

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 that may not be large enough to be identified by the level assessment, but whose trend contributes significantly to the overall Inventory trend (IPCC 2019). 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 Volume 1, Chapter 4 of 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 used to identify key categories for the United States; provides level and trend assessment equations; and provides a brief evaluation of IPCC’s quantitative methodologies for defining key categories. The UNFCCC common reporting format (CRF) reporting software generates Table 7, which also identifies key categories using an Approach 1 analysis based on the default disaggregation approach provided in Volume 1, Chapter 4, Table 4.1 of the *2006 IPCC Guidelines*. The disaggregation of categories presented in CRF Table 7 and this annex vary but the results of the key category analysis are consistent. Consistent with the UNFCCC reporting guidelines, the United States key category analysis uses the IPCC suggested aggregation level as the basis for the analysis, but in some cases the disaggregation does differ. Differences arise from implementation of special considerations identified in Table 4.1. As stated in section 4.2 in Volume 1, Chapter 4 of the *2006 IPCC Guidelines*, “...countries using Approach 2 will probably choose the same level of aggregation that was used for the uncertainty analysis.” In order to retain consistency in the categorization with the uncertainty analysis, the aggregation level for this analysis (i.e. Approach 1, 2 etc.) does reflect some (e.g., for 1.A.1, 3.A, 3.B) but not all special considerations such as disaggregating for significant subcategories, fuel types, and/or carbon pools for the following categories: Fuel Combustion Activities—Water-borne Navigation (1.A.3.d), Fuel Combustion Activities—Other Sectors (1.A.4), Fugitive Emissions from Fuels—Oil (1.B.2.a) and Natural Gas (1.B.2.b), Petrochemical and Carbon Black Production (2.B.8), Direct and Indirect N₂O Emissions (3.D.1 and 3.D.2), land use categories (4.A, 4.B, 4.C, 4.D, 4.E, and 4.F), Solid Waste Disposal (5.A) and Wastewater (5.D). Most other differences stem from additional disaggregation to subcategories consistent with the uncertainty analysis, including within Fuel Combustion Activities—Other Sectors (1.A.4.a Commercial/Institutional and 1.A.4.b Residential), Fossil Fuel Combustion—Non-Specified Stationary (1.A.5.a Incineration of Waste, Non-Energy Use of Fossil Fuels, and U.S. Territories) and Mobile (1.A.5.b Military), Biomass Burning (4.A(V) Forest Fires and 4.C(V) Grass Fires), and Biological Treatment of Solid Waste (5.B.1 Composting and 5.B.2 Anaerobic Digestion at Biogas Facilities). As EPA disaggregates the uncertainty analysis, it will reflect these special considerations in aggregation levels of the key category analysis. Finally, in addition to conducting Approach 1 and 2 level and trend assessments, a qualitative assessment of categories, as described in the *2006 IPCC Guidelines*, 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 review its qualitative assessment on an annual basis.

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 CO₂ Eq. emissions in 2020. 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 Categories for the United States (1990 and 2020)

CRF Source/Sink Category	Greenhouse Gas	Approach 1				Approach 2				2020 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	•	•	•	•	•	•	•	•	1,333.8
CO ₂ Emissions from Stationary Combustion - Coal - Electricity Generation	CO ₂	•	•	•	•	•	•	•	•	788.2
CO ₂ Emissions from Stationary Combustion - Gas - Electricity Generation	CO ₂	•	•	•	•	•	•	•	•	634.3
CO ₂ Emissions from Stationary Combustion - Gas - Industrial	CO ₂	•	•	•	•	•	•	•	•	485.5
CO ₂ Emissions from Stationary Combustion - Gas - Residential	CO ₂	•	•	•	•	•	•	•	•	256.4
CO ₂ Emissions from Stationary Combustion - Oil - Industrial	CO ₂	•	•	•	•	•	•	•	•	237.8
CO ₂ Emissions from Stationary Combustion - Gas - Commercial	CO ₂	•	•	•	•	•	•	•	•	173.9
CO ₂ Emissions from Mobile Combustion: Aviation	CO ₂	•	•	•	•	•	•	•	•	121.3
CO ₂ Emissions from Non-Energy Use of Fuels	CO ₂	•	•	•	•	•	•	•	•	121.0
CO ₂ Emissions from Stationary Combustion - Oil - Residential	CO ₂	•	•	•	•	•	•	•	•	59.5

CRF Source/Sink Category	Greenhouse Gas	Approach 1				Approach 2				2020 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	
CO ₂ Emissions from Mobile Combustion: Other ^a	CO ₂	•	•	•	•					57.1
CO ₂ Emissions from Stationary Combustion - Oil - Commercial	CO ₂	•	•	•	•					51.6
CO ₂ Emissions from Stationary Combustion - Coal - Industrial	CO ₂	•	•	•	•	•	•	•	•	43.0
CO ₂ Emissions from Natural Gas Systems	CO ₂	•		•		•				35.4
CO ₂ Emissions from Mobile Combustion: Railways	CO ₂	•		•						31.0
CO ₂ Emissions from Petroleum Systems	CO ₂	•	•	•	•	•	•	•	•	30.2
CO ₂ Emissions from Mobile Combustion: Marine	CO ₂	•	•	•	•					23.7
CO ₂ Emissions from Stationary Combustion - Oil - U.S. Territories	CO ₂	•		•						16.9
CO ₂ Emissions from Stationary Combustion - Oil - Electricity Generation	CO ₂	•	•	•	•	•	•		•	16.2
CO ₂ Emissions from Mobile Combustion: Military	CO ₂		•		•					5.2
CO ₂ Emissions from Coal Mining	CO ₂						•			2.2
CO ₂ Emissions from Stationary Combustion - Coal - Commercial	CO ₂		•		•		•			1.4

CRF Source/Sink Category	Greenhouse Gas	Approach 1				Approach 2				2020 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	
CO ₂ Emissions from Stationary Combustion - Coal - Residential	CO ₂						•		•	-
CH ₄ Emissions from Natural Gas Systems	CH ₄	•	•	•	•	•	•	•	•	164.9
Fugitive Emissions from Coal Mining	CH ₄	•	•	•	•	•	•	•	•	41.2
CH ₄ Emissions from Petroleum Systems	CH ₄	•	•	•	•	•	•	•	•	40.2
CH ₄ Emissions from Abandoned Oil and Gas Wells	CH ₄					•		•		6.9
CH ₄ Emissions from Stationary Combustion - Residential	CH ₄					•	•	•	•	4.1
N ₂ O Emissions from Stationary Combustion - Coal - Electricity Generation	N ₂ O	•		•		•	•	•	•	15.2
N ₂ O Emissions from Mobile Combustion: Road	N ₂ O	•	•	•	•				•	9.8
N ₂ O Emissions from Stationary Combustion - Gas - Electricity Generation	N ₂ O						•			4.5
N ₂ O Emissions from Stationary Combustion - Industrial	N ₂ O					•	•			2.3
Industrial Processes and Product Use										
CO ₂ Emissions from Cement Production	CO ₂	•	•	•	•					40.7
CO ₂ Emissions from Iron and Steel Production &	CO ₂	•	•	•	•	•	•	•	•	37.7

CRF Source/Sink Category	Greenhouse Gas	Approach 1				Approach 2				2020 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	
Metallurgical Coke Production										
CO ₂ Emissions from Petrochemical Production	CO ₂	•	•	•	•					30.0
Emissions from Substitutes for Ozone Depleting Substances: Refrigeration and Air conditioning	HFCs, PFCs	•	•	•	•	•	•	•	•	137.7
Emissions from Substitutes for Ozone Depleting Substances: Aerosols	HFCs, PFCs	•	•	•	•	•	•	•	•	18.1
Emissions from Substitutes for Ozone Depleting Substances: Foam Blowing Agents	HFCs, PFCs		•		•					15.5
SF ₆ and CF ₄ Emissions from Electrical Transmission and Distribution	SF ₆ , CF ₄	•	•	•	•		•		•	3.8
HFC-23 Emissions from HCFC-22 Production	HFCs	•	•	•	•		•		•	2.1
PFC Emissions from Aluminum Production	PFCs	•	•	•	•					1.7
Agriculture										
CO ₂ Emissions from Liming	CO ₂						•		•	2.4
CH ₄ Emissions from Enteric Fermentation: Cattle	CH ₄	•	•	•	•	•	•	•		168.9
CH ₄ Emissions from Manure Management: Cattle	CH ₄	•	•	•	•	•	•		•	33.5

CRF Source/Sink Category	Greenhouse Gas	Approach 1				Approach 2				2020 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	
CH ₄ Emissions from Manure Management: Other Livestock	CH ₄	•		•	•			•		26.1
CH ₄ Emissions from Rice Cultivation	CH ₄	•		•		•		•		15.7
Direct N ₂ O Emissions from Agricultural Soil Management	N ₂ O	•		•		•		•		271.7
Indirect N ₂ O Emissions from Applied Nitrogen	N ₂ O	•		•		•	•	•		44.6
Waste										
CH ₄ Emissions from Commercial Landfills	CH ₄	•	•	•	•	•	•	•	•	94.2
CH ₄ Emissions from Domestic Wastewater Treatment	CH ₄					•				11.8
N ₂ O Emissions from Domestic Wastewater Treatment	N ₂ O	•		•		•		•	•	23.0
Land Use, Land-Use Change, and Forestry										
Net CO ₂ Emissions from Land Converted to Settlements	CO ₂			•	•			•	•	77.9
Net CO ₂ Emissions from Land Converted to Cropland	CO ₂			•				•	•	54.4
Net CO ₂ Emissions from Grassland Remaining Grassland	CO ₂							•	•	4.5
Net CO ₂ Emissions from Cropland Remaining Cropland	CO ₂			•				•		(23.3)
Net CO ₂ Emissions from Land Converted to Grassland	CO ₂			•	•			•	•	(24.1)

CRF Source/Sink Category	Greenhouse Gas	Approach 1				Approach 2				2020 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	
Net CO ₂ Emissions from Land Converted to Forest Land	CO ₂			•				•		(99.5)
Net CO ₂ Emissions from Settlements Remaining Settlements	CO ₂			•	•			•	•	(126.1)
Net CO ₂ Emissions from Forest Land Remaining Forest Land	CO ₂			•	•			•	•	(668.1)
CH ₄ Emissions from Flooded Lands Remaining Flooded Lands	CH ₄			•						19.9
CH ₄ Emissions from Forest Fires	CH ₄				•				•	13.6
N ₂ O Emissions from Forest Fires	N ₂ O				•				•	11.7
Subtotal of Key Categories Without LULUCF^b										5,793.6
Total Gross Emissions Without LULUCF										5,981.4
Percent of Total Without LULUCF										97%
Subtotal of Key Categories With LULUCF^c										5,013.7
Total Net Emissions With LULUCF										5,222.4
Percent of Total With LULUCF										96%

Note: Parentheses indicate negative values (or sequestration).

^a Other includes emissions from pipelines.

^b Subtotal includes key categories from Level Approach 1 Without LULUCF, Level Approach 2 Without LULUCF, Trend Approach 1 Without LULUCF, and Trend Approach 2 Without LULUCF.

^c Subtotal includes key categories from Level Approach 1 With LULUCF, Level Approach 2 With LULUCF, Trend Approach 1 With LULUCF, and Trend Approach 2 With LULUCF.

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 2020) in which each source or sink category reached the threshold for being a key category based on either an Approach 1 or Approach 2 level assessment.

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

CRF Source/Sink Category	Greenhouse Gas	1990 Emissions (MMT CO ₂ Eq.)	2020 Emissions (MMT CO ₂ Eq.)	Key Category	ID Criteria ^a	Level in which year(s) ^b
Energy						
1.A.3.b CO ₂ Emissions from Mobile Combustion: Road	CO ₂	1,157.4	1,333.8	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
1.A.1 CO ₂ Emissions from Stationary Combustion - Coal - Electricity Generation	CO ₂	1,546.5	788.2	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
1.A.1 CO ₂ Emissions from Stationary Combustion - Gas - Electricity Generation	CO ₂	175.4	634.3	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
1.A.2 CO ₂ Emissions from Stationary Combustion - Gas - Industrial	CO ₂	408.8	485.5	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
1.A.4.b CO ₂ Emissions from Stationary Combustion - Gas - Residential	CO ₂	237.8	256.4	•	L ₁ T ₁ L ₂	1990, 2020
1.A.2 CO ₂ Emissions from Stationary Combustion - Oil - Industrial	CO ₂	287.1	237.8	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
1.A.4.a CO ₂ Emissions from Stationary Combustion - Gas - Commercial	CO ₂	142.0	173.9	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
1.A.3.a CO ₂ Emissions from Mobile Combustion: Aviation	CO ₂	187.2	121.3	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
1.A.5 CO ₂ Emissions from Non-Energy Use of Fuels	CO ₂	112.2	121.0	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
1.A.4.b CO ₂ Emissions from Stationary Combustion - Oil - Residential	CO ₂	97.8	59.5	•	L ₁ T ₁ L ₂ T ₂	1990, 2020 ₁
1.A.3.e CO ₂ Emissions from Mobile Combustion: Other ^b	CO ₂	36.0	57.1	•	L ₁ T ₁	1990 ₁ , 2020 ₁
1.A.4.a CO ₂ Emissions from Stationary Combustion - Oil - Commercial	CO ₂	74.3	51.6	•	L ₁ T ₁	1990 ₁ , 2020 ₁
1.A.2 CO ₂ Emissions from Stationary Combustion - Coal - Industrial	CO ₂	157.8	43.0	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
1.B.2 CO ₂ Emissions from Natural Gas Systems	CO ₂	31.9	35.4	•	L ₁ L ₂	1990, 2020
1.A.3.c CO ₂ Emissions from Mobile Combustion: Railways	CO ₂	35.5	31.0	•	L ₁	1990 ₁ , 2020 ₁
1.B.2 CO ₂ Emissions from Petroleum Systems	CO ₂	9.6	30.2	•	L ₁ T ₁ L ₂ T ₂	2020
1.A.3.d CO ₂ Emissions from Mobile Combustion: Marine	CO ₂	39.3	23.7	•	L ₁ T ₁	1990 ₁ , 2020 ₁
1.A.5 CO ₂ Emissions from Stationary Combustion - Oil - U.S. Territories	CO ₂	21.2	16.9	•	L ₁	1990 ₁ , 2020 ₁

CRF Source/Sink Category	Greenhouse Gas	1990 Emissions (MMT CO ₂ Eq.)	2020 Emissions (MMT CO ₂ Eq.)	Key Category	ID Criteria ^a	Level in which year(s) ^b
1.A.1 CO ₂ Emissions from Stationary Combustion - Oil - Electricity Generation	CO ₂	97.5	16.2	•	L ₁ T ₁ L ₂ T ₂	1990, 2020 ₁
5.C.1 CO ₂ Emissions from Incineration of Waste	CO ₂	12.9	13.1			
1.A.5.b CO ₂ Emissions from Mobile Combustion: Military	CO ₂	13.6	5.2	•	T ₁	
1.A.5 CO ₂ Emissions from Stationary Combustion - Coal - U.S. Territories	CO ₂	0.5	3.1			
1.A.5 CO ₂ Emissions from Stationary Combustion - Gas - U.S. Territories	CO ₂	NO	2.6			
1.B.1 CO ₂ Emissions from Coal Mining	CO ₂	4.6	2.2	•	T ₂	
1.A.4.a CO ₂ Emissions from Stationary Combustion - Coal - Commercial	CO ₂	12.0	1.4	•	T ₁ T ₂	
1.A.1 CO ₂ Emissions from Stationary Combustion - Geothermal Energy	CO ₂	0.5	0.4			
1.B.2 CO ₂ Emissions from Abandoned Oil and Gas Wells	CO ₂	+	+			
1.A.4.b CO ₂ Emissions from Stationary Combustion - Coal - Residential	CO ₂	3.0	0.0	•		
1.B.2 CH ₄ Emissions from Natural Gas Systems	CH ₄	195.5	164.9	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
1.B.1 Fugitive Emissions from Coal Mining	CH ₄	96.5	41.2	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
1.B.2 CH ₄ Emissions from Petroleum Systems	CH ₄	47.8	40.2	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
1.B.2 CH ₄ Emissions from Abandoned Oil and Gas Wells	CH ₄	6.5	6.9	•	L ₂	1990 ₂ , 2020 ₂
1.B.1 Fugitive Emissions from Abandoned Underground Coal Mines	CH ₄	7.2	5.8			
1.A.4.b CH ₄ Emissions from Stationary Combustion - Residential	CH ₄	5.2	4.1	•	L ₂ T ₂	1990 ₂ , 2020 ₂
1.A.2 CH ₄ Emissions from Stationary Combustion - Industrial	CH ₄	1.8	1.4			
1.A.4.a CH ₄ Emissions from Stationary Combustion - Commercial	CH ₄	1.1	1.2			
1.A.1 CH ₄ Emissions from Stationary Combustion - Gas - Electricity Generation	CH ₄	0.1	1.1			
1.A.3.e CH ₄ Emissions from Mobile Combustion: Other ^b	CH ₄	0.8	1.0			
1.A.3.b CH ₄ Emissions from Mobile Combustion: Road	CH ₄	5.2	0.8			

CRF Source/Sink Category	Greenhouse Gas	1990 Emissions (MMT CO ₂ Eq.)	2020 Emissions (MMT CO ₂ Eq.)	Key Category	ID Criteria ^a	Level in which year(s) ^b
1.A.3.d CH ₄ Emissions from Mobile Combustion: Marine	CH ₄	0.4	0.4			
1.A.1 CH ₄ Emissions from Stationary Combustion - Coal - Electricity Generation	CH ₄	0.3	0.2			
5.B.2 CH ₄ Emissions from Anaerobic Digestion at Biogas Facilities	CH ₄	+	0.2			
1.A.3.c CH ₄ Emissions from Mobile Combustion: Railways	CH ₄	0.1	0.1			
1.A.5 CH ₄ Emissions from Stationary Combustion - U.S. Territories	CH ₄	+	+			
1.A.3.a CH ₄ Emissions from Mobile Combustion: Aviation	CH ₄	0.1	+			
1.A.1 CH ₄ Emissions from Stationary Combustion - Wood - Electricity Generation	CH ₄	+	+			
1.A.1 CH ₄ Emissions from Stationary Combustion - Oil - Electricity Generation	CH ₄	+	+			
1.A.5.b CH ₄ Emissions from Mobile Combustion: Military	CH ₄	+	+			
5.C.1 CH ₄ Emissions from Incineration of Waste	CH ₄	+	+			
1.A.1 N ₂ O Emissions from Stationary Combustion - Coal - Electricity Generation	N ₂ O	20.1	15.2	•	L ₁ L ₂ T ₂	1990, 2020 ₂
1.A.3.b N ₂ O Emissions from Mobile Combustion: Road	N ₂ O	37.7	9.8	•	L ₁ T ₁	1990 ₁
1.A.3.e N ₂ O Emissions from Mobile Combustion: Other ^b	N ₂ O	4.7	6.1			
1.A.1 N ₂ O Emissions from Stationary Combustion - Gas - Electricity Generation	N ₂ O	0.3	4.5	•	T ₂	
1.A.2 N ₂ O Emissions from Stationary Combustion - Industrial	N ₂ O	3.1	2.3	•	L ₂ T ₂	1990 ₂
1.A.3.a N ₂ O Emissions from Mobile Combustion: Aviation	N ₂ O	1.7	1.1			
1.A.4.b N ₂ O Emissions from Stationary Combustion - Residential	N ₂ O	1.0	0.8			
5.C.1 N ₂ O Emissions from Incineration of Waste	N ₂ O	0.5	0.4			
1.A.4.a N ₂ O Emissions from Stationary Combustion - Commercial	N ₂ O	0.4	0.3			
1.A.3.c N ₂ O Emissions from Mobile Combustion: Railways	N ₂ O	0.3	0.2			
1.A.3.d N ₂ O Emissions from Mobile Combustion: Marine	N ₂ O	0.3	0.2			

CRF Source/Sink Category	Greenhouse Gas	1990 Emissions (MMT CO ₂ Eq.)	2020 Emissions (MMT CO ₂ Eq.)	Key Category	ID Criteria ^a	Level in which year(s) ^b
1.A.5 N ₂ O Emissions from Stationary Combustion - U.S. Territories	N ₂ O	0.1	0.1			
1.B.2 N ₂ O Emissions from Petroleum Systems	N ₂ O	+	+			
1.A.1 N ₂ O Emissions from Stationary Combustion - Wood - Electricity Generation	N ₂ O	+	+			
1.B.2 N ₂ O Emissions from Natural Gas Systems	N ₂ O	+	+			
1.A.1 N ₂ O Emissions from Stationary Combustion - Oil - Electricity Generation	N ₂ O	0.1	+			
1.A.5.b N ₂ O Emissions from Mobile Combustion: Military	N ₂ O	+	+			
Industrial Processes and Product Use						
2.A.1 CO ₂ Emissions from Cement Production	CO ₂	33.5	40.7	•	L ₁ T ₁	1990 ₁ , 2020 ₁
2.C.1 CO ₂ Emissions from Iron and Steel Production & Metallurgical Coke Production	CO ₂	104.7	37.7	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
2.B.8 CO ₂ Emissions from Petrochemical Production	CO ₂	21.6	30.0	•	L ₁ T ₁	1990 ₁ , 2020 ₁
2.B.1 CO ₂ Emissions from Ammonia Production	CO ₂	13.0	12.7			
2.A.2 CO ₂ Emissions from Lime Production	CO ₂	11.7	11.3			
2.A.4 CO ₂ Emissions from Other Process Uses of Carbonates	CO ₂	6.2	9.8			
2.B.10 CO ₂ Emissions from Urea Consumption for Non-Ag Purposes	CO ₂	3.8	6.0			
2.B.10 CO ₂ Emissions from Carbon Dioxide Consumption	CO ₂	1.5	5.0			
2.A.3 CO ₂ Emissions from Glass Production	CO ₂	2.3	1.9			
2.C.3 CO ₂ Emissions from Aluminum Production	CO ₂	6.8	1.7			
2.B.7 CO ₂ Emissions from Soda Ash Production	CO ₂	1.4	1.5			
2.C.2 CO ₂ Emissions from Ferroalloy Production	CO ₂	2.2	1.4			
2.B.6 CO ₂ Emissions from Titanium Dioxide Production	CO ₂	1.2	1.3			
2.C.6 CO ₂ Emissions from Zinc Production	CO ₂	0.6	1.0			
2.B.10 CO ₂ Emissions from Phosphoric Acid Production	CO ₂	1.5	0.9			
2.C.5 CO ₂ Emissions from Lead Production	CO ₂	0.5	0.5			

CRF Source/Sink Category	Greenhouse Gas	1990 Emissions (MMT CO ₂ Eq.)	2020 Emissions (MMT CO ₂ Eq.)	Key Category	ID Criteria ^a	Level in which year(s) ^b
2.B.5 CO ₂ Emissions from Silicon Carbide Production and Consumption	CO ₂	0.2	0.2			
2.C.4 CO ₂ Emissions from Magnesium Production and Processing	CO ₂	0.1	+			
2.B.8 CH ₄ Emissions from Petrochemical Production	CH ₄	0.2	0.3			
2.B.5 CH ₄ Emissions from Silicon Carbide Production and Consumption	CH ₄	+	+			
2.C.2 CH ₄ Emissions from Ferroalloy Production	CH ₄	+	+			
2.C.1 CH ₄ Emissions from Iron and Steel Production & Metallurgical Coke Production	CH ₄	+	+			
2.B.2 N ₂ O Emissions from Nitric Acid Production	N ₂ O	12.1	9.3			
2.B.3 N ₂ O Emissions from Adipic Acid Production	N ₂ O	15.2	8.3			
2.G N ₂ O Emissions from Product Uses	N ₂ O	4.2	4.2			
2.B.4 N ₂ O Emissions from Caprolactam, Glyoxal, and Glyoxylic Acid Production	N ₂ O	1.7	1.2			
2.E N ₂ O Emissions from Electronics Industry	N ₂ O	+	0.3			
2.F.1 Emissions from Substitutes for Ozone Depleting Substances: Refrigeration and Air conditioning	HFCs, PFCs	+	137.7	•	L ₁ T ₁ L ₂ T ₂	2020
2.F.4 Emissions from Substitutes for Ozone Depleting Substances: Aerosols	HFCs, PFCs	0.2	18.1	•	L ₁ T ₁ L ₂ T ₂	2020
2.F.2 Emissions from Substitutes for Ozone Depleting Substances: Foam Blowing Agents	HFCs, PFCs	+	15.5	•	T ₁	
2.F.3 Emissions from Substitutes for Ozone Depleting Substances: Fire Protection	HFCs, PFCs	NO	2.8			
2.F.5 Emissions from Substitutes for Ozone Depleting Substances: Solvents	HFCs, PFCs	NO	2.0			
2.E PFC, HFC, SF ₆ , and NF ₃ Emissions from Electronics Industry	HiGWP	3.6	4.4			
2.G SF ₆ and CF ₄ Emissions from Electrical Transmission and Distribution	SF ₆ , CF ₄	23.2	3.8	•	L ₁ T ₁ T ₂	1990 ₁
2.B.9 HFC-23 Emissions from HCFC-22 Production	HFCs	46.1	2.1	•	L ₁ T ₁ T ₂	1990 ₁
2.C.3 PFC Emissions from Aluminum Production	PFCs	21.5	1.7	•	L ₁ T ₁	1990 ₁

CRF Source/Sink Category	Greenhouse Gas	1990 Emissions (MMT CO ₂ Eq.)	2020 Emissions (MMT CO ₂ Eq.)	Key Category	ID Criteria ^a	Level in which year(s) ^b
2.C.4 SF ₆ Emissions from Magnesium Production and Processing	SF ₆	5.2	0.9			
2.C.4 HFC-134a Emissions from Magnesium Production and Processing	HFCs	NO	0.1			
Agriculture						
3.H CO ₂ Emissions from Urea Fertilization	CO ₂	2.4	5.3			
3.G CO ₂ Emissions from Liming	CO ₂	4.7	2.4	•	T ₂	
3.A.1 CH ₄ Emissions from Enteric Fermentation: Cattle	CH ₄	157.2	168.9	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
3.B.1 CH ₄ Emissions from Manure Management: Cattle	CH ₄	15.9	33.5	•	L ₁ T ₁ L ₂ T ₂	2020
3.B.4 CH ₄ Emissions from Manure Management: Other Livestock	CH ₄	19.0	26.1	•	L ₁ T ₂	1990 ₁ , 2020 ₁
3.C CH ₄ Emissions from Rice Cultivation	CH ₄	16.0	15.7	•	L ₁ L ₂	1990 ₂ , 2020
3.A.4 CH ₄ Emissions from Enteric Fermentation: Other Livestock	CH ₄	6.3	6.2			
3.F CH ₄ Emissions from Field Burning of Agricultural Residues	CH ₄	0.4	0.4			
3.D.1 Direct N ₂ O Emissions from Agricultural Soil Management	N ₂ O	272.6	271.7	•	L ₁ L ₂	1990, 2020
3.D.2 Indirect N ₂ O Emissions from Applied Nitrogen	N ₂ O	43.5	44.6	•	L ₁ L ₂ T ₂	1990, 2020
3.B.1 N ₂ O Emissions from Manure Management: Cattle	N ₂ O	11.1	15.5			
3.B.4 N ₂ O Emissions from Manure Management: Other Livestock	N ₂ O	2.8	4.2			
3.F N ₂ O Emissions from Field Burning of Agricultural Residues	N ₂ O	0.2	0.2			
Waste						
5.A CH ₄ Emissions from Commercial Landfills	CH ₄	165.7	94.2	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
5.A CH ₄ Emissions from Industrial Landfills	CH ₄	10.9	15.1			
5.D CH ₄ Emissions from Domestic Wastewater Treatment	CH ₄	14.7	11.8	•	L ₂	1990 ₂
5.D CH ₄ Emissions from Industrial Wastewater Treatment	CH ₄	5.6	6.4			
5.B CH ₄ Emissions from Composting	CH ₄	0.4	2.3			
5.D N ₂ O Emissions from Domestic Wastewater Treatment	N ₂ O	16.2	23.0	•	L ₁ L ₂ T ₂	1990 ₂ , 2020
5.B N ₂ O Emissions from Composting	N ₂ O	0.3	2.0			
5.D N ₂ O Emissions from Industrial Wastewater Treatment	N ₂ O	0.4	0.5			

+ Absolute value does not exceed 0.05 MMT CO₂ Eq.

NO (Not Occurring)

^a If the source is a key category for both L₁ and L₂ (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., 1990₂ designates a category is key for the Approach 2 assessment only in 1990).

^b Other includes emissions from pipelines.

Note: LULUCF sources and sinks are not included in the analysis presented in this table. See Table A-3 for the results of the analysis with LULUCF.

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

CRF Source/Sink Category	Greenhouse Gas	1990 Emissions (MMT CO ₂ Eq.)	2020 Emissions (MMT CO ₂ Eq.)	Key Category	ID Criteria ^a	Level in which year(s) ^b
Energy						
1.A.3.b CO ₂ Emissions from Mobile Combustion: Road	CO ₂	1,157.4	1,333.8	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
1.A.1 CO ₂ Emissions from Stationary Combustion - Coal - Electricity Generation	CO ₂	1,546.5	788.2	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
1.A.1 CO ₂ Emissions from Stationary Combustion - Gas - Electricity Generation	CO ₂	175.4	634.3	•	L ₁ T ₁ L ₂ T ₂	1990 ₁ , 2020
1.A.2 CO ₂ Emissions from Stationary Combustion - Gas - Industrial	CO ₂	408.8	485.5	•	L ₁ T ₁ L ₂ T ₂	1990, 2020 ₁
1.A.4.b CO ₂ Emissions from Stationary Combustion - Gas - Residential	CO ₂	237.8	256.4	•	L ₁ T ₁ L ₂	1990, 2020 ₁
1.A.2 CO ₂ Emissions from Stationary Combustion - Oil - Industrial	CO ₂	287.1	237.8	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
1.A.4.a CO ₂ Emissions from Stationary Combustion - Gas - Commercial	CO ₂	142.0	173.9	•	L ₁ T ₁ L ₂	1990, 2020
1.A.3.a CO ₂ Emissions from Mobile Combustion: Aviation	CO ₂	187.2	121.3	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
1.A.5 CO ₂ Emissions from Non-Energy Use of Fuels	CO ₂	112.2	121.0	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
1.A.4.b CO ₂ Emissions from Stationary Combustion - Oil - Residential	CO ₂	97.8	59.5	•	L ₁ T ₁	1990 ₁ , 2020 ₁
1.A.3.e CO ₂ Emissions from Mobile Combustion: Other ^b	CO ₂	36.0	57.1	•	L ₁ T ₁	1990 ₁ , 2020 ₁
1.A.4.a CO ₂ Emissions from Stationary Combustion - Oil - Commercial	CO ₂	74.3	51.6	•	L ₁ T ₁	1990 ₁ , 2020 ₁
1.A.2 CO ₂ Emissions from Stationary Combustion - Coal - Industrial	CO ₂	157.8	43.0	•	L ₁ T ₁ L ₂ T ₂	1990, 2020 ₁
1.B.2 CO ₂ Emissions from Natural Gas Systems	CO ₂	31.9	35.4	•	L ₁	1990 ₁ , 2020 ₁
1.A.3.c CO ₂ Emissions from Mobile Combustion: Railways	CO ₂	35.5	31.0	•	L ₁	1990 ₁ , 2020 ₁
1.B.2 CO ₂ Emissions from Petroleum Systems	CO ₂	9.6	30.2	•	L ₁ T ₁ L ₂ T ₂	2020
1.A.3.d CO ₂ Emissions from Mobile Combustion: Marine	CO ₂	39.3	23.7	•	L ₁ T ₁	1990 ₁ , 2020 ₁
1.A.5 CO ₂ Emissions from Stationary Combustion - Oil - U.S. Territories	CO ₂	21.2	16.9	•	L ₁	1990 ₁ , 2020 ₁
1.A.1 CO ₂ Emissions from Stationary Combustion - Oil - Electricity Generation	CO ₂	97.5	16.2	•	L ₁ T ₁ T ₂	1990 ₁ , 2020 ₁

CRF Source/Sink Category	Greenhouse Gas	1990 Emissions (MMT CO ₂ Eq.)	2020 Emissions (MMT CO ₂ Eq.)	Key Category	ID Criteria ^a	Level in which year(s) ^b
5.C.1 CO ₂ Emissions from Incineration of Waste	CO ₂	12.9	13.1			
1.A.5.b CO ₂ Emissions from Mobile Combustion: Military	CO ₂	13.6	5.2	•	T ₁	
1.A.5 CO ₂ Emissions from Stationary Combustion - Coal - U.S. Territories	CO ₂	0.5	3.1			
1.A.5 CO ₂ Emissions from Stationary Combustion - Gas - U.S. Territories	CO ₂	NO	2.6			
1.B.1 CO ₂ Emissions from Coal Mining	CO ₂	4.6	2.2			
1.A.4.a CO ₂ Emissions from Stationary Combustion - Coal - Commercial	CO ₂	12.0	1.4	•	T ₁	
1.A.1 CO ₂ Emissions from Stationary Combustion - Geothermal Energy	CO ₂	0.5	0.4			
1.B.2 CO ₂ Emissions from Abandoned Oil and Gas Wells	CO ₂	+	+			
1.A.4.b CO ₂ Emissions from Stationary Combustion - Coal - Residential	CO ₂	3.0	0.0	•	T ₂	
1.B.2 CH ₄ Emissions from Natural Gas Systems	CH ₄	195.5	164.9	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
1.B.1 Fugitive Emissions from Coal Mining	CH ₄	96.5	41.2	•	L ₁ T ₁ L ₂ T ₂	1990, 2020 ₁
1.B.2 CH ₄ Emissions from Petroleum Systems	CH ₄	47.8	40.2	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
1.B.2 CH ₄ Emissions from Abandoned Oil and Gas Wells	CH ₄	6.5	6.9	•	L ₂	1990 ₂ , 2020 ₂
1.B.1 Fugitive Emissions from Abandoned Underground Coal Mines	CH ₄	7.2	5.8			
1.A.4.b CH ₄ Emissions from Stationary Combustion - Residential	CH ₄	5.2	4.1	•	L ₂ T ₂	1990 ₂ , 2020 ₂
1.A.2 CH ₄ Emissions from Stationary Combustion - Industrial	CH ₄	1.8	1.4			
1.A.4.a CH ₄ Emissions from Stationary Combustion - Commercial	CH ₄	1.1	1.2			
1.A.1 CH ₄ Emissions from Stationary Combustion - Gas - Electricity Generation	CH ₄	0.1	1.1			
1.A.3.e CH ₄ Emissions from Mobile Combustion: Other ^b	CH ₄	0.8	1.0			
1.A.3.b CH ₄ Emissions from Mobile Combustion: Road	CH ₄	5.2	0.8			
1.A.3.d CH ₄ Emissions from Mobile Combustion: Marine	CH ₄	0.4	0.4			

CRF Source/Sink Category	Greenhouse Gas	1990 Emissions (MMT CO ₂ Eq.)	2020 Emissions (MMT CO ₂ Eq.)	Key Category	ID Criteria ^a	Level in which year(s) ^b
1.A.1 CH ₄ Emissions from Stationary Combustion - Coal - Electricity Generation	CH ₄	0.3	0.2			
5.B.2 CH ₄ Emissions from Anaerobic Digestion at Biogas Facilities	CH ₄	0.0	0.2			
1.A.3.c CH ₄ Emissions from Mobile Combustion: Railways	CH ₄	0.1	0.1			
1.A.5 CH ₄ Emissions from Stationary Combustion - U.S. Territories	CH ₄	+	+			
1.A.3.a CH ₄ Emissions from Mobile Combustion: Aviation	CH ₄	0.1	+			
1.A.1 CH ₄ Emissions from Stationary Combustion - Wood - Electricity Generation	CH ₄	+	+			
1.A.1 CH ₄ Emissions from Stationary Combustion - Oil - Electricity Generation	CH ₄	+	+			
1.A.5.b CH ₄ Emissions from Mobile Combustion: Military	CH ₄	+	+			
5.C.1 CH ₄ Emissions from Incineration of Waste	CH ₄	+	+			
1.A.1 N ₂ O Emissions from Stationary Combustion - Coal - Electricity Generation	N ₂ O	20.1	15.2	•	L ₁ L ₂ T ₂	1990, 2020 ₂
1.A.3.b N ₂ O Emissions from Mobile Combustion: Road	N ₂ O	37.7	9.8	•	L ₁ T ₁ T ₂	1990 ₁
1.A.3.e N ₂ O Emissions from Mobile Combustion: Other ^b	N ₂ O	4.7	6.1			
1.A.1 N ₂ O Emissions from Stationary Combustion - Gas - Electricity Generation	N ₂ O	0.3	4.5			
1.A.2 N ₂ O Emissions from Stationary Combustion - Industrial	N ₂ O	3.1	2.3			
1.A.3.a N ₂ O Emissions from Mobile Combustion: Aviation	N ₂ O	1.7	1.1			
1.A.4.b N ₂ O Emissions from Stationary Combustion - Residential	N ₂ O	1.0	0.8			
5.C.1 N ₂ O Emissions from Incineration of Waste	N ₂ O	0.5	0.4			
1.A.4.a N ₂ O Emissions from Stationary Combustion - Commercial	N ₂ O	0.4	0.3			
1.A.3.c N ₂ O Emissions from Mobile Combustion: Railways	N ₂ O	0.3	0.2			
1.A.3.d N ₂ O Emissions from Mobile Combustion: Marine	N ₂ O	0.3	0.2			
1.A.5 N ₂ O Emissions from Stationary Combustion - U.S. Territories	N ₂ O	0.1	0.1			

CRF Source/Sink Category	Greenhouse Gas	1990 Emissions (MMT CO ₂ Eq.)	2020 Emissions (MMT CO ₂ Eq.)	Key Category	ID Criteria ^a	Level in which year(s) ^b
1.B.2 N ₂ O Emissions from Petroleum Systems	N ₂ O	+	+			
1.A.1 N ₂ O Emissions from Stationary Combustion - Wood - Electricity Generation	N ₂ O	+	+			
1.B.2 N ₂ O Emissions from Natural Gas Systems	N ₂ O	+	+			
1.A.1 N ₂ O Emissions from Stationary Combustion - Oil - Electricity Generation	N ₂ O	0.1	+			
1.A.5.b N ₂ O Emissions from Mobile Combustion: Military	N ₂ O	+	+			
Industrial Processes and Product Use						
2.A.1 CO ₂ Emissions from Cement Production	CO ₂	33.5	40.7	•	L ₁ T ₁	1990 ₁ , 2020 ₁
2.C.1 CO ₂ Emissions from Iron and Steel Production & Metallurgical Coke Production	CO ₂	104.7	37.7	•	L ₁ T ₁ L ₂ T ₂	1990, 2020 ₁
2.B.8 CO ₂ Emissions from Petrochemical Production	CO ₂	21.6	30.0	•	L ₁ T ₁	1990 ₁ , 2020 ₁
2.B.1 CO ₂ Emissions from Ammonia Production	CO ₂	13.0	12.7			
2.A.2 CO ₂ Emissions from Lime Production	CO ₂	11.7	11.3			
2.A.4 CO ₂ Emissions from Other Process Uses of Carbonates	CO ₂	6.2	9.8			
2.B.10 CO ₂ Emissions from Urea Consumption for Non-Ag Purposes	CO ₂	3.8	6.0			
2.B.10 CO ₂ Emissions from Carbon Dioxide Consumption	CO ₂	1.5	5.0			
2.A.3 CO ₂ Emissions from Glass Production	CO ₂	2.3	1.9			
2.C.3 CO ₂ Emissions from Aluminum Production	CO ₂	6.8	1.7			
2.B.7 CO ₂ Emissions from Soda Ash Production	CO ₂	1.4	1.5			
2.C.2 CO ₂ Emissions from Ferroalloy Production	CO ₂	2.2	1.4			
2.B.6 CO ₂ Emissions from Titanium Dioxide Production	CO ₂	1.2	1.3			
2.C.6 CO ₂ Emissions from Zinc Production	CO ₂	0.6	1.0			
2.B.10 CO ₂ Emissions from Phosphoric Acid Production	CO ₂	1.5	0.9			
2.C.5 CO ₂ Emissions from Lead Production	CO ₂	0.5	0.5			
2.B.5 CO ₂ Emissions from Silicon Carbide Production and Consumption	CO ₂	0.2	0.2			

CRF Source/Sink Category	Greenhouse Gas	1990 Emissions (MMT CO ₂ Eq.)	2020 Emissions (MMT CO ₂ Eq.)	Key Category	ID Criteria ^a	Level in which year(s) ^b
2.C.4 CO ₂ Emissions from Magnesium Production and Processing	CO ₂	0.1	+			
2.B.8 CH ₄ Emissions from Petrochemical Production	CH ₄	0.2	0.3			
2.B.5 CH ₄ Emissions from Silicon Carbide Production and Consumption	CH ₄	+	+			
2.C.2 CH ₄ Emissions from Ferroalloy Production	CH ₄	+	+			
2.C.1 CH ₄ Emissions from Iron and Steel Production & Metallurgical Coke Production	CH ₄	+	+			
2.B.2 N ₂ O Emissions from Nitric Acid Production	N ₂ O	12.1	9.3			
2.B.3 N ₂ O Emissions from Adipic Acid Production	N ₂ O	15.2	8.3			
2.G N ₂ O Emissions from Product Uses	N ₂ O	4.2	4.2			
2.B.4 N ₂ O Emissions from Caprolactam, Glyoxal, and Glyoxylic Acid Production	N ₂ O	1.7	1.2			
2.E N ₂ O Emissions from Electronics Industry	N ₂ O	+	0.3			
2.F.1 Emissions from Substitutes for Ozone Depleting Substances: Refrigeration and Air conditioning	HFCs, PFCs	+	137.7	•	L ₁ T ₁ L ₂ T ₂	2020
2.F.4 Emissions from Substitutes for Ozone Depleting Substances: Aerosols	HFCs, PFCs	0.2	18.1	•	L ₁ T ₁ L ₂ T ₂	2020
2.F.2 Emissions from Substitutes for Ozone Depleting Substances: Foam Blowing Agents	HFCs, PFCs	+	15.5	•	T ₁	
2.F.3 Emissions from Substitutes for Ozone Depleting Substances: Fire Protection	HFCs, PFCs	NO	2.8			
2.F.5 Emissions from Substitutes for Ozone Depleting Substances: Solvents	HFCs, PFCs	NO	2.0			
2.E PFC, HFC, SF ₆ , and NF ₃ Emissions from Electronics Industry	HiGWP	3.6	4.4			
2.G SF ₆ and CF ₄ Emissions from Electrical Transmission and Distribution	SF ₆ , CF ₄	23.2	3.8	•	L ₁ T ₁ T ₂	1990 ₁
2.B.9 HFC-23 Emissions from HCFC-22 Production	HFCs	46.1	2.1	•	L ₁ T ₁ T ₂	1990 ₁
2.C.3 PFC Emissions from Aluminum Production	PFCs	21.5	1.7	•	L ₁ T ₁	1990 ₁
2.C.4 SF ₆ Emissions from Magnesium Production and Processing	SF ₆	5.2	0.9			

CRF Source/Sink Category	Greenhouse Gas	1990 Emissions (MMT CO ₂ Eq.)	2020 Emissions (MMT CO ₂ Eq.)	Key Category	ID Criteria ^a	Level in which year(s) ^b
2.C.4 HFC-134a Emissions from Magnesium Production and Processing	HFCs	NO	0.1			
Agriculture						
3.H CO ₂ Emissions from Urea Fertilization	CO ₂	2.4	5.3			
3.G CO ₂ Emissions from Liming	CO ₂	4.7	2.4	•	T ₂	
3.A.1 CH ₄ Emissions from Enteric Fermentation: Cattle	CH ₄	157.2	168.9	•	L ₁ T ₁ L ₂	1990, 2020
3.B.1 CH ₄ Emissions from Manure Management: Cattle	CH ₄	15.9	33.5	•	L ₁ T ₁ T ₂	2020 ₁
3.B.4 CH ₄ Emissions from Manure Management: Other Livestock	CH ₄	19.0	26.1	•	L ₁ T ₁	1990 ₁ , 2020 ₁
3.C CH ₄ Emissions from Rice Cultivation	CH ₄	16.0	15.7	•	L ₁ L ₂	1990 ₂ , 2020
3.A.4 CH ₄ Emissions from Enteric Fermentation: Other Livestock	CH ₄	6.3	6.2			
3.F CH ₄ Emissions from Field Burning of Agricultural Residues	CH ₄	0.4	0.4			
3.D.1 Direct N ₂ O Emissions from Agricultural Soil Management	N ₂ O	272.6	271.7	•	L ₁ L ₂	1990, 2020
3.D.2 Indirect N ₂ O Emissions from Applied Nitrogen	N ₂ O	43.5	44.6	•	L ₁ L ₂	1990, 2020
3.B.1 N ₂ O Emissions from Manure Management: Cattle	N ₂ O	11.1	15.5			
3.B.4 N ₂ O Emissions from Manure Management: Other Livestock	N ₂ O	2.8	4.2			
3.F N ₂ O Emissions from Field Burning of Agricultural Residues	N ₂ O	0.2	0.2			
Waste						
5.A CH ₄ Emissions from Commercial Landfills	CH ₄	165.7	94.2	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
5.A CH ₄ Emissions from Industrial Landfills	CH ₄	10.9	15.1			
5.D CH ₄ Emissions from Domestic Wastewater Treatment	CH ₄	14.7	11.8			
5.D CH ₄ Emissions from Industrial Wastewater Treatment	CH ₄	5.6	6.4			
5.B CH ₄ Emissions from Composting	CH ₄	0.4	2.3			
5.D N ₂ O Emissions from Domestic Wastewater Treatment	N ₂ O	16.2	23.0	•	L ₁ L ₂ T ₂	1990 ₂ , 2020
5.B N ₂ O Emissions from Composting	N ₂ O	0.3	2.0			
5.D N ₂ O Emissions from Industrial Wastewater Treatment	N ₂ O	0.4	0.5			
Land Use, Land Use Change, and Forestry						
4.E.2 Net CO ₂ Emissions from Land Converted to Settlements	CO ₂	60.8	77.9	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
4.B.2 Net CO ₂ Emissions from Land Converted to Cropland	CO ₂	51.8	54.4	•	L ₁ L ₂ T ₂	1990, 2020
4.C.1 Net CO ₂ Emissions from Grassland Remaining Grassland	CO ₂	6.9	4.5	•	L ₂ T ₂	1990 ₂ , 2020 ₂

CRF Source/Sink Category	Greenhouse Gas	1990 Emissions (MMT CO ₂ Eq.)	2020 Emissions (MMT CO ₂ Eq.)	Key Category	ID Criteria ^a	Level in which year(s) ^b
4.D.2 Net CO ₂ Emissions from Lands Converted to Wetlands	CO ₂	4.3	0.3			
4.D.1 Net CO ₂ Emissions from Coastal Wetlands Remaining Coastal Wetlands	CO ₂	(+)	(+)			
4.B.1 Net CO ₂ Emissions from Cropland Remaining Cropland	CO ₂	(23.2)	(+)	•	L ₁ L ₂	1990, 2020
4.C.2 Net CO ₂ Emissions from Land Converted to Grassland	CO ₂	(+)	(+)	•	L ₁ T ₁ L ₂ T ₂	2020
4.A.2 Net CO ₂ Emissions from Land Converted to Forest Land	CO ₂	(+)	(+)	•	L ₁ L ₂	1990, 2020
4.E.1 Net CO ₂ Emissions from Settlements Remaining Settlements	CO ₂	(+)	(+)	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
4.A.1 Net CO ₂ Emissions from Forest Land Remaining Forest Land	CO ₂	(+)	(+)	•	L ₁ T ₁ L ₂ T ₂	1990, 2020
4.D.1 CH ₄ Emissions from Flooded Lands Remaining Flooded Lands	CH ₄	18.2	19.9	•	L ₁	2020 ₁
4.A.1 CH ₄ Emissions from Forest Fires	CH ₄	2.3	13.6	•	T ₁ T ₂	
4.D.1 CH ₄ Emissions from Coastal Wetlands Remaining Coastal Wetlands	CH ₄	3.7	3.8			
4.C.1 CH ₄ Emissions from Grass Fires	CH ₄	0.1	0.3			
4.D.2 CH ₄ Emissions from Land Converted to Flooded Lands	CH ₄	2.6	0.2			
4.D.2 CH ₄ Emissions from Land Converted to Coastal Wetlands	CH ₄	0.2	0.2			
4.A.4 CH ₄ Emissions from Drained Organic Soils	CH ₄	+	+			
4.D.1 CH ₄ Emissions from Peatlands Remaining Peatlands	CH ₄	+	+			
4.A.1 N ₂ O Emissions from Forest Fires	N ₂ O	1.8	11.7	•	T ₁ T ₂	
4.E.1 N ₂ O Emissions from Settlement Soils	N ₂ O	2.0	2.5			
4.A.1 N ₂ O Emissions from Forest Soils	N ₂ O	0.1	0.5			
4.C.1 N ₂ O Emissions from Grass Fires	N ₂ O	0.1	0.3			
4.D.1 N ₂ O Emissions from Coastal Wetlands Remaining Coastal Wetlands	N ₂ O	0.1	0.2			
4.A.4 N ₂ O Emissions from Drained Organic Soils	N ₂ O	0.1	0.1			
4.D.1 N ₂ O Emissions from Peatlands Remaining Peatlands	N ₂ O	+	+			

+ Absolute value does not exceed 0.05 MMT CO₂ Eq.
NO (Not Occurring)

^a If the source is a key category for both L₁ and L₂ (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., 1990₂ designates a category is key for the Approach 2 assessment only in 1990).

^b Other includes emissions from pipelines.

Note: Parentheses indicate negative values (or sequestration).

Approach for 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 90 percent of inventory uncertainty.

Including the Approach 2 provides additional insight into why certain source and sink 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. 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. The uncertainty associated with CO₂ from mobile combustion is applied to each mode's emission estimate. Note, an uncertainty analysis was conducted for the CO₂ and N₂O emissions from waste incineration, but has not yet been conducted for the CH₄ emissions from waste incineration.

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 category analyses, 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 KCA-1 through Table KCA-4 contain the 1990 and 2020 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. Tables are available online at: <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2020>.

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 descending 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 KCA-5 through Table KCA-6 contain the trend assessments 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. Tables are available online at: <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2020>.

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