emissions from Incineration of Waste | $CH_4$ | + | | | |
| Non-$CO_2$ Emissions from Stationary Combustion - Electricity Generation | $N_2O$ | 24.4 | | | |
| $N_2O$ Emissions from Mobile Combustion: Road | $N_2O$ | 12.1 | • | $L_1$ $T_1$ $T_2$ | $1990_1$ |
| $N_2O$ Emissions from Mobile Combustion: Other | $N_2O$ | 2.7 | | | |
| Non-$CO_2$ Emissions from Stationary Combustion - Industrial | $N_2O$ | 2.6 | | | |
| $N_2O$ Emissions from Mobile Combustion: Aviation | $N_2O$ | 1.6 | | | |
| Non-$CO_2$ Emissions from Stationary Combustion - Residential | $N_2O$ | 0.7 | | | |
| $N_2O$ Emissions from Mobile Combustion: Marine | $N_2O$ | 0.5 | | | |
| Non-$CO_2$ Emissions from Stationary Combustion - Commercial | $N_2O$ | 0.3 | | | |
| $N_2O$ Emissions from Incineration of Waste | $N_2O$ | 0.3 | | | |
| Non-$CO_2$ Emissions from Stationary Combustion - U.S. Territories | $N_2O$ | 0.1 | | | |
| $N_2O$ Emissions from Petroleum Systems | $N_2O$ | + | | | |
| $N_2O$ Emissions from Natural Gas Systems | $N_2O$ | + | | | |
| International Bunker Fuels[c] | Several | 2.0 | • | Q | |
| **Industrial Processes and Product Use** | | | | | |
| $CO_2$ Emissions from Iron and Steel Production & Metallurgical Coke Production | $CO_2$ | 41.8 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, $2017_1$ |
| $CO_2$ Emissions from Cement Production | $CO_2$ | 39.4 | • | $L_1$ $T_1$ | $1990_1$, $2017_1$ |
| $CO_2$ Emissions from Petrochemical Production | $CO_2$ | 28.2 | • | $L_1$ $T_1$ | $2017_1$ |
| $CO_2$ Emissions from Ammonia Production | $CO_2$ | 13.8 | | | |
| $CO_2$ Emissions from Lime Production | $CO_2$ | 13.2 | | | |
| $CO_2$ Emissions from Other Process Uses of Carbonates | $CO_2$ | 10.1 | | | |
| $CO_2$ Emissions from Carbon Dioxide Consumption | $CO_2$ | 4.5 | | | |
| $CO_2$ Emissions from Urea Consumption for Non-Ag Purposes | $CO_2$ | 4.3 | | | |
| $CO_2$ Emissions from Ferroalloy Production | $CO_2$ | 2.0 | | | |
| $CO_2$ Emissions from Soda Ash Production | $CO_2$ | 1.8 | | | |
| $CO_2$ Emissions from Titanium Dioxide Production | $CO_2$ | 1.7 | | | |
| $CO_2$ Emissions from Glass Production | $CO_2$ | 1.3 | | | |
| $CO_2$ Emissions from Aluminum Production | $CO_2$ | 1.2 | | | |
| $CO_2$ Emissions from Phosphoric Acid Production | $CO_2$ | 1.0 | | | |
| $CO_2$ Emissions from Zinc Production | $CO_2$ | 1.0 | | | |
| $CO_2$ Emissions from Lead Production | $CO_2$ | 0.5 | | | |
| $CO_2$ Emissions from Silicon Carbide Production and Consumption | $CO_2$ | 0.2 | | | |
| $CO_2$ Emissions from Magnesium Production and Processing | $CO_2$ | + | | | |
| $CH_4$ Emissions from Petrochemical Production | $CH_4$ | 0.4 | | | |
| $CH_4$ Emissions from Ferroalloy Production | $CH_4$ | + | | | |
| $CH_4$ Emissions from Silicon Carbide Production and Consumption | $CH_4$ | + | | | |
| $CH_4$ Emissions from Iron and Steel Production & Metallurgical Coke Production | $CH_4$ | + | | | |
| $N_2O$ Emissions from Nitric Acid Production | $N_2O$ | 10.1 | | | |

| | | | | | |
|---|---|---|---|---|---|
| $N_2O$ Emissions from Adipic Acid Production | $N_2O$ | 7.0 | • | $T_1$ | |
| $N_2O$ Emissions from Product Uses | $N_2O$ | 4.2 | | | |
| $N_2O$ Emissions from Caprolactam, Glyoxal, and Glyoxylic Acid Production | $N_2O$ | 1.4 | | | |
| $N_2O$ Emissions from Semiconductor Manufacture | $N_2O$ | 0.2 | | | |
| Emissions from Substitutes for Ozone Depleting Substances | HiGWP | 152.2 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 2017 |
| HFC-23 Emissions from HCFC-22 Production | HiGWP | 5.2 | • | $L_1$ $T_1$ $T_2$ | $1990_1$ |
| PFC, HFC, $SF_6$, and $NF_3$ Emissions from Semiconductor Manufacture | HiGWP | 4.7 | | | |
| $SF_6$ Emissions from Electrical Transmission and Distribution | HiGWP | 4.3 | • | $T_1$ | |
| PFC Emissions from Aluminum Production | HiGWP | 1.1 | • | $T_1$ | |
| $SF_6$ Emissions from Magnesium Production and Processing | HiGWP | 1.1 | | | |
| HFC-134a Emissions from Magnesium Production and Processing | HiGWP | 0.1 | | | |
| **Agriculture** | | | | | |
| $CO_2$ Emissions from Urea Fertilization | $CO_2$ | 5.1 | | | |
| $CO_2$ Emissions from Liming | $CO_2$ | 3.2 | | | |
| $CH_4$ Emissions from Enteric Fermentation | $CH_4$ | 175.4 | • | $L_1$ $T_1$ $L_2$ | 1990, 2017 |
| $CH_4$ Emissions from Manure Management | $CH_4$ | 61.7 | • | $L_1$ $T_1$ $T_2$ | $1990_1$, $2017_1$ |
| $CH_4$ Emissions from Rice Cultivation | $CH_4$ | 11.3 | | | |
| $CH_4$ Emissions from Field Burning of Agricultural Residues | $CH_4$ | 0.2 | | | |
| Direct $N_2O$ Emissions from Agricultural Soil Management | $N_2O$ | 227.7 | • | $L_1$ $T_1$ $L_2$ | 1990, 2017 |
| Indirect $N_2O$ Emissions from Applied Nitrogen | $N_2O$ | 38.8 | • | $L_1$ $L_2$ | 1990, 2017 |
| $N_2O$ Emissions from Manure Management | $N_2O$ | 18.7 | | | |
| $N_2O$ Emissions from Field Burning of Agricultural Residues | $N_2O$ | 0.1 | | | |
| **Waste** | | | | | |
| $CH_4$ Emissions from Landfills | $CH_4$ | 107.7 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |
| $CH_4$ Emissions from Wastewater Treatment | $CH_4$ | 14.3 | | | |
| $CH_4$ Emissions from Composting | $CH_4$ | 2.2 | | | |
| $N_2O$ Emissions from Wastewater Treatment | $N_2O$ | 5.0 | | | |
| $N_2O$ Emissions from Composting | $N_2O$ | 1.9 | | | |
| **Land Use, Land Use Change, and Forestry** | | | | | |
| Net $CO_2$ Emissions from Land Converted to Settlements | $CO_2$ | 86.2 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |
| Net $CO_2$ Emissions from Land Converted to Cropland | $CO_2$ | 66.9 | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |
| Net $CO_2$ Emissions from Land Converted to Grassland | $CO_2$ | 8.3 | • | $L_2$ | $1990_2$, $2017_2$ |
| Net $CO_2$ Emissions from Land Converted to Wetlands | $CO_2$ | (+) | | | |
| Net $CO_2$ Emissions from Grassland Remaining Grassland | $CO_2$ | (+) | • | Q | |
| Net $CO_2$ Emissions from Coastal Wetlands Remaining Coastal Wetlands | $CO_2$ | (+) | | | |
| Net $CO_2$ Emissions from Cropland Remaining Cropland | $CO_2$ | (+) | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, $2017_2$ |
| Net $CO_2$ Emissions from Land Converted to Forest Land | $CO_2$ | (+) | • | $L_1$ | $1990_1$, $2017_1$ |
| Net $CO_2$ Emissions from Settlements Remaining Settlements | $CO_2$ | (+) | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |
| Net $CO_2$ Emissions from Forest Land Remaining Forest Land | $CO_2$ | (+) | • | $L_1$ $T_1$ $L_2$ $T_2$ | 1990, 2017 |
| $CH_4$ Emissions from Forest Fires | $CH_4$ | 4.9 | | | |

| | | |
|---|---|---|
| $CH_4$ Emissions from Coastal Wetlands Remaining Coastal Wetlands | $CH_4$ | 3.6 |
| $CH_4$ Emissions from Grass Fires | $CH_4$ | 0.3 |
| $CH_4$ Emissions from Drained Organic Soils | $CH_4$ | + |
| $CH_4$ Emissions from Land Converted to Coastal Wetlands | $CH_4$ | + |
| $CH_4$ Emissions from Peatlands Remaining Peatlands | $CH_4$ | + |
| $N_2O$ Emissions from Forest Fires | $N_2O$ | 3.2 |
| $N_2O$ Emissions from Settlement Soils | $N_2O$ | 2.5 |
| $N_2O$ Emissions from Forest Soils | $N_2O$ | 0.5 |
| $N_2O$ Emissions from Grass Fires | $N_2O$ | 0.3 |
| $N_2O$ Emissions from Coastal Wetlands Remaining Coastal Wetlands | $N_2O$ | 0.1 |
| $N_2O$ Emissions from Drained Organic Soils | $N_2O$ | 0.1 |
| $N_2O$ Emissions from Peatlands Remaining Peatlands | $N_2O$ | + |

+ Does not exceed 0.05 MMT $CO_2$ Eq.

[a] For the ID criteria, Q refers to "Qualitative," L refers to a key category identified through a level assessment; T refers to a key category identified through a trend assessment and the subscripted number refers to either an Approach 1 or Approach 2 assessment (e.g., $L_2$ designates a source is a key category for an Approach 2 level assessment).

[b] If the source is a key category for both $L_1$ and $L_2$ (as designated in the ID criteria column), it is a key category for both assessments in the years provided unless noted by a subscript, in which case it is a key category only for that assessment in only that year (e.g., $1990_2$ designates a source is a key category for the Approach 2 assessment only in 1990).

[c] Emissions from these sources not included in emission totals.

Note: Parentheses indicate negative values (or sequestration).

## Evaluation of Key Categories

### Level Assessment

When using an Approach 1 for the level assessment, a predetermined cumulative emissions threshold is used to identify key categories. When source and sink categories are sorted in order of decreasing absolute emissions, those that fall at the top of the list and cumulatively account for 95 percent of emissions are considered key categories. The 95 percent threshold in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (IPCC 2006) was designed to establish a general level where the key category analysis covers approximately 75 to 92 percent of inventory uncertainty.

Including the Approach 2 provides additional insight into why certain source categories are considered key, and how to prioritize inventory improvements. In the Approach 2, the level assessment for each category from the Approach 1 is multiplied by its percent relative uncertainty. If the uncertainty reported is asymmetrical, the absolute value of the larger uncertainty is used. While $CO_2$ emissions from geothermal energy are included in the overall emissions estimate, they are not an official IPCC source category. As a result, there are no guidelines to associate uncertainty with the emissions estimate; therefore, an uncertainty analysis was not conducted. The uncertainty associated with $CO_2$ from mobile combustion is applied to each mode's emission estimate. No uncertainty was associated with $CH_4$ emissions from waste incineration because emissions are less than 0.05 kt $CH_4$ and an uncertainty analysis was not conducted. When source and sink categories are sorted in decreasing order of this calculation, those that fall at the top of the list and cumulatively account for 90 percent of emissions are considered key categories. The key categories identified by the Approach 2 level assessment may differ from those identified by the Approach 1 assessment. The final set of key categories includes all source and sink categories identified as key by either the Approach 1 or the Approach 2 assessment, keeping in mind that the two assessments are not mutually exclusive.

It is important to note that a key category analysis can be sensitive to the definitions of the source and sink categories. If a large source or sink category is split into many subcategories, then the subcategories may have contributions to the total inventory that are too small for those source categories to be considered key. Similarly, a collection of small, non-key source categories adding up to less than 5 percent of total emissions could become key source categories if those source categories were aggregated into a single source or sink category. The United States has attempted to define source and sink categories by the conventions that would allow comparison with other international key categories, while still maintaining the category definitions that constitute how the emissions estimates were calculated for this report. As such, some of the category names used in the key category analysis may differ from the names used in the main body of the report. Additionally, the United States accounts for some source categories, including fossil fuel feedstocks, international bunkers, and emissions from U.S. Territories, that are derived from unique data sources using country-specific methodologies.

Table A-4 through Table A-7 contain the 1990 and 2017 level assessments for both with and without LULUCF sources and sinks, and contain further detail on where each source falls within the analysis. Approach 1 key categories are shaded dark gray. Additional key categories identified by the Approach 2 assessment are shaded light gray.

### Trend Assessment

Approach 1 for trend assessment is defined as the product of the source or sink category level assessment and the absolute difference between the source or sink category trend and the total trend. In turn, the source or sink category trend is defined as the change in emissions from the base year to the current year, as a percentage of current year emissions from that source or sink category. The total trend is the percentage change in total inventory emissions from the base year to the current year.

Thus, the source or sink category trend assessment will be large if the source or sink category represents a large percentage of emissions and/or has a trend that is quite different from the overall inventory trend. To determine key categories, the trend assessments are sorted in decreasing order, so that the source or sink categories with the highest trend assessments appear first. The trend assessments are summed until the threshold of 95 percent is reached; all categories that fall within that cumulative 95 percent are considered key categories.

For Approach 2, the trend assessment for each category from Approach 1 is multiplied by its percent relative uncertainty. If the uncertainty reported is asymmetrical, the larger uncertainty is used. When source and sink categories are sorted in decreasing order of this calculation, those that fall at the top of the list and cumulatively account for 90 percent of emissions are considered key categories. The key categories identified by the Approach 2 trend assessment may differ from those identified by the Approach 1 assessment. The final set of key categories includes all source and sink categories identified as key by either the Approach 1 or the Approach 2 assessment, keeping in mind that the two assessments are not mutually exclusive.

Table A-8 and Table A-9 contain the 1990 through 2017 trend assessment for both with and without LULUCF sources and sinks, and contain further detail on where each source falls within the analysis. Approach 1 key categories are shaded dark gray. Additional key categories identified by the Approach 2 assessment are shaded light gray.

**Table A-4: 1990 Key Source Category Approach 1 and Approach 2 Analysis—Level Assessment, without LULUCF**

| IPCC Source Categories | Direct Greenhouse Gas | 1990 Estimate (MMT $CO_2$ Eq.) | Approach 1 Level Assessment | Cumulative Total | Uncertainty[a] | Approach 2 Level Assessment |
|---|---|---|---|---|---|---|
| $CO_2$ Emissions from Stationary Combustion - Coal - Electricity Generation | $CO_2$ | 1,547.6 | 0.24 | 0.24 | 10% | 0.023 |
| $CO_2$ Emissions from Mobile Combustion: Road | $CO_2$ | 1,162.2 | 0.18 | 0.43 | 6% | 0.012 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Industrial | $CO_2$ | 408.5 | 0.06 | 0.49 | 7% | 0.005 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Industrial | $CO_2$ | 293.7 | 0.05 | 0.54 | 20% | 0.009 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Residential | $CO_2$ | 237.7 | 0.04 | 0.57 | 7% | 0.003 |
| Direct $N_2O$ Emissions from Agricultural Soil Management | $N_2O$ | 212.7 | 0.03 | 0.61 | 18% | 0.006 |
| $CH_4$ Emissions from Natural Gas Systems | $CH_4$ | 193.9 | 0.03 | 0.64 | 17% | 0.005 |
| $CO_2$ Emissions from Mobile Combustion: Aviation | $CO_2$ | 187.4 | 0.03 | 0.67 | 6% | 0.002 |
| $CH_4$ Emissions from Landfills | $CH_4$ | 179.6 | 0.03 | 0.69 | 40% | 0.011 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Electricity Generation | $CO_2$ | 175.3 | 0.03 | 0.72 | 5% | 0.001 |
| $CH_4$ Emissions from Enteric Fermentation | $CH_4$ | 164.2 | 0.03 | 0.75 | 18% | 0.005 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Industrial | $CO_2$ | 155.3 | 0.02 | 0.77 | 16% | 0.004 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Commercial | $CO_2$ | 142.0 | 0.02 | 0.79 | 7% | 0.002 |
| $CO_2$ Emissions from Non-Energy Use of Fuels | $CO_2$ | 119.5 | 0.02 | 0.81 | 36% | 0.007 |
| $CO_2$ Emissions from Iron and Steel Production & Metallurgical Coke Production | $CO_2$ | 101.6 | 0.02 | 0.83 | 17% | 0.003 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Electricity Generation | $CO_2$ | 97.5 | 0.02 | 0.84 | 9% | 0.001 |

| | | | | | | |
|---|---|---|---|---|---|---|
| $CO_2$ Emissions from Stationary Combustion - Oil - Residential | $CO_2$ | 97.4 | 0.02 | 0.86 | 6% | 0.001 |
| Fugitive Emissions from Coal Mining | $CH_4$ | 96.5 | 0.02 | 0.87 | 14% | 0.002 |
| $CO_2$ Emissions from Mobile Combustion: Other | $CO_2$ | 73.2 | 0.01 | 0.89 | 6% | 0.001 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Commercial | $CO_2$ | 72.6 | 0.01 | 0.90 | 6% | 0.001 |
| $CO_2$ Emissions from Mobile Combustion: Marine | $CO_2$ | 46.3 | 0.01 | 0.90 | 6% | <0.001 |
| HFC-23 Emissions from HCFC-22 Production | HFCs | 46.1 | 0.01 | 0.91 | 10% | 0.001 |
| $CH_4$ Emissions from Petroleum Systems | $CH_4$ | 42.1 | 0.01 | 0.92 | 34% | 0.002 |
| Indirect $N_2O$ Emissions from Applied Nitrogen | $N_2O$ | 39.0 | 0.01 | 0.92 | 143% | 0.009 |
| $N_2O$ Emissions from Mobile Combustion: Road | $N_2O$ | 37.6 | 0.01 | 0.93 | 14% | 0.001 |
| $CH_4$ Emissions from Manure Management | $CH_4$ | 37.1 | 0.01 | 0.94 | 20% | 0.001 |
| $CO_2$ Emissions from Cement Production | $CO_2$ | 33.5 | 0.01 | 0.94 | 6% | <0.001 |
| $CO_2$ Emissions from Natural Gas Systems | $CO_2$ | 30.0 | <0.01 | 0.95 | 17% | 0.001 |
| $CO_2$ Emissions from Stationary Combustion - Oil - U.S. Territories | $CO_2$ | 26.9 | <0.01 | 0.95 | 11% | <0.001 |
| $SF_6$ Emissions from Electrical Transmission and Distribution | $SF_6$ | 23.1 | <0.01 | 0.95 | 15% | 0.001 |
| PFC Emissions from Aluminum Production | PFCs | 21.5 | <0.01 | 0.96 | 9% | <0.001 |
| $CO_2$ Emissions from Petrochemical Production | $CO_2$ | 21.3 | <0.01 | 0.96 | 5% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Electricity Generation | $N_2O$ | 20.5 | <0.01 | 0.96 | 42% | 0.001 |
| $CH_4$ Emissions from Rice Cultivation | $CH_4$ | 16.0 | <0.01 | 0.97 | 49% | 0.001 |
| $CH_4$ Emissions from Wastewater Treatment | $CH_4$ | 15.3 | <0.01 | 0.97 | 28% | 0.001 |
| $N_2O$ Emissions from Adipic Acid Production | $N_2O$ | 15.2 | <0.01 | 0.97 | 5% | <0.001 |
| $N_2O$ Emissions from Manure Management | $N_2O$ | 14.0 | <0.01 | 0.97 | 24% | 0.001 |
| $CO_2$ Emissions from Ammonia Production | $CO_2$ | 13.0 | <0.01 | 0.98 | 7% | <0.001 |
| $N_2O$ Emissions from Nitric Acid Production | $N_2O$ | 12.1 | <0.01 | 0.98 | 5% | <0.001 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Commercial | $CO_2$ | 12.0 | <0.01 | 0.98 | 15% | <0.001 |
| $CO_2$ Emissions from Lime Production | $CO_2$ | 11.7 | <0.01 | 0.98 | 2% | <0.001 |
| $CO_2$ Emissions from Petroleum Systems | $CO_2$ | 8.9 | <0.01 | 0.98 | 34% | <0.001 |
| $CO_2$ Emissions from Incineration of Waste | $CO_2$ | 8.0 | <0.01 | 0.98 | 16% | <0.001 |
| Fugitive Emissions from Abandoned Underground Coal Mines | $CH_4$ | 7.2 | <0.01 | 0.98 | 22% | <0.001 |
| $CH_4$ Emissions from Mobile Combustion: Other | $CH_4$ | 7.1 | <0.01 | 0.99 | 52% | 0.001 |
| $CO_2$ Emissions from Aluminum Production | $CO_2$ | 6.8 | <0.01 | 0.99 | 3% | <0.001 |
| $CH_4$ Emissions from Abandoned Oil and Gas Wells | $CH_4$ | 6.6 | <0.01 | 0.99 | 215% | 0.002 |
| $CO_2$ Emissions from Other Process Uses of Carbonates | $CO_2$ | 6.3 | <0.01 | 0.99 | 15% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Residential | $CH_4$ | 5.2 | <0.01 | 0.99 | 218% | 0.002 |
| $CH_4$ Emissions from Mobile Combustion: Road | $CH_4$ | 5.2 | <0.01 | 0.99 | 27% | <0.001 |
| $SF_6$ Emissions from Magnesium Production and Processing | $SF_6$ | 5.2 | <0.01 | 0.99 | 6% | <0.001 |
| $CO_2$ Emissions from Liming | $CO_2$ | 4.7 | <0.01 | 0.99 | 111% | 0.001 |
| $N_2O$ Emissions from Product Uses | $N_2O$ | 4.2 | <0.01 | 0.99 | 24% | <0.001 |
| $CO_2$ Emissions from Urea Consumption for Non-Ag Purposes | $CO_2$ | 3.8 | <0.01 | 0.99 | 12% | <0.001 |
| PFC, HFC, $SF_6$, and $NF_3$ Emissions from Semiconductor Manufacture | Several | 3.6 | <0.01 | 0.99 | 6% | <0.001 |
| $N_2O$ Emissions from Wastewater Treatment | $N_2O$ | 3.4 | <0.01 | 0.99 | 108% | 0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Industrial | $N_2O$ | 3.1 | <0.01 | 1.00 | 199% | 0.001 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Residential | $CO_2$ | 3.0 | <0.01 | 1.00 | NE | <0.001 |

| | | | | | | |
|---|---|---|---|---|---|---|
| $CO_2$ Emissions from Urea Fertilization | $CO_2$ | 2.4 | <0.01 | 1.00 | 43% | <0.001 |
| $CO_2$ Emissions from Ferroalloy Production | $CO_2$ | 2.2 | <0.01 | 1.00 | 12% | <0.001 |
| $N_2O$ Emissions from Mobile Combustion: Other | $N_2O$ | 2.1 | <0.01 | 1.00 | 60% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Industrial | $CH_4$ | 1.8 | <0.01 | 1.00 | 47% | <0.001 |
| $N_2O$ Emissions from Mobile Combustion: Aviation | $N_2O$ | 1.7 | <0.01 | 1.00 | 65% | <0.001 |
| $N_2O$ Emissions from Caprolactam, Glyoxal, and Glyoxylic Acid Production | $N_2O$ | 1.7 | <0.01 | 1.00 | 31% | <0.001 |
| $CO_2$ Emissions from Glass Production | $CO_2$ | 1.5 | <0.01 | 1.00 | 4% | <0.001 |
| $CO_2$ Emissions from Phosphoric Acid Production | $CO_2$ | 1.5 | <0.01 | 1.00 | 21% | <0.001 |
| $CO_2$ Emissions from Carbon Dioxide Consumption | $CO_2$ | 1.5 | <0.01 | 1.00 | 5% | <0.001 |
| $CO_2$ Emissions from Soda Ash Production | $CO_2$ | 1.4 | <0.01 | 1.00 | 9% | <0.001 |
| $CO_2$ Emissions from Titanium Dioxide Production | $CO_2$ | 1.2 | <0.01 | 1.00 | 13% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Commercial | $CH_4$ | 1.1 | <0.01 | 1.00 | 144% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Residential | $N_2O$ | 1.0 | <0.01 | 1.00 | 209% | <0.001 |
| $CO_2$ Emissions from Stationary Combustion - Coal - U.S. Territories | $CO_2$ | 0.6 | <0.01 | 1.00 | 19% | <0.001 |
| $CO_2$ Emissions from Zinc Production | $CO_2$ | 0.6 | <0.01 | 1.00 | 16% | <0.001 |
| $N_2O$ Emissions from Mobile Combustion: Marine | $N_2O$ | 0.6 | <0.01 | 1.00 | 44% | <0.001 |
| $CH_4$ Emissions from Mobile Combustion: Marine | $CH_4$ | 0.6 | <0.01 | 1.00 | 87% | <0.001 |
| $CO_2$ Emissions from Lead Production | $CO_2$ | 0.5 | <0.01 | 1.00 | 15% | <0.001 |
| $N_2O$ Emissions from Incineration of Waste | $N_2O$ | 0.5 | <0.01 | 1.00 | 324% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Electricity Generation | $CH_4$ | 0.4 | <0.01 | 1.00 | 3% | <0.001 |
| $CO_2$ Emissions from Stationary Combustion - Geothermal Energy | $CO_2$ | 0.4 | <0.01 | 1.00 | NA | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Commercial | $N_2O$ | 0.4 | <0.01 | 1.00 | 178% | <0.001 |
| $CH_4$ Emissions from Composting | $CH_4$ | 0.4 | <0.01 | 1.00 | 50% | <0.001 |
| $CO_2$ Emissions from Silicon Carbide Production and Consumption | $CO_2$ | 0.4 | <0.01 | 1.00 | 9% | <0.001 |
| $N_2O$ Emissions from Composting | $N_2O$ | 0.3 | <0.01 | 1.00 | 50% | <0.001 |
| $CH_4$ Emissions from Petrochemical Production | $CH_4$ | 0.3 | <0.01 | 1.00 | 57% | <0.001 |
| Emissions from Substitutes for Ozone Depleting Substances | Several | 0.3 | <0.01 | 1.00 | 12% | <0.001 |
| $CH_4$ Emissions from Field Burning of Agricultural Residues | $CH_4$ | 0.1 | <0.01 | 1.00 | 51% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - U.S. Territories | $N_2O$ | 0.1 | <0.01 | 1.00 | 198% | <0.001 |
| $CH_4$ Emissions from Mobile Combustion: Aviation | $CH_4$ | 0.1 | <0.01 | 1.00 | 89% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - U.S. Territories | $CH_4$ | + | <0.01 | 1.00 | 55% | <0.001 |
| $N_2O$ Emissions from Field Burning of Agricultural Residues | $N_2O$ | + | <0.01 | 1.00 | 47% | <0.001 |
| $N_2O$ Emissions from Semiconductor Manufacture | $N_2O$ | + | <0.01 | 1.00 | 12% | <0.001 |
| $CH_4$ Emissions from Silicon Carbide Production and Consumption | $CH_4$ | + | <0.01 | 1.00 | 10% | <0.001 |
| $CH_4$ Emissions from Iron and Steel Production & Metallurgical Coke Production | $CH_4$ | + | <0.01 | 1.00 | 20% | <0.001 |
| $CH_4$ Emissions from Ferroalloy Production | $CH_4$ | + | <0.01 | 1.00 | 12% | <0.001 |

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|---|---|---|---|---|---|---|
| $N_2O$ Emissions from Petroleum Systems | $N_2O$ | + | <0.01 | 1.00 | 34% | <0.001 |
| $CO_2$ Emissions from Abandoned Oil and Gas Wells | $CO_2$ | + | <0.01 | 1.00 | 215% | <0.001 |
| $CO_2$ Emissions from Magnesium Production and Processing | $CO_2$ | + | <0.01 | 1.00 | 2% | <0.001 |
| $N_2O$ Emissions from Natural Gas Systems | $N_2O$ | + | <0.01 | 1.00 | 17% | <0.001 |
| $CH_4$ Emissions from Incineration of Waste | $CH_4$ | + | <0.01 | 1.00 | NE | <0.001 |
| HFC-134a Emissions from Magnesium Production and Processing | HFCs | 0.0 | <0.01 | 1.00 | 4% | <0.001 |
| $CO_2$ Emissions from Stationary Combustion - Gas - U.S. Territories | $CO_2$ | 0.0 | <0.01 | 1.00 | 17% | <0.001 |

+ Does not exceed 0.05 MMT $CO_2$ Eq.
NE (Not Estimated)
NA (Not Available)
[a] Percent relative uncertainty. If the corresponding uncertainty is asymmetrical, the uncertainty given here is the larger and always positive.
Note: LULUCF sources and sinks are not included in this analysis.

**Table A-5: 1990 Key Source Category Approach 1 and Approach 2 Analysis—Level Assessment, with LULUCF**

| IPCC Source/Sink Categories | Direct Greenhouse Gas | 1990 Estimate (MMT $CO_2$ Eq.) | Approach 1 Level Assessment | Cumulative Total | Uncertainty[a] | Approach 2 Level Assessment |
|---|---|---|---|---|---|---|
| $CO_2$ Emissions from Stationary Combustion - Coal - Electricity Generation | $CO_2$ | 1,547.6 | 0.21 | 0.21 | 10% | 0.020 |
| $CO_2$ Emissions from Mobile Combustion: Road | $CO_2$ | 1,162.2 | 0.15 | 0.36 | 6% | 0.010 |
| Net $CO_2$ Emissions from Forest Land Remaining Forest Land | $CO_2$ | 680.1 | 0.09 | 0.45 | 152% | 0.138 |
| $CO_2$ Emissions from Stationary Combustion - Gas – Industrial | $CO_2$ | 408.5 | 0.05 | 0.51 | 7% | 0.004 |
| $CO_2$ Emissions from Stationary Combustion - Oil – Industrial | $CO_2$ | 293.7 | 0.04 | 0.55 | 20% | 0.008 |
| $CO_2$ Emissions from Stationary Combustion - Gas – Residential | $CO_2$ | 237.7 | 0.03 | 0.58 | 7% | 0.002 |
| Direct $N_2O$ Emissions from Agricultural Soil Management | $N_2O$ | 212.7 | 0.03 | 0.61 | 18% | 0.005 |
| $CH_4$ Emissions from Natural Gas Systems | $CH_4$ | 193.9 | 0.03 | 0.63 | 17% | 0.004 |
| $CO_2$ Emissions from Mobile Combustion: Aviation | $CO_2$ | 187.4 | 0.02 | 0.66 | 6% | 0.002 |
| $CH_4$ Emissions from Landfills | $CH_4$ | 179.6 | 0.02 | 0.68 | 40% | 0.010 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Electricity Generation | $CO_2$ | 175.3 | 0.02 | 0.70 | 5% | 0.001 |
| $CH_4$ Emissions from Enteric Fermentation | $CH_4$ | 164.2 | 0.02 | 0.73 | 18% | 0.004 |
| $CO_2$ Emissions from Stationary Combustion - Coal – Industrial | $CO_2$ | 155.3 | 0.02 | 0.75 | 16% | 0.003 |
| $CO_2$ Emissions from Stationary Combustion - Gas – Commercial | $CO_2$ | 142.0 | 0.02 | 0.77 | 7% | 0.001 |
| Net $CO_2$ Emissions from Settlements Remaining Settlements | $CO_2$ | 122.1 | 0.02 | 0.78 | 86% | 0.014 |
| $CO_2$ Emissions from Non-Energy Use of Fuels | $CO_2$ | 119.5 | 0.02 | 0.80 | 36% | 0.006 |
| Net $CO_2$ Emissions from Land Converted to Forest Land | $CO_2$ | 119.1 | 0.02 | 0.81 | 9% | 0.001 |
| $CO_2$ Emissions from Iron and Steel Production & Metallurgical Coke Production | $CO_2$ | 101.6 | 0.01 | 0.83 | 17% | 0.002 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Electricity Generation | $CO_2$ | 97.5 | 0.01 | 0.84 | 9% | 0.001 |
| $CO_2$ Emissions from Stationary Combustion - Oil – Residential | $CO_2$ | 97.4 | 0.01 | 0.85 | 6% | 0.001 |
| Fugitive Emissions from Coal Mining | $CH_4$ | 96.5 | 0.01 | 0.87 | 14% | 0.002 |
| Net $CO_2$ Emissions from Land Converted to Cropland | $CO_2$ | 75.6 | 0.01 | 0.88 | 60% | 0.006 |
| $CO_2$ Emissions from Mobile Combustion: Other | $CO_2$ | 73.2 | 0.01 | 0.89 | 6% | 0.001 |

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|---|---|---|---|---|---|---|
| $CO_2$ Emissions from Stationary Combustion - Oil – Commercial | $CO_2$ | 72.6 | 0.01 | 0.90 | 6% | 0.001 |
| Net $CO_2$ Emissions from Land Converted to Settlements | $CO_2$ | 62.9 | 0.01 | 0.90 | 29% | 0.002 |
| $CO_2$ Emissions from Mobile Combustion: Marine | $CO_2$ | 46.3 | 0.01 | 0.91 | 6% | <0.001 |
| HFC-23 Emissions from HCFC-22 Production | HFCs | 46.1 | 0.01 | 0.92 | 10% | 0.001 |
| $CH_4$ Emissions from Petroleum Systems | $CH_4$ | 42.1 | 0.01 | 0.92 | 34% | 0.002 |
| Net $CO_2$ Emissions from Cropland Remaining Cropland | $CO_2$ | 40.9 | 0.01 | 0.93 | 423% | 0.023 |
| Indirect $N_2O$ Emissions from Applied Nitrogen | $N_2O$ | 39.0 | 0.01 | 0.93 | 143% | 0.007 |
| $N_2O$ Emissions from Mobile Combustion: Road | $N_2O$ | 37.6 | 0.01 | 0.94 | 14% | 0.001 |
| $CH_4$ Emissions from Manure Management | $CH_4$ | 37.1 | <0.01 | 0.94 | 20% | 0.001 |
| $CO_2$ Emissions from Cement Production | $CO_2$ | 33.5 | <0.01 | 0.95 | 6% | <0.001 |
| $CO_2$ Emissions from Natural Gas Systems | $CO_2$ | 30.0 | <0.01 | 0.95 | 17% | 0.001 |
| $CO_2$ Emissions from Stationary Combustion - Oil - U.S. Territories | $CO_2$ | 26.9 | <0.01 | 0.95 | 11% | <0.001 |
| $SF_6$ Emissions from Electrical Transmission and Distribution | $SF_6$ | 23.1 | <0.01 | 0.96 | 15% | <0.001 |
| PFC Emissions from Aluminum Production | PFCs | 21.5 | <0.01 | 0.96 | 9% | <0.001 |
| $CO_2$ Emissions from Petrochemical Production | $CO_2$ | 21.3 | <0.01 | 0.96 | 5% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Electricity Generation | $N_2O$ | 20.5 | <0.01 | 0.97 | 42% | 0.001 |
| $CH_4$ Emissions from Rice Cultivation | $CH_4$ | 16.0 | <0.01 | 0.97 | 49% | 0.001 |
| $CH_4$ Emissions from Wastewater Treatment | $CH_4$ | 15.3 | <0.01 | 0.97 | 28% | 0.001 |
| $N_2O$ Emissions from Adipic Acid Production | $N_2O$ | 15.2 | <0.01 | 0.97 | 5% | <0.001 |
| $N_2O$ Emissions from Manure Management | $N_2O$ | 14.0 | <0.01 | 0.97 | 24% | <0.001 |
| $CO_2$ Emissions from Ammonia Production | $CO_2$ | 13.0 | <0.01 | 0.98 | 7% | <0.001 |
| $N_2O$ Emissions from Nitric Acid Production | $N_2O$ | 12.1 | <0.01 | 0.98 | 5% | <0.001 |
| $CO_2$ Emissions from Stationary Combustion - Coal – Commercial | $CO_2$ | 12.0 | <0.01 | 0.98 | 15% | <0.001 |
| $CO_2$ Emissions from Lime Production | $CO_2$ | 11.7 | <0.01 | 0.98 | 2% | <0.001 |
| $CO_2$ Emissions from Petroleum Systems | $CO_2$ | 8.9 | <0.01 | 0.98 | 34% | <0.001 |
| Net $CO_2$ Emissions from Land Converted to Grassland | $CO_2$ | 8.7 | <0.01 | 0.98 | 214% | 0.002 |
| $CO_2$ Emissions from Incineration of Waste | $CO_2$ | 8.0 | <0.01 | 0.98 | 16% | <0.001 |
| Fugitive Emissions from Abandoned Underground Coal Mines | $CH_4$ | 7.2 | <0.01 | 0.99 | 22% | <0.001 |
| $CH_4$ Emissions from Mobile Combustion: Other | $CH_4$ | 7.1 | <0.01 | 0.99 | 52% | <0.001 |
| $CO_2$ Emissions from Aluminum Production | $CO_2$ | 6.8 | <0.01 | 0.99 | 3% | <0.001 |
| $CH_4$ Emissions from Abandoned Oil and Gas Wells | $CH_4$ | 6.6 | <0.01 | 0.99 | 215% | 0.002 |
| $CO_2$ Emissions from Other Process Uses of Carbonates | $CO_2$ | 6.3 | <0.01 | 0.99 | 15% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion – Residential | $CH_4$ | 5.2 | <0.01 | 0.99 | 218% | 0.002 |
| $CH_4$ Emissions from Mobile Combustion: Road | $CH_4$ | 5.2 | <0.01 | 0.99 | 27% | <0.001 |
| $SF_6$ Emissions from Magnesium Production and Processing | $SF_6$ | 5.2 | <0.01 | 0.99 | 6% | <0.001 |
| $CO_2$ Emissions from Liming | $CO_2$ | 4.7 | <0.01 | 0.99 | 111% | 0.001 |
| $N_2O$ Emissions from Product Uses | $N_2O$ | 4.2 | <0.01 | 0.99 | 24% | <0.001 |
| Net $CO_2$ Emissions from Coastal Wetlands Remaining Coastal Wetlands | $CO_2$ | 4.0 | <0.01 | 0.99 | 64% | <0.001 |
| $CO_2$ Emissions from Urea Consumption for Non-Ag Purposes | $CO_2$ | 3.8 | <0.01 | 0.99 | 12% | <0.001 |
| PFC, HFC, $SF_6$, and $NF_3$ Emissions from Semiconductor Manufacture | Several | 3.6 | <0.01 | 0.99 | 6% | <0.001 |
| $CH_4$ Emissions from Coastal Wetlands Remaining Coastal Wetlands | $CH_4$ | 3.4 | <0.01 | 0.99 | 30% | <0.001 |
| $N_2O$ Emissions from Wastewater Treatment | $N_2O$ | 3.4 | <0.01 | 0.99 | 108% | <0.001 |

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|---|---|---|---|---|---|---|
| Non-$CO_2$ Emissions from Stationary Combustion - Industrial | $N_2O$ | 3.1 | <0.01 | 1.00 | 199% | 0.001 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Residential | $CO_2$ | 3.0 | <0.01 | 1.00 | NE | <0.001 |
| $CO_2$ Emissions from Urea Fertilization | $CO_2$ | 2.4 | <0.01 | 1.00 | 43% | <0.001 |
| $CO_2$ Emissions from Ferroalloy Production | $CO_2$ | 2.2 | <0.01 | 1.00 | 12% | <0.001 |
| $N_2O$ Emissions from Mobile Combustion: Other | $N_2O$ | 2.1 | <0.01 | 1.00 | 60% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Industrial | $CH_4$ | 1.8 | <0.01 | 1.00 | 47% | <0.001 |
| $N_2O$ Emissions from Mobile Combustion: Aviation | $N_2O$ | 1.7 | <0.01 | 1.00 | 65% | <0.001 |
| $N_2O$ Emissions from Caprolactam, Glyoxal, and Glyoxylic Acid Production | $N_2O$ | 1.7 | <0.01 | 1.00 | 31% | <0.001 |
| $CO_2$ Emissions from Glass Production | $CO_2$ | 1.5 | <0.01 | 1.00 | 4% | <0.001 |
| $CO_2$ Emissions from Phosphoric Acid Production | $CO_2$ | 1.5 | <0.01 | 1.00 | 21% | <0.001 |
| $CO_2$ Emissions from Carbon Dioxide Consumption | $CO_2$ | 1.5 | <0.01 | 1.00 | 5% | <0.001 |
| $CH_4$ Emissions from Forest Fires | $CH_4$ | 1.5 | <0.01 | 1.00 | 17% | <0.001 |
| $CO_2$ Emissions from Soda Ash Production | $CO_2$ | 1.4 | <0.01 | 1.00 | 9% | <0.001 |
| $N_2O$ Emissions from Settlement Soils | $N_2O$ | 1.4 | <0.01 | 1.00 | 48% | <0.001 |
| $CO_2$ Emissions from Titanium Dioxide Production | $CO_2$ | 1.2 | <0.01 | 1.00 | 13% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion – Commercial | $CH_4$ | 1.1 | <0.01 | 1.00 | 144% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion – Residential | $N_2O$ | 1.0 | <0.01 | 1.00 | 209% | <0.001 |
| $N_2O$ Emissions from Forest Fires | $N_2O$ | 1.0 | <0.01 | 1.00 | 14% | <0.001 |
| $CO_2$ Emissions from Stationary Combustion - Coal - U.S. Territories | $CO_2$ | 0.6 | <0.01 | 1.00 | 19% | <0.001 |
| $CO_2$ Emissions from Zinc Production | $CO_2$ | 0.6 | <0.01 | 1.00 | 16% | <0.001 |
| $N_2O$ Emissions from Mobile Combustion: Marine | $N_2O$ | 0.6 | <0.01 | 1.00 | 44% | <0.001 |
| $CH_4$ Emissions from Mobile Combustion: Marine | $CH_4$ | 0.6 | <0.01 | 1.00 | 87% | <0.001 |
| $CO_2$ Emissions from Lead Production | $CO_2$ | 0.5 | <0.01 | 1.00 | 15% | <0.001 |
| $N_2O$ Emissions from Incineration of Waste | $N_2O$ | 0.5 | <0.01 | 1.00 | 324% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Electricity Generation | $CH_4$ | 0.4 | <0.01 | 1.00 | 3% | <0.001 |
| $CO_2$ Emissions from Stationary Combustion - Geothermal Energy | $CO_2$ | 0.4 | <0.01 | 1.00 | NA | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion – Commercial | $N_2O$ | 0.4 | <0.01 | 1.00 | 178% | <0.001 |
| $CH_4$ Emissions from Composting | $CH_4$ | 0.4 | <0.01 | 1.00 | 50% | <0.001 |
| $CO_2$ Emissions from Silicon Carbide Production and Consumption | $CO_2$ | 0.4 | <0.01 | 1.00 | 9% | <0.001 |
| $N_2O$ Emissions from Composting | $N_2O$ | 0.3 | <0.01 | 1.00 | 50% | <0.001 |
| $CH_4$ Emissions from Petrochemical Production | $CH_4$ | 0.3 | <0.01 | 1.00 | 57% | <0.001 |
| Emissions from Substitutes for Ozone Depleting Substances | Several | 0.3 | <0.01 | 1.00 | 12% | <0.001 |
| $N_2O$ Emissions from Coastal Wetlands Remaining Coastal Wetlands | $N_2O$ | 0.1 | <0.01 | 1.00 | 116% | <0.001 |
| $CH_4$ Emissions from Field Burning of Agricultural Residues | $CH_4$ | 0.1 | <0.01 | 1.00 | 51% | <0.001 |
| $N_2O$ Emissions from Drained Organic Soils | $N_2O$ | 0.1 | <0.01 | 1.00 | 124% | <0.001 |
| $N_2O$ Emissions from Forest Soils | $N_2O$ | 0.1 | <0.01 | 1.00 | 318% | <0.001 |
| $N_2O$ Emissions from Grass Fires | $N_2O$ | 0.1 | <0.01 | 1.00 | 140% | <0.001 |
| $CH_4$ Emissions from Grass Fires | $CH_4$ | 0.1 | <0.01 | 1.00 | 139% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - U.S. Territories | $N_2O$ | 0.1 | <0.01 | 1.00 | 198% | <0.001 |
| $CH_4$ Emissions from Mobile Combustion: Aviation | $CH_4$ | 0.1 | <0.01 | 1.00 | 89% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - U.S. Territories | $CH_4$ | + | <0.01 | 1.00 | 55% | <0.001 |

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|---|---|---|---|---|---|---|
| $N_2O$ Emissions from Field Burning of Agricultural Residues | $N_2O$ | + | <0.01 | 1.00 | 47% | <0.001 |
| Net $CO_2$ Emissions from Land Converted to Wetlands | $CO_2$ | + | <0.01 | 1.00 | 30% | <0.001 |
| $N_2O$ Emissions from Semiconductor Manufacture | $N_2O$ | + | <0.01 | 1.00 | 12% | <0.001 |
| $CH_4$ Emissions from Silicon Carbide Production and Consumption | $CH_4$ | + | <0.01 | 1.00 | 10% | <0.001 |
| $CH_4$ Emissions from Iron and Steel Production & Metallurgical Coke Production | $CH_4$ | + | <0.01 | 1.00 | 20% | <0.001 |
| $CH_4$ Emissions from Ferroalloy Production | $CH_4$ | + | <0.01 | 1.00 | 12% | <0.001 |
| $N_2O$ Emissions from Natural Gas Systems | $N_2O$ | + | <0.01 | 1.00 | 17% | <0.001 |
| $CH_4$ Emissions from Drained Organic Soils | $CH_4$ | + | <0.01 | 1.00 | 76% | <0.001 |
| $CH_4$ Emissions from Land Converted to Coastal Wetlands | $CH_4$ | + | <0.01 | 1.00 | 30% | <0.001 |
| $CO_2$ Emissions from Abandoned Oil and Gas Wells | $CO_2$ | + | <0.01 | 1.00 | 215% | <0.001 |
| $CH_4$ Emissions from Peatlands Remaining Peatlands | $CH_4$ | + | <0.01 | 1.00 | 78% | <0.001 |
| $CO_2$ Emissions from Magnesium Production and Processing | $CO_2$ | + | <0.01 | 1.00 | 2% | <0.001 |
| $N_2O$ Emissions from Petroleum Systems | $N_2O$ | + | <0.01 | 1.00 | 34% | <0.001 |
| $N_2O$ Emissions from Peatlands Remaining Peatlands | $N_2O$ | + | <0.01 | 1.00 | 54% | <0.001 |
| $CH_4$ Emissions from Incineration of Waste | $CH_4$ | + | <0.01 | 1.00 | NE | <0.001 |
| $CO_2$ Emissions from Stationary Combustion - Gas - U.S. Territories | $CO_2$ | 0.0 | <0.01 | 1.00 | 17% | <0.001 |
| HFC-134a Emissions from Magnesium Production and Processing | HFCs | 0.0 | <0.01 | 1.00 | 4% | <0.001 |

+ Does not exceed 0.05 MMT $CO_2$ Eq.
NE (Not Estimated)
NA (Not Available)
[a] Percent relative uncertainty. If the corresponding uncertainty is asymmetrical, the uncertainty given here is the larger and always positive.

**Table A-6: 2017 Key Source Category Approach 1 and Approach 2 Analysis—Level Assessment, without LULUCF**

| IPCC Source Categories | Direct Greenhouse Gas | 2017 Estimate (MMT $CO_2$ Eq.) | Approach 1 Level Assessment | Cumulative Total | Uncertainty[a] | Approach 2 Level Assessment |
|---|---|---|---|---|---|---|
| $CO_2$ Emissions from Mobile Combustion: Road | $CO_2$ | 1,493.6 | 0.23 | 0.23 | 6% | 0.015 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Electricity Generation | $CO_2$ | 1,210.0 | 0.19 | 0.42 | 10% | 0.018 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Electricity Generation | $CO_2$ | 505.1 | 0.08 | 0.50 | 5% | 0.004 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Industrial | $CO_2$ | 486.0 | 0.08 | 0.57 | 7% | 0.005 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Industrial | $CO_2$ | 276.4 | 0.04 | 0.61 | 20% | 0.009 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Residential | $CO_2$ | 242.1 | 0.04 | 0.65 | 7% | 0.003 |
| Direct $N_2O$ Emissions from Agricultural Soil Management | $N_2O$ | 227.7 | 0.04 | 0.69 | 18% | 0.006 |
| $CO_2$ Emissions from Mobile Combustion: Aviation | $CO_2$ | 177.0 | 0.03 | 0.71 | 6% | 0.002 |
| $CH_4$ Emissions from Enteric Fermentation | $CH_4$ | 175.4 | 0.03 | 0.74 | 18% | 0.005 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Commercial | $CO_2$ | 173.6 | 0.03 | 0.77 | 7% | 0.002 |
| $CH_4$ Emissions from Natural Gas Systems | $CH_4$ | 166.2 | 0.03 | 0.79 | 17% | 0.004 |
| Emissions from Substitutes for Ozone Depleting Substances | Several | 152.2 | 0.02 | 0.82 | 12% | 0.003 |
| $CO_2$ Emissions from Non-Energy Use of Fuels | $CO_2$ | 124.6 | 0.02 | 0.84 | 36% | 0.007 |
| $CH_4$ Emissions from Landfills | $CH_4$ | 107.7 | 0.02 | 0.85 | 40% | 0.007 |
| $CO_2$ Emissions from Mobile Combustion: Other | $CO_2$ | 83.2 | 0.01 | 0.87 | 6% | 0.001 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Fugitive Emissions from Coal Mining | $CH_4$ | 62.6 | 0.01 | 0.88 | 14% | 0.001 |
| $CH_4$ Emissions from Manure Management | $CH_4$ | 61.7 | 0.01 | 0.88 | 20% | 0.002 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Commercial | $CO_2$ | 59.3 | 0.01 | 0.89 | 6% | 0.001 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Residential | $CO_2$ | 56.4 | 0.01 | 0.90 | 6% | <0.001 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Industrial | $CO_2$ | 55.1 | 0.01 | 0.91 | 16% | 0.001 |
| $CO_2$ Emissions from Iron and Steel Production & Metallurgical Coke Production | $CO_2$ | 41.8 | 0.01 | 0.92 | 17% | 0.001 |
| $CO_2$ Emissions from Mobile Combustion: Marine | $CO_2$ | 40.4 | 0.01 | 0.92 | 6% | <0.001 |
| $CO_2$ Emissions from Cement Production | $CO_2$ | 39.4 | 0.01 | 0.93 | 6% | <0.001 |
| Indirect $N_2O$ Emissions from Applied Nitrogen | $N_2O$ | 38.8 | 0.01 | 0.94 | 143% | 0.009 |
| $CH_4$ Emissions from Petroleum Systems | $CH_4$ | 37.7 | 0.01 | 0.94 | 34% | 0.002 |
| $CO_2$ Emissions from Stationary Combustion - Oil - U.S. Territories | $CO_2$ | 34.3 | 0.01 | 0.95 | 11% | 0.001 |
| $CO_2$ Emissions from Petrochemical Production | $CO_2$ | 28.2 | <0.01 | 0.95 | 5% | <0.001 |
| $CO_2$ Emissions from Natural Gas Systems | $CO_2$ | 26.3 | <0.01 | 0.96 | 17% | 0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Electricity Generation | $N_2O$ | 24.4 | <0.01 | 0.96 | 42% | 0.002 |
| $CO_2$ Emissions from Petroleum Systems | $CO_2$ | 23.3 | <0.01 | 0.96 | 34% | 0.001 |
| $N_2O$ Emissions from Manure Management | $N_2O$ | 18.7 | <0.01 | 0.97 | 24% | 0.001 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Electricity Generation | $CO_2$ | 18.5 | <0.01 | 0.97 | 9% | <0.001 |
| $CH_4$ Emissions from Wastewater Treatment | $CH_4$ | 14.3 | <0.01 | 0.97 | 28% | 0.001 |
| $CO_2$ Emissions from Ammonia Production | $CO_2$ | 13.8 | <0.01 | 0.97 | 7% | <0.001 |
| $CO_2$ Emissions from Lime Production | $CO_2$ | 13.2 | <0.01 | 0.97 | 2% | <0.001 |
| $N_2O$ Emissions from Mobile Combustion: Road | $N_2O$ | 12.1 | <0.01 | 0.98 | 14% | <0.001 |
| $CH_4$ Emissions from Rice Cultivation | $CH_4$ | 11.3 | <0.01 | 0.98 | 49% | 0.001 |
| $CO_2$ Emissions from Incineration of Waste | $CO_2$ | 10.8 | <0.01 | 0.98 | 16% | <0.001 |
| $CO_2$ Emissions from Other Process Uses of Carbonates | $CO_2$ | 10.1 | <0.01 | 0.98 | 15% | <0.001 |
| $N_2O$ Emissions from Nitric Acid Production | $N_2O$ | 10.1 | <0.01 | 0.98 | 5% | <0.001 |
| $N_2O$ Emissions from Adipic Acid Production | $N_2O$ | 7.0 | <0.01 | 0.98 | 5% | <0.001 |
| $CH_4$ Emissions from Abandoned Oil and Gas Wells | $CH_4$ | 6.9 | <0.01 | 0.99 | 215% | 0.002 |
| Fugitive Emissions from Abandoned Underground Coal Mines | $CH_4$ | 6.4 | <0.01 | 0.99 | 22% | <0.001 |
| HFC-23 Emissions from HCFC-22 Production | HFCs | 5.2 | <0.01 | 0.99 | 10% | <0.001 |
| $CO_2$ Emissions from Urea Fertilization | $CO_2$ | 5.1 | <0.01 | 0.99 | 43% | <0.001 |
| $N_2O$ Emissions from Wastewater Treatment | $N_2O$ | 5.0 | <0.01 | 0.99 | 108% | 0.001 |
| PFC, HFC, $SF_6$, and $NF_3$ Emissions from Semiconductor Manufacture | Several | 4.7 | <0.01 | 0.99 | 6% | <0.001 |
| $CO_2$ Emissions from Carbon Dioxide Consumption | $CO_2$ | 4.5 | <0.01 | 0.99 | 5% | <0.001 |
| $CO_2$ Emissions from Urea Consumption for Non-Ag Purposes | $CO_2$ | 4.3 | <0.01 | 0.99 | 12% | <0.001 |
| $SF_6$ Emissions from Electrical Transmission and Distribution | $SF_6$ | 4.3 | <0.01 | 0.99 | 15% | <0.001 |
| $N_2O$ Emissions from Product Uses | $N_2O$ | 4.2 | <0.01 | 0.99 | 24% | <0.001 |
| $CO_2$ Emissions from Stationary Combustion - Coal - U.S. Territories | $CO_2$ | 4.0 | <0.01 | 0.99 | 19% | <0.001 |
| $CO_2$ Emissions from Liming | $CO_2$ | 3.2 | <0.01 | 0.99 | 111% | 0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Residential | $CH_4$ | 3.1 | <0.01 | 0.99 | 218% | 0.001 |
| $CO_2$ Emissions from Stationary Combustion - Gas - U.S. Territories | $CO_2$ | 3.0 | <0.01 | 0.99 | 17% | <0.001 |
| $N_2O$ Emissions from Mobile Combustion: Other | $N_2O$ | 2.7 | <0.01 | 0.99 | 60% | <0.001 |

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|---|---|---|---|---|---|---|
| Non-$CO_2$ Emissions from Stationary Combustion - Industrial | $N_2O$ | 2.6 | <0.01 | 0.99 | 199% | 0.001 |
| $CH_4$ Emissions from Composting | $CH_4$ | 2.2 | <0.01 | 1.00 | 50% | <0.001 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Commercial | $CO_2$ | 2.0 | <0.01 | 1.00 | 15% | <0.001 |
| $CO_2$ Emissions from Ferroalloy Production | $CO_2$ | 2.0 | <0.01 | 1.00 | 12% | <0.001 |
| $N_2O$ Emissions from Composting | $N_2O$ | 1.9 | <0.01 | 1.00 | 50% | <0.001 |
| $CH_4$ Emissions from Mobile Combustion: Other | $CH_4$ | 1.9 | <0.01 | 1.00 | 52% | <0.001 |
| $CO_2$ Emissions from Soda Ash Production | $CO_2$ | 1.8 | <0.01 | 1.00 | 9% | <0.001 |
| $CO_2$ Emissions from Titanium Dioxide Production | $CO_2$ | 1.7 | <0.01 | 1.00 | 13% | <0.001 |
| $N_2O$ Emissions from Mobile Combustion: Aviation | $N_2O$ | 1.6 | <0.01 | 1.00 | 65% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Industrial | $CH_4$ | 1.6 | <0.01 | 1.00 | 47% | <0.001 |
| $N_2O$ Emissions from Caprolactam, Glyoxal, and Glyoxylic Acid Production | $N_2O$ | 1.4 | <0.01 | 1.00 | 31% | <0.001 |
| $CO_2$ Emissions from Glass Production | $CO_2$ | 1.3 | <0.01 | 1.00 | 4% | <0.001 |
| $CO_2$ Emissions from Aluminum Production | $CO_2$ | 1.2 | <0.01 | 1.00 | 3% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Commercial | $CH_4$ | 1.2 | <0.01 | 1.00 | 144% | <0.001 |
| PFC Emissions from Aluminum Production | PFCs | 1.1 | <0.01 | 1.00 | 9% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Electricity Generation | $CH_4$ | 1.1 | <0.01 | 1.00 | 3% | <0.001 |
| $SF_6$ Emissions from Magnesium Production and Processing | $SF_6$ | 1.1 | <0.01 | 1.00 | 6% | <0.001 |
| $CO_2$ Emissions from Phosphoric Acid Production | $CO_2$ | 1.0 | <0.01 | 1.00 | 21% | <0.001 |
| $CO_2$ Emissions from Zinc Production | $CO_2$ | 1.0 | <0.01 | 1.00 | 16% | <0.001 |
| $CH_4$ Emissions from Mobile Combustion: Road | $CH_4$ | 1.0 | <0.01 | 1.00 | 27% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Residential | $N_2O$ | 0.7 | <0.01 | 1.00 | 209% | <0.001 |
| $N_2O$ Emissions from Mobile Combustion: Marine | $N_2O$ | 0.5 | <0.01 | 1.00 | 44% | <0.001 |
| $CO_2$ Emissions from Lead Production | $CO_2$ | 0.5 | <0.01 | 1.00 | 15% | <0.001 |
| $CO_2$ Emissions from Stationary Combustion - Geothermal Energy | $CO_2$ | 0.4 | <0.01 | 1.00 | NA | <0.001 |
| $CH_4$ Emissions from Petrochemical Production | $CH_4$ | 0.4 | <0.01 | 1.00 | 57% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Commercial | $N_2O$ | 0.3 | <0.01 | 1.00 | 178% | <0.001 |
| $CH_4$ Emissions from Mobile Combustion: Marine | $CH_4$ | 0.3 | <0.01 | 1.00 | 87% | <0.001 |
| $N_2O$ Emissions from Incineration of Waste | $N_2O$ | 0.3 | <0.01 | 1.00 | 324% | <0.001 |
| $N_2O$ Emissions from Semiconductor Manufacture | $N_2O$ | 0.2 | <0.01 | 1.00 | 12% | <0.001 |
| $CH_4$ Emissions from Field Burning of Agricultural Residues | $CH_4$ | 0.2 | <0.01 | 1.00 | 51% | <0.001 |
| $CO_2$ Emissions from Silicon Carbide Production and Consumption | $CO_2$ | 0.2 | <0.01 | 1.00 | 9% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - U.S. Territories | $N_2O$ | 0.1 | <0.01 | 1.00 | 198% | <0.001 |
| HFC-134a Emissions from Magnesium Production and Processing | HFCs | 0.1 | <0.01 | 1.00 | 4% | <0.001 |
| $N_2O$ Emissions from Field Burning of Agricultural Residues | $N_2O$ | 0.1 | <0.01 | 1.00 | 47% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - U.S. Territories | $CH_4$ | 0.1 | <0.01 | 1.00 | 55% | <0.001 |
| $CH_4$ Emissions from Mobile Combustion: Aviation | $CH_4$ | + | <0.01 | 1.00 | 89% | <0.001 |
| $N_2O$ Emissions from Petroleum Systems | $N_2O$ | + | <0.01 | 1.00 | 34% | <0.001 |

| | | | | | | |
|---|---|---|---|---|---|---|
| $CH_4$ Emissions from Ferroalloy Production | $CH_4$ | + | <0.01 | 1.00 | 12% | <0.001 |
| $CH_4$ Emissions from Silicon Carbide Production and Consumption | $CH_4$ | + | <0.01 | 1.00 | 10% | <0.001 |
| $CH_4$ Emissions from Iron and Steel Production & Metallurgical Coke Production | $CH_4$ | + | <0.01 | 1.00 | 20% | <0.001 |
| $CO_2$ Emissions from Abandoned Oil and Gas Wells | $CO_2$ | + | <0.01 | 1.00 | 215% | <0.001 |
| $N_2O$ Emissions from Natural Gas Systems | $N_2O$ | + | <0.01 | 1.00 | 17% | <0.001 |
| $CO_2$ Emissions from Magnesium Production and Processing | $CO_2$ | + | <0.01 | 1.00 | 2% | <0.001 |
| $CH_4$ Emissions from Incineration of Waste | $CH_4$ | + | <0.01 | 1.00 | NE | <0.001 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Residential | $CO_2$ | 0.0 | <0.01 | 1.00 | NE | <0.001 |

+ Does not exceed 0.05 MMT $CO_2$ Eq.
NE (Not Estimated)
NA (Not Available)
[a] Percent relative uncertainty. If the corresponding uncertainty is asymmetrical, the uncertainty given here is the larger and always positive.
Note: LULUCF sources and sinks are not included in this analysis.

## Table A-7: 2017 Key Source Category Approach 1 and Approach 2 Analysis—Level Assessment with LULUCF

| IPCC Source/Sink Categories | Direct Greenhouse Gas | 2017 Estimate (MMT $CO_2$ Eq.) | Approach 1 Level Assessment | Cumulative Total | Uncertainty[a] | Approach 2 Level Assessment |
|---|---|---|---|---|---|---|
| $CO_2$ Emissions from Mobile Combustion: Road | $CO_2$ | 1,493.6 | 0.20 | 0.20 | 6% | 0.013 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Electricity Generation | $CO_2$ | 1,210.0 | 0.16 | 0.36 | 10% | 0.016 |
| Net $CO_2$ Emissions from Forest Land Remaining Forest Land | $CO_2$ | 620.3 | 0.08 | 0.44 | 152% | 0.125 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Electricity Generation | $CO_2$ | 505.1 | 0.07 | 0.51 | 5% | 0.003 |
| $CO_2$ Emissions from Stationary Combustion - Gas – Industrial | $CO_2$ | 486.0 | 0.06 | 0.57 | 7% | 0.005 |
| $CO_2$ Emissions from Stationary Combustion - Oil – Industrial | $CO_2$ | 276.4 | 0.04 | 0.61 | 20% | 0.007 |
| $CO_2$ Emissions from Stationary Combustion - Gas – Residential | $CO_2$ | 242.1 | 0.03 | 0.64 | 7% | 0.002 |
| Direct $N_2O$ Emissions from Agricultural Soil Management | $N_2O$ | 227.7 | 0.03 | 0.67 | 18% | 0.005 |
| $CO_2$ Emissions from Mobile Combustion: Aviation | $CO_2$ | 177.0 | 0.02 | 0.69 | 6% | 0.001 |
| $CH_4$ Emissions from Enteric Fermentation | $CH_4$ | 175.4 | 0.02 | 0.72 | 18% | 0.004 |
| $CO_2$ Emissions from Stationary Combustion - Gas – Commercial | $CO_2$ | 173.6 | 0.02 | 0.74 | 7% | 0.002 |
| $CH_4$ Emissions from Natural Gas Systems | $CH_4$ | 166.2 | 0.02 | 0.76 | 17% | 0.004 |
| Emissions from Substitutes for Ozone Depleting Substances | Several | 152.2 | 0.02 | 0.78 | 12% | 0.002 |
| Net $CO_2$ Emissions from Settlements Remaining Settlements | $CO_2$ | 134.5 | 0.02 | 0.80 | 86% | 0.015 |
| $CO_2$ Emissions from Non-Energy Use of Fuels | $CO_2$ | 124.6 | 0.02 | 0.82 | 36% | 0.006 |
| Net $CO_2$ Emissions from Land Converted to Forest Land | $CO_2$ | 120.6 | 0.02 | 0.83 | 9% | 0.002 |
| $CH_4$ Emissions from Landfills | $CH_4$ | 107.7 | 0.01 | 0.85 | 40% | 0.006 |
| Net $CO_2$ Emissions from Land Converted to Settlements | $CO_2$ | 86.2 | 0.01 | 0.86 | 29% | 0.003 |
| $CO_2$ Emissions from Mobile Combustion: Other | $CO_2$ | 83.2 | 0.01 | 0.87 | 6% | 0.001 |
| Net $CO_2$ Emissions from Land Converted to Cropland | $CO_2$ | 66.9 | 0.01 | 0.88 | 60% | 0.005 |
| Fugitive Emissions from Coal Mining | $CH_4$ | 62.6 | 0.01 | 0.89 | 14% | 0.001 |
| $CH_4$ Emissions from Manure Management | $CH_4$ | 61.7 | 0.01 | 0.90 | 20% | 0.002 |

| | | | | | | |
|---|---|---|---|---|---|---|
| $CO_2$ Emissions from Stationary Combustion - Oil - Commercial | $CO_2$ | 59.3 | 0.01 | 0.90 | 6% | <0.001 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Residential | $CO_2$ | 56.4 | 0.01 | 0.91 | 6% | <0.001 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Industrial | $CO_2$ | 55.1 | 0.01 | 0.92 | 16% | 0.001 |
| $CO_2$ Emissions from Iron and Steel Production & Metallurgical Coke Production | $CO_2$ | 41.8 | 0.01 | 0.92 | 17% | 0.001 |
| $CO_2$ Emissions from Mobile Combustion: Marine | $CO_2$ | 40.4 | 0.01 | 0.93 | 6% | <0.001 |
| $CO_2$ Emissions from Cement Production | $CO_2$ | 39.4 | 0.01 | 0.93 | 6% | <0.001 |
| Indirect $N_2O$ Emissions from Applied Nitrogen | $N_2O$ | 38.8 | 0.01 | 0.94 | 143% | 0.007 |
| $CH_4$ Emissions from Petroleum Systems | $CH_4$ | 37.7 | <0.01 | 0.94 | 34% | 0.002 |
| $CO_2$ Emissions from Stationary Combustion - Oil - U.S. Territories | $CO_2$ | 34.3 | <0.01 | 0.95 | 11% | <0.001 |
| $CO_2$ Emissions from Petrochemical Production | $CO_2$ | 28.2 | <0.01 | 0.95 | 5% | <0.001 |
| $CO_2$ Emissions from Natural Gas Systems | $CO_2$ | 26.3 | <0.01 | 0.96 | 17% | 0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Electricity Generation | $N_2O$ | 24.4 | <0.01 | 0.96 | 42% | 0.001 |
| $CO_2$ Emissions from Petroleum Systems | $CO_2$ | 23.3 | <0.01 | 0.96 | 34% | 0.001 |
| $N_2O$ Emissions from Manure Management | $N_2O$ | 18.7 | <0.01 | 0.97 | 24% | 0.001 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Electricity Generation | $CO_2$ | 18.5 | <0.01 | 0.97 | 9% | <0.001 |
| $CH_4$ Emissions from Wastewater Treatment | $CH_4$ | 14.3 | <0.01 | 0.97 | 28% | 0.001 |
| $CO_2$ Emissions from Ammonia Production | $CO_2$ | 13.8 | <0.01 | 0.97 | 7% | <0.001 |
| $CO_2$ Emissions from Lime Production | $CO_2$ | 13.2 | <0.01 | 0.97 | 2% | <0.001 |
| $N_2O$ Emissions from Mobile Combustion: Road | $N_2O$ | 12.1 | <0.01 | 0.97 | 14% | <0.001 |
| $CH_4$ Emissions from Rice Cultivation | $CH_4$ | 11.3 | <0.01 | 0.98 | 49% | 0.001 |
| $CO_2$ Emissions from Incineration of Waste | $CO_2$ | 10.8 | <0.01 | 0.98 | 16% | <0.001 |
| Net $CO_2$ Emissions from Cropland Remaining Cropland | $CO_2$ | 10.3 | <0.01 | 0.98 | 423% | 0.006 |
| $CO_2$ Emissions from Other Process Uses of Carbonates | $CO_2$ | 10.1 | <0.01 | 0.98 | 15% | <0.001 |
| $N_2O$ Emissions from Nitric Acid Production | $N_2O$ | 10.1 | <0.01 | 0.98 | 5% | <0.001 |
| Net $CO_2$ Emissions from Land Converted to Grassland | $CO_2$ | 8.3 | <0.01 | 0.98 | 214% | 0.002 |
| $N_2O$ Emissions from Adipic Acid Production | $N_2O$ | 7.0 | <0.01 | 0.98 | 5% | <0.001 |
| $CH_4$ Emissions from Abandoned Oil and Gas Wells | $CH_4$ | 6.9 | <0.01 | 0.98 | 215% | 0.002 |
| Fugitive Emissions from Abandoned Underground Coal Mines | $CH_4$ | 6.4 | <0.01 | 0.99 | 22% | <0.001 |
| HFC-23 Emissions from HCFC-22 Production | HFCs | 5.2 | <0.01 | 0.99 | 10% | <0.001 |
| $CO_2$ Emissions from Urea Fertilization | $CO_2$ | 5.1 | <0.01 | 0.99 | 43% | <0.001 |
| $N_2O$ Emissions from Wastewater Treatment | $N_2O$ | 5.0 | <0.01 | 0.99 | 108% | 0.001 |
| $CH_4$ Emissions from Forest Fires | $CH_4$ | 4.9 | <0.01 | 0.99 | 17% | <0.001 |
| PFC, HFC, $SF_6$, and $NF_3$ Emissions from Semiconductor Manufacture | Several | 4.7 | <0.01 | 0.99 | 6% | <0.001 |
| $CO_2$ Emissions from Carbon Dioxide Consumption | $CO_2$ | 4.5 | <0.01 | 0.99 | 5% | <0.001 |
| Net $CO_2$ Emissions from Coastal Wetlands Remaining Coastal Wetlands | $CO_2$ | 4.4 | <0.01 | 0.99 | 64% | <0.001 |
| $CO_2$ Emissions from Urea Consumption for Non-Ag Purposes | $CO_2$ | 4.3 | <0.01 | 0.99 | 12% | <0.001 |
| $SF_6$ Emissions from Electrical Transmission and Distribution | $SF_6$ | 4.3 | <0.01 | 0.99 | 15% | <0.001 |
| $N_2O$ Emissions from Product Uses | $N_2O$ | 4.2 | <0.01 | 0.99 | 24% | <0.001 |
| $CO_2$ Emissions from Stationary Combustion - Coal - U.S. Territories | $CO_2$ | 4.0 | <0.01 | 0.99 | 19% | <0.001 |
| $CH_4$ Emissions from Coastal Wetlands Remaining Coastal Wetlands | $CH_4$ | 3.6 | <0.01 | 0.99 | 30% | <0.001 |

| | | | | | | |
|---|---|---|---|---|---|---|
| $N_2O$ Emissions from Forest Fires | $N_2O$ | 3.2 | <0.01 | 0.99 | 14% | <0.001 |
| $CO_2$ Emissions from Liming | $CO_2$ | 3.2 | <0.01 | 0.99 | 111% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Residential | $CH_4$ | 3.1 | <0.01 | 0.99 | 218% | 0.001 |
| $CO_2$ Emissions from Stationary Combustion - Gas - U.S. Territories | $CO_2$ | 3.0 | <0.01 | 0.99 | 17% | <0.001 |
| $N_2O$ Emissions from Mobile Combustion: Other | $N_2O$ | 2.7 | <0.01 | 0.99 | 60% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Industrial | $N_2O$ | 2.6 | <0.01 | 1.00 | 199% | 0.001 |
| $N_2O$ Emissions from Settlement Soils | $N_2O$ | 2.5 | <0.01 | 1.00 | 48% | <0.001 |
| $CH_4$ Emissions from Composting | $CH_4$ | 2.2 | <0.01 | 1.00 | 50% | <0.001 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Commercial | $CO_2$ | 2.0 | <0.01 | 1.00 | 15% | <0.001 |
| $CO_2$ Emissions from Ferroalloy Production | $CO_2$ | 2.0 | <0.01 | 1.00 | 12% | <0.001 |
| $N_2O$ Emissions from Composting | $N_2O$ | 1.9 | <0.01 | 1.00 | 50% | <0.001 |
| $CH_4$ Emissions from Mobile Combustion: Other | $CH_4$ | 1.9 | <0.01 | 1.00 | 52% | <0.001 |
| $CO_2$ Emissions from Soda Ash Production | $CO_2$ | 1.8 | <0.01 | 1.00 | 9% | <0.001 |
| $CO_2$ Emissions from Titanium Dioxide Production | $CO_2$ | 1.7 | <0.01 | 1.00 | 13% | <0.001 |
| $N_2O$ Emissions from Mobile Combustion: Aviation | $N_2O$ | 1.6 | <0.01 | 1.00 | 65% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Industrial | $CH_4$ | 1.6 | <0.01 | 1.00 | 47% | <0.001 |
| $N_2O$ Emissions from Caprolactam, Glyoxal, and Glyoxylic Acid Production | $N_2O$ | 1.4 | <0.01 | 1.00 | 31% | <0.001 |
| $CO_2$ Emissions from Glass Production | $CO_2$ | 1.3 | <0.01 | 1.00 | 4% | <0.001 |
| $CO_2$ Emissions from Aluminum Production | $CO_2$ | 1.2 | <0.01 | 1.00 | 3% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Commercial | $CH_4$ | 1.2 | <0.01 | 1.00 | 144% | <0.001 |
| PFC Emissions from Aluminum Production | PFCs | 1.1 | <0.01 | 1.00 | 9% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Electricity Generation | $CH_4$ | 1.1 | <0.01 | 1.00 | 3% | <0.001 |
| $SF_6$ Emissions from Magnesium Production and Processing | $SF_6$ | 1.1 | <0.01 | 1.00 | 6% | <0.001 |
| $CO_2$ Emissions from Phosphoric Acid Production | $CO_2$ | 1.0 | <0.01 | 1.00 | 21% | <0.001 |
| $CO_2$ Emissions from Zinc Production | $CO_2$ | 1.0 | <0.01 | 1.00 | 16% | <0.001 |
| $CH_4$ Emissions from Mobile Combustion: Road | $CH_4$ | 1.0 | <0.01 | 1.00 | 27% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Residential | $N_2O$ | 0.7 | <0.01 | 1.00 | 209% | <0.001 |
| $N_2O$ Emissions from Mobile Combustion: Marine | $N_2O$ | 0.5 | <0.01 | 1.00 | 44% | <0.001 |
| $N_2O$ Emissions from Forest Soils | $N_2O$ | 0.5 | <0.01 | 1.00 | 318% | <0.001 |
| $CO_2$ Emissions from Lead Production | $CO_2$ | 0.5 | <0.01 | 1.00 | 15% | <0.001 |
| $CO_2$ Emissions from Stationary Combustion - Geothermal Energy | $CO_2$ | 0.4 | <0.01 | 1.00 | NA | <0.001 |
| $CH_4$ Emissions from Petrochemical Production | $CH_4$ | 0.4 | <0.01 | 1.00 | 57% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - Commercial | $N_2O$ | 0.3 | <0.01 | 1.00 | 178% | <0.001 |
| $N_2O$ Emissions from Grass Fires | $N_2O$ | 0.3 | <0.01 | 1.00 | 140% | <0.001 |
| $CH_4$ Emissions from Mobile Combustion: Marine | $CH_4$ | 0.3 | <0.01 | 1.00 | 87% | <0.001 |
| $N_2O$ Emissions from Incineration of Waste | $N_2O$ | 0.3 | <0.01 | 1.00 | 324% | <0.001 |
| $CH_4$ Emissions from Grass Fires | $CH_4$ | 0.3 | <0.01 | 1.00 | 139% | <0.001 |
| $N_2O$ Emissions from Semiconductor Manufacture | $N_2O$ | 0.2 | <0.01 | 1.00 | 12% | <0.001 |
| $CH_4$ Emissions from Field Burning of Agricultural Residues | $CH_4$ | 0.2 | <0.01 | 1.00 | 51% | <0.001 |

| | | | | | | |
|---|---|---|---|---|---|---|
| $CO_2$ Emissions from Silicon Carbide Production and Consumption | $CO_2$ | 0.2 | <0.01 | 1.00 | 9% | <0.001 |
| $N_2O$ Emissions from Coastal Wetlands Remaining Coastal Wetlands | $N_2O$ | 0.1 | <0.01 | 1.00 | 116% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - U.S. Territories | $N_2O$ | 0.1 | <0.01 | 1.00 | 198% | <0.001 |
| HFC-134a Emissions from Magnesium Production and Processing | HFCs | 0.1 | <0.01 | 1.00 | 4% | <0.001 |
| $N_2O$ Emissions from Drained Organic Soils | $N_2O$ | 0.1 | <0.01 | 1.00 | 124% | <0.001 |
| $N_2O$ Emissions from Field Burning of Agricultural Residues | $N_2O$ | 0.1 | <0.01 | 1.00 | 47% | <0.001 |
| Non-$CO_2$ Emissions from Stationary Combustion - U.S. Territories | $CH_4$ | 0.1 | <0.01 | 1.00 | 55% | <0.001 |
| Net $CO_2$ Emissions from Land Converted to Wetlands | $CO_2$ | + | <0.01 | 1.00 | 30% | <0.001 |
| $CH_4$ Emissions from Mobile Combustion: Aviation | $CH_4$ | + | <0.01 | 1.00 | 89% | <0.001 |
| $N_2O$ Emissions from Natural Gas Systems | $N_2O$ | + | <0.01 | 1.00 | 17% | <0.001 |
| $CH_4$ Emissions from Drained Organic Soils | $CH_4$ | + | <0.01 | 1.00 | 76% | <0.001 |
| $CH_4$ Emissions from Land Converted to Coastal Wetlands | $CH_4$ | + | <0.01 | 1.00 | 30% | <0.001 |
| $CH_4$ Emissions from Ferroalloy Production | $CH_4$ | + | <0.01 | 1.00 | 12% | <0.001 |
| $CH_4$ Emissions from Silicon Carbide Production and Consumption | $CH_4$ | + | <0.01 | 1.00 | 10% | <0.001 |
| $CH_4$ Emissions from Iron and Steel Production & Metallurgical Coke Production | $CH_4$ | + | <0.01 | 1.00 | 20% | <0.001 |
| $CO_2$ Emissions from Abandoned Oil and Gas Wells | $CO_2$ | + | <0.01 | 1.00 | 215% | <0.001 |
| $N_2O$ Emissions from Petroleum Systems | $N_2O$ | + | <0.01 | 1.00 | 34% | <0.001 |
| $CH_4$ Emissions from Peatlands Remaining Peatlands | $CH_4$ | + | <0.01 | 1.00 | 78% | <0.001 |
| $CO_2$ Emissions from Magnesium Production and Processing | $CO_2$ | + | <0.01 | 1.00 | 2% | <0.001 |
| $N_2O$ Emissions from Peatlands Remaining Peatlands | $N_2O$ | + | <0.01 | 1.00 | 54% | <0.001 |
| $CH_4$ Emissions from Incineration of Waste | $CH_4$ | + | <0.01 | 1.00 | NE | <0.001 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Residential | $CO_2$ | 0.0 | <0.01 | 1.00 | NE | <0.001 |

+ Does not exceed 0.05 MMT $CO_2$ Eq.
NE (Not Estimated)
NA (Not Available)
[a] Percent relative uncertainty. If the corresponding uncertainty is asymmetrical, the uncertainty given here is the larger and always positive.

## Table A-8: 1990-2017 Key Source Category Approach 1 and 2 Analysis—Trend Assessment, without LULUCF

| IPCC Source Categories | Direct Greenhouse Gas | 1990 Estimate (MMT $CO_2$ Eq.) | 2017 Estimate (MMT $CO_2$ Eq.) | Approach 1 Trend Assessment | Approach 2 Trend Assessment | % Contribution to Trend | Cumulative Total |
|---|---|---|---|---|---|---|---|
| $CO_2$ Emissions from Stationary Combustion - Coal - Electricity Generation | $CO_2$ | 1,547.6 | 1,210.0 | 0.06 | 0.005 | 17.7 | 18 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Electricity Generation | $CO_2$ | 175.3 | 505.1 | 0.05 | 0.003 | 16.0 | 34 |
| $CO_2$ Emissions from Mobile Combustion: Road | $CO_2$ | 1,162.2 | 1,493.6 | 0.05 | 0.003 | 15.3 | 49 |
| Emissions from Substitutes for Ozone Depleting Substances | Several | 0.3 | 152.2 | 0.02 | 0.003 | 7.4 | 56 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Industrial | $CO_2$ | 155.3 | 55.1 | 0.02 | 0.003 | 5.0 | 62 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $CO_2$ Emissions from Stationary Combustion - Oil - Electricity Generation | $CO_2$ | 97.5 | 18.5 | 0.01 | 0.001 | 3.9 | 65 |
| $CH_4$ Emissions from Landfills | $CH_4$ | 179.6 | 107.7 | 0.01 | 0.005 | 3.7 | 69 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Industrial | $CO_2$ | 408.5 | 486.0 | 0.01 | 0.001 | 3.5 | 73 |
| $CO_2$ Emissions from Iron and Steel Production & Metallurgical Coke Production | $CO_2$ | 101.6 | 41.8 | 0.01 | 0.002 | 3.0 | 76 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Residential | $CO_2$ | 97.4 | 56.4 | 0.01 | <0.001 | 2.1 | 78 |
| HFC-23 Emissions from HCFC-22 Production | HFCs | 46.1 | 5.2 | 0.01 | 0.001 | 2.0 | 80 |
| Fugitive Emissions from Coal Mining | $CH_4$ | 96.5 | 62.6 | 0.01 | 0.001 | 1.7 | 81 |
| $CH_4$ Emissions from Natural Gas Systems | $CH_4$ | 193.9 | 166.2 | <0.01 | 0.001 | 1.5 | 83 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Commercial | $CO_2$ | 142.0 | 173.6 | <0.01 | <0.001 | 1.4 | 84 |
| $N_2O$ Emissions from Mobile Combustion: Road | $N_2O$ | 37.6 | 12.1 | <0.01 | 0.001 | 1.3 | 86 |
| $CH_4$ Emissions from Manure Management | $CH_4$ | 37.1 | 61.7 | <0.01 | 0.001 | 1.2 | 87 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Industrial | $CO_2$ | 293.7 | 276.4 | <0.01 | 0.001 | 1.1 | 88 |
| PFC Emissions from Aluminum Production | PFCs | 21.5 | 1.1 | <0.01 | <0.001 | 1.0 | 89 |
| $SF_6$ Emissions from Electrical Transmission and Distribution | $SF_6$ | 23.1 | 4.3 | <0.01 | <0.001 | 0.9 | 90 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Commercial | $CO_2$ | 72.6 | 59.3 | <0.01 | <0.001 | 0.7 | 91 |
| $CO_2$ Emissions from Petroleum Systems | $CO_2$ | 8.9 | 23.3 | <0.01 | 0.001 | 0.7 | 91 |
| $CO_2$ Emissions from Mobile Combustion: Aviation | $CO_2$ | 187.4 | 177.0 | <0.01 | <0.001 | 0.6 | 92 |
| Direct $N_2O$ Emissions from Agricultural Soil Management | $N_2O$ | 212.7 | 227.7 | <0.01 | <0.001 | 0.6 | 93 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Commercial | $CO_2$ | 12.0 | 2.0 | <0.01 | <0.001 | 0.5 | 93 |
| $CO_2$ Emissions from Mobile Combustion: Other | $CO_2$ | 73.2 | 83.2 | <0.01 | <0.001 | 0.4 | 93 |
| $CH_4$ Emissions from Enteric Fermentation | $CH_4$ | 164.2 | 175.4 | <0.01 | <0.001 | 0.4 | 94 |
| $N_2O$ Emissions from Adipic Acid Production | $N_2O$ | 15.2 | 7.0 | <0.01 | <0.001 | 0.4 | 94 |
| $CO_2$ Emissions from Stationary Combustion - Oil - U.S. Territories | $CO_2$ | 26.9 | 34.3 | <0.01 | <0.001 | 0.3 | 95 |
| $CO_2$ Emissions from Mobile Combustion: Marine | $CO_2$ | 46.3 | 40.4 | <0.01 | <0.001 | 0.3 | 95 |
| $CO_2$ Emissions from Petrochemical Production | $CO_2$ | 21.3 | 28.2 | <0.01 | <0.001 | 0.3 | 95 |
| $CO_2$ Emissions from Aluminum Production | $CO_2$ | 6.8 | 1.2 | <0.01 | <0.001 | 0.3 | 96 |
| $CO_2$ Emissions from Cement Production | $CO_2$ | 33.5 | 39.4 | <0.01 | <0.001 | 0.3 | 96 |
| $CH_4$ Emissions from Mobile Combustion: Other | $CH_4$ | 7.1 | 1.9 | <0.01 | <0.001 | 0.3 | 96 |
| $CH_4$ Emissions from Petroleum Systems | $CH_4$ | 42.1 | 37.7 | <0.01 | <0.001 | 0.2 | 96 |
| $CH_4$ Emissions from Rice Cultivation | $CH_4$ | 16.0 | 11.3 | <0.01 | <0.001 | 0.2 | 97 |
| $N_2O$ Emissions from Manure Management | $N_2O$ | 14.0 | 18.7 | <0.01 | <0.001 | 0.2 | 97 |
| $CH_4$ Emissions from Mobile Combustion: Road | $CH_4$ | 5.2 | 1.0 | <0.01 | <0.001 | 0.2 | 97 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $SF_6$ Emissions from Magnesium Production and Processing | $SF_6$ | 5.2 | 1.1 | <0.01 | <0.001 | 0.2 | 97 |
| $CO_2$ Emissions from Natural Gas Systems | $CO_2$ | 30.0 | 26.3 | <0.01 | <0.001 | 0.2 | 97 |
| $CO_2$ Emissions from Other Process Uses of Carbonates | $CO_2$ | 6.3 | 10.1 | <0.01 | <0.001 | 0.2 | 98 |
| Non-$CO_2$ Emissions from Stationary Combustion - Electricity Generation | $N_2O$ | 20.5 | 24.4 | <0.01 | <0.001 | 0.2 | 98 |
| $CO_2$ Emissions from Stationary Combustion - Coal - U.S. Territories | $CO_2$ | 0.6 | 4.0 | <0.01 | <0.001 | 0.2 | 98 |
| $CO_2$ Emissions from Non-Energy Use of Fuels | $CO_2$ | 119.5 | 124.6 | <0.01 | <0.001 | 0.2 | 98 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Residential | $CO_2$ | 3.0 | 0.0 | <0.01 | <0.001 | 0.1 | 98 |
| $CO_2$ Emissions from Stationary Combustion - Gas - U.S. Territories | $CO_2$ | 0.0 | 3.0 | <0.01 | <0.001 | 0.1 | 98 |
| $CO_2$ Emissions from Carbon Dioxide Consumption | $CO_2$ | 1.5 | 4.5 | <0.01 | <0.001 | 0.1 | 99 |
| $CO_2$ Emissions from Incineration of Waste | $CO_2$ | 8.0 | 10.8 | <0.01 | <0.001 | 0.1 | 99 |
| $CO_2$ Emissions from Urea Fertilization | $CO_2$ | 2.4 | 5.1 | <0.01 | <0.001 | 0.1 | 99 |
| Non-$CO_2$ Emissions from Stationary Combustion - Residential | $CH_4$ | 5.2 | 3.1 | <0.01 | 0.001 | 0.1 | 99 |
| $N_2O$ Emissions from Nitric Acid Production | $N_2O$ | 12.1 | 10.1 | <0.01 | <0.001 | 0.1 | 99 |
| $CH_4$ Emissions from Composting | $CH_4$ | 0.4 | 2.2 | <0.01 | <0.001 | 0.1 | 99 |
| $N_2O$ Emissions from Composting | $N_2O$ | 0.3 | 1.9 | <0.01 | <0.001 | 0.1 | 99 |
| $CO_2$ Emissions from Liming | $CO_2$ | 4.7 | 3.2 | <0.01 | <0.001 | 0.1 | 99 |
| $N_2O$ Emissions from Wastewater Treatment | $N_2O$ | 3.4 | 5.0 | <0.01 | <0.001 | 0.1 | 99 |
| $CO_2$ Emissions from Lime Production | $CO_2$ | 11.7 | 13.2 | <0.01 | <0.001 | 0.1 | 99 |
| $CH_4$ Emissions from Wastewater Treatment | $CH_4$ | 15.3 | 14.3 | <0.01 | <0.001 | 0.1 | 99 |
| PFC, HFC, $SF_6$, and $NF_3$ Emissions from Semiconductor Manufacture | Several | 3.6 | 4.7 | <0.01 | <0.001 | 0.1 | 99 |
| Fugitive Emissions from Abandoned Underground Coal Mines | $CH_4$ | 7.2 | 6.4 | <0.01 | <0.001 | <0.1 | 100 |
| Indirect $N_2O$ Emissions from Applied Nitrogen | $N_2O$ | 39.0 | 38.8 | <0.01 | <0.001 | <0.1 | 100 |
| Non-$CO_2$ Emissions from Stationary Combustion - Electricity Generation | $CH_4$ | 0.4 | 1.1 | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Residential | $CO_2$ | 237.7 | 242.1 | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Mobile Combustion: Other | $N_2O$ | 2.1 | 2.7 | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Ammonia Production | $CO_2$ | 13.0 | 13.8 | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Phosphoric Acid Production | $CO_2$ | 1.5 | 1.0 | <0.01 | <0.001 | <0.1 | 100 |
| Non-$CO_2$ Emissions from Stationary Combustion - Industrial | $N_2O$ | 3.1 | 2.6 | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Urea Consumption for Non-Ag Purposes | $CO_2$ | 3.8 | 4.3 | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Titanium Dioxide Production | $CO_2$ | 1.2 | 1.7 | <0.01 | <0.001 | <0.1 | 100 |
| Non-$CO_2$ Emissions from Stationary Combustion - Residential | $N_2O$ | 1.0 | 0.7 | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Zinc Production | $CO_2$ | 0.6 | 1.0 | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Soda Ash Production | $CO_2$ | 1.4 | 1.8 | <0.01 | <0.001 | <0.1 | 100 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $N_2O$ Emissions from Caprolactam, Glyoxal, and Glyoxylic Acid Production | $N_2O$ | 1.7 | 1.4 | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Abandoned Oil and Gas Wells | $CH_4$ | 6.6 | 6.9 | <0.01 | <0.001 | <0.1 | 100 |
| Non-$CO_2$ Emissions from Stationary Combustion - Industrial | $CH_4$ | 1.8 | 1.6 | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Mobile Combustion: Marine | $CH_4$ | 0.6 | 0.3 | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Glass Production | $CO_2$ | 1.5 | 1.3 | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Semiconductor Manufacture | $N_2O$ | + | 0.2 | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Ferroalloy Production | $CO_2$ | 2.2 | 2.0 | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Silicon Carbide Production and Consumption | $CO_2$ | 0.4 | 0.2 | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Incineration of Waste | $N_2O$ | 0.5 | 0.3 | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Mobile Combustion: Aviation | $N_2O$ | 1.7 | 1.6 | <0.01 | <0.001 | <0.1 | 100 |
| Non-$CO_2$ Emissions from Stationary Combustion - Commercial | $CH_4$ | 1.1 | 1.2 | <0.01 | <0.001 | <0.1 | 100 |
| HFC-134a Emissions from Magnesium Production and Processing | HFCs | 0.0 | 0.1 | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Field Burning of Agricultural Residues | $CH_4$ | 0.1 | 0.2 | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Product Uses | $N_2O$ | 4.2 | 4.2 | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Lead Production | $CO_2$ | 0.5 | 0.5 | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Petrochemical Production | $CH_4$ | 0.3 | 0.4 | <0.01 | <0.001 | <0.1 | 100 |
| Non-$CO_2$ Emissions from Stationary Combustion - Commercial | $N_2O$ | 0.4 | 0.3 | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Mobile Combustion: Aviation | $CH_4$ | 0.1 | + | <0.01 | <0.001 | <0.1 | 100 |
| Non-$CO_2$ Emissions from Stationary Combustion - U.S. Territories | $N_2O$ | 0.1 | 0.1 | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Field Burning of Agricultural Residues | $N_2O$ | + | 0.1 | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Mobile Combustion: Marine | $N_2O$ | 0.6 | 0.5 | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Silicon Carbide Production and Consumption | $CH_4$ | + | + | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Iron and Steel Production & Metallurgical Coke Production | $CH_4$ | + | + | <0.01 | <0.001 | <0.1 | 100 |
| Non-$CO_2$ Emissions from Stationary Combustion - U.S. Territories | $CH_4$ | + | 0.1 | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Petroleum Systems | $N_2O$ | + | + | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Stationary Combustion - Geothermal Energy | $CO_2$ | 0.4 | 0.4 | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Natural Gas Systems | $N_2O$ | + | + | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Ferroalloy Production | $CH_4$ | + | + | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Magnesium Production and Processing | $CO_2$ | + | + | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Abandoned Oil and Gas Wells | $CO_2$ | + | + | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Incineration of Waste | $CH_4$ | + | + | <0.01 | <0.001 | <0.1 | 100 |

+ Does not exceed 0.05 MMT $CO_2$ Eq.

Note: LULUCF sources and sinks are not included in this analysis.

## Table A-9: 1990-2017 Key Source Category Approach 1 and 2 Analysis—Trend Assessment, with LULUCF

| IPCC Source Categories | Direct Greenhouse Gas | 1990 Estimate ($MMT CO_2$ Eq.) | 2017 Estimate ($MMT CO_2$ Eq.) | Approach 1 Trend Assessment | Approach 2 Trend Assessment | % Contribution to Trend | Cumulative Total |
|---|---|---|---|---|---|---|---|
| $CO_2$ Emissions from Stationary Combustion - Coal - Electricity Generation | $CO_2$ | 1,547.6 | 1,210.0 | 0.05 | 0.004 | 15.8 | 16 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Electricity Generation | $CO_2$ | 175.3 | 505.1 | 0.04 | 0.002 | 15.1 | 31 |
| $CO_2$ Emissions from Mobile Combustion: Road | $CO_2$ | 1,162.2 | 1,493.6 | 0.04 | 0.003 | 14.9 | 46 |
| Emissions from Substitutes for Ozone Depleting Substances | Several | 0.3 | 152.2 | 0.02 | 0.002 | 7.0 | 53 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Industrial | $CO_2$ | 155.3 | 55.1 | 0.01 | 0.002 | 4.6 | 57 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Electricity Generation | $CO_2$ | 97.5 | 18.5 | 0.01 | 0.001 | 3.6 | 61 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Industrial | $CO_2$ | 408.5 | 486.0 | 0.01 | 0.001 | 3.4 | 64 |
| $CH_4$ Emissions from Landfills | $CH_4$ | 179.6 | 107.7 | 0.01 | 0.004 | 3.3 | 68 |
| Net $CO_2$ Emissions from Forest Land Remaining Forest Land | $CO_2$ | 680.1 | 620.3 | 0.01 | 0.013 | 2.9 | 71 |
| $CO_2$ Emissions from Iron and Steel Production & Metallurgical Coke Production | $CO_2$ | 101.6 | 41.8 | 0.01 | 0.001 | 2.8 | 73 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Residential | $CO_2$ | 97.4 | 56.4 | 0.01 | <0.001 | 1.9 | 75 |
| HFC-23 Emissions from HCFC-22 Production | HFCs | 46.1 | 5.2 | 0.01 | 0.001 | 1.9 | 77 |
| Fugitive Emissions from Coal Mining | $CH_4$ | 96.5 | 62.6 | <0.01 | 0.001 | 1.6 | 79 |
| Net $CO_2$ Emissions from Cropland Remaining Cropland | $CO_2$ | 40.9 | 10.3 | <0.01 | 0.017 | 1.4 | 80 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Commercial | $CO_2$ | 142.0 | 173.6 | <0.01 | <0.001 | 1.4 | 82 |
| $CH_4$ Emissions from Natural Gas Systems | $CH_4$ | 193.9 | 166.2 | <0.01 | 0.001 | 1.3 | 83 |
| $N_2O$ Emissions from Mobile Combustion: Road | $N_2O$ | 37.6 | 12.1 | <0.01 | <0.001 | 1.2 | 84 |
| $CH_4$ Emissions from Manure Management | $CH_4$ | 37.1 | 61.7 | <0.01 | 0.001 | 1.1 | 85 |
| Net $CO_2$ Emissions from Land Converted to Settlements | $CO_2$ | 62.9 | 86.2 | <0.01 | 0.001 | 1.1 | 86 |
| PFC Emissions from Aluminum Production | PFCs | 21.5 | 1.1 | <0.01 | <0.001 | 0.9 | 87 |
| $SF_6$ Emissions from Electrical Transmission and Distribution | $SF_6$ | 23.1 | 4.3 | <0.01 | <0.001 | 0.9 | 88 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Industrial | $CO_2$ | 293.7 | 276.4 | <0.01 | 0.001 | 0.9 | 89 |
| $CO_2$ Emissions from Petroleum Systems | $CO_2$ | 8.9 | 23.3 | <0.01 | 0.001 | 0.7 | 90 |
| Direct $N_2O$ Emissions from Agricultural Soil Management | $N_2O$ | 212.7 | 227.7 | <0.01 | <0.001 | 0.6 | 90 |
| $CO_2$ Emissions from Stationary Combustion - Oil - Commercial | $CO_2$ | 72.6 | 59.3 | <0.01 | <0.001 | 0.6 | 91 |
| Net $CO_2$ Emissions from Settlements Remaining Settlements | $CO_2$ | 122.1 | 134.5 | <0.01 | 0.001 | 0.5 | 91 |

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|---|---|---|---|---|---|---|---|
| $CO_2$ Emissions from Mobile Combustion: Aviation | $CO_2$ | 187.4 | 177.0 | <0.01 | <0.001 | 0.5 | 92 |
| $CH_4$ Emissions from Enteric Fermentation | $CH_4$ | 164.2 | 175.4 | <0.01 | <0.001 | 0.5 | 92 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Commercial | $CO_2$ | 12.0 | 2.0 | <0.01 | <0.001 | 0.5 | 93 |
| $CO_2$ Emissions from Mobile Combustion: Other | $CO_2$ | 73.2 | 83.2 | <0.01 | <0.001 | 0.4 | 93 |
| Net $CO_2$ Emissions from Land Converted to Cropland | $CO_2$ | 75.6 | 66.9 | <0.01 | 0.001 | 0.4 | 94 |
| $N_2O$ Emissions from Adipic Acid Production | $N_2O$ | 15.2 | 7.0 | <0.01 | <0.001 | 0.4 | 94 |
| $CO_2$ Emissions from Stationary Combustion - Oil - U.S. Territories | $CO_2$ | 26.9 | 34.3 | <0.01 | <0.001 | 0.3 | 94 |
| $CO_2$ Emissions from Petrochemical Production | $CO_2$ | 21.3 | 28.2 | <0.01 | <0.001 | 0.3 | 95 |
| $CO_2$ Emissions from Mobile Combustion: Marine | $CO_2$ | 46.3 | 40.4 | <0.01 | <0.001 | 0.3 | 95 |
| $CO_2$ Emissions from Cement Production | $CO_2$ | 33.5 | 39.4 | <0.01 | <0.001 | 0.3 | 95 |
| $CO_2$ Emissions from Aluminum Production | $CO_2$ | 6.8 | 1.2 | <0.01 | <0.001 | 0.3 | 96 |
| $CH_4$ Emissions from Mobile Combustion: Other | $CH_4$ | 7.1 | 1.9 | <0.01 | <0.001 | 0.2 | 96 |
| $CH_4$ Emissions from Rice Cultivation | $CH_4$ | 16.0 | 11.3 | <0.01 | <0.001 | 0.2 | 96 |
| $CH_4$ Emissions from Petroleum Systems | $CH_4$ | 42.1 | 37.7 | <0.01 | <0.001 | 0.2 | 96 |
| $N_2O$ Emissions from Manure Management | $N_2O$ | 14.0 | 18.7 | <0.01 | <0.001 | 0.2 | 96 |
| $CO_2$ Emissions from Non-Energy Use of Fuels | $CO_2$ | 119.5 | 124.6 | <0.01 | <0.001 | 0.2 | 97 |
| $CH_4$ Emissions from Mobile Combustion: Road | $CH_4$ | 5.2 | 1.0 | <0.01 | <0.001 | 0.2 | 97 |
| $SF_6$ Emissions from Magnesium Production and Processing | $SF_6$ | 5.2 | 1.1 | <0.01 | <0.001 | 0.2 | 97 |
| $CO_2$ Emissions from Natural Gas Systems | $CO_2$ | 30.0 | 26.3 | <0.01 | <0.001 | 0.2 | 97 |
| $CO_2$ Emissions from Other Process Uses of Carbonates | $CO_2$ | 6.3 | 10.1 | <0.01 | <0.001 | 0.2 | 97 |
| Non-$CO_2$ Emissions from Stationary Combustion - Electricity Generation | $N_2O$ | 20.5 | 24.4 | <0.01 | <0.001 | 0.2 | 98 |
| $CO_2$ Emissions from Stationary Combustion - Coal - U.S. Territories | $CO_2$ | 0.6 | 4.0 | <0.01 | <0.001 | 0.2 | 98 |
| $CH_4$ Emissions from Forest Fires | $CH_4$ | 1.5 | 4.9 | <0.01 | <0.001 | 0.2 | 98 |
| $CO_2$ Emissions from Stationary Combustion - Gas - Residential | $CO_2$ | 237.7 | 242.1 | <0.01 | <0.001 | 0.1 | 98 |
| $CO_2$ Emissions from Stationary Combustion - Gas - U.S. Territories | $CO_2$ | 0.0 | 3.0 | <0.01 | <0.001 | 0.1 | 98 |
| $CO_2$ Emissions from Stationary Combustion - Coal - Residential | $CO_2$ | 3.0 | 0.0 | <0.01 | <0.001 | 0.1 | 98 |
| $CO_2$ Emissions from Carbon Dioxide Consumption | $CO_2$ | 1.5 | 4.5 | <0.01 | <0.001 | 0.1 | 98 |
| $CO_2$ Emissions from Incineration of Waste | $CO_2$ | 8.0 | 10.8 | <0.01 | <0.001 | 0.1 | 99 |
| $CO_2$ Emissions from Urea Fertilization | $CO_2$ | 2.4 | 5.1 | <0.01 | <0.001 | 0.1 | 99 |
| $N_2O$ Emissions from Forest Fires | $N_2O$ | 1.0 | 3.2 | <0.01 | <0.001 | 0.1 | 99 |
| Non-$CO_2$ Emissions from Stationary Combustion - Residential | $CH_4$ | 5.2 | 3.1 | <0.01 | 0.001 | 0.1 | 99 |
| $N_2O$ Emissions from Nitric Acid Production | $N_2O$ | 12.1 | 10.1 | <0.01 | <0.001 | 0.1 | 99 |
| $CH_4$ Emissions from Composting | $CH_4$ | 0.4 | 2.2 | <0.01 | <0.001 | 0.1 | 99 |

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|---|---|---|---|---|---|---|---|
| $N_2O$ Emissions from Composting | $N_2O$ | 0.3 | 1.9 | <0.01 | <0.001 | 0.1 | 99 |
| $N_2O$ Emissions from Wastewater Treatment | $N_2O$ | 3.4 | 5.0 | <0.01 | <0.001 | 0.1 | 99 |
| $CO_2$ Emissions from Liming | $CO_2$ | 4.7 | 3.2 | <0.01 | <0.001 | 0.1 | 99 |
| $CO_2$ Emissions from Lime Production | $CO_2$ | 11.7 | 13.2 | <0.01 | <0.001 | 0.1 | 99 |
| $CH_4$ Emissions from Wastewater Treatment | $CH_4$ | 15.3 | 14.3 | <0.01 | <0.001 | 0.1 | 99 |
| PFC, HFC, $SF_6$, and $NF_3$ Emissions from Semiconductor Manufacture | Several | 3.6 | 4.7 | <0.01 | <0.001 | 0.1 | 99 |
| $N_2O$ Emissions from Settlement Soils | $N_2O$ | 1.4 | 2.5 | <0.01 | <0.001 | <0.1 | 99 |
| Net $CO_2$ Emissions from Land Converted to Forest Land | $CO_2$ | 119.1 | 120.6 | <0.01 | <0.001 | <0.1 | 99 |
| Fugitive Emissions from Abandoned Underground Coal Mines | $CH_4$ | 7.2 | 6.4 | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Ammonia Production | $CO_2$ | 13.0 | 13.8 | <0.01 | <0.001 | <0.1 | 100 |
| Non-$CO_2$ Emissions from Stationary Combustion - Electricity Generation | $CH_4$ | 0.4 | 1.1 | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Mobile Combustion: Other | $N_2O$ | 2.1 | 2.7 | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Urea Consumption for Non-Ag Purposes | $CO_2$ | 3.8 | 4.3 | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Phosphoric Acid Production | $CO_2$ | 1.5 | 1.0 | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Titanium Dioxide Production | $CO_2$ | 1.2 | 1.7 | <0.01 | <0.001 | <0.1 | 100 |
| Non-$CO_2$ Emissions from Stationary Combustion - Industrial | $N_2O$ | 3.1 | 2.6 | <0.01 | <0.001 | <0.1 | 100 |
| Indirect $N_2O$ Emissions from Applied Nitrogen | $N_2O$ | 39.0 | 38.8 | <0.01 | <0.001 | <0.1 | 100 |
| Net $CO_2$ Emissions from Land Converted to Grassland | $CO_2$ | 8.7 | 8.3 | <0.01 | <0.001 | <0.1 | 100 |
| Non-$CO_2$ Emissions from Stationary Combustion - Residential | $N_2O$ | 1.0 | 0.7 | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Forest Soils | $N_2O$ | 0.1 | 0.5 | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Zinc Production | $CO_2$ | 0.6 | 1.0 | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Abandoned Oil and Gas Wells | $CH_4$ | 6.6 | 6.9 | <0.01 | <0.001 | <0.1 | 100 |
| Net $CO_2$ Emissions from Coastal Wetlands Remaining Coastal Wetlands | $CO_2$ | 4.0 | 4.4 | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Soda Ash Production | $CO_2$ | 1.4 | 1.8 | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Caprolactam, Glyoxal, and Glyoxylic Acid Production | $N_2O$ | 1.7 | 1.4 | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Grass Fires | $N_2O$ | 0.1 | 0.3 | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Mobile Combustion: Marine | $CH_4$ | 0.6 | 0.3 | <0.01 | <0.001 | <0.1 | 100 |
| Non-$CO_2$ Emissions from Stationary Combustion - Industrial | $CH_4$ | 1.8 | 1.6 | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Grass Fires | $CH_4$ | 0.1 | 0.3 | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Glass Production | $CO_2$ | 1.5 | 1.3 | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Semiconductor Manufacture | $N_2O$ | + | 0.2 | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Silicon Carbide Production and Consumption | $CO_2$ | 0.4 | 0.2 | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Ferroalloy Production | $CO_2$ | 2.2 | 2.0 | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Coastal Wetlands Remaining Coastal Wetlands | $CH_4$ | 3.4 | 3.6 | <0.01 | <0.001 | <0.1 | 100 |

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|---|---|---|---|---|---|---|---|
| $N_2O$ Emissions from Incineration of Waste | $N_2O$ | 0.5 | 0.3 | <0.01 | <0.001 | <0.1 | 100 |
| Non-$CO_2$ Emissions from Stationary Combustion - Commercial | $CH_4$ | 1.1 | 1.2 | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Mobile Combustion: Aviation | $N_2O$ | 1.7 | 1.6 | <0.01 | <0.001 | <0.1 | 100 |
| HFC-134a Emissions from Magnesium Production and Processing | HFCs | 0.0 | 0.1 | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Field Burning of Agricultural Residues | $CH_4$ | 0.1 | 0.2 | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Petrochemical Production | $CH_4$ | 0.3 | 0.4 | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Lead Production | $CO_2$ | 0.5 | 0.5 | <0.01 | <0.001 | <0.1 | 100 |
| Non-$CO_2$ Emissions from Stationary Combustion - Commercial | $N_2O$ | 0.4 | 0.3 | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Product Uses | $N_2O$ | 4.2 | 4.2 | <0.01 | <0.001 | <0.1 | 100 |
| Non-$CO_2$ Emissions from Stationary Combustion - U.S. Territories | $N_2O$ | 0.1 | 0.1 | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Mobile Combustion: Aviation | $CH_4$ | 0.1 | + | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Field Burning of Agricultural Residues | $N_2O$ | + | 0.1 | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Mobile Combustion: Marine | $N_2O$ | 0.6 | 0.5 | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Silicon Carbide Production and Consumption | $CH_4$ | + | + | <0.01 | <0.001 | <0.1 | 100 |
| Non-$CO_2$ Emissions from Stationary Combustion - U.S. Territories | $CH_4$ | + | 0.1 | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Iron and Steel Production & Metallurgical Coke Production | $CH_4$ | + | + | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Coastal Wetlands Remaining Coastal Wetlands | $N_2O$ | 0.1 | 0.1 | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Stationary Combustion - Geothermal Energy | $CO_2$ | 0.4 | 0.4 | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Natural Gas Systems | $N_2O$ | + | + | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Petroleum Systems | $N_2O$ | + | + | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Ferroalloy Production | $CH_4$ | + | + | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Peatlands Remaining Peatlands | $CH_4$ | + | + | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Magnesium Production and Processing | $CO_2$ | + | + | <0.01 | <0.001 | <0.1 | 100 |
| $CO_2$ Emissions from Abandoned Oil and Gas Wells | $CO_2$ | + | + | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Drained Organic Soils | $N_2O$ | 0.1 | 0.1 | <0.01 | <0.001 | <0.1 | 100 |
| $N_2O$ Emissions from Peatlands Remaining Peatlands | $N_2O$ | + | + | <0.01 | <0.001 | <0.1 | 100 |
| Net $CO_2$ Emissions from Land Converted to Wetlands | $CO_2$ | + | + | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Drained Organic Soils | $CH_4$ | + | + | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Land Converted to Coastal Wetlands | $CH_4$ | + | + | <0.01 | <0.001 | <0.1 | 100 |
| $CH_4$ Emissions from Incineration of Waste | $CH_4$ | + | + | <0.01 | <0.001 | <0.1 | 100 |

+ Does not exceed 0.05 MMT $CO_2$ Eq.

# References

IPCC (2006) *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. The National Greenhouse Gas Inventories Programme, The Intergovernmental Panel on Climate Change, H.S. Eggleston, L. Buendia, K. Miwa, T Negara, and K. Tanabe (eds.). Hayman, Kanagawa, Japan.