

Town of Middlefield, NY Community Greenhouse Gas Inventory

Prepared by Mohawk Valley Economic Development District, Inc.

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Introduction

The purpose of collecting greenhouse gas (GHG) emissions data for Town of Middlefield is to assist in identifying key sources of emissions to provide guidelines and strategies that may help in reducing them.

This inventory presents the existing available information that is specific to the Town of Middlefield and is largely based on the Mohawk Valley GHG Inventory by Cleaner Greener Communities. As part of developing regional sustainability plans, NYSERDA funded a series of contractors to prepare regional greenhouse gas (GHG) inventories for each of New York State's ten economic development regions. (1. [Regional Greenhouse Gas Inventories in NYS](#)) (2. [Mohawk Valley Greenhouse Gas Inventory Report](#))

In addition to the Cleaner, Greener Mohawk Valley Greenhouse Gas Inventory, the Otsego County Planning Department worked with MVEDD to provide GHG estimates and other relevant demographic information for various sectors of emissions within Town of Middlefield. Together, these resources help provide the base data for this Town of Middlefield Community Greenhouse Gas Inventory.

Town of Middlefield adopted the ten-element Climate Smart Communities Pledge as a commitment to greenhouse gas (GHG) emission reduction and climate change adaptation in April 2021, and it is working towards becoming a Bronze Certified Climate Smart Community.

The Climate Smart Communities Program represents a partnership between New York State and local governments to reduce energy use and GHG emissions while working to adapt to a changing climate. The required ten elements of the Climate Smart Communities Pledge are:

1. Build a climate-smart community.
2. Inventory emissions, set goals, and plan for climate action.
3. Decrease energy use.
4. Shift to clean, renewable energy.
5. Use climate-smart materials management.
6. Implement climate-smart land use.
7. Enhance community resilience to climate change.
8. Support a green innovation economy.
9. Inform and inspire the public.
10. Engage in an evolving process of climate action.

As part of the county's efforts to become a Certified Climate Smart Community, and part of a project funded by the DEC CSC grant program, the county decided to compile a community and municipal GHG inventory as well as five other communities within the county. A GHG emissions inventory is an audit of activities that contribute to the release of emissions and acts as a baseline for a Climate Action Plan.

Regional Overview

The Town of Middlefield is in the northeastern area of Otsego County, in the southern section of the Mohawk Valley Region in NYS. Town of Middlefield is 63.3 square miles of land area. Total population according to the 2020 census is 1,882. Located along the eastern side of Otsego Lake, much of the town is rural and agricultural in nature.

Key Findings

Town of Middlefield's communitywide emissions totaled 37,038.44 CO₂e. The largest emitting sector is transportation, which accounts for 12,107.4 MT CO₂e, 33% of the total community emissions (Table 1). The second greatest contributor to Town of Middlefield's communitywide emissions is residential, which accounts for 10,426.5 MT CO₂e, 28% of the overall emissions in 2010 (Figure 1). When combined, transportation and the built environment are over 61% of Town of Middlefield's communitywide emissions.

**TABLE 1: Community GHG Inventory (2010)
Town of Middlefield**

GHG EMISSION SECTORS	MTCO ₂ e*
Residential	9,502.5
Commercial	4,725.4
Industrial	4,467.0
Transportation	11,034.4
Waste	364.1
Industrial Processes	458.3
Agriculture	2,146.9
Energy Supply	1,057.0
Total Emissions	33,756.1
Population	1,882
Per Capita Emissions	17.9

*Metric Tons of Carbon Dioxide Equivalent

**FIGURE 1: Community GHG Emissions by Sector (2010)
Town of Middlefield**

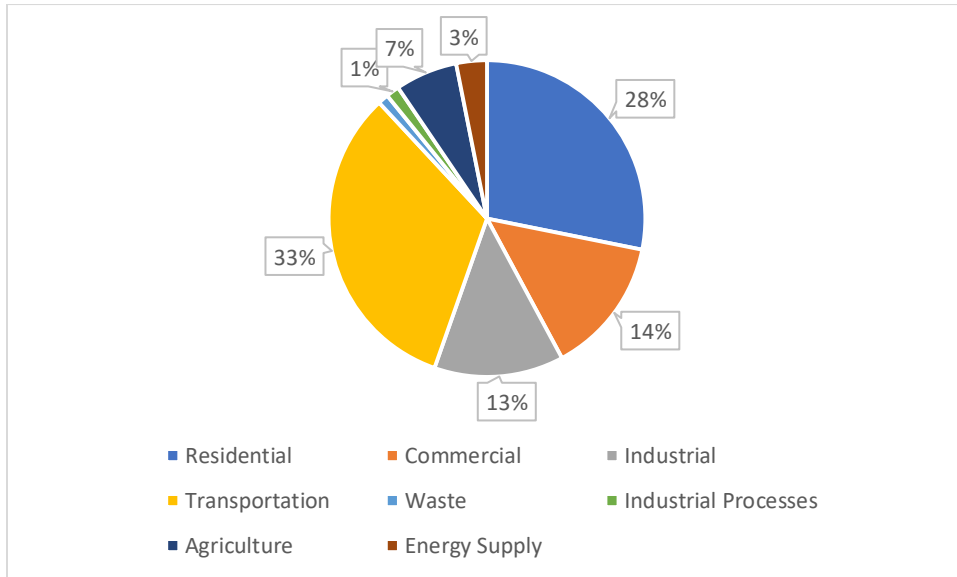


Table 2 is a summary of Mohawk Valley Region Total Emissions by County and Sector (MT CO₂e) which was provided by the Cleaner, Greener Mohawk Valley Greenhouse Gas Inventory, 2012, using 2010 data. The county-level trends are shown in Figure 2. below with comparison to the Mohawk Valley Region. The Gross Emissions per Capita for Town of Middlefield are consistent with those of the Mohawk Valley Region.

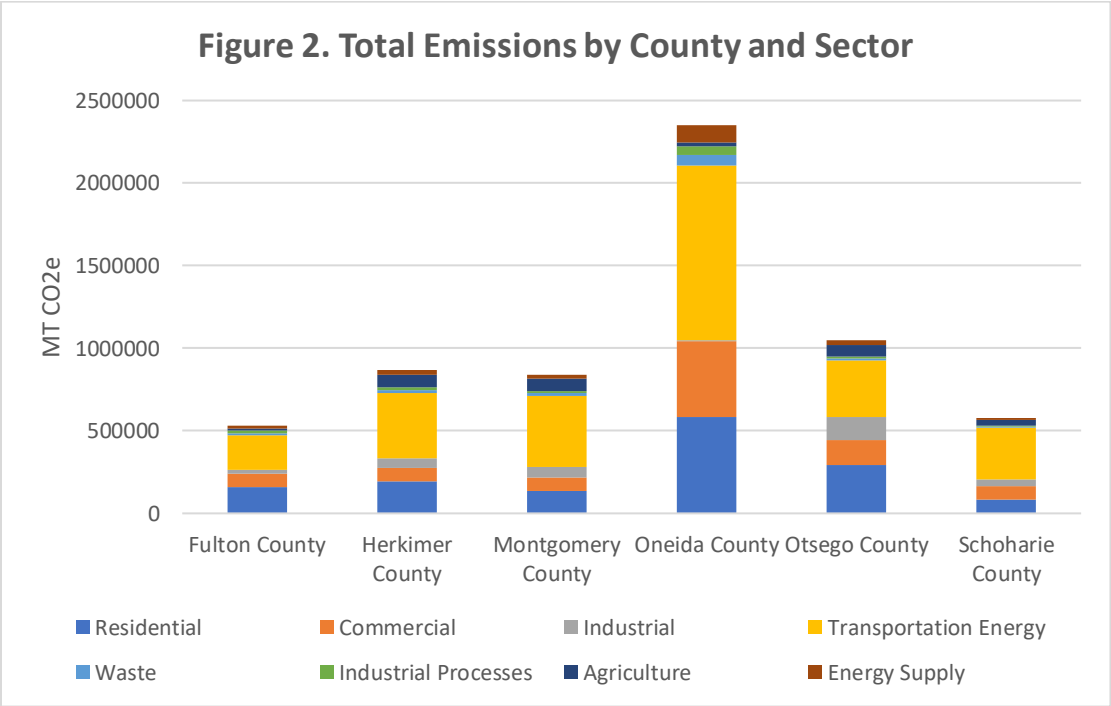
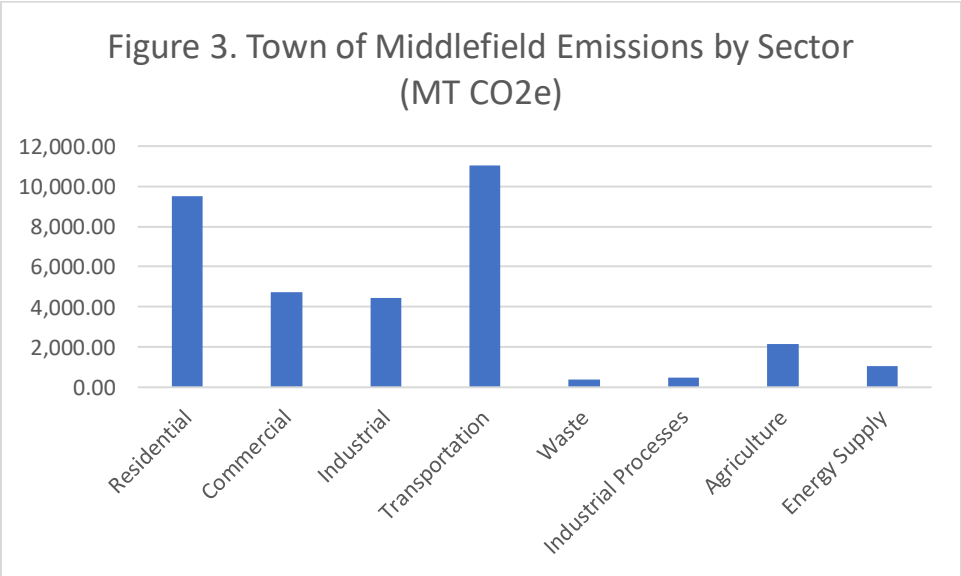


Figure 3, shows that in Town of Middlefield, leading emissions are Transportation and Residential Energy.



Definitions for Sources of Emissions:

Sources: The activities selected for the regional inventory are based on those defined by the U.S. Environmental Protection Agency (EPA) and the Intergovernmental Panel on Climate Change (IPCC). These categories are:

- **Agriculture:** Non-energy emissions from crops & livestock (e.g., methane & nitrous oxide emissions from fertilizers).
- **Industrial Processes:** Non-energy process emissions from industrial activity & fugitive emissions from fuel systems (e.g., CO₂ from cement production, A/C coolants, & leakages).
- **Waste Management:** Non-energy process emissions from landfills & wastewater treatment plants or septic systems. (e.g., methane emissions from anaerobic decay).
- **Energy Supply:** these emissions include electricity transmission and distribution (T&D) losses, natural gas T&D losses, the use of sulfur hexafluoride (SF₆) in the utility industry, and natural gas production emissions.
- **Mobile Energy Consumption (Transportation):** Fuel consumption for on-road transportation, passenger & freight rail, aviation, marine transit & off-road vehicles.
- **Stationary Energy Consumption (Buildings):** Energy used in Residential, Commercial, Industrial buildings & other non-mobile uses (e.g., electricity, natural gas, fuel oils, wood & propane).
- **Electricity Consumption:** emissions are calculated using a combination of reported usage from utilities and, where utility data are unavailable, consumption estimates.

The U.S. Community Protocol recommends communities include all emissions that occur physically within the boundary and, to the extent possible, those that occur indirectly regardless of location because of community activity or consumption. Therefore, individual GHG sources are labeled as one of the following:

Scope 1: Direct emissions that occur physically within a boundary such as those emitted by burning natural gas or fuel oil in homes and businesses.

Scope 2: Indirect emissions at electricity power plants based on the amount of electricity consumed within the boundary, regardless of where the power plants are located.

Scope 3: Other indirect, upstream, or lifecycle emissions attributed to community activity regardless of where they occur.

Energy Use

In order to look closely at energy used, as opposed to GHGs emitted, all energy use was converted to one consistent unit: Million British Thermal Units (MMBTU). Total energy use for the Mohawk Valley region in 2010 was 91,353,804 MMBTU with Energy Consumption per Capita 183 MMBTU.

Table 3 Town of Middlefield Total Energy Use (2010)

Community	Population	Total Energy Use (MMBTU)	Percent of Mohawk Valley Total (Pop.)	Percent of Mohawk Valley Total (Energy)
Town of Middlefield	1,882	364,278.8	0.4%	0.4%
Otsego County	62,260	11,327,871	12.4%	12.4%
Mohawk Valley Total	500,155	91,353,804	100%	100%

Because of the prominent role of transportation and building energy, the region's primary energy sources consumed in 2010 were gasoline, natural gas and electricity, which accounted for the bulk of regional emissions, at 35 percent, 23 percent, and 12.7 percent, respectively. These fuel sources are the most important energy means for transport and buildings in the region.

Data and Methods for Stationary Fuel Combustion GHG Emissions by Fuel

Different methods are used to estimate consumption and emissions from natural gas (for all sectors), residential stationary fuels, commercial stationary fuels, and industrial stationary fuels.

Stationary energy consumption in this inventory includes:

- 1) Scope 1, direct emissions from the combustion of natural gas, coal, kerosene, distillate fuel oil, motor gasoline and other fuels in residential, commercial, and industrial buildings, and
- 2) Scope 2, indirect emissions from grid-supplied electricity consumption for these same sectors' buildings. To avoid double-counting, Scope 1 emissions from electricity generation (i.e., from grid-tied power plants in the region) are not included in the regional GHG emissions total, but are reported here for informational purposes only.

Table 4 Town of Middlefield Stationary Fuel Consumption GHG Emissions (MT CO2e)

	Scope	Residential	Commercial	Industrial	Total
Town of Middlefield	1	4,802.1	2,505.9	0	7,308.0
	2	4,700.4	2,219.5	4,467.0	11,386.9

Data and Methods for Emissions from Energy Supply Activities

To estimate losses due to electricity transmission and distribution (T&D), total electricity consumption (in MWh) is multiplied by a T&D loss factor to determine the quantity of electricity lost during T&D. This analysis used the Eastern regional loss factor from eGRID, 5.28%. The total electricity lost is then multiplied by the electricity emission factors to estimate emissions from electricity T&D.

Table 5 Town of Middlefield Emissions from Energy Supply Activities (2010)

	Electricity T&D Emissions	Natural gas T&D Emissions	Utility SF Emissions	Natural Gas Production Emissions	Total
Town of Middlefield	662.7	241.9	152.4	0	1,057

On-Road GHG Emissions

The following information was gathered through New York State’s Department of Transportation to understand the following:

1. Vehicle Mix. Data on the on-road vehicle mix for each functional class of road (e.g., rural interstate, urban freeways and expressways) were obtained for each NYSDOT region from NYSDOT’s Environmental Science Bureau dataset.
2. Distance. Data on vehicle miles traveled (VMT) were obtained from Tompkins County and NYSDOT modeled data for all other counties. County-level VMT data were available by functional class, whereas Otsego County VMT data were presented as totals.
3. Fuel Economy. National average fuel economy values by vehicle class are used, based on the Federal Highway Administration’s Highway Statistics 2010 series.

Table 6 Town of Middlefield on Road GHG Emissions (2010)

	Total CO2 Emissions	Total GHG Emissions
Town of Middlefield	9,547.5	9,581.0

Town of Middlefield also had emission contributions from rail activities, an additional 8,865 MTCO₂e. Marine travel in Town of Middlefield was not a significant contributor.

Solid Waste

Solid waste Scope 1 accounts for emissions from landfills located within Town of Middlefield. There are no active landfills or inactive landfills within the town. However, there are several inactive landfills in Otsego County including Otsego SLF, Maryland SLF, Cherry Valley SLF, Oneonta City Landfill, Hartwick SLF, Morris SLF, Garrattsville, Otego SLF, Otsego Landfill, Oneonta – Simonson Demolition Site, New

Lisbon SLF, Worcester SLF, and MOSA C&D. To calculate solid waste emissions within the town, county level figures were scaled down based on Middlefield’s population.

Data on emissions from landfills came from EPA’s Greenhouse Gas Reporting Program data for calendar year 2010. This dataset includes emission information from large facilities (defined as those that emit >25,000 MTCO₂e per year) in nine industry groups, including landfills. Methane emissions from the facilities’ landfill processes were reported as solid waste Scope 1 emissions.

Table 7 Town of Middlefield Solid Waste Emissions (2010)

Community	Total MTCO₂e
Town of Middlefield	309.8
Otsego County	9,635
Mohawk Valley Total	85,764

Wastewater

Wastewater emissions are calculated based on the population served by each wastewater treatment process.

Table 8 Town of Middlefield Wastewater Emissions (2010)

Community	Ch₄ Emissions	N₂O Emissions	Total Emissions
Town of Middlefield	40.7	13.6	54.3
Otsego County	1,268	423	1,690
Mohawk Valley Total	30,000	10,000	40,000

Industrial Processes

Industrial processes relate to activities such as manufacturing of products, including transportation equipment, computer and electronic products, electrical equipment, machinery, furniture, metal, and glass. Emissions were collected from EPA’s Greenhouse Gas Reporting Program data for 2010. Data was collected from facilities such as power plants, landfills, metals manufacturing, mineral production, petroleum refineries, pulp and paper manufacturing, chemicals manufacturing, and government and commercial facilities. The only industrial emissions in Otsego County were from product use (ODS Substitutes) from refrigerants.

Table 9 Town of Middlefield Industrial GHG Emissions (2010)

Community	ODS Substitution	Total
Town of Middlefield	458.3	458.3
Otsego County	14,254	14,254
Mohawk Valley Total	114,513	114,513

Agriculture

Agriculture is a critical component of Town of Middlefield’s economy. Farms are local businesses providing jobs and economic growth as they spend most of their money on local goods and services, which in turn support other local businesses. Farm expenses include feed, seeds, fertilizers, chemicals, livestock, farm equipment, trucking and transportation, fuel and utilities. Banks, hardware stores, food processors and other local establishments are supported by farmers. Farms in Town of Middlefield represent a diversity of agriculture from dairy, poultry, sheep, horses, and other livestock, to vegetables, flowers, grasses, and grains.

Table 1 Town of Middlefield Agricultural GHG Emissions by Source (2010)

Community	Enteric Fermentation	Manure Management	Agriculture Soils	Total
Town of Middlefield	1,683	324.4	138.7	2,146.9
Otsego County	52,359	10,090	4,315	66,764
Mohawk Valley Total	215,881	56,250	21,599	293,730

Land Use/Forestry Changes

Much of Middlefield’s landscape is rural and heavily forested, which makes it difficult to accurately estimate carbon sequestration. Due to the spatial variability of forest composition, age, and land-management practices, developing an accurate county-wide sequestration estimate would require detailed ecological modeling beyond the scope of this baseline inventory. For this reason, the land-use sequestration sector was excluded from this inventory.

Otsego County’s Natural Resources Inventory (NRI) Tool provides a more comprehensive assessment of forest cover and ecological characteristics, which may be helpful in creating future inventories.

Comparisons to Similar Communities

The Town of Richland, located in northern Central New York, completed a community GHG inventory in 2021. ICLEI’s ClearPath Tool was used in addition to 2019 data gathered by the Town to calculate and estimate community wide emissions.

The Town of Bethel, located in Mid-Hudson region, completed a community GHG inventory in 2023. The 2010 Mid-Hudson Regional GHG Inventory data was used to calculate and estimate the Town’s community wide emissions.

Community	Population	Total MTCO ₂ e	Per Capita Emissions
Town of Middlefield	1,882	33,756	17.9
Town of Bethel	3,959	51,850	13.0
Town of Richland	3,528	49,869	14.1

Conclusion

This inventory highlights the largest percentage of community emissions coming from the transportation sector. Transportation emissions should be targeted in Middlefield's future climate action planning efforts so energy use from this sector can be reduced, lowering both energy costs and GHG emissions.

Conducting a baseline emissions inventory is an important step in climate action planning, mitigation, and adaptation. This community inventory will provide a baseline for planning purposes with the goal of setting an emissions reduction target and developing a Climate Action Plan.