

Crosswalk between the *Inventory U.S. Greenhouse Gas Emissions and Sinks by U.S. State: 1990-2021* and the State Inventory Tool (SIT, June 2023 edition)

The EPA recognizes that a number of states rely on the State Inventory Tool (SIT) to prepare their state GHG inventory Estimates. The SIT includes default activity data and estimates that states can use as a starting point for compiling a state-level GHG inventory. For many sectors/sources, the default data included in SIT are from EPA's *newly disaggregated Inventory of U.S. Greenhouse Gas Emission and Sinks by State* (hereafter *GHG Inventory by U.S. State*). However, some differences exist between default data in SIT and the annual *GHG Inventory by U.S. State* estimates due to differences in methods, data, and level of completeness. For example, for the industrial processes and product use (IPPU) sector, SIT has limited state-specific default data and instead encourages users to enter data/estimates from EPA's GHGRP. In some cases, in SIT, state-level data has been unavailable (e.g., because it is confidential business data, or the use of national level modeling that currently does not provide state-level outputs) or lags in state data compared to availability of national level data. Note also that SIT's time series typically runs around 1 to 2 years behind the national inventory (e.g., SIT might cover 1990-2020, while the national U.S. Inventory covers 1990-2021). Therefore, the default approaches in SIT may not fully reflect the latest updates for some categories reflected in the *GHG Inventory by U.S. State* data (e.g., use of GHGRP data) and may not reflect all industrial categories reflected in the *GHG Inventory by U.S. State*. In addition, the SIT provides two alternate approaches to estimating emissions (calculating CO₂ from transportation based on vehicle miles traveled (VMT) and calculating emissions from electricity consumption), which are not based on national *Inventory* methods. Table 1 below provides a detailed crosswalk and summary of key differences where methods/data, and or completeness differ by IPCC sector/category.

The versions of SIT published in January and June of 2023 implemented several updates that brought it in closer alignment with the *GHG Inventory by U.S. State* data, including adding new default activity data for carbon flux from Wetlands Converted to Forest Land and Forests Converted to Wetlands under Forest Carbon Flux. Carbon flux from aboveground biomass, belowground biomass, deadwood, and litter were also included under Agricultural Soil Carbon Flux for the first time, aligning this category with the sum of the Land Converted to Cropland, Cropland Remaining Cropland, Land Converted to Grassland, and Grassland Remaining Grassland categories in the U.S. Inventory. Carbon coefficients for natural gas and distillate fuel oil in the CO₂FFC were also updated to be annually variable. Default Global Warming Potentials (GWPs) were also updated to AR5, which aligns with EPA's update to use of AR5 with the publication of the national Inventory covering 1990-2021. Finally, the CO₂FFC module includes adjusted consumption of fuels to exclude those used for industrial processes.

EPA is currently evaluating how to use the additional state level data and/or methodological approaches available through the national *Inventory* disaggregation in the *GHG Inventory by U.S. State* to supplement or improve the embedded calculations and defaults in SIT. SIT users will retain the ability to customize the tool with their own data in lieu of using defaults. EPA will continue to coordinate with states agencies and organizations currently using SIT on how to prioritize and implement updates to SIT. The SIT is

released annually with updates, and the next update aligning the tool’s default information with the latest state-by-state GHG data is planned for December 2023/January 2024.

Table 1. Crosswalk Between the GHG Inventory by State and State Inventory Tool Methods and Data by IPCC Sector/Category

IPCC Sector/Source and/or Sink category	Gas(es)	Included in SIT (Y/N/P)	Uses same data/method (Y/N)	Key Differences	Plans to align SIT with <i>GHG Inventory by U.S. State</i> data
Energy					
Fossil Fuel Combustion <i>Transportation</i> <i>Electric Power</i> <i>Industrial</i> <i>Residential</i> <i>Commercial</i> U.S. Territories	CO ₂	Y	Mostly Y with some differences in adjustments	The main differences between the SIT and <i>GHG Inventory by U.S. State</i> totals are: SIT includes non-energy uses of fossil fuels with fossil fuel combustion. SIT includes an optional module to estimate emissions associated with electricity consumption. SIT provides an alternate approach to estimating CO ₂ emissions from transportation based on vehicle miles traveled (VMT).	* (Exploring ways to further align the US Inventory and SIT)
Non-Energy Use of Fossil Fuels	CO ₂	Y	Y	Included with Fossil Fuel Consumption in SIT.	NA
Stationary Combustion (excluding CO ₂)	CH ₄ , N ₂ O	Y	Y	SIT uses IPCC default emission factors for electric power sector and <i>GHG Inventory by U.S. State</i> uses factors by fuel and combustion type. SIT does not adjust for construction and agriculture fuel use consumption in the industrial sector.	*(SIT will switch to emissions factors by fuel and combustion type and will consider adding an adjustment for construction and agricultural fuel use.)
Mobile Combustion (excluding CO ₂)	CH ₄ , N ₂ O	Y	Y	SIT activity data includes jet fuel bunkers.	*(EPA will update bunker fuel data to match the Fossil Fuel Combustion CO ₂ module.)

IPCC Sector/Source and/or Sink category	Gas(es)	Included in SIT (Y/N/P)	Uses same data/method (Y/N)	Key Differences	Plans to align SIT with GHG Inventory by U.S. State data
Coal Mining	CH ₄ , CO ₂	P	Y	SIT uses an apportionment approach for underground mine methane emissions for 1991 and 1992 as data were previously unavailable. Default data is not available in SIT for fugitive CO ₂ emissions from coal mining.	*, Δ
Abandoned Underground Coal Mines	CH ₄	Y	Y	SIT uses the same general method as the <i>GHG Inventory by U.S. State</i> but calculates emissions on an individual mine-by-mine basis. The AMM model used for the national Inventory and the <i>GHG Inventory by U.S. State</i> uses @Risk Monte Carlo simulation software and estimates emissions by basin, state (for reporting years 2020 and onward), and abandoned mine status type, resulting in slightly different estimates.	NA
Petroleum Systems	CO ₂ , CH ₄ , N ₂ O	P	N	Default data is not available in SIT for all states for all sources. Different approach for vented and flared gas. Different years of data.	*
Natural Gas Systems	CO ₂ , CH ₄ , N ₂ O	P	N	Not all <i>GHG Inventory by U.S. State</i> sources included in SIT (e.g., meters in distribution segment). SIT includes gathering and gas processing under transmission. In <i>GHG Inventory by U.S. State</i> they are included under production and processing. Different approach for vented and flared gas. Different years of data.	*, Δ
Abandoned Oil and Gas Wells	CO ₂ , CH ₄	N	N	This source category is not included in SIT.	Δ
Incineration of Waste	CO ₂ , CH ₄ , N ₂ O	Y	Y	Included in SIT Waste module.	NA
Wood Biomass and Biofuels Consumption (memo item)		N	N	NA	NA
International Bunker Fuels (memo item)		P	Y	SIT bunker fuel calculations are completed in the CO ₂ FFC module.	NA
Industrial Processes and Product Use					
Cement Production	CO ₂	Y	Y for 1990-2009 N for 2010-2019	<i>GHG Inventory by U.S. State</i> uses GHGRP emissions data adjusted for CEMS for 2010-2020.	*

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Lime Production	CO ₂	P	N	Default data is not available in SIT for all states for all years. <i>GHG Inventory by U.S. State</i> uses the following approaches for state-level estimates - 2010-2020: GHGRP emissions adjusted for CEMS (to exclude combustion emissions) - 1990-2009: facility count to disaggregate national emissions.	*
Glass Production	CO ₂	N	N	This source category is not included in SIT. Some emissions could be partially reflected in SIT in estimating emissions for soda ash consumption.	Δ
Other Process Uses of Carbonates	CO ₂	P	N	SIT includes under Limestone and Dolomite Use. SIT includes soda ash consumption emissions with production, instead of in Other Process Uses of Carbonates which <i>GHG Inventory by U.S. State</i> does.	*(EPA is evaluating moving and/or relabeling these categories within SIT to be consistent with the <i>GHG Inventory by State</i> .)
Ammonia Production	CO ₂	Y	Y, similar for 1990-2009 N, differ for 2010-2019	For 1990-2009, <i>GHG Inventory by U.S. State</i> and SIT use the same USGS capacity data. SIT allocates state production by multiplying state % by national production and assumes all feedstock is natural gas, whereas the <i>GHG Inventory by U.S. State</i> multiplies state % by the national GHGI emissions, which accounts for differences in emissions from production using natural gas and petroleum coke. <i>GHG Inventory by U.S. State</i> doesn't account for petroleum coke more granularly yet (1 facility in KS). The <i>GHG Inventory by U.S. State</i> uses GHGRP emissions data for 2010-2020.	*
Urea Consumption for Non-Agricultural Purposes	CO ₂	Y	N	The <i>GHG Inventory by U.S. State</i> allocates emissions based on populations data and SIT assumes the same percentage as agricultural urea use.	*
Nitric Acid Production	N ₂ O	P	N	Default data is not available in SIT for relevant states for all years	*
Adipic Acid Production	N ₂ O	P	N	Default data is not available in SIT for relevant states for all years	*
Caprolactam, Glyoxal, and Glyoxylic Production	N ₂ O	N	N	This source category is not included in SIT. Note, <i>GHG Inventory by U.S. State</i> only includes emissions from caprolactam. When glyoxal and glyoxylic acid are included in the national <i>Inventory</i> , they will be added also to the <i>GHG Inventory by U.S. State</i> .	Δ

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Carbide Production and Consumption	CO ₂ , CH ₄	N	N	This source category is not included in SIT.	Δ
Titanium Dioxide Production	CO ₂	N	N	This source category is not included in SIT.	Δ
Soda Ash Production	CO ₂	Y	Y except for emissions from soda ash consumption	Emissions from production are calculated using the same data and method. SIT includes soda ash consumption emissions with production, instead of in Other Process Uses of Carbonates as allocated in the <i>GHG Inventory by U.S. State</i> .	*
Petrochemical Production	CO ₂ , CH ₄	N	N	This source category is not included in SIT.	Δ
HCFC-22 Production	HFC-23	P		Default production data is not available in SIT.	*
Carbon Dioxide Consumption	CO ₂	N	N	This source category is not included in SIT.	Δ
Phosphoric Acid Production	CO ₂	N	N	This source category is not included in SIT.	Δ
Iron and Steel Production & Metallurgical Coke Production	CO ₂ , CH ₄	P	N	SIT includes data on total steel production from AISI for 1997-2010 (and proxies 2010 data through current year). Data is available for some states directly and some as groups of states. SIT averages production by type and across groups of states evenly. <i>GHG Inventory by U.S. State</i> uses similar AISI data for 1990-2010 but allocates across groups of states based on Census data. For 2010-2020, <i>GHG Inventory by U.S. State</i> uses GHGRP data to allocate including more detail on process types e.g., BOF/EAF split.	*
Ferroalloy Production	CO ₂ , CH ₄	N	N	This source category is not included in SIT.	Δ
Aluminum Production	CO ₂ , CF ₄ , C ₂ F ₆	P	N	Default data is not available in SIT for relevant States for all years. <i>GHG Inventory by U.S. State</i> uses GHGRP data, and historical Voluntary aluminum Industry Partnership and production capacity to allocate to the states. The SIT tool is based on national averages of emission factors and technology type. The SIT tool does give the user the ability to import GHGRP data for 2010+; state emissions should be the same for 2010+ if this feature is used.	*

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Magnesium Production and Processing	CO ₂ , HFCs, SF ₆	P	N	Default data is not available in SIT for all states for all years. The SIT tool is based on national averages of emission factors, magnesium production and technology type. <i>GHG Inventory by U.S. State</i> uses GHGRP data, and historical data from the SF6 Emission Reduction Partnership for the Magnesium Industry and are based on reported gas consumption. <i>GHG Inventory by U.S. State</i> also include process types that are not included in the SIT, including wrought, anode and permanent.	*(production data) Δ (process types)
Lead Production	CO ₂	N	N	This source category is not included in SIT.	Δ
Zinc Production	CO ₂	N	N	This source category is not included in SIT.	Δ
Electronics Industry	N ₂ O, HFCs, PFCs, SF ₆ , NF ₃	Y	N	<i>GHG Inventory by U.S. State</i> uses GHGRP data, historical PFC reduction partnership data, and production capacity data to develop national estimates and disaggregate to the state. The SIT tool uses the values of state and national semiconductor shipments.	*
Substitution of Ozone Depleting Substances	HFCs, PFCs	Y	Y	NA	NA
Electrical Transmission and Distribution	SF ₆	Y	N	The <i>GHG Inventory by U.S. State</i> uses transmission miles and GHGRP data to allocate to the states. The SIT tool uses state and national electricity sales.	*
N ₂ O from Product Uses	N ₂ O	N	N	This source category is not included in SIT.	Δ
Agriculture					
Enteric Fermentation	CH ₄	Y	Y (SIT state-level emission factors are based on national Inventory outputs)	NA	NA
Manure Management	CH ₄ , N ₂ O	Y	Y (SIT simplifies waste management system categories into dry versus liquid)	NA	NA

IPCC Sector/Source and/or Sink category	Gas(es)	Included in SIT (Y/N/P)	Uses same data/method (Y/N)	Key Differences	Plans to align SIT with GHG Inventory by U.S. State data
Rice Cultivation	CH ₄	Y	N	For the <i>GHG Inventory by U.S. State</i> , EPA is implementing a combination of IPCC Tier 1 and Tier 3 approaches, utilizing the Daycent process model to run Tier 3 components. Rice cultivation emissions are estimated for the 13 states who cultivate rice. The SIT tool simplifies the calculation between ratoon and primary area of rice, multiplied by a seasonal emission factor. The SIT tool estimates rice emissions for 7 states.	*
Liming	CO ₂	Y	Y	SIT uses different proxying methodologies to estimate default data for all years.	*
Urea Fertilization	CO ₂	Y	Y	NA	NA
Field Burning of Agricultural Residues	CH ₄ , N ₂ O	Y	Y	Default data is not available in SIT for all crops for all years.	*
Agricultural Soil Management	N ₂ O	P	N	Default data is not available in SIT for all crops for all years. For the <i>GHG Inventory by U.S. State</i> , EPA is implementing a combination of IPCC Tier 1 and Tier 3 approaches, utilizing Daycent process model to run Tier 3 components. SIT uses a version of the Tier 1 method for both Direct and Indirect N ₂ O emissions estimation.	*
Land Use, Land-Use Change, and Forestry					
Forest Land Remaining Forest Land (subcategories italicized below)	CO ₂ , CH ₄ , N ₂ O	Y	Y	See below	NA
<i>Changes in Forest Carbon Stocks</i>	CO ₂	Y	Y	SIT Tool provides estimation for “Wood Products and Landfills”. The <i>GHG Inventory by U.S. State</i> does not currently include data for harvested wood products at the state-level.	NA
<i>Non-CO₂ Emissions from Forest Fires</i>	CH ₄ , N ₂ O	Y	P	For the <i>GHG Inventory by U.S. State</i> , non-CO ₂ emissions from forest fires includes emissions from both forest land remaining forest land and land converted to forest land because it is not possible to report them separately at this time. Default activity data (acres burned) is not available in SIT, states must enter this data to calculate emissions.	*

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<i>N₂O Emissions from Forest Soils</i>	N ₂ O	N	N	These source and sink categories are not included in SIT. For the <i>GHG Inventory by U.S. State</i> , N ₂ O emissions from forest soils includes emissions from both forest land remaining forest land and land converted to forest land because it is not possible to report them separately at this time.	NA
<i>Non-CO₂ Emissions from Drained Organic Soils</i>	CH ₄ , N ₂ O	N	N	These source and sink categories are not included in SIT. For the <i>GHG Inventory by U.S. State</i> , non-CO ₂ emissions from drained organic soils includes emissions from both forest land remaining forest land and land converted to forest land because it is not possible to report them separately at this time.	NA
Land Converted to Forest Land (subcategories italicized below)	CO ₂	Y	Y	NA	NA
<i>Changes in Forest Carbon Stocks</i>	CO ₂	Y	Y	NA	NA
Cropland Remaining Cropland	CO ₂	Y	N	SIT aggregates changes in aboveground biomass, belowground biomass, deadwood, litter, soil mineral and soil organic carbon stocks from Cropland Remaining Cropland, Land Converted to Cropland, Grassland Remaining Grassland, and Land Remaining Grassland under the “Ag Soil C Flux” category in SIT. SIT sources default data for agricultural soil carbon flux from the U.S. Inventory and apportions agricultural soil carbon flux to each state based on the last year of available (2015) state-level data from the national GHGI. For the <i>GHG Inventory by U.S. State</i> , EPA apportioned states based on the last three (3) years of available state data in line with the annual data currently available in the USDA National Resources Inventory (NRI).	NA
<i>Changes in Mineral and Organic Soil Carbon Stocks</i>	CO ₂	Y	N		NA
Land Converted to Cropland (subcategories italicized below)	CO ₂	Y	N		NA
<i>Changes in all Ecosystem Carbon Stocks</i>	CO ₂	Y	N		NA
Grassland Remaining Grassland (subcategories italicized below)	CO ₂ , CH ₄ , N ₂ O,	Y	N		NA
<i>Changes in Mineral and Organic Soil Carbon Stocks</i>	CO ₂	Y	N		NA
<i>Non-CO₂ Emissions from Grassland Fires</i>	CH ₄ , N ₂ O	N	N		Δ
Land Converted to Grassland (subcategories italicized below)	CO ₂	Y	N		NA

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<i>Changes in All Ecosystem Carbon Stocks</i>	CO ₂	Y	N		NA
Wetlands Remaining Wetlands (subcategories italicized below)	CO ₂ , CH ₄ , N ₂ O	N	N	These source and sink categories are not included in SIT.	Δ
<i>Changes in Organic Soil Carbon Stocks in Peatlands</i>	CO ₂	N	N		
<i>Changes in Biomass, DOM, and Soil Carbon Stocks in Coastal Wetlands</i>	CO ₂	N	N		
<i>CH₄ Emissions from Coastal Wetlands Remaining Coastal Wetlands</i>	CH ₄	N	N		
<i>N₂O Emissions from Coastal Wetlands Remaining Coastal Wetlands</i>	N ₂ O	N	N		
<i>Non-CO₂ Emissions from Peatlands Remaining Peatlands</i>	CH ₄ , N ₂ O	N	N		
<i>Flooded Land remaining Flooded Land</i>	CH ₄	N	N		
Land Converted to Wetlands (subcategories italicized below)	CO ₂ , CH ₄	N	N		
<i>Changes in Biomass, DOM, and Soil Carbon Stocks</i>	CO ₂	N	N		
<i>CH₄ Emissions from Land Converted to Coastal Wetlands</i>	CH ₄	N	N		
<i>Lands converted to Flooded Lands</i>	CH ₄ , CO ₂	N	N		

IPCC Sector/Source and/or Sink category	Gas(es)	Included in SIT (Y/N/P)	Uses same data/method (Y/N)	Key Differences	Plans to align SIT with GHG Inventory by U.S. State data
Settlements Remaining Settlements (subcategories italicized below)	CO ₂ , N ₂ O	P	See below	See below.	See below
<i>Changes in Organic Soil Carbon Stocks</i>	CO ₂	N	N	These source and sink categories are not included in SIT.	Δ
<i>Changes in Settlement Tree Carbon Stocks (i.e., urban trees)</i>	CO ₂	Y	Y	NA	NA
<i>Changes in Yard Trimming and Food Scrap Carbon Stocks in Landfills (LFYTFS)</i>	CO ₂	Y	Y	NA	NA
<i>N₂O Emissions from Settlement Soils</i>	N ₂ O	Y	N	For N ₂ O emissions from Settlement Soils, SIT calculation is based on the Total Synthetic Fertilizer Applied to Settlements. The <i>GHG Inventory by U.S. State</i> is based on the amount of N in synthetic commercial fertilizers applied to settlement soils, the amount of N in biosolids applied to non-agricultural land and surface disposal, and the area of drained organic soils within settlements. EPA apportioned states based on the last three (3) years of available state data in line with the annual data currently available in the USDA National Resources Inventory (NRI).	*
Land Converted to Settlements (subcategories italicized below)	CO ₂	N	N	These source and sink categories are not included in SIT.	Δ
<i>Changes in all Ecosystem Carbon Stocks</i>	CO ₂	N	N		
Waste					

IPCC Sector/Source and/or Sink category	Gas(es)	Included in SIT (Y/N/P)	Uses same data/method (Y/N)	Key Differences	Plans to align SIT with GHG Inventory by U.S. State data
Landfills (municipal and industrial)	CH ₄ ,	P	N	<p>Municipal: SIT default data are based on national landfilling rates and state population. <i>GHG Inventory by U.S. State</i> uses GHGRP data that is scaled up to account for non-reporting landfills. To calculate methane emissions from landfills, SIT relies on a first order decay (FOD) model to estimate emissions. In the FOD model, the CH₄ emission rate is a function of the quantity of waste deposited in landfills (in short tons) over the previous 30 years. The national <i>Inventory</i> uses both the FOD method, as well as a back-calculation method that is based on directly measured amounts of recovered CH₄ from landfills and reported to GHGRP, which contributes to slight differences in emissions estimates between the <i>GHG Inventory by State</i> and SIT</p> <p>Industrial: SIT uses a percent of MSW emissions to estimate industrial landfill emissions (default is 7%). <i>GHG Inventory by U.S. State</i> uses production volumes of pulp & paper, fruit & vegetables, and meat which is multiplied by a country and sector specific disposal factor and then used to calculate CH₄ emissions.</p>	*
Wastewater Treatment (domestic and industrial)	CH ₄ , N ₂ O	P	Y	<p>Note: The national <i>Inventory</i> wastewater emissions are estimated using 2019 Refinement to the 2006 IPCC Guidelines which includes refined methods and emission factors, but also now includes not only CH₄ but also N₂O emissions from Industrial wastewater treatment.</p> <p>Domestic: <i>GHG Inventory by U.S. State</i> downscales national <i>Inventory</i> estimates by state-level population or share of U.S. population.</p> <p>Industrial: SIT default data is not available for all industrial sources. The <i>GHG Inventory by U.S. State</i> allocates national emissions for each industry based on state share of national production. The <i>GHG Inventory by U.S. State</i> includes additional industries, i.e., both CH₄ and N₂O emissions from treatment of industrial wastewater from petroleum refining and breweries and CH₄ emissions were also estimated for treating industrial wastewater from starch-based ethanol production.</p>	*
Composting	CH ₄ , N ₂ O	N	NA	This source category is not included in SIT.	Δ
Aerobic Digestion at Biogas Facilities	CH ₄	N	NA	This source category is not included in SIT.	Δ

Key for Table Notations

P (Partial): Indicates a source is partially included in SIT, i.e., some but not all emissions within that source can be estimated by the tool and/or default activity data is missing or incomplete.

*: EPA is exploring potential to use *GHG Inventory by U.S. State* estimates to improve default data. States using the tool can opt to use *GHG Inventory by U.S. State* data or estimate using updated state-specific data if available.

Δ: EPA is evaluating adding this source to SIT. In the interim, we recommend states manually add totals from the *GHG Inventory by U.S. State* to SIT as “other.”

For more information, please visit the following:

- Inventory of U.S. Greenhouse Gas Emissions and Sinks by State: 1990-2021
<https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals>
- State Inventory Tool (SIT)
<https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool>