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9

# Recalculations and Improvements

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# Chapter 9. Recalculations and Improvements

This chapter summarizes recalculations relative to previous estimates in the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2023* (Environmental Protection Agency [EPA] 2025). This *Greenhouse Gas Inventory and Analysis for the United States (GHGIA)* estimates are updated annually to incorporate updated annual activity data, refine methods, data, and/or other key parameters, apply more significant methodological changes based on new science and research, information identified in reviews and to correct errors identified from implementing quality assurance and quality control procedures. It is Intergovernmental Panel on Climate Change good practice to recalculate the entire time series from the initial year to the latest year to ensure time series consistency; however, the scope of the recalculation depends on the scope of the update. Updates to recent years of annual statistical data occur regularly, and changes may impact only recent years of the time series.

## 9.1 Recalculations and Rationale

This *GHGIA* includes some methodological refinements but mostly routine annual activity data updates. The updates with impacts exceeding 0.05 percent of gross emissions (3.1 million metric tons [MMT] of carbon dioxide equivalent [CO<sub>2</sub> Eq.]) in 2023 are described in Table 9-1 below. More details on specific recalculations can be found within the source and/or sink section within this *GHGIA*.



**Table 9-1: Significant Recalculations and Impacts**

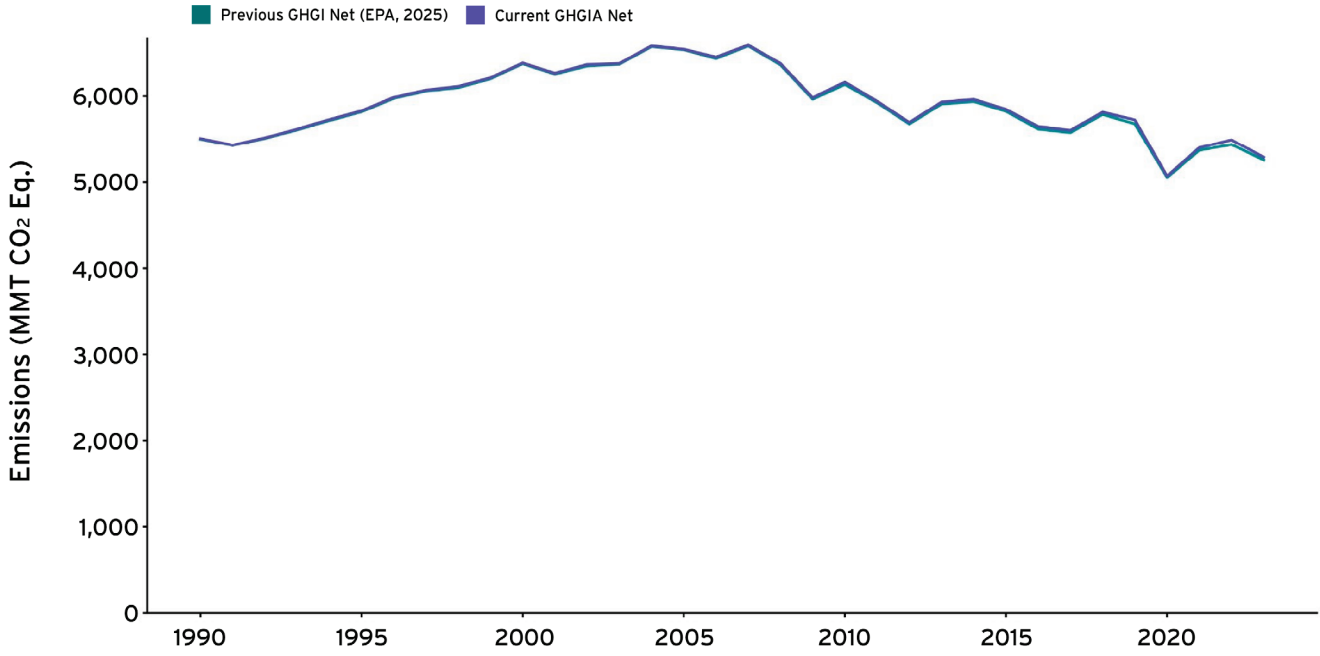
Sector	Category and Greenhouse Gas	Recalculation Reason	Change in 2023 Emissions (MMT CO <sub>2</sub> Eq.)	Average Annual Change (MMT CO <sub>2</sub> Eq. and Percent)
<b>Energy</b>	Fossil Fuel Combustion - Transportation (CO <sub>2</sub> )	Updated activity data (see Chapter 3.1 for details)	41.2	0.5 (0.03%)
<b>Energy</b>	Fossil Fuel Combustion - Non-energy use of fuels (CO <sub>2</sub> )	Updated activity data (see Chapter 3.2 for details)	-17.5	-0.2 (-0.4%)
<b>Energy</b>	Fossil Fuel Combustion - Commercial (CO <sub>2</sub> )	Updated activity data (see Chapter 3.1 for details)	-14.6	0.03 (0.02%)
<b>LULUCF</b>	Cropland Remaining Cropland	Addressed time series consistency (see Chapter 6.4 and Box 5-1 for details)	12.4	1.1 (0.06%)
<b>LULUCF</b>	Forest Land Remaining Forest Land (CO <sub>2</sub> )	Updated activity data and consistent methodology for contiguous United States (see Chapter 6.2 for details)	8.66	10.4 (1.1%)
<b>Energy</b>	Fossil Fuel Combustion - Residential (CO <sub>2</sub> )	Updated activity data (see Chapter 3.1 for details)	-6.4	-0.02 (-0.01%)
<b>LULUCF</b>	Wetlands Remaining Wetlands	Updated activity data (see Chapter 6.8 for details)	4.2	0.7 (0.02%)
<b>LULUCF</b>	Land Converted to Grassland	Addressed time series consistency (see Chapter 6.7 and Box 5-1 for details)	3.2	1.1 (0.06%)
<b>LULUCF</b>	Land Converted to Cropland	Addressed time series consistency (see Chapter 6.5 and Box 5-1 for details)	-3.1	1.1 (0.06%)

LULUCF = Land Use, Land-Use Change, and Forestry

# 9.2 Implications for Emission and Removal Levels and Trends

The impact of recalculations made for this current *GHGIA* on net emissions is shown in Figure 9-1. Supplemental data tables published with this *GHGIA* for download include disaggregated impacts over the time series for all sources.

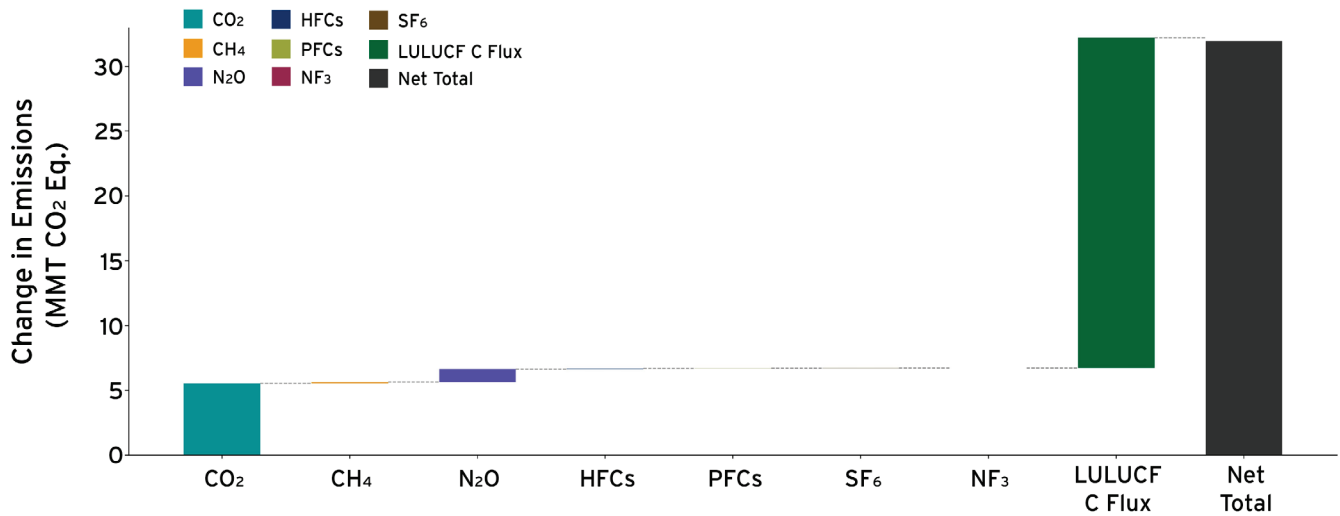
**Figure 9-1: Impacts from Recalculations on Net Emissions**



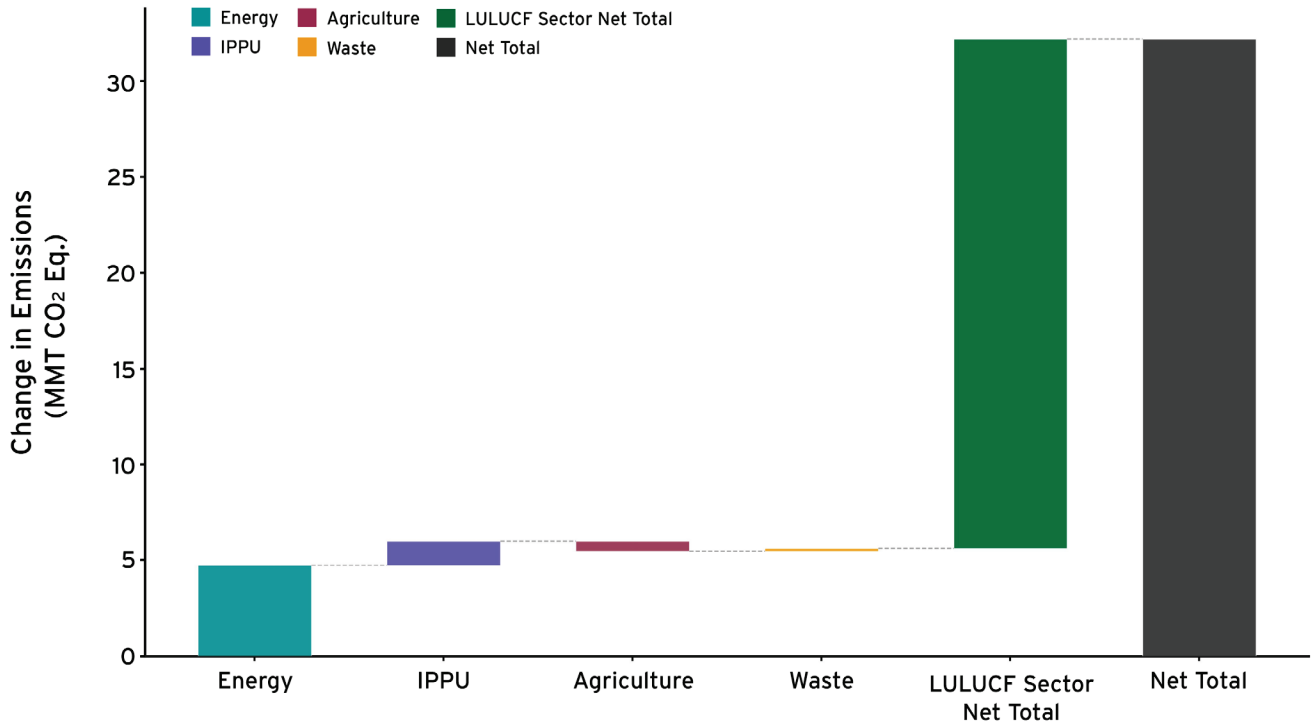
The average annual impact on net emissions was 16.5 MMT CO<sub>2</sub> Eq. over the time series 1990-2023. In 2023, the recalculations resulted in an increase of 32.2 MMT CO<sub>2</sub> Eq. or 0.6 percent of the current emissions in 2023.

The changes in 2023 emissions by greenhouse gas are shown in Figure 9-2, and the changes by sector are shown in Figure 9-3.

**Figure 9-2: Impacts from Recalculations by Gas on 2023 Net Emissions (Absolute Change)**

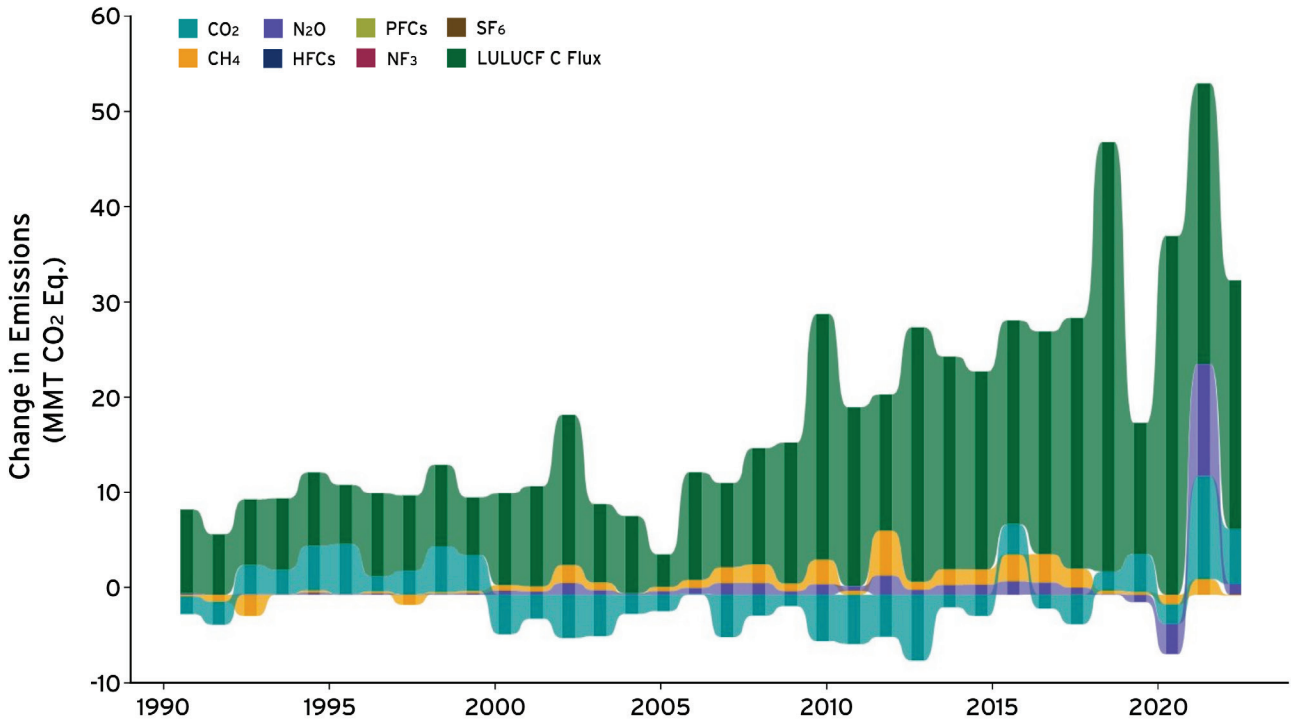


**Figure 9-3: Impacts from Recalculation by Sector on 2023 Net Emissions (Absolute Change)**



As shown in Figure 9-3, in 2023 the recalculations impact to net emissions was primarily in CO<sub>2</sub> emissions from the Energy and LULUCF sectors. Those same trends generally hold across the time series also, as seen in Figure 9-4 and Figure 9-5, which show the impacts of recalculations across the time series by gas and by sector, respectively.

**Figure 9-4: Impacts from Recalculations by Gas on Net Emissions Over Time (Absolute Change)**



Note: CH<sub>4</sub> and N<sub>2</sub>O emission changes include LULUCF CH<sub>4</sub> and N<sub>2</sub>O emissions.

**Figure 9-5: Impacts from Recalculation by Sector on Net Emissions Over Time (Absolute Change)**

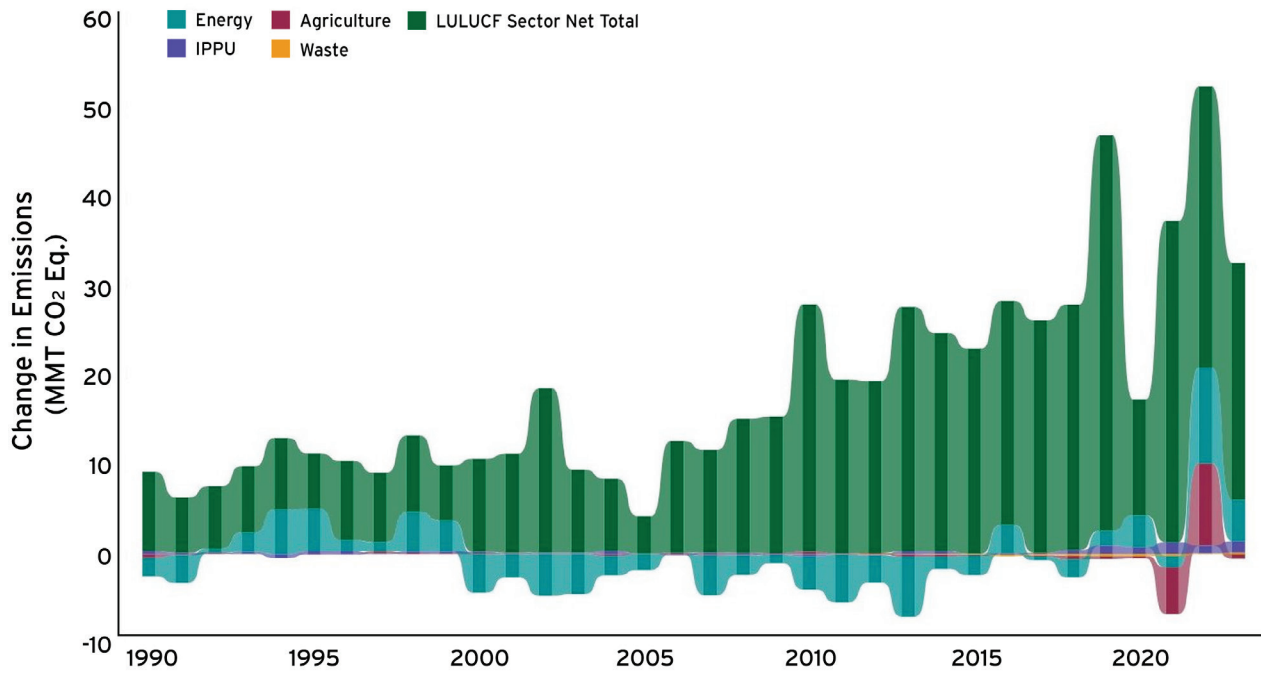


Figure 9-6 shows the impacts of recalculations across time specifically for changes in the energy sector for fossil fuel combustion CO<sub>2</sub> emissions by end use sector and emissions from non-energy use (NEU). As seen in Table 9-1, those were the energy sector sources that were most impacted by recalculations. The recalculations generally followed certain trends over time. Recalculation in NEU emissions generally resulted in opposite changes in industrial sector emissions, reflecting the linkages between those sources. The NEU estimates entail adjusting industrial sector energy use, therefore showing the opposite effects from recalculations. Similarly, changes in transportation sector emissions generally show opposite impacts on other sectors due to the shifting of estimates from one sector to the other. Section 3.1 has more details on the recalculations.

**Figure 9-6: Impacts from Recalculations in Energy Subsectors (Absolute Change)**

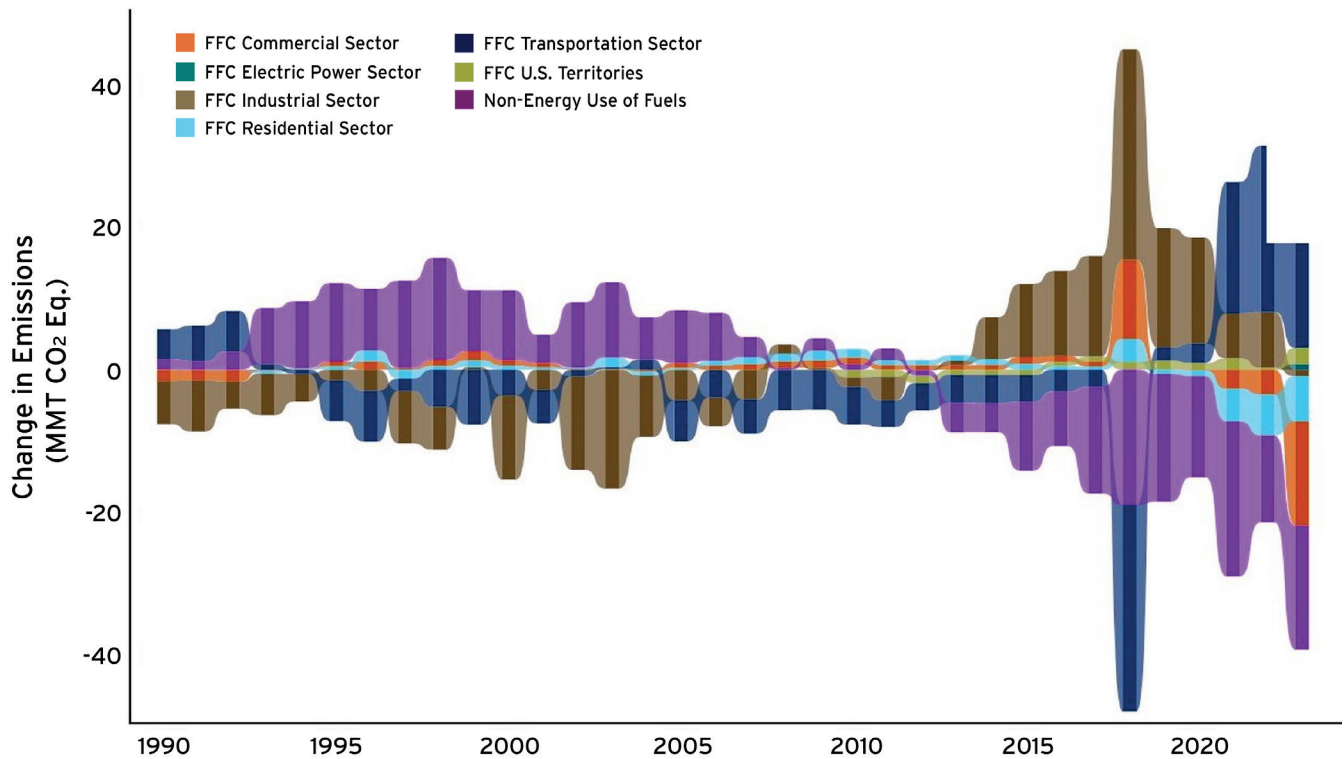
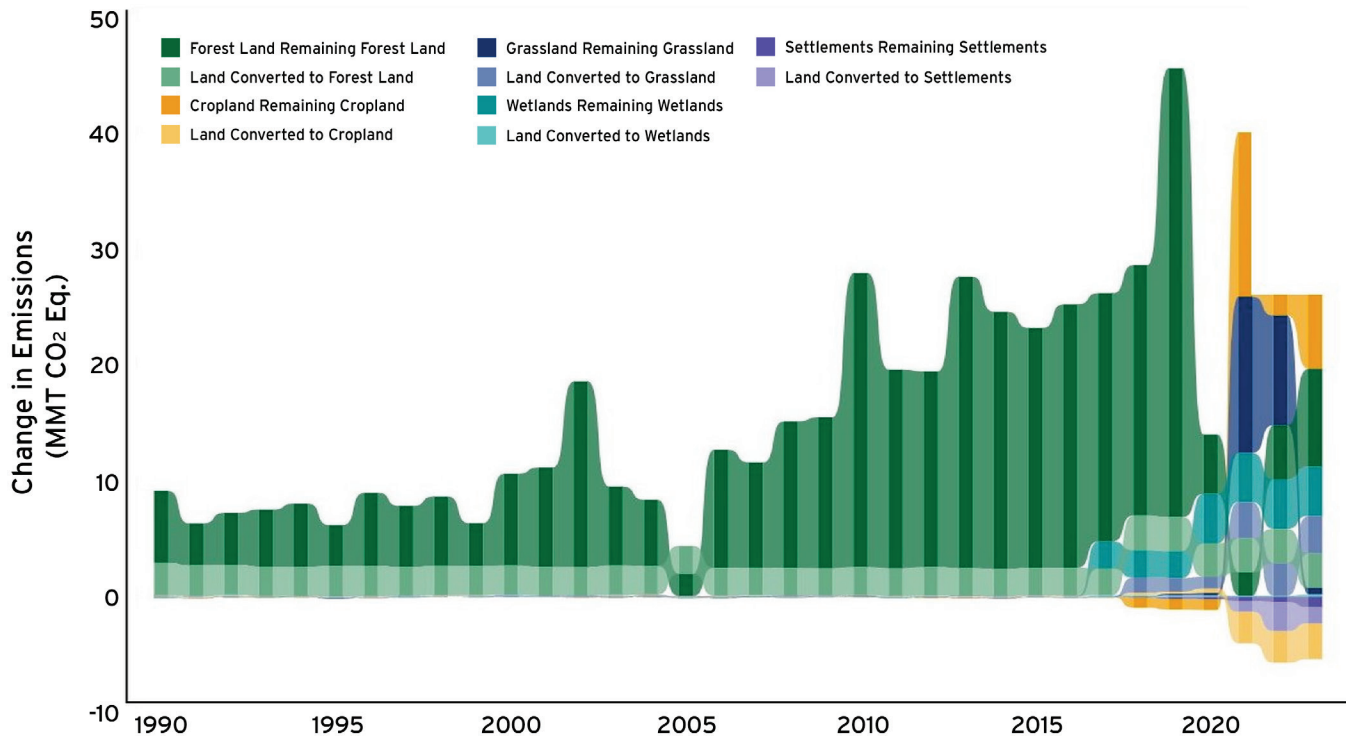


Figure 9-7 shows the impacts of recalculations across time specifically for changes in the LULUCF sector. The impacts across time were mostly from recalculations to the forest land remaining forest land category, where updated activity data and use of consistent methodologies for states in the contiguous United States were implemented. In addition, other more recent changes stemmed from recalculations to coastal wetlands remaining coastal wetlands resulting from incorporation of the latest National Oceanic and Atmospheric Administration Coastal Change Analysis Program data and updates to the Agriculture, Forestry, and Other Land Use extrapolations (see Box 5-1).

**Figure 9-7: Impacts from Recalculations in the LULUCF Sector (Absolute Change)**



## 9.3 Future Improvement Areas

In this *GHGIA*, improvement areas are noted in the introduction to each sectoral chapters. This section will be updated in future Inventories to summarize notable improvement plans and updates in responses to reviews.

# References

U.S. Environmental Protection Agency. (2025). *Inventory of U.S. greenhouse gas emissions and sinks: 1990-2023* (EPA 430-R-25-003) [Unpublished annual report released via Freedom of Information Act Request].