U.S. National GHG Inventory Overview

**EPA annually compiles the *Inventory of U.S. GHG Inventory Emissions and Sinks* Report**

- Official U.S. Government data on national GHG emissions and sinks over time by gas, source/sink and economic sector
  - All GHGs: CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, and NF_3
  - Five IPCC sectors: Energy, Industrial Processes and Product Use, Agriculture, Land Use, Land Use Change and Forestry and Waste
  - Methods: 2006 IPCC Guidelines and its Supplements and Refinements
  - Time series: 1990-2021 (published April 2023)
- Policy-neutral, informs policy
- Fulfills U.S. reporting commitment under the UNFCCC
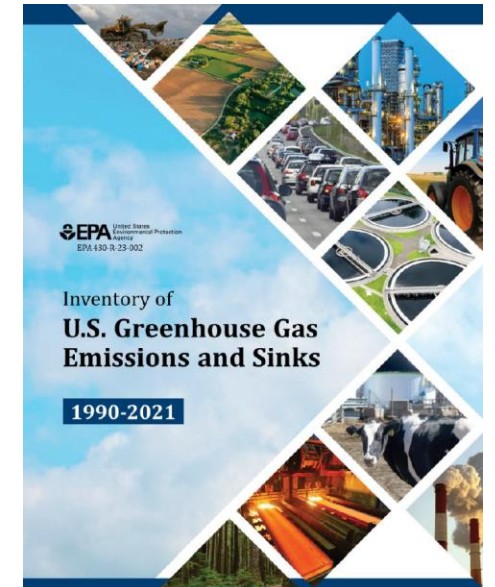
U.S. GHG Inventory by State

- Updated state-level GHG data now covering 1990-2021, fully disaggregating national GHG Inventory across the 50 states (including DC and territories) for all gases & sectors
- Reflects national GHGI improvements and sums to national data (consistent with national GHGI)
- Published annually after national GHG inventory (e.g., 3rd publication)
- GHG Inventory Data Explorer now includes a map view to visualize data across states
- Supports states, policymakers, researchers, and the general public
  - This dataset should not be viewed as official data of any state government, and we provide information on how to access up-to-date official data from states where it exists.
  - Fact sheets on data differences
    - Comparing EPA state-level GHG data with official state Inventories (i.e., scope, accounting approaches, time series, etc.)
    - Relationship to EPA's State Inventory Tool (SIT)

Understanding Approaches for
Consistent Disaggregation of National *Inventory* by State

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Approach 1	Built by applying national methods directly to more geographically disaggregated data at State or finer level (e.g., using same EPA Greenhouse Gas Reporting Program (GHGRP) Data, USDA National Agricultural Statistics Services (NASS) data)
Approach 2	Disaggregate national estimates based on geographic proxies or other indicators (i.e., population, production capacity, data reported to EPA GHGRP, etc.)
Hybrid Approach	Combination of Approach 1 and Approach 2 methods over the time series because data availability limited the use of Approach 1 for all years of the time series

Note: US Greenhouse Gas Inventory team is disaggregating over 70+ categories across 31-year time series, noting some categories include several GHGs and subcategories (including different carbon pools, etc.)

IPPU Overview

- Industrial Processes and Product Use (IPPU) sector includes GHGs occurring from industrial processes and from the use of GHGs in products (e.g., producing metals, minerals, chemicals, using fluorinated GHGs as refrigerants)
- Includes 27 source categories
  - Most sources use hybrid approach or Approach 2 due to limited state-level data and data sensitivity issues
- Emissions occur in all states and Washington, D.C.
- Accounted for ~6% of gross national GHGs in 2021
  - 3.6% higher than 2020 emissions
  - 12.2% higher than 1990 emissions

U.S. Greenhouse Gas Emissions from Industrial Processes and Product Use by State, 2021
Million metric tons of carbon dioxide equivalent
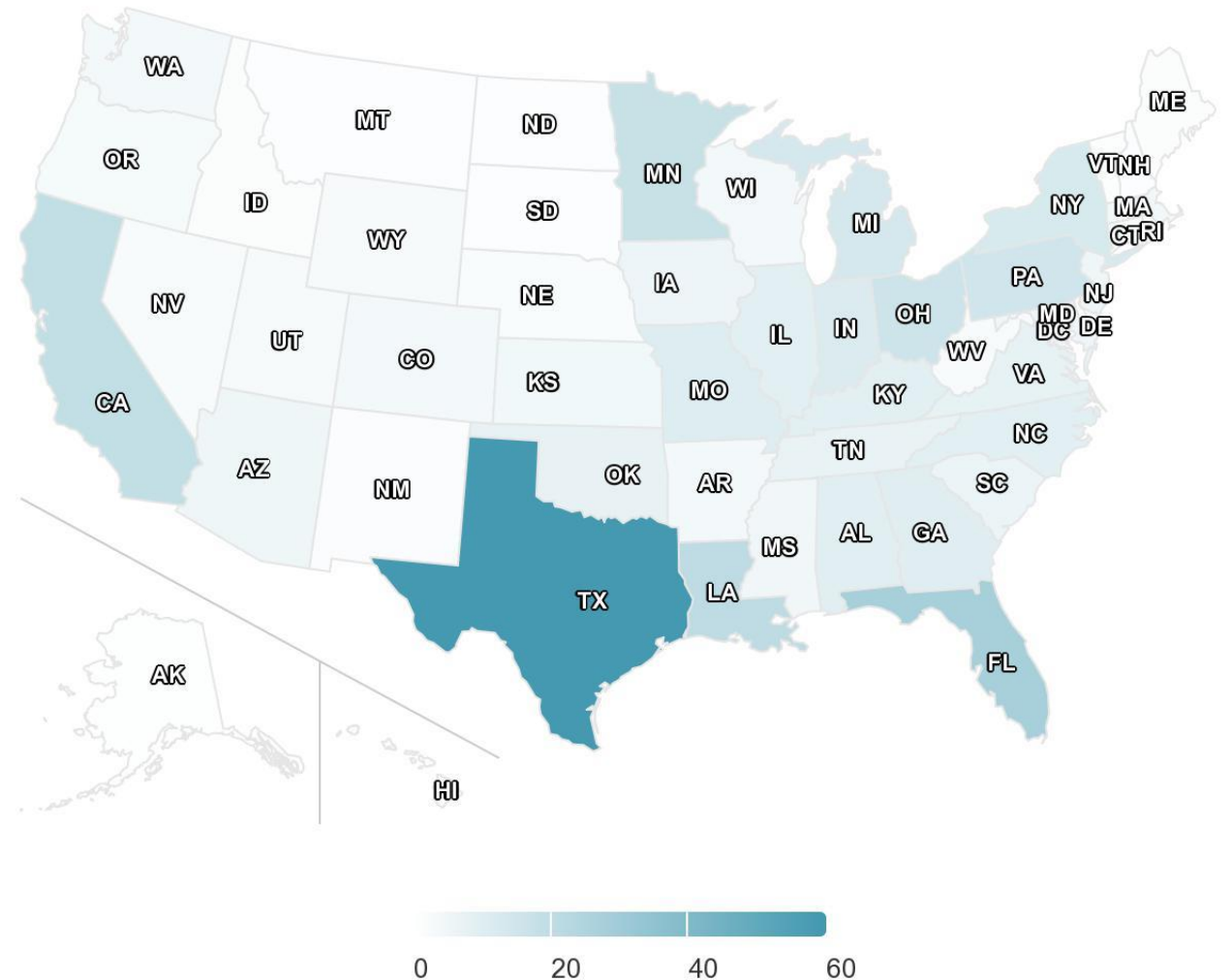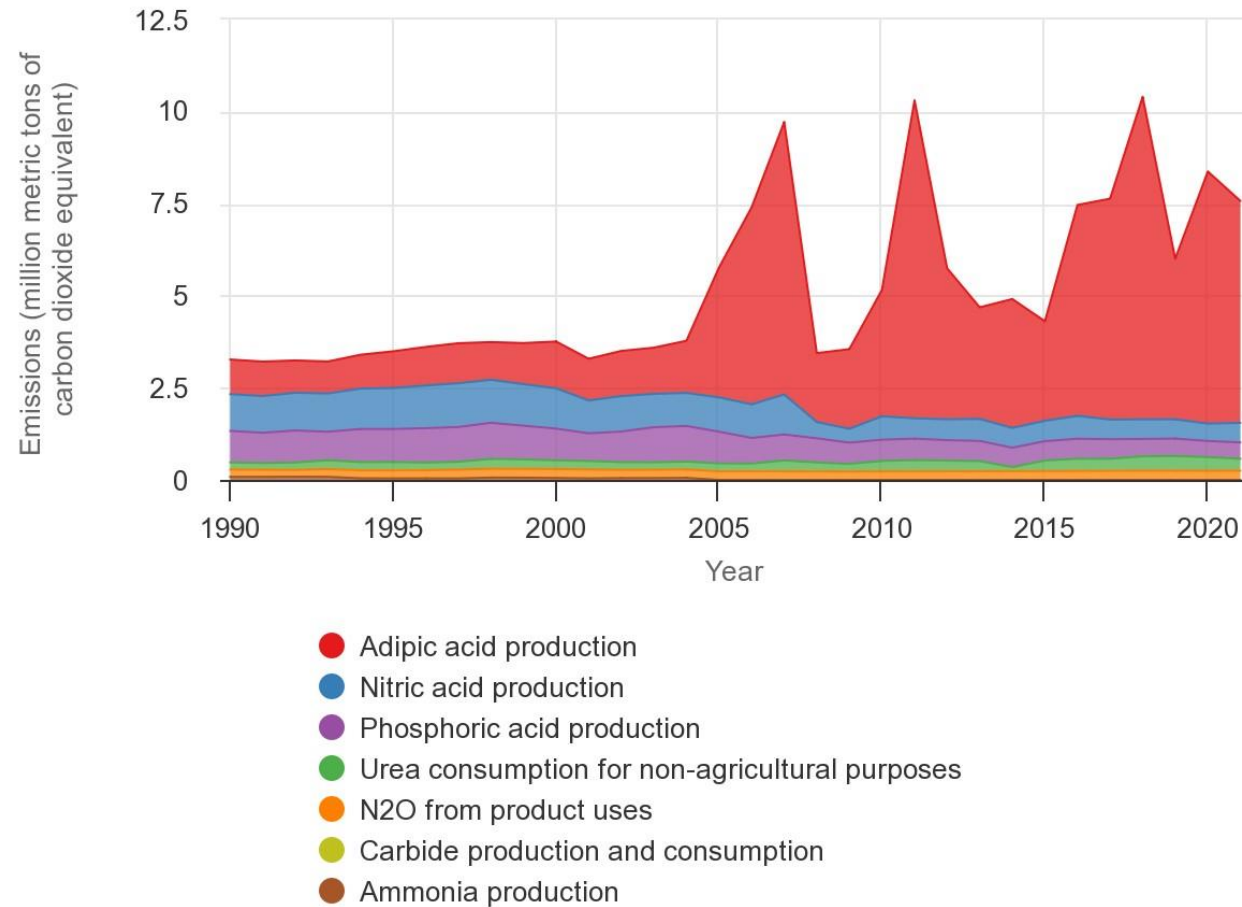
Methodology Example: Approach 1

- Adipic Acid Production (N_2O)
  - Adipic acid is produced in 4 facilities in 3 states: two in Florida, one in Texas, and one in Virginia.
  - The methodology for 2010–2021 used facility-level GHGRP process emissions.
  - The methodology for 1990–2009 used IPCC Tier 2 methods for two facilities and IPCC Tier 3 methods for two facilities.

Florida GHG Emissions from the Chemical Industry

Florida Greenhouse Gas Emissions from Chemical Industry, by Subcategory, 1990–2021
Excluding fluorinated gases

Legend:
- Adipic acid production
- Nitric acid production
- Phosphoric acid production
- Urea consumption for non-agricultural purposes
- N2O from product uses
- Carbide production and consumption
- Ammonia production

Source: U.S. EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks by State: 1990–2021.
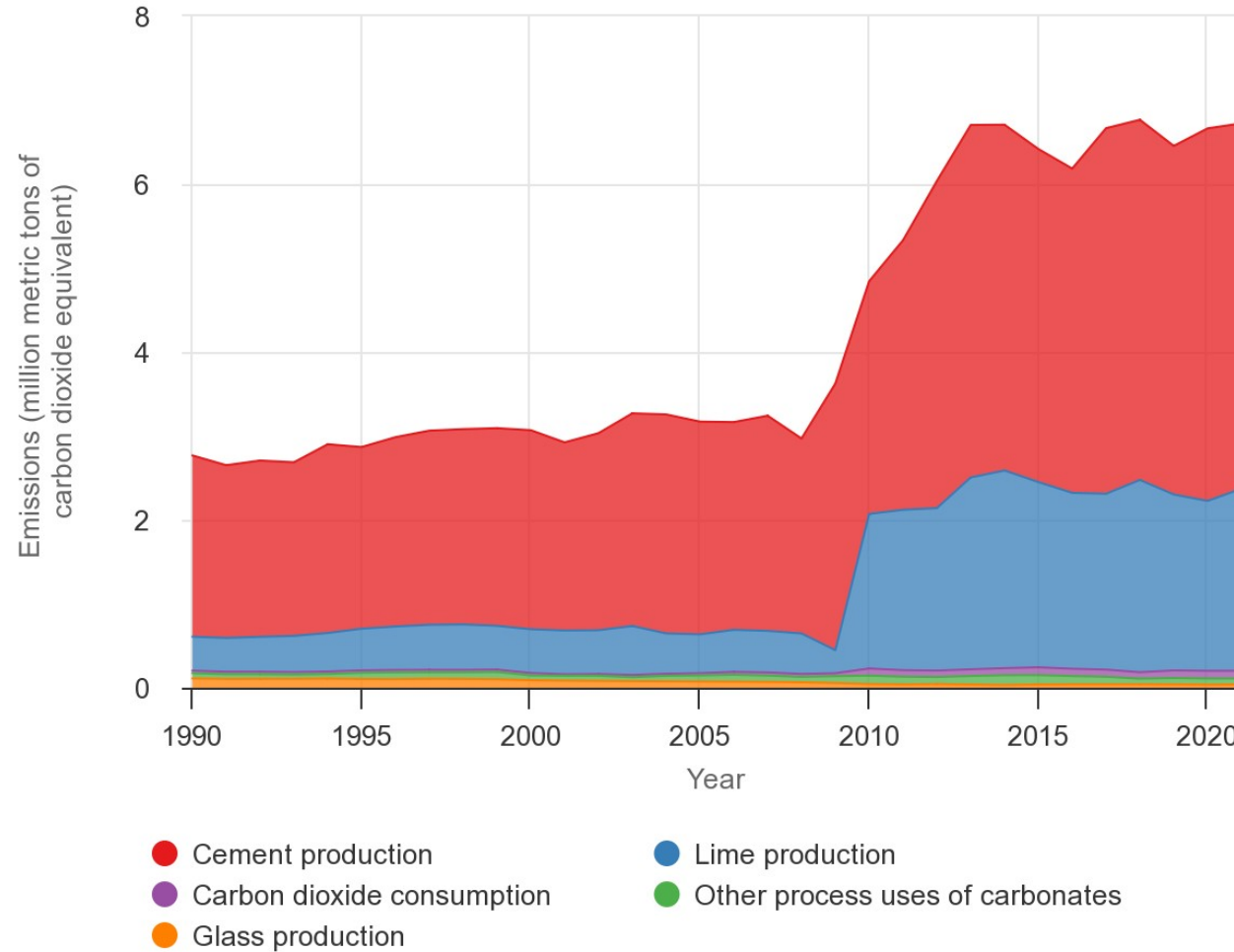https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals

Methodology Example: Approach 2

- Lime Production (CO_2)
  - Emissions are attributed to 23 of 28 states, as emissions are considered recovered for facilities in 5 states (sugar refining).
  - The methodology for 2010–2021 used facility-level GHGRP process emissions.
    - Data limitation:
      - Of the lime production facilities that report to GHGRP, most do not use CEMS, reporting process and energy related emissions separately.
      - Reported GHGRP data is adjusted for CEMS facilities (i.e., a ratio of process emissions to total emissions for non-CEMS facilities is used to disaggregate process and energy related emissions for CEMS facilities).
  - The methodology for 1990–2009 used IPCC Tier 2 methods.
    - Data limitation: activity data doesn't exist for each year for each state, so the number of facilities provided by the USGS was used as a proxy.

Missouri GHG Emissions from the Mineral Industry

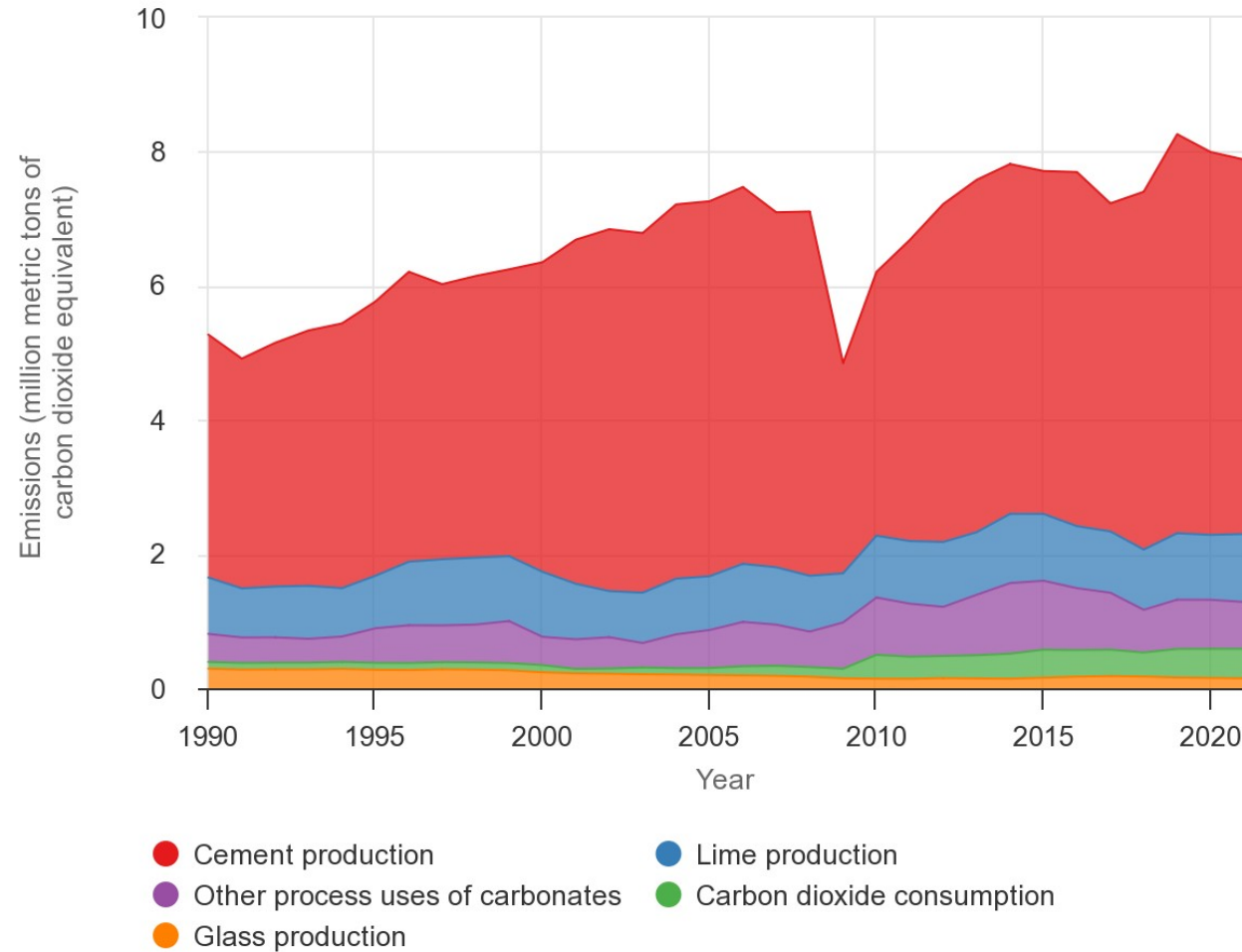Missouri Greenhouse Gas Emissions from Mineral Industry, by Subcategory, 1990–2021

Legend:
- Cement production
- Lime production
- Carbon dioxide consumption
- Other process uses of carbonates
- Glass production

Methodology Example: Hybrid Approach

- Cement Production (CO_2)
  - Cement is produced in 34 states and Puerto Rico.
  - The methodology for 2010–2021 used Approach 2. Clinker production data estimated using state-level emissions data from GHGRP.
    - Data limitation:
      - All facilities report to GHGRP, but most use CEMS and were reporting combined process and energy related emissions.
      - Reported GHGRP data was adjusted for CEMS facilities (i.e., a ratio of process emissions to total emissions for non-CEMS facilities was used to disaggregate process and energy related emissions for CEMS facilities).
  - The methodology for 1990–2009 used Approach 1 and IPCC Tier 2 methods.
    - Data limitation: state-level clinker production from USGS industry survey is available for only some states.
  - Planned improvements: EPA is reviewing additional disaggregation approaches for GHGRP combined process and combustion emissions data.

Texas GHG Emissions from the Mineral Industry

Texas Greenhouse Gas Emissions from Mineral Industry, by Subcategory, 1990–2021

Legend:
- Cement production
- Lime production
- Other process uses of carbonates
- Carbon dioxide consumption
- Glass production

Source: U.S. EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks by State: 1990–2021.
https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals

Future Work

- Planned Improvements

  - Time series consistency (1990–2009 and 2010–2021)

  - Data limitations for the different source categories (e.g., CEMS with combined process and combustion units)

- Additional Resources

	Greenhouse Gas Inventory Data Explorer https://cfpub.epa.gov/ghgdata/inventoryexplorer/
	Methodology Report: Inventory of U.S. Greenhouse Gas Emissions and Sinks by State: 1990-2021 https://www.epa.gov/ghgemissions/methodology-report-inventory-us-greenhouse-gas-emissions-and-sinks-state-1990-2021
	State Emissions and Removals web area https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks

Thank you

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