The Village of Wilson, NY

Community Greenhouse Gas Inventory

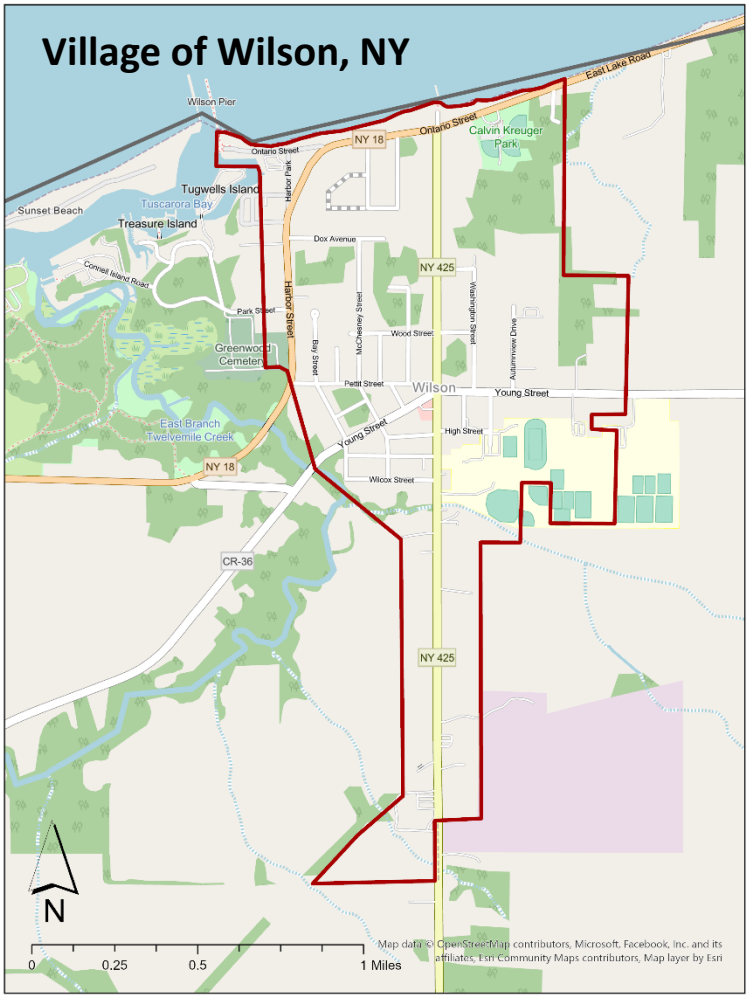
DECEMBER 2025

NEW YORK STATE | Climate Smart Communities

CONTENTS

1. INTRODUCTION

The Village of Wilson is a registered municipality in New York State's Climate Smart Communities (CSC) program, currently pursuing Bronze Certification. In 2025, the Village adopted the Climate Smart Communities pledge, committing to take action to minimize the causes and to prepare for the impacts of climate change to safeguard the health, safety and wellbeing of current and future generations of Village residents.



Why Is a Greenhouse Gas Inventory Important?

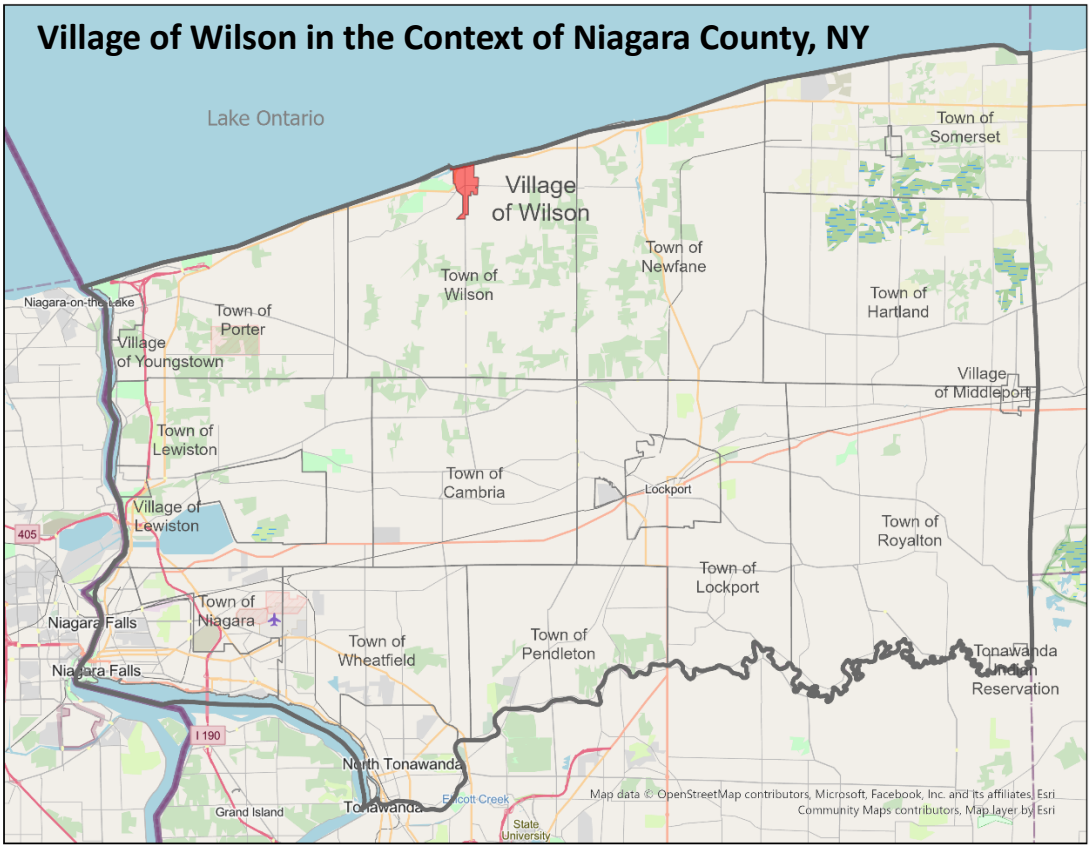
Greenhouse gas (GHG) emissions from human activities are widely acknowledged as the leading cause of climate change. *The Village of Wilson Community Greenhouse Gas Inventory* provides a breakdown of the GHG emissions generated by the Village of Wilson on an annual basis using the most recent available data at the time of the analysis, typically from 2022 and 2023 datasets. This report has been developed to contribute to the Village of Wilson's progress in the Climate Smart Communities program and to provide key data to inform and prioritize ongoing efforts reduce emissions, conserve energy, and protect the natural environment of the Village and the broader region.

The value of a community-wide GHG inventory grows as it is updated over time, allowing community leaders and residents to track emissions trends and assess how new projects and polices have impacted emission levels and energy consumption. This information can provide evidence to support continuing or scaling up efforts that have led to emissions reductions and other related benefits and changing course on those that have had few or negative effects.

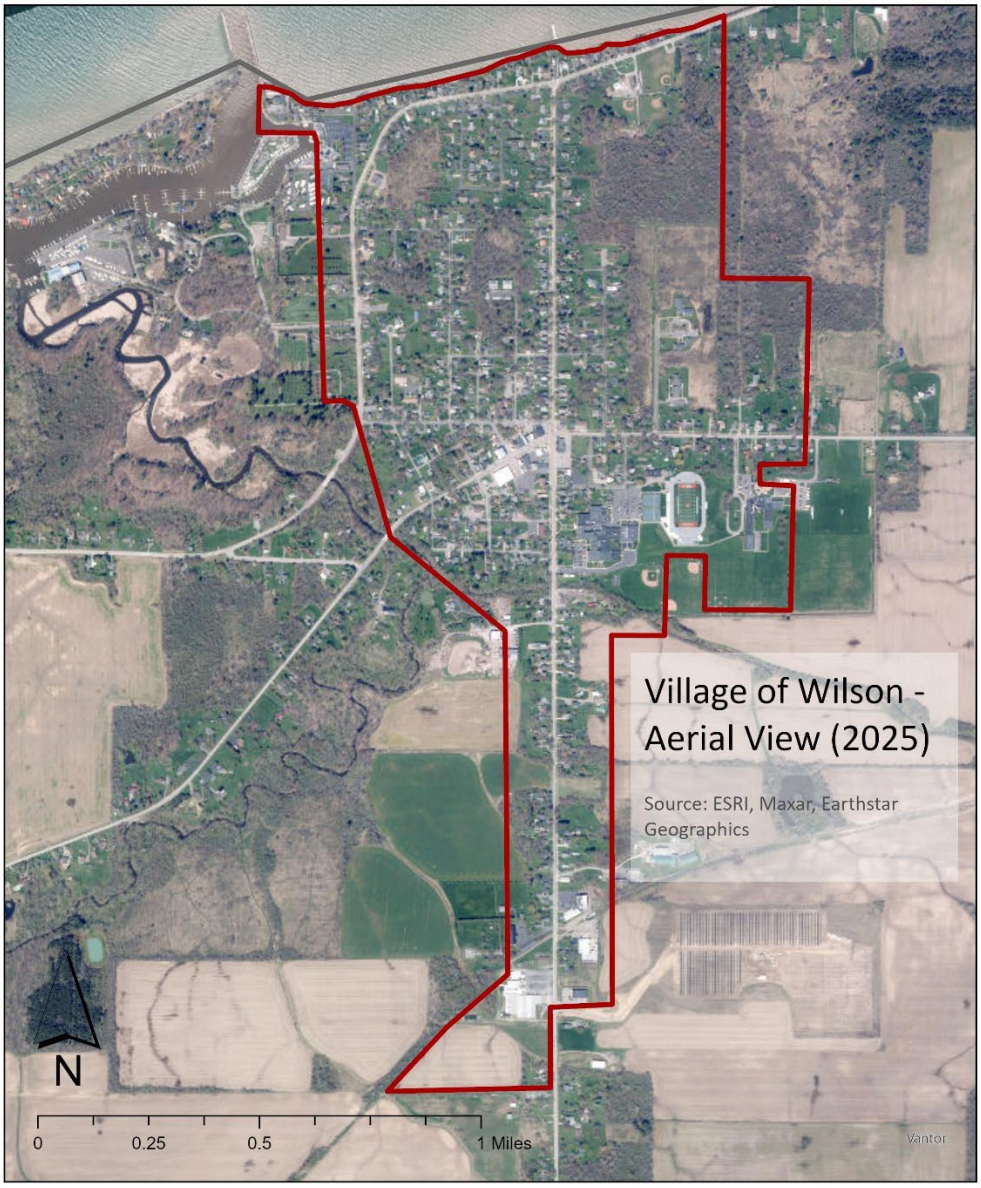
2. ABOUT THE COMMUNITY

The Village of Wilson is located in northern Niagara County (NY) on the southern shore of Lake Ontario. The Village covers 0.81 square miles within the Town of Wilson. It has a population of 1,371 and supports 516 jobs.[1]

The Village's economy and character are impacted by recreation and tourism during warmer months, attracting visitors to nearby beaches, wineries, and sport fishing opportunities on Lake Ontario and helping to support local businesses. The largest employment sectors for Wilson residents are education/healthcare/social services (22%) and professional/administrative services (18%).[2] The median household income in the Village of Wilson is $55,139.



[1] US Census Bureau, American Community Survey 5-Year Estimates (2022).
[2] US Census Bureau, American Community Survey 5-Year Estimates (2023).



3. METHODOLOGY

This GHG inventory focuses on the greenhouse gas (GHG) emissions from the activities occurring and energy consumed within the Village of Wilson. The data for this inventory was derived from the *Buffalo Niagara's 2024 Greenhouse Gas Inventory*, developed by the University at Buffalo Regional Institute (UBRI), which provides regional GHG emissions estimates as well as downscaled data for each of the 64 municipalities and two counties (Erie and Niagara) in the Buffalo Niagara region. These regional and municipal GHG inventories were developed as a component of the region's Comprehensive Climate Action Plan, a deliverable of a regional planning grant through the US EPA's Climate Pollution Reduction Grants (CPRG) initiative.

Buffalo Niagara's 2024 Greenhouse Gas Inventory follows the protocol for estimating emissions found in 2015 New York Community and Regional GHG Inventory Guidance , a collection of data sources and methods to guide communities in New York State with their inventory process. This protocol largely parallels the US Community Protocol issued by the International Council for Local Environmental Initiatives (ICLEI), though in some cases recommends data sources more specific to New York State. The 2015 NYS inventory guidance document is mentioned as one of the protocols that satisfy the requirements of NYS's Climate Smart Communities program for the PE2 Community GHG Inventory action.

In some cases, the 2024 Buffalo Niagara GHG inventory updates some methods and data sources recommended by the *2015 New York Community and Regional GHG Inventory Guidance* protocol. As data availability and methods have evolved since the 2015 protocol, this inventory tailored the approach to apply current data to standardize emissions estimates across multiple municipalities. These nuanced updates to the methods result in slight adjustments to some sector emissions. Meanwhile, changes in data availability have improved the accuracy of current emissions estimates for some sectors compared to past years.

A complete description of the methods and data sources used to develop *Buffalo Niagara's 2024 Greenhouse Gas Inventory* can be found in Appendix A. These methods and data sources are also applicable to the *Village of Wilson Community Greenhouse Gas Inventory*, which was developed using downscaled data from the regional GHG inventory.

How are GHG Emissions Reported?

To estimate GHG emissions in any distinct place, emissions can be calculated under one of three "Scopes."

- **SCOPE 1: Direct emissions** occur within a physical boundary, such as those emitted by burning natural gas or fuel oil for heating and cooking in buildings.
- **SCOPE 2: Indirect emissions related to electricity** consumption within the boundary, regardless of where the electricity is generated and the emissions occur.
- **SCOPE 3: Other indirect, upstream, or lifecycle emissions** attributed to community activity regardless of where they occur. For example, emissions from a community's solid waste may occur in a landfill that is not within the community limits.

This GHG inventory includes both direct and indirect emissions, depending on source and sector, with some emissions falling into Scopes 1, 2 and 3.

This inventory takes the approach recommended by the *2015 New York Community and Regional GHG Inventory Guidance* document and the U.S. Community Protocol, which suggest estimating indirect sources where possible. By focusing on local consumption and land use patterns, this approach is generally better at associating emissions with sources that can be managed by local policymaking. Such inventories allow communities to support setting policies and goals for emissions reductions by reporting total GHG emissions.

What Emissions Sources and Scopes are Included in this Inventory?

TABLE 1: Sources of GHG Emissions Included in the Inventory[3]

SECTOR/SOURCE	SOURCE DESCRIPTION	SCOPE
Residential Energy		
Electricity	Indirect emissions due to the electricity consumed by residential buildings	2
Natural Gas	Direct emissions from the natural gas used in residential buildings	1
Propane LPG	Direct emissions from propane or liquefied petroleum gas in residential buildings	1
Distillate Fuel Oil	Direct emissions from distillate fuel oil (1, 2, 4) used in residential buildings	1
Coal	Direct emissions from coal used in residential buildings	1
Wood	Direct emissions from wood burned to heat residential buildings	1
Commercial Energy		
Electricity	Indirect emissions due to the electricity consumed by commercial buildings	2
Natural Gas	Direct emissions from the natural gas used in commercial buildings	1
Propane LPG	Direct emissions from propane or liquefied petroleum gas in commercial buildings	1
Distillate Fuel Oil	Direct emissions from distillate fuel oil (1, 2, 4) used in commercial buildings	1
Residual Fuel Oil	Direct emissions from residual fuel oil (5, 6) used in commercial buildings	1
Coal	Direct emissions from coal used in commercial buildings	1
Wood	Emissions from wood burned in commercial buildings	1
Industrial Energy		
Electricity	Direct emissions due to the electricity consumed by industrial buildings	2
Natural Gas	Direct emissions from the natural gas used in industrial buildings	1
Propane LPG	Direct emissions from propane or liquefied petroleum gas used in industrial buildings	1
Distillate Fuel Oil	Direct emissions from distillate fuel oil (1, 2, 4) used in industrial buildings	1
Residual Fuel Oil	Direct emissions from residual fuel oil (5, 6) used in industrial buildings	1
Coal	Emissions from coal used in industrial buildings	1
Wood	Indirect emissions from wood burned in industrial buildings	1
Energy Distribution (Transmission (T&D) Losses)		
Electric T&D Losses	Indirect emissions from energy losses in transmission of electricity	2
Natural Gas T&D Losses	Direct fugitive emissions of natural gas that leaks in distribution within the boundary.	1
Use of SF6	Direct fugitive emissions of SF6, a specialized coolant used in the utility industry.	1
Industrial Processes & Product Use		
Metal Manufacturing	Direct chemical process emissions (non-energy) from industrial production of metals.	1
Chemical Manufacturing	Direct chemical process emissions (non-energy) from manufacturing of chemicals.	1
Other Industrial Processes	Direct chemical process emissions (non-energy related) from other industries.	1
Industrial Processes Product Use	Direct emissions of PFC, HFCs (refrigerants), and NF3 in vehicles, buildings, and industry.	1
Transportation		
On-road Vehicles	Indirect (community-induced) emissions from fossil fuels burned by on-road vehicles	3
Commercial Rail	Direct (in-boundary) emissions from diesel burned by commercial freight rail.	1
Light Rail	Indirect emissions from electricity consumed to operate the light rail system.	1
Personal Marine	Indirect (community-induced) emissions from personal boats and marine vehicles.	3
Commercial Marine	Direct (in-boundary) emissions from commercial shipping vehicles.	1
Aircraft	Indirect (community-induced) emissions from commercial air travel.	3
Off-road	Direct emissions from off-road equipment (construction, agricultural, lawn, etc.).	1
Waste		
Solid Waste	Indirect emissions from decomposition of waste generated by a community.	3
Public Sewage Systems	Direct emissions from waste water treatment plants within the boundary.	3
Septic Systems	Direct emissions from septic systems within the boundary.	1
Agriculture		
Enteric Fermentation	Direct emissions from enteric fermentation of livestock within the boundary.	1
Manure Management	Direct emissions from manure management within the boundary.	1
Use of Fertilizer	Direct emissions from the use of nitrogen-based fertilizers within the community.	1
Soil Management	Direct emissions from soil management practices (tilling, plowing) in the community.	1

[3] Adapted from the Geospatial GHG Accounting Framework in the *NYS DEC'S 2015 New York Community and Regional GHG Inventory Guidance* document.

This inventory excludes:

- Direct/Scope 1 emissions from solid waste facilities (landfills and waste-to-energy (WTE) plants) - to avoid double-counting with Scope 3 solid waste emissions; this method attributes waste emissions in the community where goods are consumed and waste is generated, not where it ultimately is disposed of.
- Direct emissions from grid-connected power generation rated 1MW and greater, to avoid double-counting since electricity consumption (Scope 2) is reported in the respective sectors in which it is used.
- Indirect upstream life cycle emissions related to consumption of raw materials, durable goods, and food within the community.

Quantifying GHG Emissions

There are a variety of greenhouse gases, and each GHG has a different impact on climate change. To measure GHGs uniformly, GHGs are converted to an equivalent amount of CO2 using different Global Warming Potential (GWP) values and reported in Metric Tons of CO2 equivalent (MTCO2e). For example, one molecule of methane has 25X the global warming potential of CO2, so methane emissions are multiplied by 25 to measure the equivalent GHG impact in terms of CO2.

Global Warming Potential of Major Greenhouse Gases Relative to CO_2

Common chemical name	Chemical Formula	Global Warming Potential (GWP) 100 Year time horizon[4]
Carbon dioxide	CO_2	1
Methane – non-fossil	CH_4	27.0
Methane – fossil	CH_4	29.8
Nitrous oxide	N_2O	273
Nitrogen trifluoride	NF_3	17,400
Sulfur hexafluoride	SF_6	24,300

One Metric ton of CO2 is about equal to the emissions from driving a gas-powered car with average fuel efficiency from Buffalo to San Diego (approx. 2,500 miles), or from powering an average home in the US for 1.5 months.[5]

[4] Intergovernmental Panel on Climate Change, *IPCC Global Warming Potential Values*, 6th Assessment Report, v.2.0, August 7, 2024.
[5] EPA Greenhouse Gas Equivalencies Calculator.

4. VILLAGE OF WILSON GHG EMISSIONS

An estimated **9,713 Metric Tons of CO2 equivalent (MTCO2 e) are emitted in the Village annually,** amounting to **7.08 MTCO2e per person** each year. Emissions from the Village of Wilson account for 0.1% of the Buffalo Niagara's total annual emissions of 12.7million MTCO2e. Most GHG emissions in the Village of Wilson come from the transportation (30%) and residential buildings (29%).

FIGURE 1: WILSON'S GHG EMISSIONS BY SECTOR

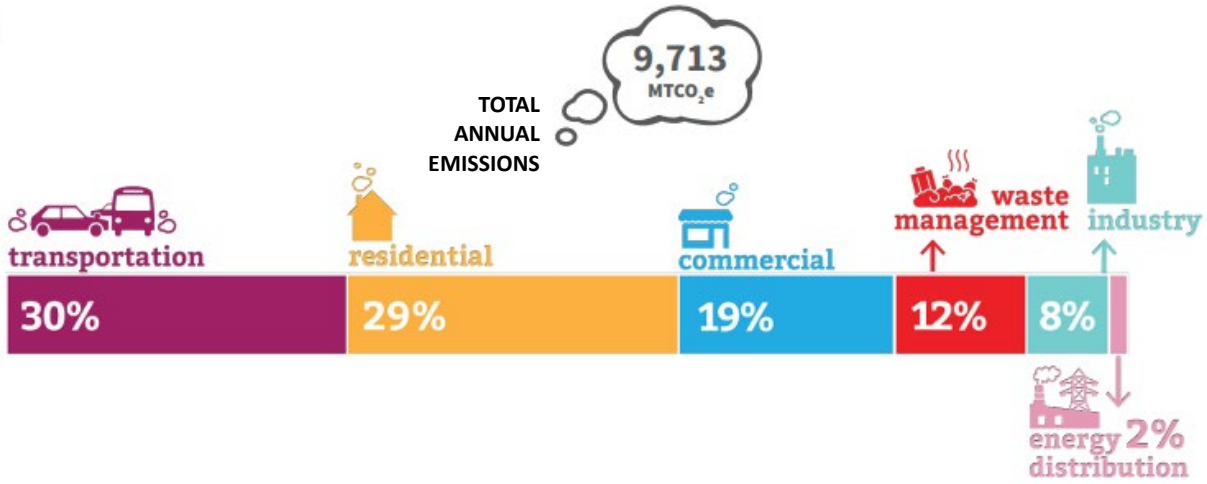


FIGURE 2: WILSON'S PER CAPITA EMISSIONS

PER CAPITA EMISSIONS ($MTCO_2E$ PER PERSON)

	Residential	Commercial	Industrial	Transportation	Waste	Agriculture	Energy Distribution	TOTAL
VILLAGE	2.07	1.37	0.54	2.16	0.84	0	0.12	7.08
REGION	2.63	1.31	1.50	4.48	0.84	0.22	0.16	11.2

FIGURE 3. WILSON'S PER CAPITA ENERGY CONSUMPTION

		VILLAGE	REGION
Electricity (kWh/person)	Residential	3,211.00	4,253
	Non-residential	3,455.21	5,643
Natural Gas (MMBtu/ person)	Residential	30.59	38.56
	Non-residential	17.19	27.01

TABLE 2: Village of Wilson – GHG Emissions by Sector and Scope

reported in Metric Tons of CO2 equivalent (MTCO2e)

	Scope 1	Scope 2	Scope 3	Total
Transportation				**2,958.8**
On-road			1680.871	
Off-road	595.8918			
Marine - personal			84.08969	
Marine - commercial	260.6412			
Rail – light & commercial	0			
Air Travel			337.3204	
Residential				**2,841.1**
Natural Gas, other fossil fuels, wood	2330.073			
Electricity, Steam		511.0751		
Commercial				**1,874.1**
Natural Gas, other fossil fuels, wood	1360.407			
Electricity, Steam		513.6714		
Industry				**735.2**
Facilities, Buildings				
Natural Gas, other fossil fuels, wood	20.65413			
Electricity, Steam		135.1131		
Products & Processes	579.4048			
Waste				**1,145.0**
Solid Waste Generation/Landfill			950.6934	
Sewage Treatment (WWTP)			166.4843	
Septic Systems	27.78971			
Agriculture				**0**
Energy Distribution				**158.6**
Natural Gas T&D		57.22508		
Electric T&D			62.62893	
SF6/Insulative gases		38.69753		
TOTAL				**9712.7**

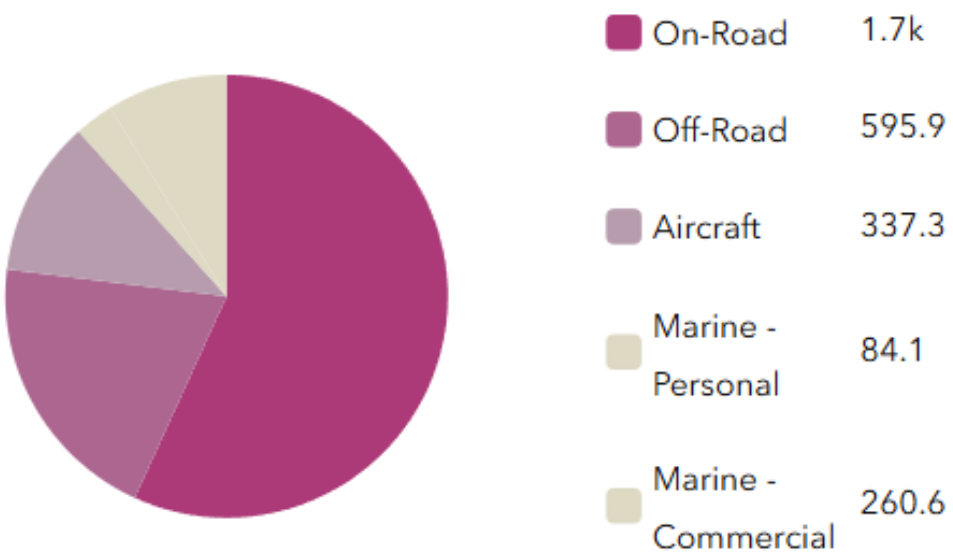
Transportation

Transportation emissions come from the combustion of fossil fuels to power vehicles on our roads and work sites, commercial and recreational boats, trains, and airplanes. Where possible, the inventory estimates the scope 3 (community-induced) emissions from on-road vehicles, personal marine vehicles, and air travel. The inventory includes scope 1 emissions (direct emissions that occur within the community's boundary) for the remaining sources of transportation emissions: rail, commercial marine, and off-road vehicles.

Total Annual Emissions from Transportation	**2,985.8 MTCO2e**
% of the Village's Total Emissions	30.5 %
Transportation Emissions per person (per year)	2.16 MTCO2e

Transportation is the largest emissions sector for the Village of Wilson, accounting for 30% of the Village's total emissions. On a per person scale, however, Wilson residents emit considerably fewer emissions from on-road transportation than the regional average (2.16 vs. 4.48 MTCO2e per person); this lower per capita emissions level may be due to the density that is characteristic of villages, offering opportunities for walking, biking and other alternatives to driving.

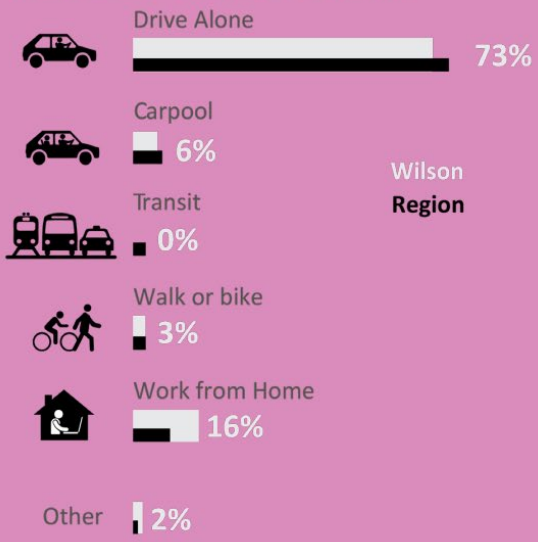
Emissions from boats and other marine vessels, both personal and commercial, account for over 11% of the Village's transportation-related GHG emissions. On the regional scale, marine emissions are 1% of the total for the transportation sector, highlighting the central role of water-based transportation in the Village of Wilson.



TRANSPORTATION

	VILLAGE	REGION
Vehicles Per Capita	**0.57**	0.61
Electric Vehicles	**1.10%**	1.50%
Walkability (Walk Score)	**50**	40
Miles of Bike Lanes/Trails	**0**	440
Bike Score	**45**	41

MODES OF TRAVEL TO WORK



For a description of the methods used to calculate transportation emissions, please see Appendix A, p. 27.

Data Sources:

On-road: NYS DOT, Vehicle Miles Traveled, 2022 and Annual Avg. Daily Traffic, 2019; NYS DMV, vehicle registrations by ZIP and vehicle class fuel mix, 2024; ReplicaHQ, Network VMT Calculator, Trip Origin-Destination, 2024; US EPA, GHG Emissions Hub, 2024; US EPA, Vehicle Fuel Economy data, 2024; US Federal Highway Administration, Average Fuel Economy by Major Vehicle Category, 2024.

Off-road: US EPA National Emissions Inventory, Erie and Niagara County Tax Parcel Data, 2023 and 2024.

Air Travel: US Bureau of Transportation Statistics (BTS) total flight miles per airport, 2022; US EPA, Inventory of Greenhouse Gas Emissions and Sinks, 2022; US BLS, Consumer Expenditure Survey, 2022; US Census, ACS, 2022.

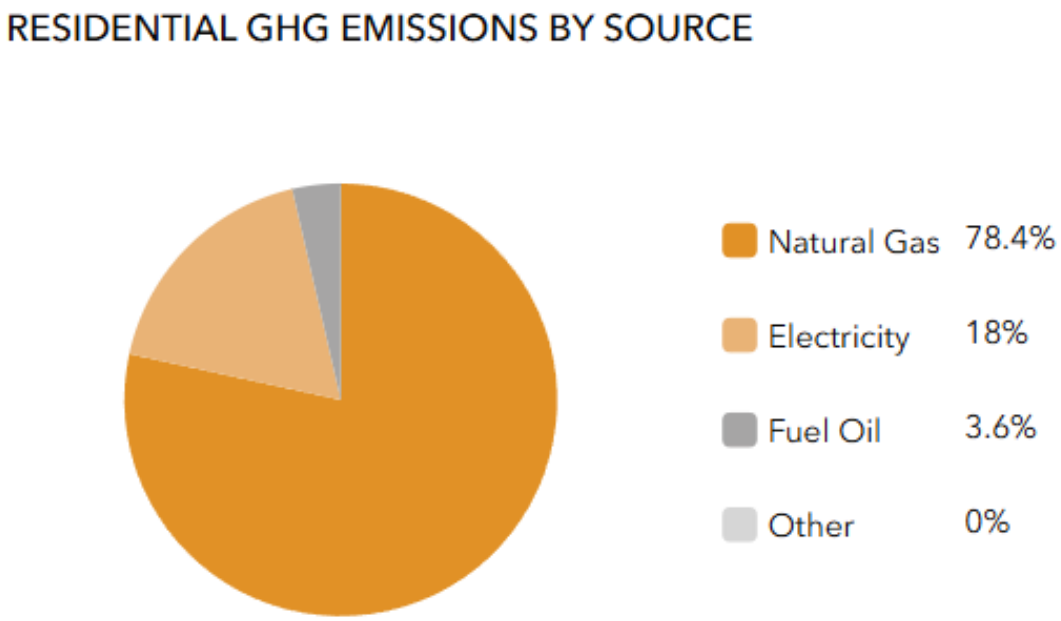
Rail: US EIA, Adjusted Distillate Fuel Oil Sales for Railroad Use, 2022 and US BTS, National Transit Database, 2023; NYS DOT, Railroad GIS data, 2024.

Residential

Residential buildings emit GHGs due to the energy used to heat and cool homes and to power appliances and devices. Residential emissions in this inventory include the scope 2 (community-induced) emissions resulting from the electricity consumed in homes, as well as the scope 1 (in-boundary) emissions from burning natural gas and other fossil fuels to heat residential buildings.

Total Annual Emissions from Residential Buildings	**2841.1 MTCO2e**
% of the Village's Total Emissions	29.3 %
Residential Emissions per person (per year)	2.07 MTCO2e

There are 627 households within the Village of Wilson, with an average household size of 2.2 people. The median year that houses in the Village were built is 1938, reflecting an older housing stock similar to that of the region as a whole. Natural gas is the predominant source for heat in home, used in 87.6% of housing units.[6]



For a description of the methods used to calculate residential emissions, please see Appendix A, p. 30.

Data Sources: Utility data on electric and natural gas consumption from NYS Utility Energy Registry (UER), 2024; US EIA, Residential Energy Consumption Survey, 2022; Erie & Niagara County, Tax Parcel Data, 2024; US Census, American Community Survey, 5-year estimates, 2022.

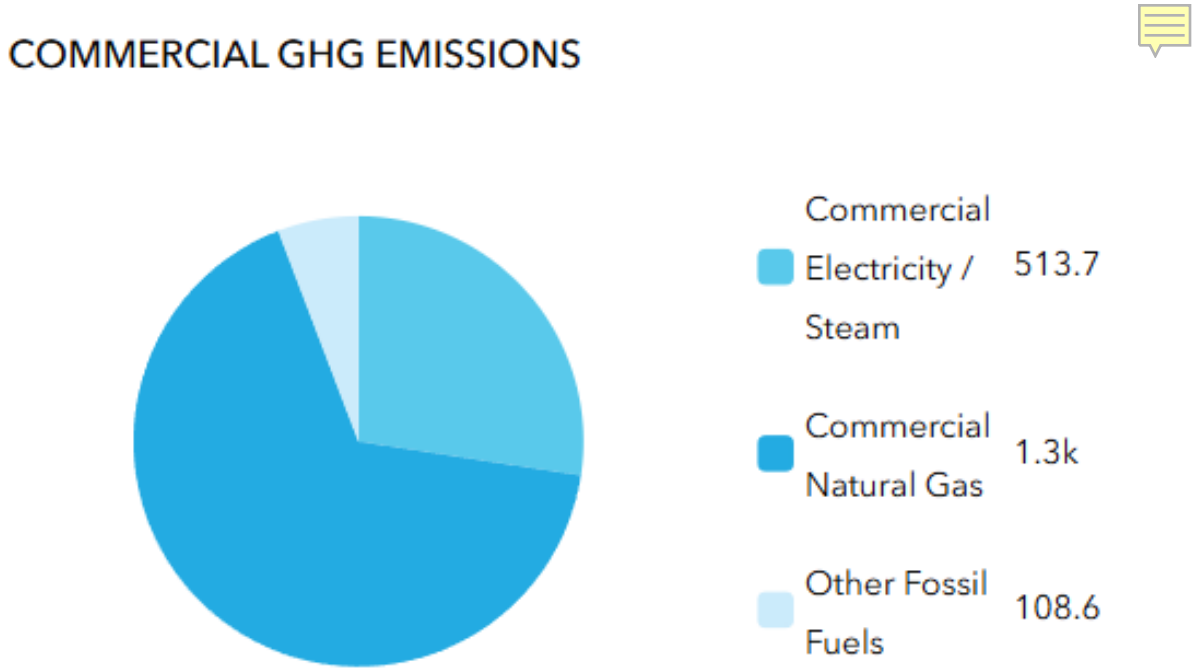
[6] US Census Bureau, American Community Survey 5-Year Estimates (2023).

Commercial

The total annual GHG emissions from commercial buildings in the Village of Wilson is 1,874.1 MTCO2e, 19% of the Village's total annual emissions.

Total Annual Emissions from Commercial Buildings	**1,874.1 MTCO2e**
% of the Village's Total Emissions	19.3 %
Commercial Emissions per person (per year)	1.37 MTCO2e

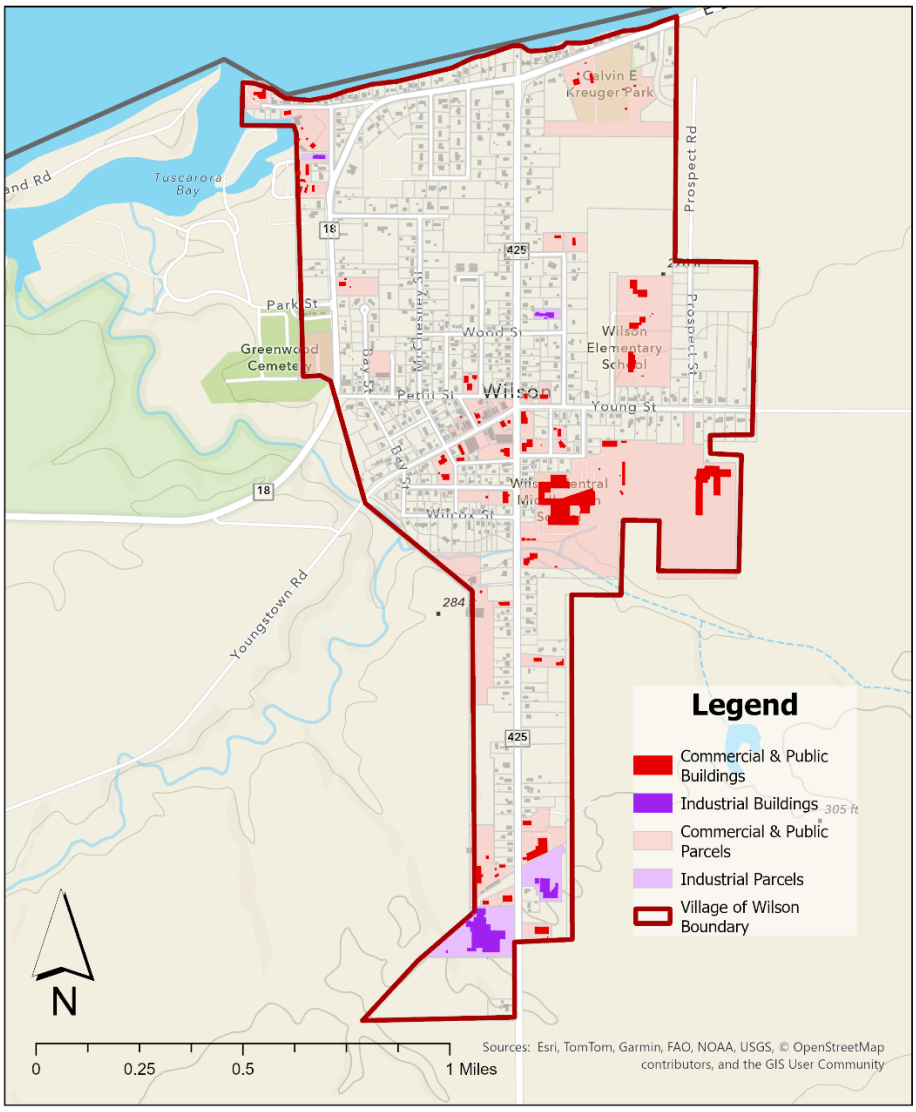
Commercial emissions come from heating, cooling, and providing electrical power to the **buildings used to conduct business in our region, including schools, government and public facilities, and buildings used by community organizations**. This inventory includes the scope 2 (community-induced) emissions resulting from the electricity consumed in commercial buildings in the community, along with the scope 1 (in-boundary) emissions from burning natural gas and other fossil fuels to heat commercial spaces.



For a description of the methods used to calculate commercial emissions, please see Appendix A, p. 30.

Data Sources: Utility data on electric and natural gas consumption from NYS Utility Energy Registry (UER), 2024; US EIA, State Energy Data System, 2022; Erie and Niagara County, Tax Parcel Data, 2024. NOTE: Monthly community-level energy consumption data is provided as-is by utility companies and may include inaccuracies.

Village of Wilson Industrial & Commercial Properties (including Public Facilities)



Data Sources: Parcels – Niagara County GIS (2024); Building Footprints – NYS Building Footprints, NYS GIS Clearinghouse (2025). Map by UBRI.

There are 83 commercial buildings, including public facilities, on 71 distinct parcels in the Village of Wilson. The largest of these are the High School/Middle School (51,864 ft^2), Elementary School (31,120 ft^2), and the brewery on Lake Street in the southern end of the village. [7]

The Village also contains 9 industrial buildings on 4 land parcels. The largest are the manufacturing sites at 683 Lake St. (49,870 ft^2) and 650 Lake St. (28,001 ft^2).

[7] The gross floor area of the buildings mentioned above was identified using NYS building footprints in GIS cross-referenced with Niagara County Property Record Online System (PROS).

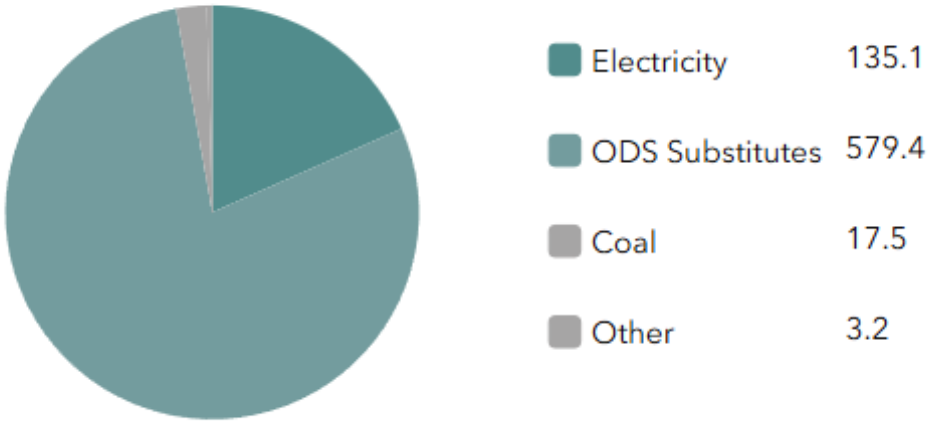
Industry

The energy needed to power industrial facilities (buildings and equipment) in the Village of Wilson results in 155.8 MTCO2e of GHG emissions per year.

Another 579.4 MTCO2e is emitted by industrial processes and products, particularly fugitive emissions of ozone-depleting substance substitutes (ODSS), which include many common refrigerants and other industrial gases.

Combined, GHG emissions from industry are 735.2 MTCO2e annually, 8% of the Village's total emissions.

Total Annual Emissions from Industrial Facilities and Processes	**735.2 MTCO2e**
% of the Village's Total Emissions	7.6 %
Commercial Emissions per person (per year)	0.54 MTCO2e



For a description of the methods used to calculate emissions from industrial facilities and products/processes, please see Appendix A, p. 31.

Data Sources:

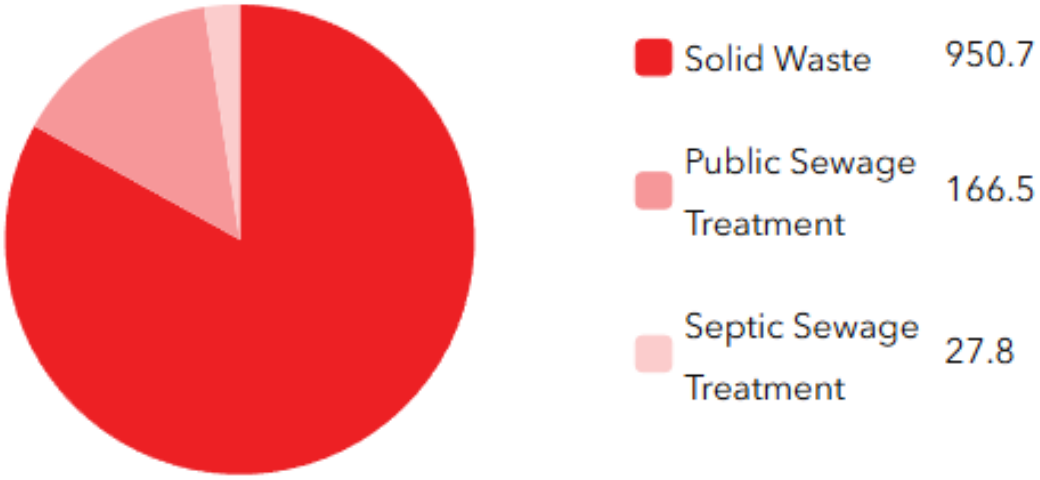
Industrial Facilities: Utility data on electric and natural gas consumption from NYS Utility Energy Registry (UER), 2024; US EIA, State Energy Data System, 2022; Erie and Niagara County, Tax Parcel Data, 2024. NOTE: Monthly community-level energy consumption data is provided as-is by utility companies and may include inaccuracies.

Industrial Processes: US EPA, National Emissions Inventory, Ozone Depleting Substance Substitutes (ODSS), 2022; US Census, ACS, 2022; NYS DEC Title V Facilities data on major industrial polluters, 2024.

Waste

Waste management produces emissions from the decomposition of the solid waste generated by households and businesses and from sewage treatment via public wastewater treatment plants and septic systems. This inventory includes the scope 3 (community-induced) emissions from solid waste disposal and public wastewater treatment, as well as scope 1 (in-boundary) emissions from septic systems.

Total Annual Emissions from Waste Management	**1145.0 MTCO2e**
% of the Village's Total Emissions	11.8 %
Waste-related Emissions per person (per year)	0.84 MTCO2e



For a description of the methods used to calculate waste sector emissions, please see Appendix A, p. 31.

Data Sources:

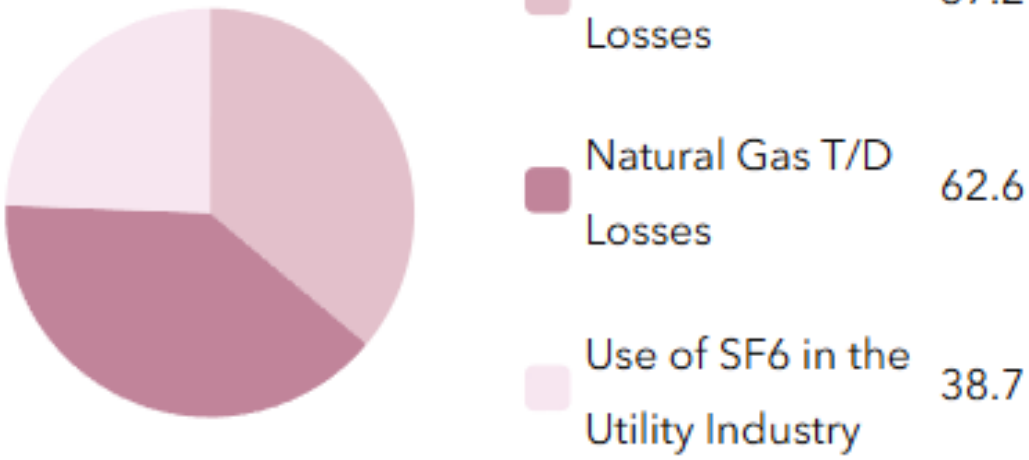
Solid Waste: NYS DEC Landfill and water treatment facility reports, 2023; NYS Solid Waste Management Plan, 2018; EPA Recycling Infrastructure Map, 2024; NYS DEC, 2015 New York Community and Regional GHG Inventory Guidance; US Census, ACS, 2022.

Sewage Treatment: NYS DEC Descriptive Data on Wastewater Treatment Plants, 2024; Erie/Niagara County Tax Parcel Data, 2024; Intergovernmental Panel on Climate Change, 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Ch. 6, www.ipccnggip.iges.or.jp/public/2019rf/pdf/5_Volume5/19R_V5_6_Ch06_Wastewater.pdf

Energy Distribution

GHG emissions occur in the process of transporting energy from where it is generated to where it is consumed. This includes the leakage of natural gas from pipelines, the energy lost by transmitting electric power through the energy grid, and the use of sulfur hexafluoride (SF_6), a potent GHG, as insulative gases in electric infrastructure, like transformers. This inventory estimates the scope 2 (indirect) emissions from transmission and distribution losses that result from the energy consumed in each community, regardless of where those losses occur.

Total Annual Emissions from Energy Distribution	**158.6 MTCO2e**
% of the Village's Total Emissions	1.6 %
Energy Distribution Emissions per person (per year)	0.12 MTCO2e



For a description of the methods used to calculate emissions from energy distribution, please see Appendix A, p. 32.

Data Sources: US Energy Information Administration, Statewide Capacity Factors, 2023; NYS UER, 2024. US EIA, Energy Consumption Data, Table 7.1 Electricity Overview, 2024; US EPA, National Emissions Inventory, 2022.

Agriculture

Based on the various data sources that were used to develop Buffalo Niagara's 2024 GHG Inventory, there is no commercial agricultural production (field crops or livestock) reported within the Village of Wilson, thus agricultural emissions are reported as 0.0 MTCO2e.

For a description of the methods used to calculate agricultural emissions, please see Appendix A, p. 32.

Data Sources: USDA, National Agricultural Statistics Service, 2022 Census of Agriculture; Erie/Niagara County Tax Parcel data, 2024; NYS Tax Parcel data, 2023. US EPA's State Inventory Tool, 2024.

5. Using the Community GHG Inventory

This community-wide greenhouse gas inventory provides a snapshot of the sources of GHG emissions within the Village of Wilson with the goal of informing decision-making about projects and policies that can help to reduce emissions, as either a primary or secondary objective.

There are a number of ways that the development of this inventory can be leveraged to continue the progress the Village is making toward reducing its emission, energy efficiency, and overall sustainability.

1. **Share with the inventory report with the community** – Making the Community GHG Inventory publicly available shows the Village's commitment to climate and sustainability goals and encourages residents, businesses, and community organizations to consider how to act on this information. The inventory can be shared via the Village's website, newsletter and social media accounts, and print copies can be made available at public facilities and government offices. Creative opportunities may arise to encourage community members to engage with the report, such as an online survey, interactive games, trivia questions, or special events.

2. **Develop a Local Climate Action Plan**—a climate action plan (CAP) builds on the results of a GHG inventory to establish an emissions reduction target for the community and outlines a roadmap for achieving the goal and strategies for measuring progress. It should include roles for the local government and for the broader community, and foster collaboration among stakeholders. Enacting a Climate Action Plan is a Priority Action in the Climate Smart Communities program, which provides resources to guide the process, such as the CSC Climate Action Planning Guide.

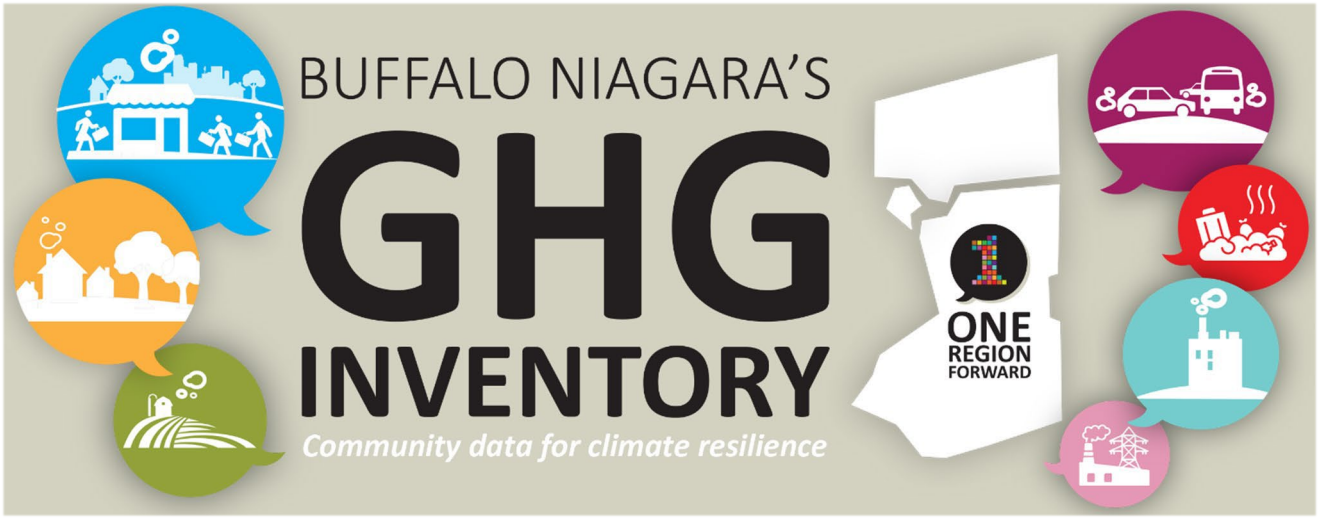
3. **Local Governments Can Lead by Example—**Local governments can highlight projects implemented at public facilities and government offices that save taxpayer dollars, improve the indoor or outdoor environment, and reduce emissions. Demonstrations at public facilities can encourage visitors to explore similar upgrades for their homes or businesses. A simple sign in a public area could point out how many dollars were saved and emissions avoided from projects such as LED lighting conversion or the installation of a new heat pump for heating and cooling.

4. **Repeat Regularly—**the Community GHG Inventory becomes even more useful when it is updated on a regular basis, allowing community leaders and residents to identify trends and track progress toward emissions reduction targets.

While the GHG emissions from within the Village of Wilson represent only a small portion of the region's overall emissions, measuring these emissions and taking action to reduce them shows a commitment on the part of the Village's leadership to the well-being of the village's residents, economy, and environment, both now and for generations to come.

APPENDIX A – Buffalo Niagara 2024 Greenhouse Gas Inventory Summary of Methods and Data Sources used for Municipal Greenhouse Gas Inventories

April 2025



University at Buffalo
Regional Institute
School of Architecture and Planning

Supporting stronger regional economies for all.

About the GHG Emissions Inventory

Greenhouse gas (GHG) inventories are essential to understand and manage a community's impact on the environment and climate. Identifying the sources of GHG emissions in a community allows the community to plan out steps to lower climate impacts that are effective and suited to the character and values of each unique community. This information can help communities make progress on other community goals, such as community resilience to natural hazards, energy efficiency, regional economic resilience, environmental conservation, air and water quality, and enhanced local quality of life.

This Greenhouse Gas Inventory is part of the 2025 Regional Greenhouse Gas Inventory for the Buffalo Niagara Region (Erie & Niagara Counties) that was prepared as a part of the scope of the region's grant from the US Environmental Protection Agency (EPA) Climate Pollution Reduction Grant (CPRG) program. The inventory is part of One Region Forward (1RF), a broad-based, regional planning initiative led by the Greater Buffalo Niagara Regional Transportation Council that seeks to promote sustainable forms of development in land use, transportation, housing, energy and climate, and food access. Analysis and production of the GHG Inventory was produced by the University at Buffalo Regional Institute through its role supporting One Region Forward with engagement, and technical analysis.

The document is meant to summarize and explain the approach used to complete this GHG inventory. For additional guidance on completing a community GHG inventory, please see the NYS DEC'S 2015 New York Community and Regional GHG Inventory Guidance and other resources listed within this document.

Recognizing the NYS GHG Collaborative Working Group

Guidance and support for this effort was provided by the New York State GHG Collaborative Working Group, a consortium of experts and planners from other regions completing similar processes for the EPA Climate Pollution Reduction Grant across New York state. This work allowed us to coordinate our inventory methods with other regions across New York in an effort to produce comparable GHG inventories for NYS municipalities now and into the future.

This inventory greatly benefited from the expertise and assistance of the New York GHG Collaborative Working Group members: Jim Yienger, Climate Action Associates; Rachel Scudder, Greater Finger Lakes Regional Planning Council (GFLPC); Jennifer Lowenstein, GFLPC; Richard Sutherland, GFLPC; Todd Fabozzi, Capital District Regional Planning Council (CDRPC); Madison Hrysko, CDRPC; Joshua McClain, University Buffalo Regional Institute (UBRI); Brian Conley, UBRI. The community-induced on-road vehicle emission estimates would not be possible without the efforts of Matt Grabau at the Greater Buffalo Niagara Regional Transportation Council, the NYS MPO Transportation working group, and Replica.

Recommended Citation: University at Buffalo Regional Institute, State University of New York at Buffalo, School of Architecture and Planning. 2025. "Buffalo Niagara 2025 Regional Greenhouse Gas Inventory."

About Greenhouse Gas Emissions

Greenhouse gases (GHGs) trap heat in the atmosphere and contribute to climate change. The greenhouse effect, and the connection between the burning of fossil fuels, rising CO2 levels and increasing global temperatures is proven science that has been established since the 19th century.[1] While Earth's climate has changed throughout its history, there is unequivocal evidence that global temperatures are rising faster now than any time over the past 10,000 years due to human activities.[2] Scientists agree that the impacts of climate change on human societies could become substantial and irreversible if the climate warms by 2.7°F above pre-industrial averages.[3] Through the Climate Leadership and Community Protection Act (CLCPA), New York State (NYS) set a goal of reducing statewide greenhouse gas emissions by 40% by 2030 and 85% by 2050, compared to 1990 levels.[4]

Greenhouse gases are generated from the energy we use to move around, work and live our lives. The vast majority of human induced GHG emissions are produced through fossil fuel combustion, sewage and solid waste management, agriculture, and industrial production.

These activities release three gases that make up 99% of GHG emissions—carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O). Fossil fuel combustion, including the burning of gasoline in our cars and the combustion of natural gas to heat our homes, account for most GHG emissions. Other GHGs produced in Buffalo Niagara, include hydrofluorocarbons (HFC) or Ozone depleting substance substitutes which are used as common refrigerants in households and vehicles, and sulfur hexafluoride (SF6) which is used in the utility industry as an insulative gas to prevent electrical arcing in energy generation and distribution.

Overview of Methods

This GHG inventory focuses on the greenhouse gas (GHG) emissions from the activities and energy consumed within each municipality in Erie and Niagara counties, using the most current data as of 2024. Emissions were estimated using NYS DEC'S 2015 New York Community and Regional GHG Inventory Guidance (**here**). These methods comply with Federal and International protocol for GHG inventories as prescribed by the International Council for Local Environmental

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1 Don Hofstrand, "The Greenhouse Effect is proven science," Iowa State University, 2021.

2 *Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report, WGI, Technical Summary; B.D. Santer et.al., "A search for human influences on the thermal structure of the atmosphere," 1996. Nature, 382; T. Westerhold et al., "An astronomically dated record of Earth's climate and its predictability over the last 66 million years," 2020. Science, 369.*

3 *Martinich, J., B.J. DeAngelo, D. Diaz, B. Ekwurzel, G. Franco, C. Frisch, J. McFarland, and B. O'Neill, 2018: Reducing Risks Through Emissions Mitigation. In Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Vol. II [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, pp. 1346–1386. doi: 10.7930/NCA4.2018.CH29*

4 *The New York State Climate Leadership and Community Protection Act (CLCPA), S. 6599, 2019-2020 Sen., Reg. Sess. § 1 (N.Y. 2019) https://climate.ny.gov/resources/scoping-plan/*

Initiatives (**here**). Please see **the 2015 NY Community GHG Inventory Guidance document** for more details and background on the methods used to complete this inventory.

In some cases, this Buffalo Niagara municipal GHG inventory updates some methods prescribed by the NYS DEC'S 2015 New York Community and Regional GHG Inventory Guidance protocol.

As data availability and methods have evolved since the 2015 protocol, this inventory tailored the approach to apply current data to standardize emissions estimates across multiple municipalities. These nuanced updates to the methods result in slight adjustments to some sector emissions. Meanwhile, changes in data availability have improved the accuracy of current emissions estimates for some sectors compared to past years.

The Buffalo Niagara 2024 Municipal GHG Inventory is one of the first standardized emissions inventories for municipalities in New York State. Estimating GHG emissions at the municipal-level is a new, evolving process with data challenges. Our scope and methods may differ from other municipal inventories and may result in data discrepancies. There are several possible approaches to estimate community-level emissions across all sectors. The data sources and methods in the Buffalo Niagara inventory may be updated in future emissions inventories.

Reporting GHG Emissions

To estimate GHG emissions in any distinct place, emissions can be calculated under one of three "Scopes."

- **SCOPE 1** are *Direct* emissions occurring within the boundary of a community;
- **SCOPE 2** inventories measure *Indirect* emissions from electric consumed in the boundary regardless of where it is generated;
- **SCOPE 3** emissions inventories include all *Indirect*, upstream or lifecycle emissions attributable to the community.

This inventory takes the approach to community-level inventories recommended by the 2015 New York Community and Regional GHG Inventory Guidance document and the U.S. Community Protocol, which suggests estimating indirect sources where possible. By focusing on local consumption and land use patterns, this approach is generally better at associating emissions with sources that can be managed by local policymaking. These inventories allow communities to support setting policies and goals for emissions reductions by reporting total GHG emissions.

To estimate emissions from activities and energy consumption within each municipality, this GHG inventory includes both direct and indirect emissions, depending on sector. This approach avoids double-counting of emissions between municipalities and focuses on emissions that can be attributable to and therefore acted upon by each municipality.

For example, the inventory measures emissions natural gas and electricity use based on where energy is consumed, not where it is produced. Similarly, waste emissions include the decomposition of solid waste generated by our region, regardless of where it is disposed. Also, on-road transportation estimates the emissions from vehicle trips that either start or end in each municipality, excluding "pass-through" vehicles.

These inventories *include*:

- Indirect emissions from community electric consumption
- Direct emissions from fuel consumption in residential, commercial, industrial buildings
- Direct emissions from commercial marine, rail, and off-road vehicles
- Indirect emissions from aircraft, personal marine vehicles, and on-road vehicles
- Indirect emissions from community solid waste generation
- Indirect emissions from public sewage systems and direct emissions from septic systems
- Direct emissions from industrial processes and product use

These inventories *exclude*:

- Direct emissions from solid waste facilities (landfills and waste-to-energy (WTE) plants)
- Direct emissions from grid-connected power generation rated 1MW and greater
- Indirect upstream life cycle emissions related to consumption of raw materials, durable goods, and food within the community

A summary of the sources of emissions included in this inventory can be found in Table 1 at the end of this document.

Quantifying GHG Emissions

There are a variety of greenhouse gases, and each GHG has a different impact on climate change. To measure GHGs uniformly, GHGs are converted to an equivalent amount of CO_2 using different Global Warming Potential (GWP) values and reported in Metric Tons of CO_2 equivalent ($MTCO_2e$). For example, one molecule of methane has 25X the global warming potential of CO_2, so methane emissions are multiplied by 25 to measure the equivalent GHG impact in terms of CO_2. One Metric ton of CO_2 is about equal to driving an average gas-powered car with average fuel efficiency from Buffalo to San Diego.

Transportation

Transportation emissions come from the combustion of fossil fuels to power vehicles on our roads and work sites, commercial and recreational boats, trains, and airplanes. Where possible, the inventory estimates the scope 3 (community-induced) emissions from on-road vehicles, personal marine vehicles, and air travel. The inventory includes scope 1 (direct emissions that occur within the community's boundary for the remaining sources of transportation emissions (rail, commercial marine, and off-road vehicles).

On-Road Vehicles

The inventory uses data on local travel patterns to estimate the scope 1 (community-induced) emissions from on-road vehicles attributable to each community. Estimating emissions from on-road vehicles in each municipality involves three main steps: 1) estimating the distance that vehicles travel on trips that arrive or leave each municipality, measured in vehicle miles traveled (VMT); 2) finding the mix of vehicle types and fuels used in the community, and 3) multiplying the distance traveled (VMT) of each vehicle-fuel type by its associated GHG emissions factor to find the total on-road emissions in each municipality.

Regional VMT data from NYS DOT is allocated to municipalities based on the percentage of regional VMT from trips that begin or end in each municipality, calculated from Replica Network VMT data. Emissions from on-road vehicles in each municipality are based on the total length of trips that begin or end in each municipality. This is found by allocating the regional VMT total to each municipality based on Replica VMT data and removing the share of VMT due to "pass-through" trips, or trips that do not begin or end in each municipality. Trip VMT is split between municipalities where trips start and end, half of aggregated trip VMT is applied to the municipality where the trip originated, and the other half to the destination municipality. Replica uses aggregated and anonymized mobile device data to create models that replicate transportation patterns to estimate where trips begin and end, and then calculates trip lengths using road network data. This data is used to estimate the percentage of VMT attributable to each vehicle type in each municipality and regionally. These estimates were compared with similar approaches applying the GBNRTC's transportation regional transportation model and NYS DOT Average Annualized Traffic Data (AADT) data.

The Replica Network VMT and NYS DOT AADT data that was used to find municipal VMT (step 1) is broken down by type of vehicle (commercial truck, passenger car, etc.…) and fuel (gas, electric, etc...). NYS DMV registration data is used to estimate the mix of fuel types used by each type of vehicle in the region and within each municipality. NYS DMV vehicle registrations data on the weight, body type, registration type, fuel type, and ZIP code of every registered vehicle is used to classify vehicles into the vehicle-fuel typology used by NYSERDA and US EPA to produce GHG estimates. Registrations by ZIP code are allocated to each municipality by the percentage of housing in each municipality that lies within each ZIP code, found in GIS using 2020 US Census block-level population data. The fuel mix of commercial trucks assumes the regional average in each municipality, but the fuel type of passenger vehicles in each municipality varies based on the fuel mix of vehicles registered in each community. Only a portion of passenger vehicle VMT estimates are assigned to the mix of registered vehicles in each municipality, since vehicles registered outside each municipality would account for a share of each municipality's VMT. This is estimated using ACS data on the number of vehicles used by residents and commuting workers in each community.

Emissions factors from the US EPA's GHG Emissions Hub and vehicle fuel efficiency data from the Federal Highway Administration (FHA) are used to calculate emissions. The FHA provides average fuel economy (MPG) of diesel and gas for major vehicle types. These MPG averages are multiplied by the calculated VMT of each vehicle-fuel type in each community to estimate total gallons of gasoline/diesel consumed per vehicle type. Fuel consumption is multiplied by associated emission factors (US EPA) to estimate emissions in CO2e. The US EPA's vehicle fuel economy database is used to estimate average fuel consumption of alternative fuels (CNG, Flex, and Electric). This data is used to find an estimated average fuel economy (MPG) of each vehicle-fuel type, which is then multiplied by the associated emission factors for each fuel type. Electric-hybrid vehicle emissions do not include emissions from electricity consumed in charging, which is included in the energy consumption sectors.

Sources: NYS DOT, Vehicle Miles Traveled, 2022 and Annual Avg. Daily Traffic, 2019; NYS DMV, vehicle registrations by ZIP and vehicle class fuel mix, 2024; ReplicaHQ, Network VMT Calculator, Trip Origin-Destination, 2024; US EPA, GHG Emissions Hub, 2024; US EPA, Vehicle Fuel Economy data, 2024; US Federal Highway Administration, Average Fuel Economy by Major Vehicle Category, 2024.

Off-Road Vehicles

The inventory estimates the in-boundary (scope 1) emissions from the burning of fossil fuels to power off-road vehicles. This includes construction equipment, commercial and industrial equipment, agricultural machinery, lawn and garden equipment, and other vehicles that use transportation fuels but do not operate on roads. The US EPA's National Emissions Inventory provides county-level estimates of emissions from off-road vehicles and machinery. County-level estimates are allocated to municipalities based on the percentage of land area, by type, within each municipality. County-level agricultural equipment emissions are allocated based on percentage of the county's agricultural land in each municipality (from 2022 NYS tax parcel data); emissions from construction and commercial/industrial equipment are allocated based on the percentage of developed land in each municipality (from 2021 NLCD land cover data); emissions from logging equipment are allocated based on the percentage of forest land (2021 NLCD data); and emissions from lawn/garden and other equipment are allocated based on the percentage of the region's total land area in each municipality.

Sources: US EPA National Emissions Inventory, Erie and Niagara County Tax Parcel Data, 2023 and 2024.

Air Travel

The inventory estimates the emissions induced by the air travel of each community's population (scope 3). The U.S. Department of Transportation's Bureau of Transportation Statistics provides data on the number and distance traveled by flights per airport. The US EPA's Inventory of Greenhouse Gas Emissions and Sinks provides the annual emissions from airplanes across the country. These figures are used to find the national average GHG emissions per flight mile in 2022 (in MT CO2e). The US BTS Flight data is used to find the total miles traveled by flights either starting or ending in the region's airports (Buffalo Niagara International and Niagara Falls International). Total flight miles are divided by two in order to attribute half of the emissions to the origin airport and the other half to the destination airport. This ensures that two regions following the same methodology would not double-count emissions. The national per-mile emissions factor is applied to this estimate of flight miles traveled by planes taking off or landing in the region.

Regional emissions from air travel are allocated to municipalities based on household income and population. The US BLS Consumer Expenditure Survey shows that average spending on airline tickets increases with income level. This BLS data provides a breakdown of average spending on air travel by household income level. These values are used to develop ratios of airline spending by income level compared to the national average. The US Census ACS data provides the number of households by income level. The ratio of spending is multiplied by the number of households within each income level to estimate the overall percentage of the region's air travel generated by the population in each municipality.

Sources: US Bureau of Transportation Statistics (BTS) total flight miles per airport, 2022; US EPA, Inventory of Greenhouse Gas Emissions and Sinks, 2022; US BLS, Consumer Expenditure Survey, 2022; US Census, ACS, 2022.

Rail

The inventory estimates the in-boundary (scope 1) emissions from rail travel in each community. This includes emissions from electricity used for passenger rail and diesel fuel consumed by locomotives in freight transportation. The US Bureau of Transportation Statistics' National Transit Database provides the annual electricity consumed to operate the NFTA light rail (2022). This is multiplied by the total output emissions factors for the Upstate NY electric grid to estimate emissions from light rail. All emissions from light rail are allocated to the City of Buffalo. (Note: Emissions of bus and other public transit vehicles are captured in on-road vehicles.) The US Energy Information Administration (EIA) provides the gallons of diesel fuel consumed annually by locomotives in each state (2022). The state total locomotive diesel fuel consumption is allocated to municipalities in the region based on the percentage of the state's railroad network that falls within each municipality. The length of railroad in each municipality is calculated in GIS using NYS DOT Railroad data.

Sources: US EIA, Adjusted Distillate Fuel Oil Sales for Railroad Use, 2022 and US BTS, National Transit Database, 2023; NYS DOT, Railroad GIS data, 2024.

Marine

The inventory estimates the preferred community-induced emissions from personal boats registered in each community and the in-boundary (scope 1) emissions from commercial marine vessels.

The US EPA National Emissions Inventory provides county-level estimates of emissions from commercial marine and pleasure craft vehicles. The total CO2 emissions from commercial vessels in the two counties are allocated to municipalities based on the percentage of the region's great lake shoreline that is found in each municipality, as a proxy for how much commercial vessels travel within each municipality's boundaries. This is calculated using GIS.

The total CO2 emissions from all personal marine vehicles in the two counties is allocated to each municipality based on the percentage of registered boats in each municipality, using the NYS DMV vehicle registrations data. Registrations by ZIP code are allocated to each municipality based on the percentage of housing in each municipality that falls within each ZIP code, found in GIS using 2020 Census block-level population data.

Sources: US EPA National Emissions Inventory, Erie and Niagara County Tax Parcel Data, 2023 and 2024; UBRI analysis of shoreline length by municipality, USGS, National Hydrography Dataset, 2024.

Residential

Residential buildings emit GHGs due to the energy used to heat and cool our homes and to power our electric appliances and devices. Residential emissions in this inventory include the scope 2 (community-induced) emissions resulting from the electricity consumed in homes as well as the scope 1 (in-boundary) emissions from burning natural gas and other fossil fuels to heat residential buildings.

The NYS Utility Energy Registry provides community-level data on residential consumption of natural gas and electricity. The amount of electricity (in megawatt-hours) and natural gas (in therms) consumed in each municipality is multiplied by emission factors for Upstate NY's grid (US EPA) to estimate the emissions from energy use in commercial buildings.

State level data on the household use of other fossil fuels (wood, coal, fuel oil) is allocated to communities based the number of occupied housing units using these fuels (from 2022 ACS and 2024 tax parcel data). The estimated amount of these fuels used in each community is multiplied by the relevant emissions factors (US EPA) to estimate emissions from wood, fuel oil, and coal use.

Sources: Utility data on electric and natural gas consumption from NYS Utility Energy Registry (UER), 2024; US EIA, Residential Energy Consumption Survey, 2022; Erie & Niagara County, Tax Parcel Data, 2024; US Census, American Community Survey, 5-year estimates, 2022.

NOTE: Monthly community-level energy consumption data is provided as-is by utility companies and may include inaccuracies. The Villages of Akron and Springville operate municipal electric services which are not included in the UER data. Electric consumption for these villages is estimated using regional averages (per square footage) from UER data and Erie/Niagara County Tax Parcel Data.

Commercial

Commercial emissions come from heating, cooling, and providing electrical power to the buildings used to conduct business in our region. This inventory includes the scope 2 (community-induced) emissions resulting from the electricity consumed in commercial buildings in a community, along with the scope 1 (in-boundary) emissions from burning natural gas and other fossil fuels to heat commercial spaces.

The NYS Utility Energy Registry provides community-level data on commercial consumption of natural gas and electricity. The amount of natural gas (in therms) and electricity (in megawatt-hours) consumed in each municipality is multiplied by emission factors for natural gas and Upstate NY's grid (US EPA) to estimate the emissions from household energy use.

State level data from the US EIA on the commercial use of other fossil fuels (wood, coal, fuel oil) is allocated to communities based on the commercial square footage (using 2024 tax parcel data). The estimated amount of these fuels used in each community is multiplied by the relevant emissions factors (US EPA) to estimate emissions from wood, fuel oil, and coal use.

Sources: Utility data on electric and natural gas consumption from NYS Utility Energy Registry (UER), 2024; US EIA, State Energy Data System, 2022; Erie and Niagara County, Tax Parcel Data, 2024. NOTE:

Monthly community-level energy consumption data is provided as-is by utility companies and may include inaccuracies.

Industrial Buildings

Industrial buildings create emissions from the electricity, natural gas, and other fossil fuels used to heat/cool and power these facilities. This inventory includes the scope 2 (community-induced) emissions resulting from the electricity consumed in industrial facilities as well as the scope 1 (in-boundary) emissions from burning natural gas and other fossil fuels to heat industrial buildings.

The NYS Utility Energy Registry provides community-level data on industrial consumption of natural gas and electricity. The amount of natural gas (in therms) and electricity (in megawatt-hours) consumed in each municipality is multiplied by emission factors for natural gas and Upstate NY's grid (US EPA) to estimate the emissions from energy use in industrial buildings.

State level data from the US EIA provides the industrial use of other fossil fuels (wood, coal, fuel oil). This data is allocated to communities based on the commercial square footage (using 2024 tax parcel data). The estimated amount of these fuels used in each community is multiplied by the relevant emissions factors (US EPA) to estimate emissions from wood, fuel oil, and coal use.

Sources: Utility data on electric and natural gas consumption from NYS Utility Energy Registry (UER), 2024; US EIA, State Energy Data System, 2022; Erie and Niagara County, Tax Parcel Data, 2024. NOTE: Monthly community-level energy consumption data is provided as-is by utility companies and may include inaccuracies.

Industrial Processes

Emissions result from the industrial processes that transform raw materials into final products, and the use of refrigerants and industrial gases known as Ozone-depleting substance substitutes (ODSS)—potent GHGs that may escape into the atmosphere during use. The inventory includes the in-boundary emissions from industrial processes at manufacturing facilities (chemical, metal, etc..) and the leakage of ODSS that occur within each community.

Industrial process emissions are reported to the NYS DEC through the Title V facility permits. This includes chemical, metal, and other manufacturing processes that produce emissions by converting raw products into manufactured goods. These point source emissions are geolocated and allocated to the community where the facility is located. State-level data on the use of Ozone-depleting Substance Substitutes (ODSS) is allocated to each community on a per capita basis.

Sources: US EPA, National Emissions Inventory, Ozone Depleting Substance Substitutes (ODSS), 2022; US Census, ACS, 2022; NYS DEC Title V Facilities data on major industrial polluters, 2024.

Waste Management

Waste management produces emissions from the decomposition of the solid waste generated by households and businesses and the wastewater treatment in sewer and septic systems. This inventory includes the scope 3 (community-induced) emissions from solid waste disposal and public wastewater treatment, as well as scope 1 (in-boundary) emissions from septic systems.

Solid waste

NYS DEC's Division of Materials Management provides information on how much waste was collected at each landfill broken down by county. These forms were reviewed to find the total amount of municipal solid waste (MSW) generated by communities in Erie and Niagara counties. This includes landfills elsewhere in the State that received waste from Erie and Niagara counties. The total amount of waste is summed from these reports and supplemented with figures from the NYS 2018 Solid Waste Management Plan to estimate the total amount of waste generated in the region. This estimate of regional waste generated is allocated to municipalities based on percentage of the regional population.

The NYS DEC DMM reports do not breakdown all waste into different components (i.e., paper, plastics, food waste, lawn debris, etc.) so the average emission factors for mixed MSW (from the US EPA Emission Factors Hub) is applied to the total estimated weight of waste generated in each municipality. EPA Recycling Infrastructure Map estimates recycling rates by ZIP code. This data is allocated to municipalities by the percentage of housing units in each ZIP code that fall within each municipality, and multiplied by the total tons of waste generated in each municipality to estimate the amount of waste recycled in each municipality.

The estimate assumes that 56% of waste is landfilled and 44% incinerated, based on guidance from the 2015 NYS Community GHG Inventory Guidance. Total tons of waste landfilled, incinerated, and recycled per capita is multiplied by EPA emissions factors by waste type.

Sources: NYS DEC Landfill and water treatment facility reports, 2023; NYS Solid Waste Management Plan, 2018; EPA Recycling Infrastructure Map, 2024; NYS DEC, 2015 New York Community and Regional GHG Inventory Guidance; US Census, ACS, 2022.

Sewage treatment

Wastewater treatment emissions are estimated using the NYS DEC data on emissions and energy use at public wastewater treatment facilities and the US EPA State Inventory Tool Wastewater module. Septic emissions are estimated using an IPCC calculation, based on number of households with septic systems in each community, which is found through the tax parcel data.

Sources: NYS DEC Descriptive Data on Wastewater Treatment Plants, 2024; Erie/Niagara County Tax Parcel Data, 2024; Intergovernmental Panel on Climate Change, 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Ch. 6, www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/5_Volume5/19R_V5_6_Ch06_Wastewater.pdf

Energy Distribution

GHG emissions occur in the process of transporting energy from where it is generated to where it is consumed. This includes the leakage of natural gas from pipelines, the energy lost by transmitting electric power through the energy grid, and the use of sulfur hexafluoride (SF6)—a potent GHGs as insulative gases in electric infrastructure, like transformers. This inventory estimates the scope 2 (indirect) emissions from transmission and distribution losses that result from the energy consumed in each community, regardless of where those losses occur.

State-based transmission and distribution (T&D) loss rates from the US EIA are applied to the total energy (electric and gas) consumed in each community. This is then multiplied by associated emission factors to estimate the GHGs resulting from the distribution of natural gas and electricity to any community.

This inventory estimates the in-boundary (scope 1) emissions from the use of SF6 that results from the electricity and natural gas consumed in each municipality as proportional to electricity consumption. US EPA's National Emissions Inventory (2022) provides data on the release of SF6. This is divided by national annual energy consumption data from the US Energy Information Administration to find a national average of SF6 released per MMBTU consumed. This rate is applied to the electricity consumption of each community to estimate the release of SF6 attributable to the community.

Sources: US Energy Information Administration, Statewide Capacity Factors, 2023; NYS UER, 2024. US EIA, Energy Consumption Data, Table 7.1 Electricity Overview, 2024; US EPA, National Emissions Inventory, 2022.

Agriculture

Most agricultural emissions are from livestock—the digestive process of animals, like cows, and the decomposition of manure both produce methane, a potent GHG. Crop production generates emissions by plowing, which releases GHGs stored in the soil and using fertilizers, which release GHGs as they breakdown. The inventory estimates the scope 1 (in-boundary) emissions from agricultural activities in each community.

Agricultural emissions are estimated by applying county-level data from the USDA Agricultural Census (2022) the US EPA's State Inventory Tool to produce county-level emissions estimates. The enteric fermentation emissions are based on the number of livestock by type, according to the USDA Agricultural Census as of December 2022. Cropland emissions (from soils and fertilizers) are based on state default values provided by the US EPA Sit tool (2022), and information from the USDA Agricultural Census (2022) on the area of cropland using tilling practices, and the total amount of fertilizer applied on crops.

County-level emission estimates are then allocated to municipalities using information on agricultural land area in each community from tax parcel data. Emissions are allocated to municipalities based on the percentage of agricultural land in each municipality, found using 2023 NYS tax parcel data. Livestock emissions (manure and enteric fermentation) are based on the percentage of the region's livestock agricultural land (classified as dairy, beef, pig, sheep farms, etc.). Fertilizer and soil management emissions are allocated based on the percentage of regional farmland in each municipality.

Sources: USDA, National Agricultural Statistics Service, 2022 Census of Agriculture; Erie/Niagara County Tax Parcel data, 2024; NYS Tax Parcel data, 2023. US EPA's State Inventory Tool, 2024.

TABLE 1: Sources of GHG Emissions Included in the Inventory

SECTOR/SOURCE	SOURCE DESCRIPTION	SCOPE
Residential Energy		
Electricity	Indirect emissions due to the electricity consumed by residential buildings	2
Natural Gas	Direct emissions from the natural gas used in residential buildings	1
Propane LPG	Direct emissions from propane or liquefied petroleum gas in residential buildings	1
Distillate Fuel Oil	Direct emissions from distillate fuel oil (1, 2, 4) used in residential buildings	1
Coal	Direct emissions from coal used in residential buildings	1
Wood	Direct emissions from wood burned to heat residential buildings	1
Commercial Energy		
Electricity	Indirect emissions due to the electricity consumed by commercial buildings	2
Natural Gas	Direct emissions from the natural gas used in commercial buildings	1
Propane LPG	Direct emissions from propane or liquefied petroleum gas in commercial buildings	1
Distillate Fuel Oil	Direct emissions from distillate fuel oil (1, 2, 4) used in commercial buildings	1
Residual Fuel Oil	Direct emissions from residual fuel oil (5, 6) used in commercial buildings	1
Coal	Direct emissions from coal used in commercial buildings	1
Wood	Emissions from wood burned in commercial buildings	1
Industrial Energy		
Electricity	Direct emissions due to the electricity consumed by industrial buildings	2
Natural Gas	Direct emissions from the natural gas used in industrial buildings	1
Propane LPG	Direct emissions from propane or liquefied petroleum gas used in industrial buildings	1
Distillate Fuel Oil	Direct emissions from distillate fuel oil (1, 2, 4) used in industrial buildings	1
Residual Fuel Oil	Direct emissions from residual fuel oil (5, 6) used in industrial buildings	1
Coal	Emissions from coal used in industrial buildings	1
Wood	Indirect emissions from wood burned in industrial buildings	1
Energy Distribution (Transmission (T&D) Losses)		
Electric T&D Losses	Indirect emissions from energy losses in transmission of electricity	2
Natural Gas T&D Losses	Direct fugitive emissions of natural gas that leaks in distribution within the boundary.	1
Use of SF6	Direct fugitive emissions of SF6, a specialized coolant used in the utility industry.	1
Industrial Processes & Product Use		
Metal Manufacturing	Direct chemical process emissions (non-energy) from industrial production of metals.	1
Chemical Manufacturing	Direct chemical process emissions (non-energy) from manufacturing of chemicals.	1
Other Industrial Processes	Direct chemical process emissions (non-energy related) from other industries.	1
Industrial Processes Product Use	Direct emissions of PFC, HFCs (refrigerants), and NF3 in vehicles, buildings, and industry.	1
Transportation		
On-road Vehicles	Indirect (community-induced) emissions from fossil fuels burned by on-road vehicles	3
Commercial Rail	Direct (in-boundary) emissions from diesel burned by commercial freight rail.	1
Light Rail	Indirect emissions from electricity consumed to operate the light rail system.	1
Personal Marine	Indirect (community-induced) emissions from personal boats and marine vehicles.	3
Commercial Marine	Direct (in-boundary) emissions from commercial shipping vehicles.	1
Aircraft	Indirect (community-induced) emissions from commercial air travel.	3
Off-road	Direct emissions from off-road equipment (construction, agricultural, lawn, etc.).	1
Waste		
Solid Waste	Indirect emissions from decomposition of waste generated by a community.	3
Public Sewage Systems	Direct emissions from wastewater treatment plants within the boundary.	3
Septic Systems	Direct emissions from septic systems within the boundary.	1
Agriculture		
Enteric Fermentation	Direct emissions from enteric fermentation of livestock within the boundary.	1
Manure Management	Direct emissions from manure management within the boundary.	1
Use of Fertilizer	Direct emissions from the use of nitrogen-based fertilizers within the community.	1
Soil Management	Direct emissions from soil management practices (tilling, plowing) in the community.	1

NOTE: Adapted from the Geospatial GHG Accounting Framework in the NYS DEC'S 2015 New York Community and Regional GHG Inventory Guidance document.