9. Recalculations and Improvements

Each year, many emission and sink estimates in the *Inventory of U.S. Greenhouse Gas Emissions and Sinks* are recalculated and revised through the use of better methods and/or data with the goal of improving inventory quality and reducing uncertainties, including improving the transparency, completeness, consistency, and overall usefulness of the report. In this effort, the United States follows the *2006 IPCC Guidelines* (IPCC 2006) and its refinements/supplements, which state:

> *"Both methodological changes and refinements over time are an essential part of improving inventory quality. It is good practice to change or refine methods when available data have changed; the previously used method is not consistent with the IPCC guidelines for that category; a category has become key; the previously used method is insufficient to reflect mitigation activities in a transparent manner; the capacity for inventory preparation has increased; improved inventory methods become available; and/or for correction of errors."*

When methodological changes have been implemented, the previous *Inventory's* time series (i.e., 1990 to 2021) is assessed and potentially recalculated to reflect the change, per guidance in IPCC (2006, 2019). Changes in historical data are often the result of changes in statistical data supplied by other agencies, and these changes do not necessarily impact the entire time series.

The results of all methodological changes and historical data updates made in the current *Inventory* in calculating CO_2-equivalent U.S. greenhouse gas emissions and sinks are presented in Figure 9-2, while impacts on both total and net emissions by gas are presented in Table 9-1 and Table 9-2. Collectively, these changes resulted in an average annual decrease of 114.8 million metric tons of carbon dioxide equivalent (MMT CO_2 Eq.) (1.9 percent) in net total emissions relative to the previously published *Inventory* (i.e., the 1990 to 2021 report) in units of MMT CO_2 Eq.

Figure 9-1: Impacts of Recalculations on Net Emissions

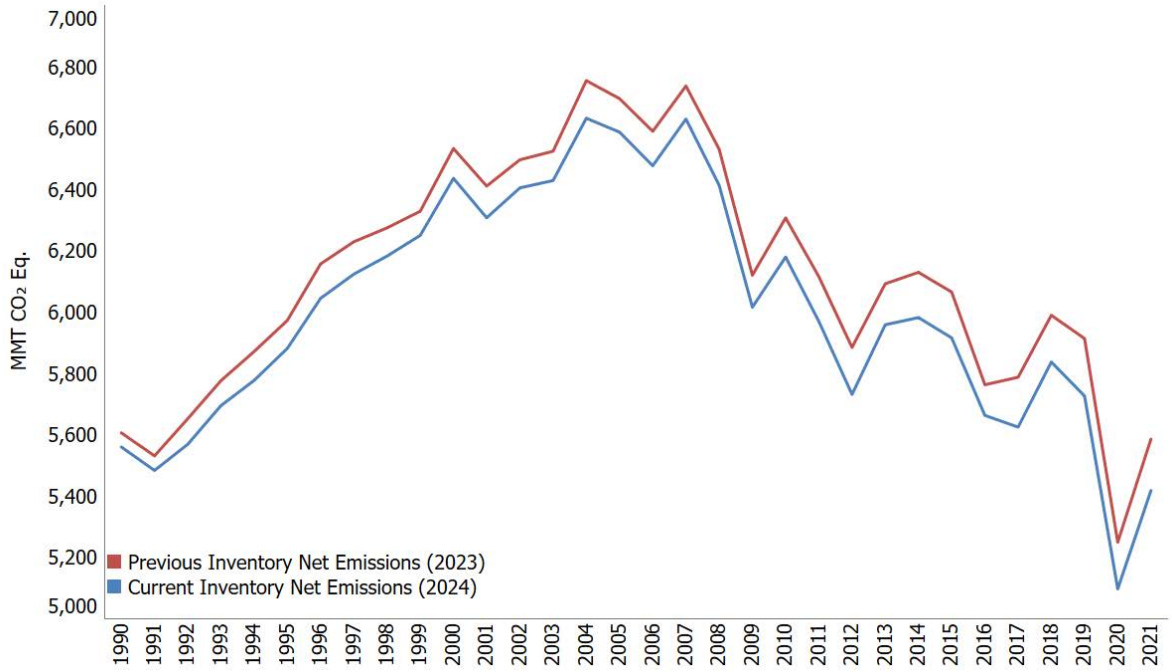

Table 9-1: Overall Impact of Recalculations by Gas Compared to Previous *Inventory*

Gas/Source	1990	2005	2018	2019	2020	2021	Average Annual Change
CO_2	10.7	(5.3)	(15.6)	(27.7)	(25.7)	(15.0)	(4.6)
CH_4[a]	3.0	4.4	(2.6)	(13.4)	(6.9)	(7.0)	0.5
N_2O[a]	1.9	3.4	9.3	6.1	2.3	4.9	3.9
HFCs and PFCs	34.0	14.8	6.8	7.2	6.1	5.7	21.2
Total Gross Emissions (Sources)	**49.6**	**17.3**	**(2.1)**	**(27.8)**	**(24.2)**	**(11.4)**	**21.0**
Change in LULUCF Total Net Flux[b]	(95.8)	(123.0)	(148.8)	(153.4)	(120.2)	(151.4)	(133.6)
LULUCF Emissions[c]	0.0	(3.5)	(1.6)	(6.2)	(8.0)	(4.9)	(2.2)
CH_4	(0.4)	(2.8)	(1.8)	(4.4)	(6.1)	(3.8)	(2.0)
N_2O	0.4	(0.7)	0.2	(1.8)	(1.9)	(1.1)	(0.2)
Change in LULUCF Sector Net Total[d]	(95.7)	(126.5)	(150.4)	(159.5)	(128.2)	(156.3)	(135.8)
Net Emissions (Sources and Sinks)	**(46.2)**	**(109.3)**	**(152.4)**	**(187.3)**	**(152.4)**	**(167.8)**	**(114.8)**

[a] Does not include CH_4 and N_2O emissions from LULUCF.

[b] LULUCF carbon stock change includes any C stock gains and losses from all land use and land use conversion categories

[c] LULUCF emissions include the CH_4 and N_2O emissions reported for peatlands remaining peatlands, forest fires, drained organic soils, grassland fires, and coastal wetlands remaining coastal wetlands; CH_4 emissions from land converted to coastal wetlands; and N_2O emissions from forest soils and settlement soils.

[d] The LULUCF sector net total is the net sum of all CH_4 and N_2O emissions to the atmosphere plus net carbon stock changes. More detail on the impacts of recalculations on the LULUCF sector can be found in Table 9-5.

Notes: Parentheses indicate negative values. Totals may not sum due to independent rounding.

Table 9-2: Overall Impact of Recalculations by Sector Compared to Previous *Inventory*

Gas/Source	1990	2005	2018	2019	2020	2021	Average Annual Change
Energy	16.8	1.6	(13.4)	(32.1)	(25.6)	(16.7)	(0.2)
IPPU	33.5	15.3	5.0	5.1	4.7	5.2	20.4
Agriculture	3.1	4.1	12.9	5.6	2.4	6.7	5.3
LULUCF	(95.8)	(126.5)	(150.4)	(159.5)	(128.2)	(156.3)	(135.8)
Waste	0.0	(0.1)	(0.5)	(0.2)	0.2	0.0	(0.1)
Total Gross Emissions (Sources)	**49.6**	**17.3**	**(2.1)**	**(27.8)**	**(24.2)**	**(11.4)**	**21.0**
Net Emissions (Sources and Sinks)	**(46.2)**	**(109.3)**	**(152.4)**	**(187.3)**	**(152.4)**	**(167.8)**	**(114.8)**

Notes: Parentheses indicate negative values. Totals may not sum due to independent rounding.

Table 9-4 and Table 9-5 include the category-level quantitative effects of methodological changes and historical data updates made in the current *Inventory* in calculating CO_2-equivalent U.S. greenhouse gas emissions by gas across all sectors. To understand the details of any specific recalculation or methodological improvement, see the Recalculations sections within each source/sink categories' section found in Chapters 3 through 7 of this report. A discussion of *Inventory* improvements in response to review processes is described in Annex 8.

Key Recalculations and Improvements for 1990-2022 *Inventory*

The current *Inventory* includes new categories that improve completeness of the national estimates. Specifically, the current report includes CO_2 emissions from ceramics production and non-metallurgical magnesia production within other process use of carbonates category, fluorinated gases from fluorochemical production other than HCFC-22 within the fluorochemical production category, and managed forest land in Hawaii and several U.S. Territories.[1] The report also now includes SF_6 and PFCs from product uses.

The following source and sink categories underwent the most significant methodological and historical data changes. A brief summary of the recalculations and/or improvements undertaken are provided for these categories.

Table 9-3: Key Recalculations

Sector	Category	Reason for Recalculation or Improvement	Impact of Recalculation on 2021 Value	Average Impact over Time Series	
				Percent	(MMT CO_2 Eq.)
LULUCF	Forest Land Remaining Forest Land (CO_2)	Accuracy. Use of new and updated data and methods from the USFS Forest Inventory and Analysis program, see details in Chapter 6.2.	148.8	+21.7%	159.1
LULUCF	Land Converted to Grassland (CO_2)	Accuracy. Use of new activity data and methods from FIA, USDA-NRCS NRI and DayCent model, see details in Chapter 6.7.	49.2	-237.1%	53.1
LULUCF	Land Converted to Cropland (CO_2)	Accuracy. Use of new activity data and methods from FIA, USDA-NRCS NRI and DayCent model, see details in Chapter 6.5.	21.6	-36.6%	20.7

[1] American Samoa, Guam, Northern Marianas Islands, U.S. Virgin Islands, and Puerto Rico.

LULUCF	Grassland Remaining Grassland (CO_2)	Accuracy. Use of new data from USDA-NRCS NRI, and re-calibration of the DayCent model, see details in Chapter 6.6.	0.6	+1,850.1%	10.7
Energy	Non-Energy Use of Fuels (CO_2)	Accuracy and Consistency. Use of new, updated, and recategorized data from U.S. International Trade Commission, EIA and other data sources (ACC), see details in Chapter 3.2.	28.6	-8.2%	10.1
LULUCF	Land Converted to Settlements (CO_2)	Accuracy. Use of new data from USDA-NRCS NRI, FIA, and extended time series, see details in Chapter 6.11.	12.8	-9.3%	7.7
IPPU	Fluorochemical Production (HFCs)	Completeness. Inclusion of new subcategory fluorochemical production other than HCFC-22, see details in Chapter 4.14 and 4.15.	1.7	+58.7%	6.8
Energy	Fossil Fuel Combustion (CO_2)	Accuracy and Consistency. Use of updated data and alignment of methodology from EIA, see details in Chapter 3.1.	15.2	+0.1%	5.8
LULUCF	Cropland Remaining Cropland (CO_2)	Accuracy. Use of new data from USDA-NRCS NRI and the OpTIS remote-sensing data, and methods to extend time series, see details in Chapter 6.4.	13.0	+26.4%	4.2
Agriculture	Agricultural Soil Management (N_2O)	Accuracy. Use of updated time series data for land representation, re-calibration of DayCent model, and updated cropland management parameters, see details in Chapter 5.4.	3.9	+1.1%	3.3
Energy	Petroleum Systems (CH_4)	Accuracy. Use of additional data from GHGRP, see details in Chapter 3.6.	1.5	-4.6%	2.5
LULUCF	Wetlands Remaining Wetlands (CO_2)	Accuracy. Use of new data and updated emissions factors, see details in Chapter 1.8.	2.3	+2.2%	2.4

Figure 9-2: Impacts of Recalculations to U.S. Greenhouse Gas Emissions and Sinks by Sector

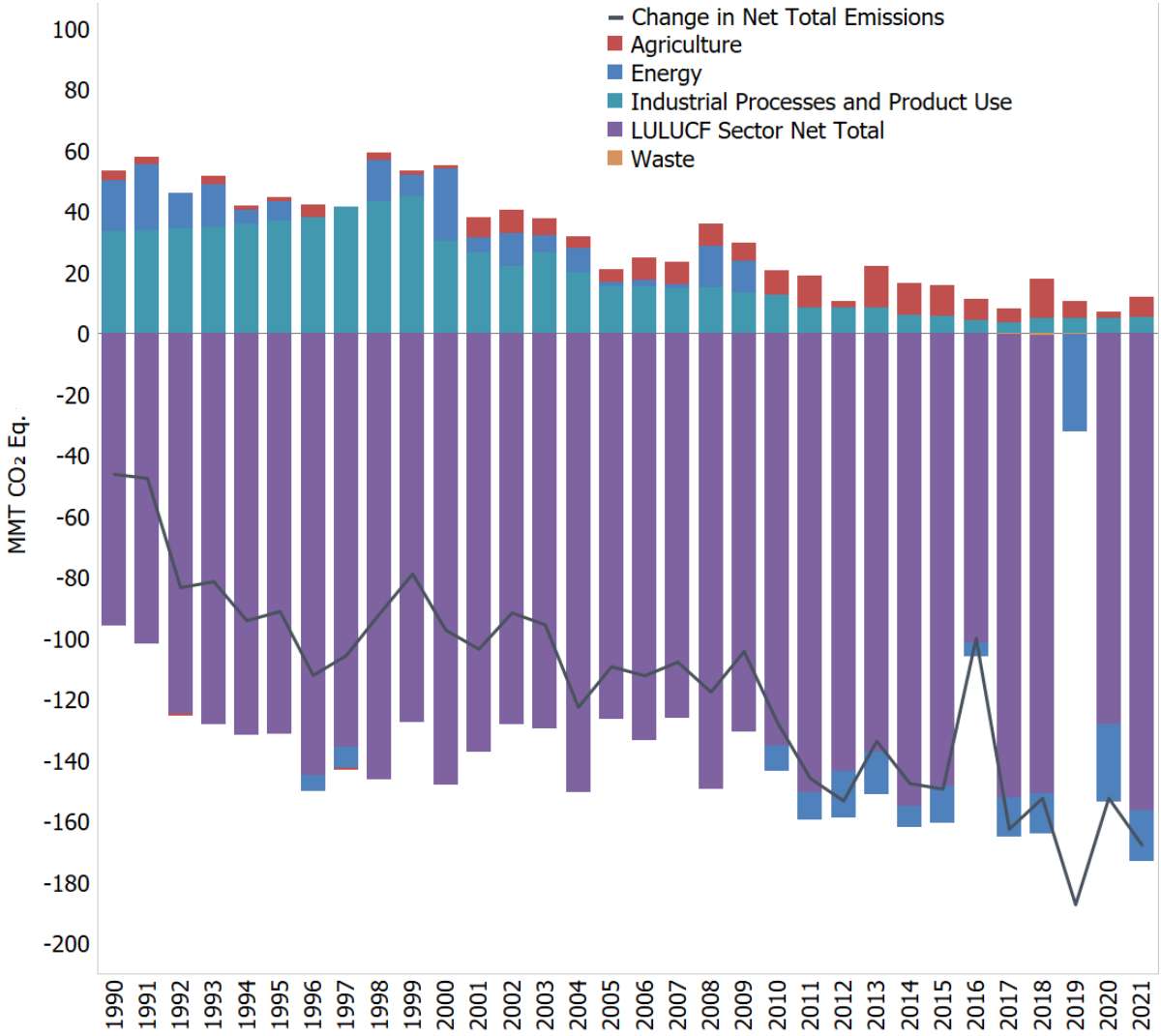

Table 9-4: Revisions to U.S. Greenhouse Gas Emissions (MMT CO_2 Eq.)

Gas/Source	1990	2005	2018	2019	2020	2021	Average Annual Change
CO_2	**10.7**	**(5.3)**	**(15.6)**	**(27.7)**	**(25.7)**	**(15.0)**	**(4.6)**
Fossil Fuel Combustion	*24.0*	*(3.2)*	*(1.7)*	*(3.3)*	*(3.2)*	*15.2*	*5.8*
Electric Power Sector	NC	NC	NC	NC	+	+	+
Transportation	NC	NC	0.2	0.2	0.3	1.1	0.1
Industrial	24.0	(3.2)	(3.1)	(6.1)	(5.9)	4.8	5.2
Residential	(+)	+	0.7	1.5	1.6	4.7	0.3
Commercial	(+)	+	0.5	1.0	0.8	4.5	0.2
U.S. Territories	(+)	(+)	(+)	(+)	(+)	(+)	(+)
Non-Energy Use of Fuels	(13.3)	(3.9)	(11.1)	(21.1)	(21.5)	(28.6)	(10.1)
Natural Gas Systems	0.2	1.3	(+)	(+)	0.3	(0.4)	0.4
Cement Production	NC	NC	NC	NC	NC	NC	NC

Lime Production	NC	NC	NC	NC	NC	NC	NC
Other Process Uses of Carbonates[a]	0.9	1.0	0.6	0.6	0.6	0.6	0.8
Glass Production	0.3	(+)	NC	NC	NC	NC	+
Soda Ash Production	NC	NC	NC	NC	NC	NC	NC
Carbon Dioxide Consumption	NC	NC	NC	NC	NC	NC	NC
Incineration of Waste	NC	NC	NC	NC	NC	NC	NC
Titanium Dioxide Production	NC	NC	NC	(0.1)	0.1	NC	+
Aluminum Production	NC	NC	NC	NC	NC	NC	NC
Iron and Steel Production & Metallurgical Coke Production	+	+	+	+	+	0.2	+
Ferroalloy Production	NC	NC	NC	NC	NC	NC	NC
Ammonia Production	NC	NC	NC	NC	NC	(+)	(+)
Urea Consumption for Non-Agricultural Purposes	NC	NC	+	(+)	(+)	1.6	0.1
Phosphoric Acid Production	NC	NC	NC	NC	NC	(+)	(+)
Petrochemical Production	(1.5)	(0.5)	(2.1)	(2.2)	(1.9)	(2.5)	(1.4)
Carbide Production and Consumption	NC	NC	NC	NC	NC	NC	NC
Lead Production	NC	NC	NC	NC	(+)	(+)	(+)
Zinc Production	NC	NC	NC	NC	NC	+	+
Petroleum Systems	0.1	(+)	(1.3)	(1.4)	(0.1)	(0.5)	(0.1)
Abandoned Oil and Gas Wells	+	+	+	+	+	+	+
Magnesium Production and Processing	+	+	NC	NC	NC	(+)	+
Liming	NC	NC	NC	NC	(+)	(0.7)	(+)
Urea Fertilization	NC	NC	(+)	+	+	+	(+)
Coal Mining	(+)	(+)	(+)	(+)	(+)	(+)	(+)
Substitution of Ozone Depleting Substances	NC	NC	NC	NC	NC	NC	NC
Biomass and Biodiesel Consumption[b]	*NC*	*NC*	*(+)*	*(+)*	*(9.9)*	*(12.3)*	*(0.7)*
International Bunker Fuels[c]	*NC*	*NC*	*NC*	*NC*	*NC*	*NC*	*NC*
CH_4[d]	**3.0**	**4.4**	**(2.6)**	**(13.4)**	**(6.9)**	**(7.0)**	**0.5**
Stationary Combustion	+	(+)	+	+	(0.8)	(0.9)	(+)
Mobile Combustion	+	(0.1)	(+)	(+)	(+)	(+)	(0.1)
Coal Mining	NC	(0.4)	NC	(+)	NC	(+)	(+)
Abandoned Underground Coal Mines	NC	NC	NC	NC	NC	(0.1)	(+)
Natural Gas Systems	3.7	6.9	(4.0)	(4.9)	(5.0)	(6.8)	1.9
Petroleum Systems	(1.9)	(2.7)	(1.6)	(7.7)	(1.2)	(1.5)	(2.5)
Abandoned Oil and Gas Wells	0.1	0.2	0.2	0.1	0.2	0.3	0.2
Petrochemical Production	(0.2)	(0.1)	(0.3)	(0.4)	(0.3)	(0.4)	(0.2)
Carbide Production and Consumption	NC	NC	NC	NC	NC	NC	NC
Iron and Steel Production & Metallurgical Coke Production	NC	NC	NC	NC	+	(+)	+
Ferroalloy Production	NC	NC	NC	NC	NC	NC	NC
Enteric Fermentation	+	+	(+)	(+)	0.1	1.5	0.1
Manure Management	0.1	0.1	1.2	0.9	0.2	0.4	0.3
Rice Cultivation	1.0	0.4	2.5	(1.2)	1.0	1.5	1.0
Field Burning of Agricultural Residues	0.1	0.2	0.1	0.2	0.1	0.1	0.1
Landfills	NC	(+)	(0.4)	(0.3)	(0.7)	(0.6)	(+)
Wastewater Treatment	(+)	(+)	(+)	(+)	(0.4)	(0.4)	(+)
Composting	NC	NC	NC	NC	NC	NC	NC
Anaerobic Digestion at Biogas Facilities	(+)	(+)	(0.2)	(0.2)	(0.2)	(0.2)	(0.1)
Incineration of Waste	NC	NC	NC	NC	NC	NC	NC
International Bunker Fuels[c]	NC	NC	NC	NC	NC	NC	NC
N_2O[d]	**1.9**	**3.4**	**9.3**	**6.1**	**2.3**	**4.9**	**3.9**
Stationary Combustion	0.1	(+)	(+)	(+)	(0.1)	(0.1)	+
Mobile Combustion	+	+	0.1	0.1	+	0.1	0.1
Adipic Acid Production	NC	NC	(+)	NC	NC	NC	(+)

Nitric Acid Production	NC	NC	NC	NC	NC	NC	NC
Manure Management	1.0	0.7	(0.6)	(0.6)	(0.6)	(0.3)	0.5
Agricultural Soil Management	0.8	2.6	9.7	6.3	1.6	3.9	3.3
Field Burning of Agricultural Residues	+	+	+	+	+	+	+
Wastewater Treatment	NC	NC	+	0.3	1.4	1.1	0.1
N_2O from Product Uses	NC	NC	NC	NC	NC	NC	NC
Caprolactam, Glyoxal, and Glyoxylic Acid Production	NC	NC	NC	NC	(+)	(+)	(+)
Incineration of Waste	NC	NC	NC	NC	NC	NC	NC
Composting	NC	NC	NC	NC	NC	NC	NC
Electronics Industry	NC	NC	+	+	+	+	+
Natural Gas Systems	+	+	+	+	+	+	+
Petroleum Systems	(+)	(+)	+	(+)	(+)	(+)	(+)
International Bunker Fuels[c]	*NC*	*NC*	*NC*	*NC*	*NC*	*NC*	*NC*
HFCs, PFCs, SF_6 and NF_3	**34.0**	**14.8**	**6.8**	**7.2**	**6.1**	**5.7**	**21.2**
HFCs	**8.7**	**5.4**	**3.0**	**2.7**	**2.1**	**1.9**	**6.9**
Substitution of Ozone Depleting Substances	NC	0.1	0.1	0.1	0.1	0.2	0.1
Fluorochemical Production[e]	8.7	5.3	2.9	2.6	2.0	1.7	6.8
Electronics Industry	(+)	(+)	(+)	+	(+)	+	+
Magnesium Production and Processing	NC	NC	NC	NC	NC	NC	NC
PFCs	**17.7**	**4.2**	**3.1**	**3.3**	**2.7**	**2.8**	**9.3**
Aluminum Production	NC	NC	NC	NC	NC	+	+
Fluorochemical Production	17.5*	4.0*	2.9*	3.0*	2.5*	2.6*	9.1*
Electronics Industry	(+)	+	0.1	0.1	0.1	+	+
Substitution of Ozone Depleting Substances	NC	+	(+)	(+)	(+)	(+)	(+)
SF_6 and PFCs from Other Product Use	0.1*	0.1*	0.2*	0.2*	0.2*	0.1*	0.1*
Electrical Equipment	+	(+)	NC	(+)	+	(+)	(+)
SF_6	**7.4**	**4.7**	**0.5**	**0.6**	**0.6**	**0.4**	**4.6**
Electrical Equipment	NC	+	(0.2)	(+)	+	+	(+)
SF_6 and PFCs from Other Product Use	1.3*	1.3*	0.8*	0.6*	0.5*	0.4*	1.2*
Fluorochemical Production	5.8*	3.3*	+	+	+	+	3.3*
Electronics Industry	NC	+	+	+	+	(+)	+
Magnesium Production and Processing	0.2	0.1	NC	NC	NC	+	0.1
NF_3	**0.3**	**0.6**	**0.1**	**0.6**	**0.7**	**0.5**	**0.5**
Electronics Industry	NC	NC	+	+	+	(+)	+
Fluorochemical Production	0.3*	0.6*	0.1*	0.6*	0.7*	0.5*	0.5*
Total Gross Emissions (Sources)	**49.6**	**17.3**	**(2.1)**	**(27.8)**	**(24.2)**	**(11.4)**	**21.0**
Percent Change in Total Emissions	**0.8%**	**0.2%**	**0.0%**	**-0.4%**	**-0.4%**	**(+)**	**0.3%**
Change in LULUCF Sector Net Total[f]	(95.8)	(126.5)	(150.4)	(159.5)	(128.2)	(156.3)	(135.8)
Net Emissions (Sources and Sinks)	**(46.2)**	**(109.3)**	**(152.4)**	**(187.3)**	**(152.4)**	**(167.8)**	**(114.8)**
Percent Change in Net Emissions	**-0.8%**	**-1.6%**	**-2.5%**	**-3.2%**	**-2.9%**	**-3.0%**	**-1.9%**

NC (No Change)

+ Absolute value does not exceed 0.05 MMT CO_2 Eq. or 0.05 percent.

* Indicates a new source for the current *Inventory* year. Emissions from new sources are captured in net emissions and percent change totals.

[a] Category includes emissions from ceramics production (new subcategory, not estimated in the previous *Inventory*), other uses of soda ash, and non-metallurgical magnesia (new subcategory, not estimated in the previous *Inventory*) in the current *Inventory.*

[b] Emissions from biomass and biofuel consumption are not included specifically in summing Energy sector totals. Net carbon fluxes from changes in biogenic carbon reservoirs are accounted for in the estimates for LULUCF.

[c] Emissions from international bunker fuels are not included in totals.

[d] LULUCF emissions of CH_4 and N_2O are reported separately from gross emissions totals in Table 9-4. LULUCF emissions include the CH_4 and N_2O emissions reported for peatlands remaining peatlands, forest fires, drained organic soils, grassland

fires, and coastal wetlands remaining coastal wetlands; CH_4 emissions from land converted to coastal wetlands; and N_2O emissions from forest soils and settlement soils.

[e] This category was reported as HCFC-22 production in the 1990 to 2021 *Inventory*.

[f] The LULUCF sector net total is the net sum of all CH_4 and N_2O emissions to the atmosphere plus net carbon stock changes. More detail on the impacts of recalculations on the LULUCF sector can be found in Table 9-5.

Notes: Totals may not sum due to independent rounding. Parentheses indicate negative values.

Table 9-5: Revisions to U.S. Greenhouse Gas Emissions and Removals (Net Flux) from Land Use, Land-Use Change, and Forestry (MMT CO_2 Eq.)

Land-Use Category	1990	2005	2017	2018	2019	2020	Average Annual Change
Forest Land Remaining Forest Land	**(153.1)**	**(164.6)**	**(170.4)**	**(169.0)**	**(162.4)**	**(153.4)**	**(160.7)**
Changes in Forest Carbon Stocks[a]	(153.3)	(161.8)	(169.1)	(163.8)	(154.6)	(148.8)	(159.1)
Non-CO_2 Emissions from Forest Fires[b]	0.3	(2.8)	(1.3)	(5.1)	(7.7)	(4.5)	(1.6)
N_2O Emissions from Forest Soils[c]	+	(+)	(+)	(+)	(+)	(+)	(+)
Non-CO_2 Emissions from Drained Organic Soils[d]	NC	NC	NC	NC	NC	NC	NC
Land Converted to Forest Land	**(1.8)**	**(1.7)**	**(2.1)**	**(2.0)**	**(2.0)**	**(2.1)**	**(1.8)**
Changes in Forest Carbon Stocks[e]	(1.8)	(1.7)	(2.1)	(2.0)	(2.0)	(2.1)	(1.8)
Cropland Remaining Cropland	**18.1**	**(2.6)**	**(1.2)**	**(4.9)**	**14.5**	**(13.0)**	**(4.2)**
Changes in Mineral and Organic Soil Carbon Stocks	18.1	(2.6)	(1.2)	(4.9)	14.5	(13.0)	(4.2)
Land Converted to Cropland	**(9.4)**	**(20.1)**	**(24.4)**	**(24.9)**	**(27.4)**	**(21.6)**	**(20.7)**
Changes in all Ecosystem Carbon Stocks[f]	(9.4)	(20.1)	(24.4)	(24.9)	(27.4)	(21.6)	(20.7)
Grassland Remaining Grassland	**15.7**	**13.2**	**17.8**	**14.2**	**10.5**	**0.9**	**10.8**
Changes in Mineral and Organic Soil Carbon Stocks	15.7	13.0	17.3	14.5	10.0	0.6	10.7
Non-CO_2 Emissions from Grassland Fires[g]	0.1	0.1	0.5	(0.3)	0.4	0.3	0.1
Land Converted to Grassland	**41.9**	**61.9**	**49.4**	**48.7**	**54.6**	**49.2**	**53.1**
Changes in all Ecosystem Carbon Stocks[f]	41.9	61.9	49.4	48.7	54.6	49.2	53.1
Wetlands Remaining Wetlands	**(4.7)**	**(3.7)**	**(3.7)**	**(3.7)**	**(3.7)**	**(3.7)**	**(3.9)**
Changes in Organic Soil Carbon Stocks in Peatlands	NC	NC	(0.1)	(0.1)	(0.1)	(0.2)	(+)
Changes in Biomass, DOM, and Soil Carbon Stocks in Coastal Wetlands	(2.4)	(2.4)	(2.3)	(2.3)	(2.3)	(2.3)	(2.4)
CH_4 Emissions from Coastal Wetlands Remaining Coastal Wetlands	NC	NC	NC	NC	NC	NC	NC
N_2O Emissions from Coastal Wetlands Remaining Coastal Wetlands	NC	NC	NC	NC	NC	NC	NC
Non-CO_2 Emissions from Peatlands Remaining Peatlands	NC	NC	(+)	(+)	(+)	(+)	(+)
CH_4 Emissions from Flooded Land Remaining Flooded Land	(2.3)	(1.3)	(1.2)	(1.2)	(1.2)	(1.2)	(1.5)
Land Converted to Wetlands	**3.9**	**0.4**	**(0.1)**	**(0.1)**	**0.1**	**0.1**	**1.1**
Changes in Biomass, DOM, and Soil Carbon Stocks in Land Converted to Coastal Wetlands	(+)	(+)	(+)	(+)	(+)	(+)	(+)
CH_4 Emissions from Land Converted to Coastal Wetlands	NC	NC	NC	NC	NC	NC	NC
Changes in Land Converted to Flooded Land	2.2	0.3	(+)	(+)	0.1	0.1	0.6
CH_4 Emissions from Land Converted to Flooded Land	1.8	0.2	(+)	(+)	+	+	0.5
Settlements Remaining Settlements	**(1.4)**	**(1.4)**	**(6.0)**	**(7.1)**	**(0.2)**	**0.2**	**(1.8)**
Changes in Organic Soil Carbon Stocks	(1.4)	(2.1)	(1.6)	(1.3)	(0.7)	(0.4)	(1.8)

Changes in Settlement Tree Carbon Stocks	(0.2)	0.4	(4.9)	(6.2)	0.1	+	(0.3)
Changes in Yard Trimming and Food Scrap Carbon Stocks in Landfills	NC	NC	NC	NC	NC	0.1	+
N_2O Emissions from Settlement Soils[h]	0.3	0.3	0.5	0.5	0.5	0.5	0.4
Land Converted to Settlements	**(5.2)**	**(7.9)**	**(9.7)**	**(10.9)**	**(12.2)**	**(12.8)**	**(7.7)**
Changes in all Ecosystem Carbon Stocks[f]	(5.2)	(7.9)	(9.7)	(10.9)	(12.2)	(12.8)	(7.7)
Change in LULUCF Total Net Flux[i]	**(95.8)**	**(123.0)**	**(148.8)**	**(153.4)**	**(120.2)**	**(151.4)**	**(133.6)**
Change in LULUCF Emissions[j]	**+**	**(3.6)**	**(1.6)**	**(6.2)**	**(8.0)**	**(4.9)**	**(2.2)**
CH_4	(0.4)	(2.8)	(1.8)	(4.4)	(6.1)	(3.8)	(2.0)
N_2O	0.4	(0.7)	0.2	(1.8)	(1.9)	(1.1)	(0.2)
Change in LULUCF Sector Net Total[k]	**(95.8)**	**(126.6)**	**(150.4)**	**(159.5)**	**(128.2)**	**(156.3)**	**(135.8)**
Percent Change in LULUCF Sector Net Total	**-10.9%**	**-16.2%**	**-19.7%**	**-22.7%**	**-16.5%**	**-20.7%**	**-17.0%**

NC (No Change)

+ Absolute value does not exceed 0.05 MMT CO_2 Eq. or 0.05 percent.

[a] Includes the net changes to carbon stocks stored in all forest ecosystem pools (estimates include carbon stock changes from drained organic soils from both forest land remaining forest land and land converted to forest land) and harvested wood products.

[b] Estimates include CH_4 and N_2O emissions from fires on both forest land remaining forest land and land converted to forest land.

[c] Estimates include N_2O emissions from N fertilizer additions on both forest land remaining forest land and land converted to forest land.

[d] Estimates include CH_4 and N_2O emissions from drained organic soils on both forest land remaining forest land and land converted to forest land. Carbon stock changes from drained organic soils are included with the forest land remaining forest land forest ecosystem pools.

[e] Includes the net changes to carbon stocks stored in all forest ecosystem pools.

[f] Includes changes in mineral and organic soil carbon stocks for all land use conversions to cropland, grassland, and settlements, respectively. Also includes aboveground/belowground biomass, dead wood, and litter carbon stock changes for conversion of forest land to cropland, grassland, and settlements.

[g] Estimates include CH_4 and N_2O emissions from fires on both grassland remaining grassland and land converted to grassland.

[h] Estimates include N_2O emissions from N fertilizer additions on both settlements remaining settlements and land converted to settlements because it is not possible to separate the activity data at this time.

[i] LULUCF carbon stock change includes any C stock gains and losses from all land use and land use conversion categories.

[j] LULUCF emissions include the CH_4 and N_2O emissions reported for peatlands remaining peatlands, forest fires, drained organic soils, grassland fires, and coastal wetlands remaining coastal wetlands; CH_4 emissions from land converted to coastal wetlands, flooded land remaining flooded land, and land converted to flooded land; and N_2O emissions from forest soils and settlement soils.

[k] The LULUCF sector net total is the net sum of all LULUCF CH_4 and N_2O emissions to the atmosphere plus LULUCF net carbon stock changes in units of MMT CO_2 Eq.

Notes: Totals may not sum due to independent rounding. Parentheses indicate negative values.