Town of Owasco, New York
Municipal Operations and Community Greenhouse Gas Inventory Update

Compiled by the Central New York Regional Planning and Development Board

December 8, 2021

Town of Owasco

2 Bristol Ave

Auburn, NY 13021

This GHG inventory update was compiled by the Central New York Regional Planning and Development Board (CNY RPDB) in support of the Town's Climate Smart Communities and Clean Energy Communities efforts. Contributors include:

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I. Introduction

Background

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.

The Town of Owasco adopted the ten-element Climate Smart Communities Pledge as a commitment to greenhouse gas (GHG) emission reduction and climate change adaptation in December 2014, and it is working towards becoming a Bronze Certified Climate Smart Community. The Climate Smart Communities Certification program recognizes communities that have gone beyond the ten pledge elements by completing and documenting mitigation and adaptation actions at the local level. Certified communities are the foremost leaders in the state in terms of climate action. Communities can achieve certification at the Bronze, Silver, or Gold (currently in development) level.

As part of the town's efforts to become a Certified Climate Smart Community, the town decided to compile a community and municipal GHG inventory update using a baseline of 2019. 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. The original GHG inventory was completed for the town in July 2015 with a baseline of 2010, and their Climate Action Plan was completed in November 2015.

It is important to note that the information provided in this inventory is not meant to be exhaustive, but rather to provide an estimate of community and municipal emissions data at one snapshot in time, 2019. The inventory information will inform climate action planning efforts in the town moving forward. This inventory will act as a baseline for tracking and understanding trends associated with future GHG mitigation efforts.

For the municipal operations GHG inventory, energy used by buildings and facilities, streetlights, water and sewer, and the vehicle fleet were gathered for the 2019 year, and for the community GHG inventory, residential energy use, commercial/industrial energy use, transportation, waste generation, wastewater treatment, and agricultural information were gathered for the 2019 year. Methods of calculation explained in the U.S. Community Operations

Protocol[1] were utilized to generate emissions figures. Data was entered into the ClearPath[2] tool, outputs were aggregated into metric tons of CO_2 equivalent, and emissions were delineated by sector, source, and scope (for municipal emissions).

Climate Change and Greenhouse Gases

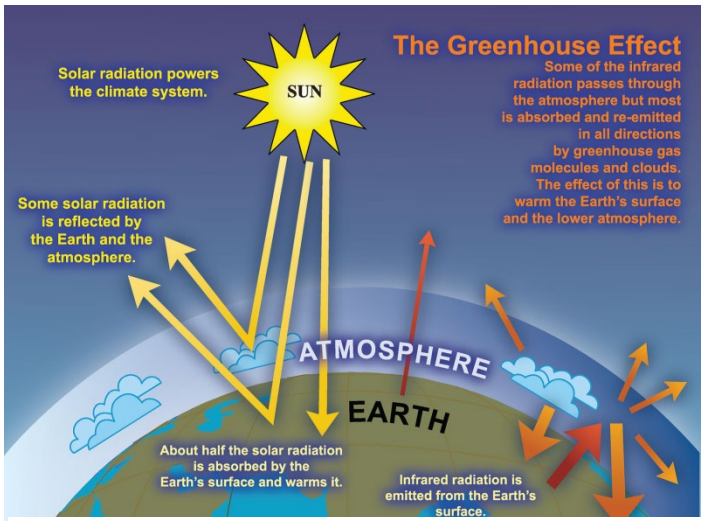


Figure 1: The Greenhouse Effect

Climate change is recognized as a global concern. Scientists have documented changes to the Earth's climate including the rise in global average temperatures, as well as sea levels, during the last century. An international panel of leading climate scientists, the Intergovernmental Panel on Climate Change (IPCC), was formed in 1988 by the World Meteorological Organization and the United Nations Environment Program to provide objective and up-to-date information regarding the changing climate. In its 2014 Fifth Assessment Report, the IPCC states that there is **a greater than 95 percent chance that rising global average temperatures, observed since the mid-20th century, are primarily due to human activities.**[3] Evidence of observed changes in extremes such as heatwaves, heavy precipitation, droughts, and tropical cyclones, and, in particular, their attribution to human influence, has strengthened since the Fifth Assessment Report, as noted in the Sixth Assessment Report AR6 Climate Change: The Physical Science Basis study published in August 2021.[4]

The rising trend of human-generated GHG emissions is a global threat. The increased presence of these gases affects the warming of the planet by contributing to the natural greenhouse effect, which warms the atmosphere and makes the earth habitable for humans and other species (see Figure 1).[5] Mitigation of GHGs is occurring in all sectors as a means of reducing the impacts of this warming trend. However, scientific models predict that some effects of climate change are inevitable no matter how much mitigative action is taken now. Therefore, climate mitigation actions must be paired with adaptation measures in order to continue efforts to curb emissions contributions to global warming, while adapting communities so that they are able to withstand

[1] The Local Government Operations Protocol and U.S. Community Operations Protocol were developed by ICLEI-Local Governments for Sustainability in order to provide "accounting for GHG emissions associated with local government operated buildings, vehicles, and other operations" and "detailed, cutting-edge guidance on completing a GHG emissions inventory at the community scale in the United States — including emissions from businesses, residents, and transportation," according to ICLEI's website.
[2] ClearPath is a proprietary tool developed by ICLEI-Local Governments for Sustainability to assist local governments with conducting greenhouse gas emissions inventories and with the development of local climate action plans.
[3] IPCC. 2014. Fifth Assessment Report. https://www.ipcc.ch/report/ar5/syr/
[4] IPCC. 2021. Sixth Assessment Report Headline Statements from the Summary for Policymakers. https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Headline_Statements.pdf
[5] IPCC Working Group. https://wg1.ipcc.ch/publications/wg1-ar4/faq/wg1_faq-1.3.html

climate change impacts and maintain social, economic, and environmental resilience in the face of uncertainty. Climate adaptation can take shape through infrastructure assessments and emergency planning, as well as through educational efforts to raise public awareness about potential climate change impacts.

New York State outlined projected climate impacts and vulnerabilities during the 2011 ClimAid assessment and 2014 supplement (ClimAid Report).[6] The ClimAid Report projects changes to ecosystems (e.g., increased presence of invasive species and shifts in tree composition), while water quality and quantity may also be impacted due to changes in precipitation. Potential beneficial economic impacts were also identified, such as a longer recreation season in the summer, and a longer growing season for the agricultural sector due to rising temperatures. Scientific evidence suggests that the impacts of global climate change will be different in various regions, and will include temperature shifts, more extreme heat events, sea level rise and coastal flooding, more frequent intense precipitation events, and human health risks.

We have already experienced the effects of a changing climate in New York State and abroad, [7] the need for climate action and adaptation is imperative. The goal of building community resilience in order to protect the health and livelihood of residents and natural systems serves as a motivating factor in the assessment of greenhouse gas contributions and effective sustainability planning.

New York State GHG Emissions and Climate Goals

According to the July 2019 *New York State Greenhouse Gas Inventory: 1990-2016* report prepared by the New York State Energy Research and Development Authority (NYSERDA), 2016 state emissions were equal to 206 million metric tons of carbon dioxide equivalent ($MMTCO_2e$), the majority of which came from energy-related sources (173 $MMTCO_2e$) compared to non-energy sources (33 $MMTCO_2e$).[8] Of the energy-related emissions sources, 36% were from transportation, 30% from on-site fuel combustion from buildings, 15% from electricity generation, and 3% from other sources such as fugitive emissions from fossil fuel infrastructure and incineration of municipal waste (see Figure 2).

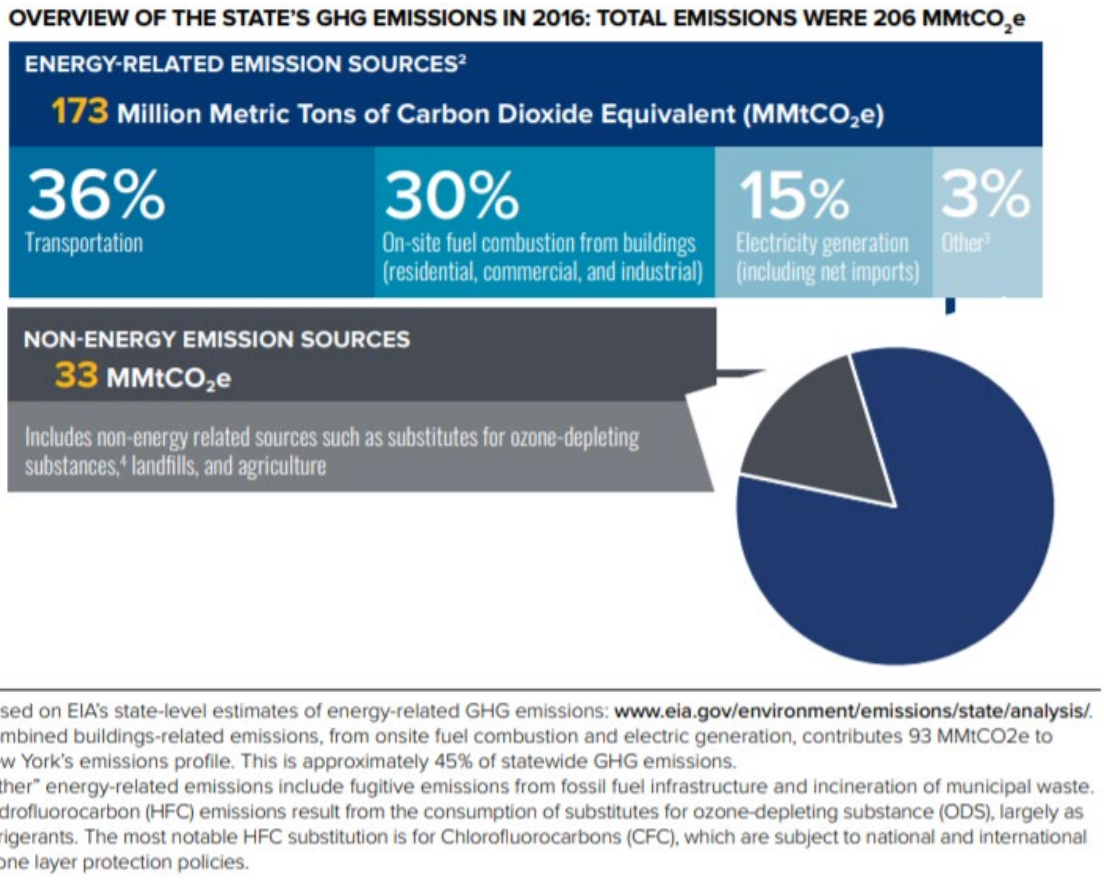
In July 2019, Governor Cuomo signed the **Climate Leadership and Community Protection Act** (CLCPA) into law. The CLCPA is New York State's ambitious emissions reduction plan with the goal of making electricity 70% renewable by 2030 and 100% carbon neutral by 2040, reducing GHG emissions 40% below 1990 levels by 2030 and 85% below 1990 levels by 2050,

[6] NYSERDA. 2014. Climate Change in New York State: Updating the 2011 ClimAID Climate Risk Information. https://www.nyserda.ny.gov/About/Publications/Research%20and%20Development%20Technical%20Reports/Environmental%20Research%20and%20Development%20Technical%20Reports/Response%20to%20Climate%20Change%20in%20New%20York

[7] NYSERDA. 2014. Climate Change in New York State: Updating the 2011 ClimAID Climate Risk Information. https://www.nyserda.ny.gov/About/Publications/Research%20and%20Development%20Technical%20Reports/Environmental%20Research%20and%20Development%20Technical%20Reports/Response%20to%20Climate%20Change%20in%20New%20York; and National Climate Assessment. 2014. Climate Change Impacts in the United States. https://nca2014.globalchange.gov/.

[8] NYSERDA. Greenhouse Gas Inventory Fact Sheet. https://www.nyserda.ny.gov/About/Publications/EA-Reports-and-Studies/Energy-Statistics.

implementing 6,000 MW of solar by 2025, 3,000 MW of energy storage by 2030, and 9,000 MW of offshore wind by 2035 (see Figure 3).



[1] Based on EIA's state-level estimates of energy-related GHG emissions: **www.eia.gov/environment/emissions/state/analysis/**.
[2] Combined buildings-related emissions, from onsite fuel combustion and electric generation, contributes 93 MMtCO2e to New York's emissions profile. This is approximately 45% of statewide GHG emissions.
[3] "Other" energy-related emissions include fugitive emissions from fossil fuel infrastructure and incineration of municipal waste.
[4] Hydrofluorocarbon (HFC) emissions result from the consumption of substitutes for ozone-depleting substance (ODS), largely as refrigerants. The most notable HFC substitution is for Chlorofluorocarbons (CFC), which are subject to national and international ozone layer protection policies.

Figure 2: Overview of the State's GHG Emissions in 2016

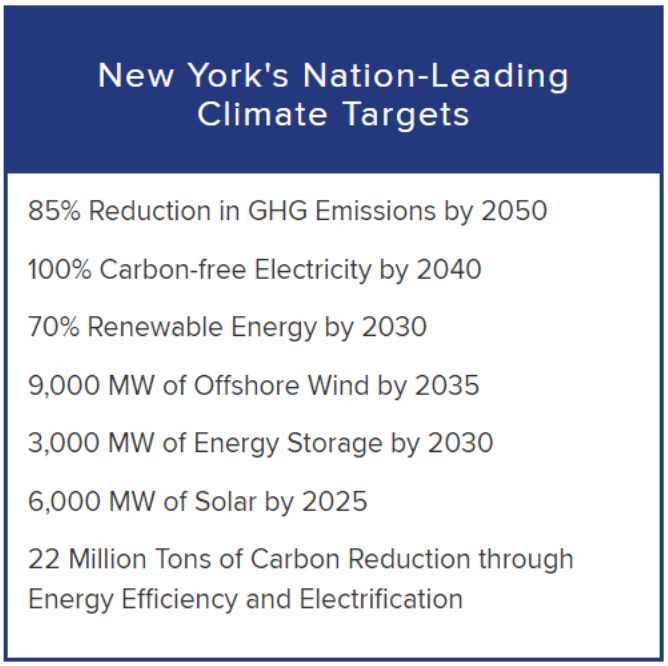


Figure 3: Overview of the CLCPA targets

The Purpose of a Greenhouse Gas Inventory

Many local governments have decided to gain a detailed understanding of how their emissions and their community's emissions are related to climate change and have committed to reducing GHG emissions at the local level. Local governments exercise direct control over their own operations and can lead by example by reducing energy usage in municipal facilities, using alternative fuels for their fleets, and investing in renewable energy sources. Local governments can also influence community-wide activities that contribute to climate change by improving building codes and standards, providing cleaner transportation options, and educating members of the community about their choices as consumers. Each local government is unique with its own set of opportunities, challenges, and solutions, and therefore climate action needs to be tailored to each community at the local level.

Because local governments typically contribute less than ten percent of the total greenhouse gas emissions generated in a given community, it is recommended that local governments develop both local government operations and community-wide greenhouse gas emissions inventories and reduction strategies[9]. Before concerted management and reduction of greenhouse gas emissions can occur within our local governments and communities, local governments must undertake measurement and analysis of all GHG sources. This report includes a GHG inventory update for both municipal operations and the community-at-large for the 2019 year.

It is important to note that this inventory represents an estimate of emissions for the Town of Owasco for the 2019 year, and that the purpose of this inventory is to gain a general baseline of emissions upon which the town can work from for climate action planning purposes. This

[9] ICLEI. 2012. U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions.

inventory includes a number of assumptions and estimations, and the methods used to establish this baseline will not necessarily be the same methods used to measure progress.

There are several major benefits to compiling emissions inventories:

1. **Fiscal benefits:** Developing climate and energy strategies can help reduce energy costs and save taxpayer dollars. Conducting a GHG emissions inventory will explain exactly how energy is being used and identify opportunities to become more efficient.

2. **Climate leadership:** By taking action now to address climate change, local governments and elected officials can be recognized for their leadership on climate and energy issues.

3. **Community benefits:** Measures to reduce GHG emissions and energy consumption typically have many co-benefits. They can improve air quality and public health, stimulate the local economy, create green jobs, and make communities more livable and walkable.

4. **Regulatory preparedness:** Taking action now will help your jurisdiction prepare for any future legislative requirements and position your local government for successful compliance.

Town Profile

The Town of Owasco is located in western Cayuga County. The town covers an area of approximately 23.5 square miles. According to the 2019 American Community Survey, the town has a population of about 3,656 residents, with 1,526 occupied housing units.

II. Data Collection and Analysis

For the municipal inventory update, information related to building and facilities, streetlights, water and sewer, and vehicle fleet were collected for the Owasco municipal operations for the 2019 year following the Local Government Operations Protocol. Specific data collection methods for each sector are explained within each section of this report.

For the community inventory update, information related to residential, commercial/industrial, transportation, waste, wastewater, and agriculture were collected for the Owasco community for the 2019 year following the U.S. Community Protocol. Specific data collection methods for each sector are explained within each section of this report.

The ICLEI ClearPath tool was utilized to convert the information into emissions data measured in metric tons of carbon dioxide equivalent ($MTCO_2e$). The online tool streamlines the process of converting different sources, units, and varieties of emissions into comparable energy use and emissions figures.

Reporting

The three most prevalent greenhouse gases, and therefore the focus of this analysis, are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). The unit used to discuss these gases in

aggregate is carbon dioxide equivalent (CO_2e), which is a conversion based on each gas's Global Warming Potential (GWP), or the impact of 1 unit of each gas in the atmosphere compared to 1 unit of CO_2 (see Table 1). This inventory uses the 20-year GWP values published by the IPCC's 5th Assessment Report. A discussion of emissions using the IPCC's 4th Assessment Report is also included later in this report since these were the GWPs used in the 2015 inventory report.

Greenhouse Gas (GHG)	Global Warming Potential (GWP)
Carbon Dioxide (CO_2)	1
Methane (CH_4)	85
Nitrous Oxide (N_2O)	264

Table 1: IPCC 5th Assessment 20-year Global Warming Potential Values

Emissions are reported by sector and source in the community inventory update and also by scope for the municipal update. Sectors are included or excluded in the boundaries of GHG inventories based on availability of data, relevance to emissions totals, and scale to which they can be changed. The municipal inventory update includes emissions for the buildings and facilities, streetlights, water delivery facilities, and vehicle fleet sector. The community inventory update includes emissions for the residential, commercial/industrial, transportation, waste, and wastewater sectors. Commercial and industrial sectors are combined due to availability of data from the Utility Energy Registry (UER), which combines commercial/industrial electricity and natural gas use into what it refers to as the "business" sector. Emissions data is also reported by source, including electricity, natural gas, fuel oil, propane, gasoline, and diesel.

III. Municipal Operations Emissions Inventory

Overall Results

In 2019, the Town of Owasco's municipal emissions totaled 309 $MTCO_2e$. The vehicle fleet sector contributed to the largest percentage of emissions, accounting for 144 $MTCO_2e$, or 47% of the government's total emissions. Water and sewer was the second largest emitting sector, producing 95 $MTCO_2e$, or 31% of total municipal emissions, followed by the buildings and facilities sector, which produced 57 $MTCO_2e$, or 18% of total emissions, and the streetlights and traffic signals sector, which produced 13 $MTCO_2e$, or 4% of total emissions.

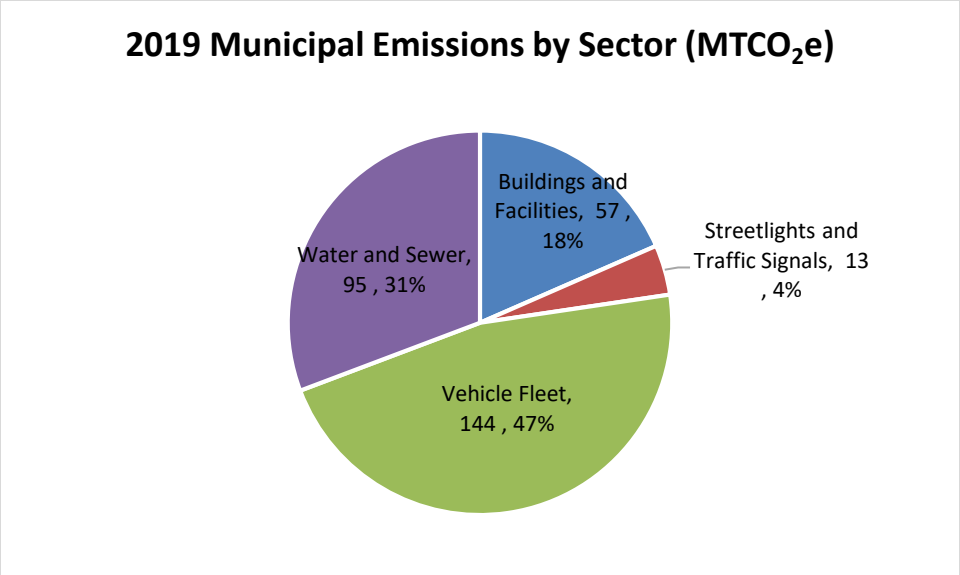


Figure 4: 2019 Municipal Emissions by Sector

The largest source of municipal emissions in the Town of Owasco in 2019 was diesel, accounting for 100 $MTCO_2e$, or 32% of all community emissions. Natural gas was also a large emitting source, producing 91 $MTCO_2e$ (30%).

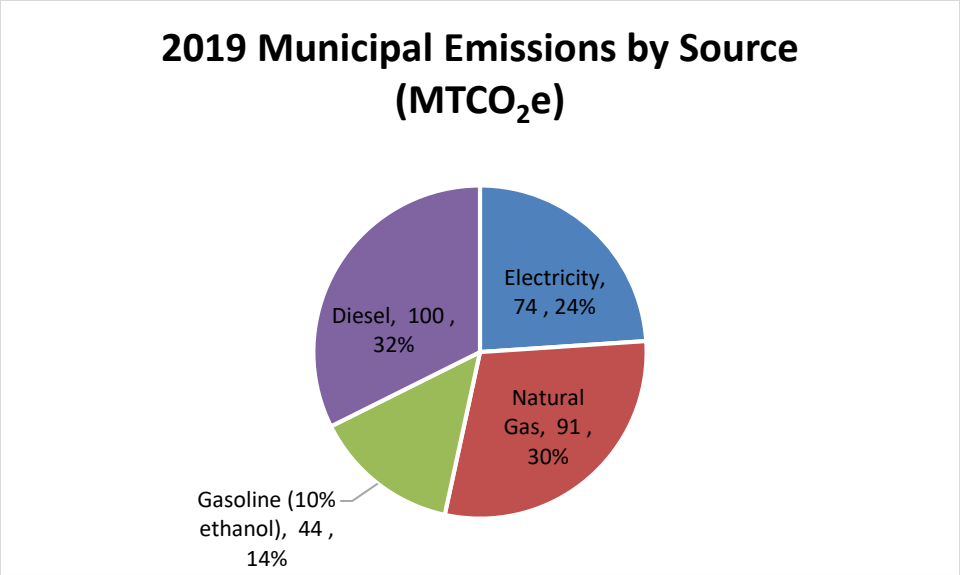


Figure 5: 2019 Municipal Emissions by Source

The majority (76%) of municipal emissions were scope 1 emissions. **Scope 1 emissions** are those that are directly emitted by the government onsite, including stationary combustion and vehicle fleet emissions. **Scope 2 emissions** are those that are indirectly emitted by the

government through energy created elsewhere, such as electricity. **Scope 3 emissions** are other indirect emissions not included in scope 2, such as emissions from wastewater, solid waste processes, or employee commute. Scope 3 emissions were not included in this inventory update primarily due to lack of data.

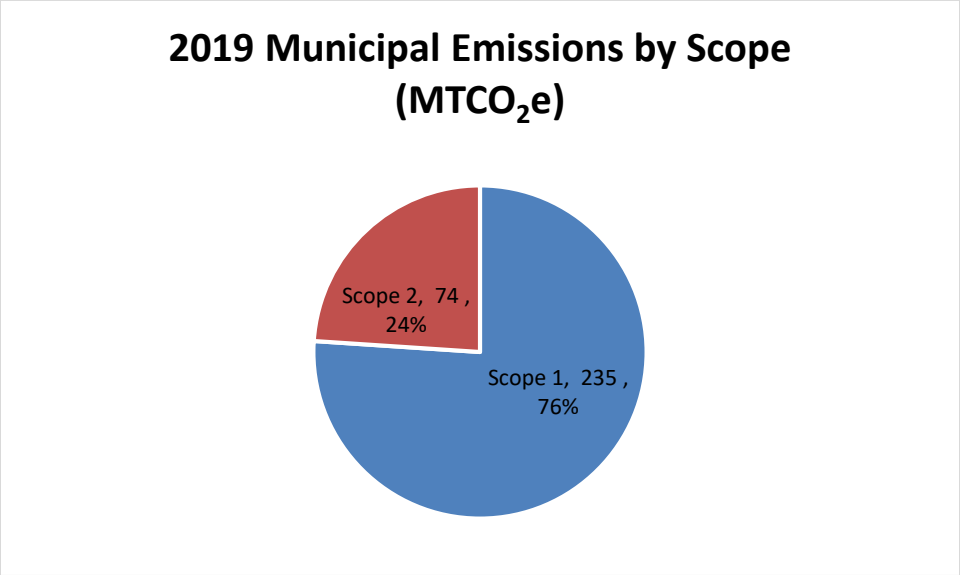


Figure 6: 2019 Municipal Emissions by Scope

Buildings and Facilities

Methods and inputs

Building and facility electricity and natural gas usage for 2019 was collected using National Grid bills. This sector includes all municipal accounts that are not streetlights or related to water or sewer facilities. There was no propane or fuel oil used in this sector in 2019.

Building and facility energy uses were entered into ClearPath using standard emissions factors[10] for natural gas, and the Environmental Protection Agency (EPA)'s Emissions & Generation Resource Integrated Database (eGRID) factors for NPCC Upstate NY from 2019 were used for electricity emissions calculations (see Table 2 below).[11]

[10] The ClearPath tool provides standard emissions factors that were developed by ICLEI and are described in the Local Government Operations Protocol, Appendix G.
[11] US EPA. Emissions & Generation Resource Integrated Database (eGRID). https://www.epa.gov/egrid/summary-data.

1. Subregion Output Emission Rates (eGRID2019)																
eGRID subregion acronym	eGRID subregion name	Total output emission rates lb/MWh							Non-baseload output emission rates lb/MWh							Grid Gross Loss (%)
		CO_2	CH_4	N_2O	CO_2e	Annual NO_x	Ozone Season NO_x	SO_2	CO_2	CH_4	N_2O	CO_2e	Annual NO_x	Ozone Season NO_x	SO_2	
AKGD	ASCC Alaska Grid	1,114.4	0.098	0.013	1,120.8	6.2	6.1	0.7	1,333.0	0.123	0.017	1,341.0	6.6	6.7	0.8	5.4%
AKMS	ASCC Miscellaneous	549.3	0.026	0.004	551.3	8.1	7.8	0.7	1,520.2	0.067	0.012	1,525.4	22.6	22.8	2.0	5.4%
AZNM	WECC Southwest	952.3	0.068	0.010	956.9	0.6	0.6	0.2	1,445.3	0.100	0.014	1,451.9	0.9	0.9	0.3	5.1%
CAMX	WECC California	453.2	0.033	0.004	455.3	0.4	0.4	0.0	964.0	0.058	0.007	967.6	0.8	0.8	0.1	5.1%
ERCT	ERCOT All	868.6	0.057	0.008	872.4	0.5	0.5	0.6	1,277.2	0.083	0.012	1,282.7	0.9	0.8	0.9	5.1%
FRCC	FRCC All	861.0	0.055	0.007	864.5	0.3	0.3	0.2	1,029.5	0.054	0.007	1,033.0	0.3	0.3	0.2	5.1%
HIMS	HICC Miscellaneous	1,185.6	0.143	0.022	1,195.6	8.1	8.4	4.1	1,549.5	0.107	0.018	1,557.6	12.3	12.8	5.3	5.5%
HIOA	HICC Oahu	1,694.5	0.185	0.028	1,707.6	3.7	4.1	7.0	1,704.1	0.158	0.025	1,715.6	4.5	4.6	8.1	5.5%
MROE	MRO East	1,502.6	0.147	0.022	1,512.6	0.8	0.9	0.4	1,577.7	0.145	0.021	1,587.4	0.8	0.9	0.4	5.1%
MROW	MRO West	1,098.4	0.119	0.017	1,106.4	0.8	0.8	1.1	1,806.8	0.188	0.027	1,819.6	1.4	1.3	1.7	5.1%
NEWE	NPCC New England	488.9	0.077	0.010	493.8	0.3	0.3	0.1	839.9	0.089	0.012	845.5	0.4	0.4	0.1	5.1%
NWPP	WECC Northwest	715.2	0.068	0.010	719.9	0.6	0.6	0.4	1,617.5	0.156	0.022	1,628.1	1.6	1.5	0.9	5.1%
NYCW	NPCC NYC/Westchester	553.8	0.021	0.002	555.1	0.2	0.2	0.0	1,016.2	0.022	0.002	1,017.5	0.4	0.4	0.0	5.1%
NYLI	NPCC Long Island	1,209.0	0.157	0.020	1,218.9	0.9	0.9	0.2	1,300.6	0.044	0.005	1,303.3	0.8	0.8	0.2	5.1%
NYUP	NPCC Upstate NY	232.3	0.017	0.002	233.0	0.1	0.1	0.0	890.2	0.047	0.006	892.6	0.4	0.4	0.2	5.1%
PRMS	Puerto Rico Miscellaneou	1,537.3	0.084	0.013	1,543.3	3.5	3.9	3.2	1,587.9	0.055	0.010	1,592.3	4.5	5.1	5.0	0.0%
RFCE	RFC East	695.0	0.053	0.007	698.5	0.3	0.3	0.3	1,237.9	0.089	0.012	1,243.8	0.7	0.6	0.7	5.1%
RFCM	RFC Michigan	1,189.3	0.114	0.016	1,197.0	0.7	0.7	1.0	1,766.9	0.177	0.025	1,778.8	1.2	1.2	2.1	5.1%
RFCW	RFC West	1,067.7	0.099	0.014	1,074.4	0.8	0.6	0.7	1,831.6	0.178	0.026	1,843.7	1.5	1.1	1.3	5.1%
RMPA	WECC Rockies	1,242.6	0.117	0.017	1,250.6	0.7	0.6	0.4	1,578.8	0.126	0.018	1,587.3	0.8	0.8	0.4	5.1%
SPNO	SPP North	1,070.0	0.112	0.016	1,077.6	0.6	0.6	0.2	1,958.6	0.200	0.029	1,972.2	1.1	1.2	0.4	5.1%
SPSO	SPP South	1,002.0	0.070	0.010	1,006.7	0.7	0.8	0.8	1,543.7	0.108	0.015	1,550.9	1.2	1.2	1.3	5.1%
SRMV	SERC Mississippi Valley	806.8	0.043	0.006	809.6	0.6	0.6	0.7	1,200.1	0.068	0.010	1,204.7	0.9	1.0	1.4	5.1%
SRMW	SERC Midwest	1,584.4	0.169	0.025	1,595.9	1.0	0.8	2.4	1,960.9	0.216	0.031	1,975.6	1.2	1.1	2.8	5.1%
SRSO	SERC South	969.2	0.071	0.010	974.0	0.4	0.4	0.2	1,389.5	0.101	0.015	1,396.4	0.8	0.7	0.4	5.1%
SRTV	SERC Tennessee Valley	949.7	0.087	0.013	955.6	0.5	0.5	0.6	1,565.2	0.139	0.020	1,574.6	0.7	0.8	0.9	5.1%
SRVC	SERC Virginia/Carolina	675.4	0.058	0.008	679.1	0.3	0.4	0.2	1,349.2	0.118	0.017	1,356.9	0.7	0.8	0.4	5.1%
U.S.		**884.2**	**0.075**	**0.011**	**889.2**	**0.6**	**0.6**	**0.5**	**1,420.2**	**0.114**	**0.016**	**1,427.8**	**1.0**	**0.9**	**0.9**	**5.1%**

Created: 2/23/2021

Table 2: eGRID2019 Summary Table: Subregion Emissions

Results

Building and facilities electricity consumption in 2019 was 74,548 kWh and natural gas consumption was 9,112 therms. Building and facilities emissions from electricity in 2019 were 8 $MTCO_2e$; emissions from natural gas were 49 $MTCO_2e$. Overall building and facilities emissions in 2019 were 57 $MTCO_2e$.

Streetlights and Traffic Signals

Methods and inputs

Streetlights and Traffic Signals electricity for 2019 was collected using National Grid bills. Streetlight energy use was entered into ClearPath using eGRID 2019 factors.

Results

Streetlights and Traffic Signals electricity consumption in 2019 was 121,937 kWh, a total of 13 $MTCO_2e$.

Water and Sewer Facilities

Methods and inputs

Water and sewer facilities electricity and natural gas usage for 2019 was collected using National Grid bills. This sector includes all municipal accounts that are related to water and sewer facilities, including pump stations and the water department building on E Lake Road.

Water and sewer facilities energy uses were entered into ClearPath using standard emissions factors for natural gas and the eGRID 2019 factors.

Results

Water and sewer facilities electricity consumption in 2019 was 501,180 kWh (53 $MTCO_2e$), and natural gas use totaled 7,813 therms (42 $MTCO_2e$). Water Delivery Facilities emissions totaled 95 $MTCO_2e$.

Vehicle Fleet

Methods and inputs

Gasoline and diesel fuel use for 2019 was collected from the Town of Owasco and entered into ClearPath using standard emissions factors for diesel. Gasoline was entered into ClearPath assuming a standard 10% ethanol blend.[12]

Results

Vehicle fleet gasoline consumption in 2019 was 5,575.78 gallons (44 $MTCO_2e$), and diesel use totaled 9,807.06 gallons (100 $MTCO_2e$). Vehicle Fleet emissions totaled 144 $MTCO_2e$ in 2019.

IV. Community Emissions Inventory

Overall Results

In 2019, the Town of Owasco's community emissions totaled 1,074,550 $MTCO_2e$; however, since agricultural emissions represent about 98% of these emissions, we have removed agricultural emissions to focus on the other sectors for the purposes of this discussion. The Agricultural sector will be discussed later.

Total emissions not including agriculture equaled 24,905 $MTCO_2e$. The residential energy sector contributed to the largest percentage of emissions, accounting for 11,169 $MTCO_2e$, or 45% of the community's total emissions outside of agriculture. Transportation was the next highest emitting sector, producing 7,557 $MTCO_2e$, or 30% of total community emissions, followed by the waste sector, which emitted 3,573 $MTCO_2e$, or 14% of emissions. The commercial/industrial energy use sector produced 2,266 $MTCO_2e$, or 9% of total emissions, followed by the wastewater sector which contributed 340 $MTCO_2e$, or 2% of emissions.

[12] The gasoline entry in ClearPath was entered as ethanol with 10% biofuel to account for the typical 10% ethanol blend.

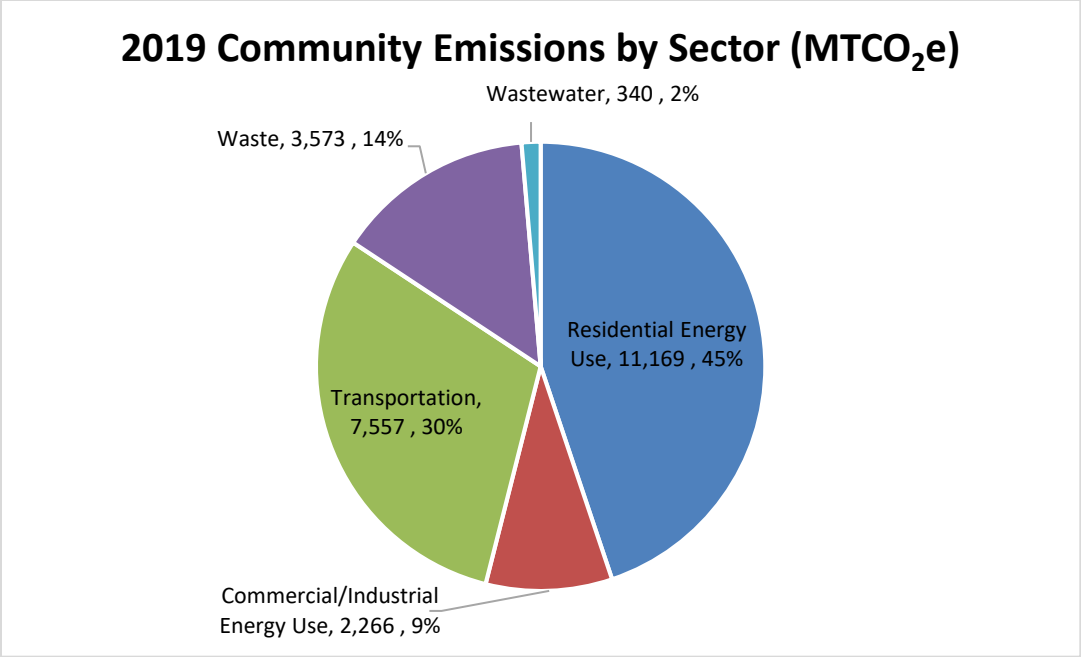


Figure 7: 2019 Community Emissions by Sector

The largest source of community emissions in the Town of Owasco in 2019 was natural gas, accounting for 9,978 $MTCO_2e$, or 40% of all community emissions. Gasoline was also a large emitting source, producing 5,340 $MTCO_2e$ (22%).

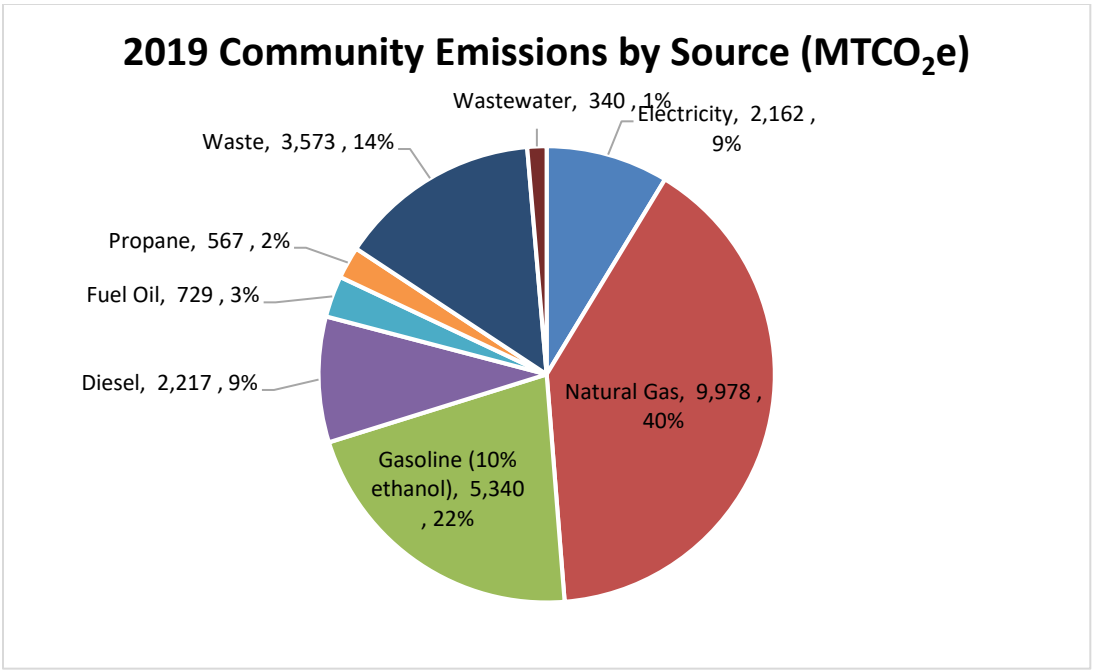


Figure 8: 2019 Community Emissions by Source

Residential Sector

Methods and inputs

Residential electricity and natural gas usage for 2019 was collected using the Utility Energy Registry (UER), which was developed pursuant to the Order Adopting the Utility Energy Registry, issued by the New York State Public Service Commission on April 20, 2018. The UER "standardizes and crowdsources data directly from utilities," and "was developed by NYSERDA to provide local communities data they need to develop greenhouse gas (GHG) inventories and to track progress towards climate goals."[13] Most of the Town of Owasco's residential natural gas data has been withheld for 2019 due to privacy screens built into the UER, however, so data from neighboring communities was used to estimate residential natural gas usage within the Town.

Residential propane and fuel oil use were compiled using the 2019 American Community Survey 5-Year Estimates tables for Selected Housing Characteristics which indicate house heating fuels within the Town of Owasco. This information was compared to New York State data for household heating fuel, also from the 2019 American Community Survey 5-Year Estimates tables, and amount/type of fuel consumed within the state (according to the US Energy Information Administration (EIA)'s 2019 Residential Energy Consumption Estimates)[14] to calculate estimated heating fuel use within Town of Owasco homes.

Residential energy uses were entered into ClearPath using standard emissions factors[15] for natural gas, propane, and fuel oil. eGRID factors for NPCC Upstate NY from 2019 were used for electricity emissions calculations (as explained above).[16]

Results

Residential electricity consumption in 2019 was 15,928,913 kWh; residential natural gas consumption was estimated at 1,590,606 therms; residential propane consumption was estimated at 7,178 MMBtu; and residential fuel oil consumption was estimated at 6,946 MMBtu. Residential emissions from electricity in 2019 were 1,693 $MTCO_2e$; emissions from residential natural gas were 8,505 $MTCO_2e$; emissions from propane were 450 $MTCO_2e$; and emissions from fuel oil were 521 $MTCO_2e$. Overall residential emissions in 2019 were 11,169 $MTCO_2e$.

[13]NYSERDA. Utility Energy Registry. https://utilityregistry.org/app/#/
[14]US EIA. State Energy Data System (SEDS): 1960-2019. https://www.eia.gov/state/seds/seds-data-complete.php#Consumption
[15] The ClearPath tool provides standard emissions factors that were developed by ICLEI and are described in the Local Government Operations Protocol, Appendix G.
[16] US EPA. Emissions & Generation Resource Integrated Database (eGRID). https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid.

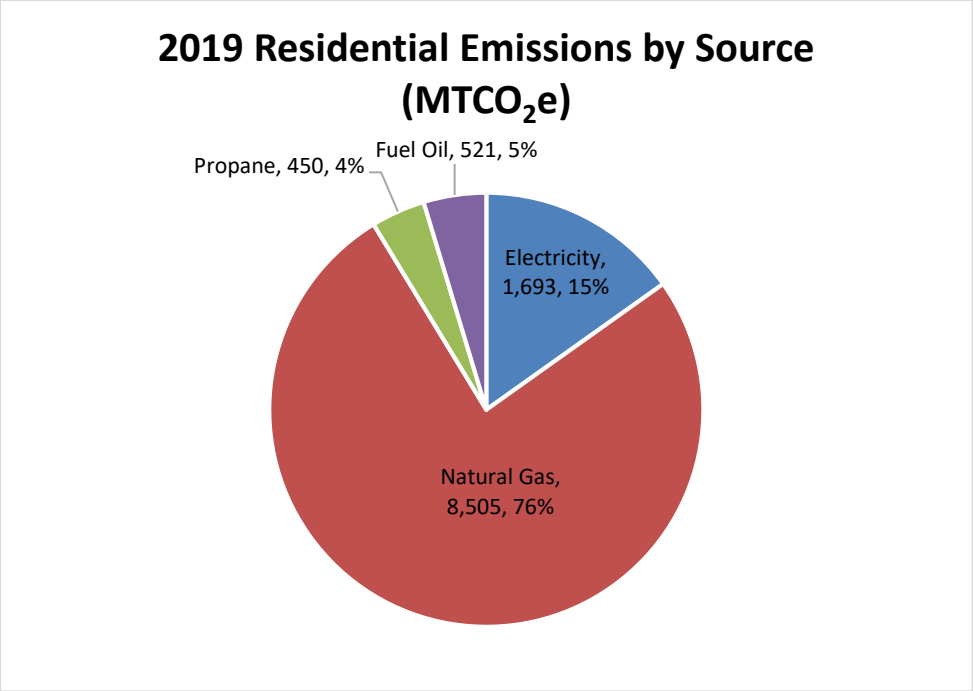


Figure 9: 2019 Residential Emissions by Source

Commercial/Industrial Sector

Methods and inputs

Commercial/industrial electricity and natural gas usage for 2019 were gathered from the National Grid UER data for 2019, under the Business field (which includes non-residential customers).

Commercial/industrial propane and fuel oil use were estimated by assuming the proportion of residential homes using propane and fuel oil within the Town of Owasco is equal to the proportion of commercial square footage within the Town of Owasco using propane and fuel oil.

The proportion of residential homes using propane and fuel oil was determined from the 2019 American Community Survey 5-Year Estimates tables for Selected Housing Characteristics, which indicate house heating fuels within the Town of Owasco, compared to total occupied housing units within the town. These ratios were multiplied by the estimated commercial square footage within the Town of Owasco to come up with the estimated commercial/industrial space within the town that uses fuel oil and propane.

Commercial/industrial square footage in the Town of Owasco was estimated using commercial floor space per worker from the US EIA's Commercial Buildings Energy Consumption Survey (CBECS) information for 2012 (this was the most recent year with data available),[17] multiplied by the total number of nonfarm workers in the Town of Owasco according to the American Community Survey 2019 5-year tables for Occupation by Sex for the Civilian Employed

[17] US EIA. Commercial Buildings Energy Consumption Survey (CBECS). https://www.eia.gov/consumption/commercial/data/2012/#b1-b2

Population 16 Years and Over (including all employed minus natural resources, construction, and maintenance occupations).

Commercial square footage in the Town of Owasco using fuel oil and propane were then compared to commercial square footage using fuel oil and propane within New York State. Total commercial floor space within New York was calculated using EIA's Commercial Buildings Energy Consumption Survey (CBECS) for 2012 (this was the most recent year with data available),[18] multiplied by the total number of nonfarm workers as per the American Community Survey 2019 5-year tables for Occupation by Sex for the Civilian Employed Population 16 Years and Over (including all employed minus natural resources, construction, and maintenance occupations) for New York State. Owasco commercial/industrial space using fuel oil and propane were then compared to the statewide proportion of households using fuel oil and propane from the statewide American Community Survey. That ratio was then multiplied by the total fuel use within New York State (from the EIA's State Energy Data System (SEDS) 2019 report)[19] to come up with the total commercial/industrial fuel oil and propane use within the Town of Owasco. These calculations are explained in detail within the CNY RPDB's data collection and analysis workbooks for this inventory.

Commercial energy uses were entered into ClearPath using the default emissions factors for natural gas, propane, and fuel oil.[20] Similar to the residential electric analysis, the EPA's eGRID factors from 2019 was used for electricity emissions calculations for the commercial/industrial sector.[21]

Results

Commercial/industrial electricity consumption in 2019 was 4,416,144 kWh; commercial/industrial natural gas consumption was 275,406 therms; commercial/industrial propane consumption was estimated at 1,860 million British Thermal Units (MMBtu); and commercial/industrial fuel oil consumption was 2,766 MMBtu. Commercial/industrial emissions from electricity in 2019 were 469 $MTCO_2e$; emissions from commercial/industrial natural gas were 1,473 $MTCO_2e$; emissions from propane were 117 $MTCO_2e$; and emissions from fuel oil were 208 $MTCO_2e$. Total emissions from the commercial/industrial sector in 2019 were 2,169 $MTCO_2e$.

[18] US EIA. Commercial Buildings Energy Consumption Survey (CBECS). https://www.eia.gov/consumption/commercial/data/2012/#b1-b2

[19] US EIA. State Energy Data System (SEDS): 1960-2019. https://www.eia.gov/state/seds/seds-data-complete.php#Consumption.

[20] The ClearPath tool provides standard emissions factors that were developed by ICLEI and are described in the Local Government Operations Protocol, Appendix G.

[21] US EPA. Emissions & Generation Resource Integrated Database (eGRID). https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid.

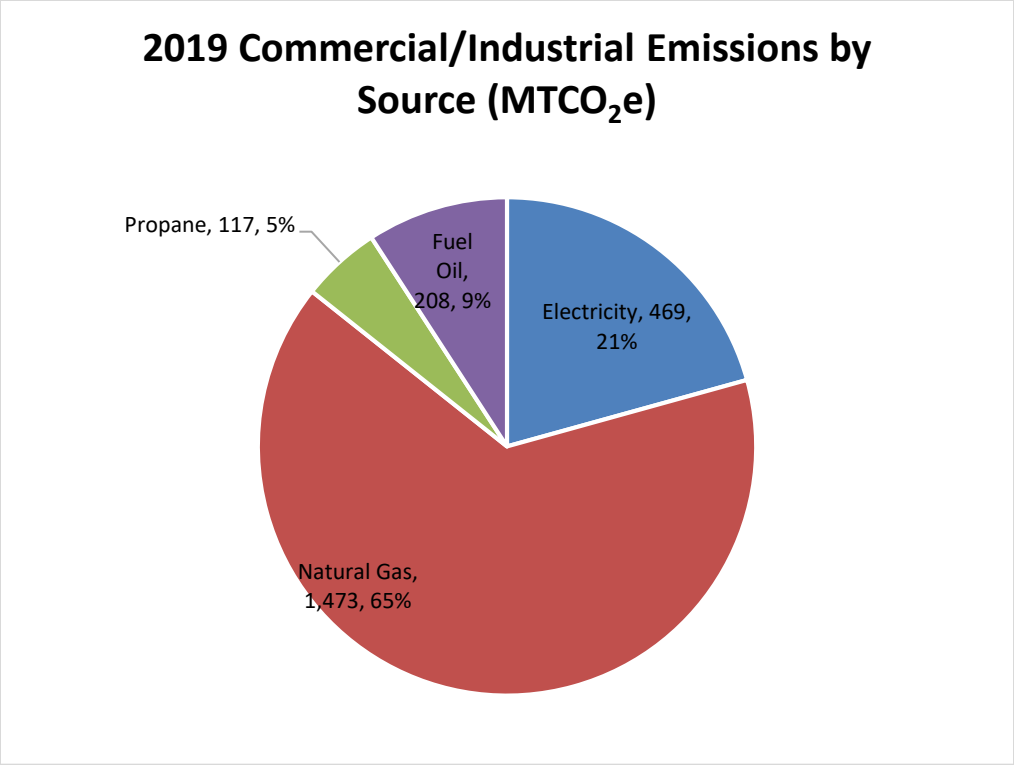


Figure 10: 2019 Commercial/Industrial Emissions by Source

Transportation Sector

Methods and inputs

Transportation emissions were estimated using estimated annual vehicle miles traveled (AVMT), 2019 U.S. National Default emissions factors (updated 2021 – see Table 3 below)[22], and estimates for percentage of vehicle types.[23] Transportation emissions were broken down for diesel and gasoline, assuming a standard 10% ethanol blend in gasoline.[24]

AVMT for 2019 was calculated by multiplying available Annual Average Daily Traffic (AADT) counts from 2019 by road lengths within the Town of Owasco and multiplying total daily VMT by 365 days per year.[25]

[22] As per Eli Yewdall at ICLEI, "The default vehicle factor sets are derived from EIA data for fuel economy, and EPA emissions factors for CH4 and N2O. Because EPA publishes factors by model year, we had to convert those to represent the average mix of new and old vehicles on the road in a particular year; we did this using data from the US National GHG inventory."

[23] As provided by Eli Yewdall at ICLEI: Gasoline passenger vehicles: 68.6% Deisel passenger vehicles: 0.3% Gasoline light trucks: 19.7% Deisel light trucks: 0.8% Gasoline heavy trucks: 1.4% Deisel heavy trucks: 8.5%

[24] The gasoline entry in ClearPath was entered as ethanol with 10% biofuel to account for the typical 10% ethanol blend.

[25] AADT and road segment length GIS data provided by the NYSDOT Highway Data Services Bureau. These traffic counts include all traffic within the town, including pass-through traffic where the origin and destination of trips

* Name	2019 US National Defaults (updated 2021)
Year	2019
Gas Passenger Vehicle Fuel Economy (MPG)	24.1
Gas Passenger Vehicle g CH4/mi	0.0183
Gas PassengerVehicle g N2O/mi	0.0083
Gas Light Truck Fuel Economy (MPG)	17.6
Gas Light Truck g CH4/mi	0.0193
Gas Light Truck g N2O/mi	0.0148
Gas Heavy Truck Fuel Economy (MPG)	5.371652
Gas Heavy Truck g CH4/mi	0.0785
Gas Heavy Truck g N2O/mi	0.0633
Gas Transit Bus Fuel Economy (MPG)	17.6
Gas Transit Bus g CH4/mi	0.0193
Gas Transit Bus g N2O/mi	0.0148
Gas Para Transit Bus Fuel Economy (MPG)	17.6
Gas Para Transit Bus g CH4/mi	0.0193
Gas Para Transit Bus g N2O/mi	0.0148
Gas Motorcycle Fuel Economy (MPG)	24.1
Gas Motorcycle g CH4/mi	0.0183
Gas Motorcycle g N2O/mi	0.0083
Electric Vehicle Fuel Economy (MPGe)	
Diesel Passenger Vehicle Fuel Economy (MPG)	24.1
Diesel Passenger Vehicle g CH4/mi	0.0005
Diesel PassengerVehicle g N2O/mi	0.001
Diesel Light Truck Fuel Economy (MPG)	17.6
Diesel Light Truck g CH4/mi	0.001
Diesel Light Truck g N2O/mi	0.0015
Diesel Heavy Truck Fuel Economy (MPG)	6.392468
Diesel Heavy Truck g CH4/mi	0.0051
Diesel Heavy Truck g N2O/mi	0.0048
Diesel Transit Bus Fuel Economy (MPG)	17.6
Diesel Transit Bus g CH4/mi	0.001
Diesel Transit Bus g N2O/mi	0.0015
Diesel Para Transit Bus Fuel Economy (MPG)	17.6
Diesel Para Transit Bus g CH4/mi	0.001
Diesel Para Transit Bus g N2O/mi	0.0015
Diesel Motorcycle Fuel Economy (MPG)	24.1
Diesel Motorcycle g CH4/mi	0.0005
Diesel Motorcycle g N2O/mi	0.001

Table 3: 2019 US National Default Transportation Emissions

occur outside of the town's boundaries. These trips will be more difficult to address in climate action planning than the trips that begin and/or end within the town.

AADT counts were primarily only available for main arteries; therefore, additional calculations for AADT were needed to estimate AVMT for local/collector roads, as well as some main arteries that do not have AADTs available. The total length of roads in Owasco with traffic counts is 17.435 miles, while 45.402 miles of roads do not have AADT counts available.

According to the *Minimum Maintenance Standards Regulation 239/02*, a set of guidelines produced by the Association of Municipalities of Ontario to help local communities estimate traffic volume, while conducting an AADT count, it is possible to estimate the traffic volume for dead-ends and cul-de-sacs to avoid resource intensive counts. This is done by multiplying the number of houses on the roadway by a factor of 6 for rural areas.[26]

This method was applied to the Town of Owasco for the roads without AADT counts since most of these roads were local/collector roads. It was determined that there were 1,526 occupied households in the Town of Owasco in 2019, according to the American Community Survey. It was assumed that all homes are on roadways that do not have a count, since most houses are on local/collector roads. By multiplying the number of occupied homes by 6, a combined AADT count of 9,156 was calculated for all 45.402 miles of roads without AADT counts available. In order to calculate VMTs, an average AADT value was needed, and derived by dividing the total AADT by the 45.402 miles of uncounted roadway. This gave an average AADT value of 201.7 for 2019, which was applied to all roadways that did not have a count.

Results

AVMT for roads with AADT counts available in 2019 totaled 12,289,067, while AVMT for roads without AADT counts available in 2019 totaled 3,341,940. Total AVMT in 2019 was 15,631,007.

BeginDescr	EndDescrip	RoadwayNam	Calculatio	AADT	RCSTAYearD	Length_Mi	VMT
CAYUGA CO LINE - 2ND TIME	CR 61C ROCKEFELLER RD		2019	1534	310002, 2019, CT	2.830060	4341.31
NY 38A	T/L	ROCKEFELLER RD	2019	964	315084, 2019, CT	1.357580	1308.71
OWASCO ST	SOUTH SEWARD	HAVENS AVE	2019	1819	314011, 2019, CT	0.140766	256.05
US 20	OWASCO TL	BEECH RD	2019	400	315024, 2019, CT	0.000077	0.03
RT 437	AUBURN CL		2019	6241	310032, 2019, CT	1.540000	9611.14
RT 38 CAYUGA CO	RT 38A END RT 437		2019	5429	310058, 2019, CT	0.120471	654.04
MELROSE RD	MELROSE RD	MELROSE PKWY	2019	116	315014, 2019, CT	0.239983	27.84

[26] http://www.townshipsofheadclaramaria.ca/download.php?dl=YToyOntzOjI6ImlkIjtzOjI6Ijg1IjtzOjM6ImtleSI7aTo0O30=

BeginDescr	EndDescrip	RoadwayNam	Calculatio	AADT	RCSTAYearD	Length_Mi	VMT
BRAE RIDGE RD	OAKRIDGE RD	BROOKSHIRE LA	2019	322	315013, 2019, CT	0.079992	25.76
RT 20 E GENESEE ST	S FULTON ST	OWASCO ST	2019	9996	310356, 2019, CT	0.001081	10.80
AUBURN CL	RT 20 END RT 38A	OWASCO ST	2019	9996	310356, 2019, CT	0.009047	90.43
CR 61C ROCKEFELLER RD	RT 437		2019	3493	310355, 2019, CT	3.829770	13377.39
NY 38A	CR 73	MELROSE RD	2019	1469	315086, 2019, CT	1.009960	1483.63
CR 74	NY 38A	MARTIN RD	2019	126	316070, 2019, CT	2.247180	283.14
CR 164	NY 38A	NORTH RD	2019	433	316069, 2019, CT	3.350540	1450.78
MELROSE RD	SENNETT TL	TOWN HALL RD	2019	1105	316020, 2019, CT	0.675973	746.95
NY 41A	CAYUGA CO LN	ANDREWS RD	2019	281	332211, 2019, CT	0.002382	0.67
						Daily VMT total	33,668.68
						365 days	365.00
						Annual VMT	12,289,066.66

Table 4: 2019 Town of Owasco Traffic Data for Road Segments with Available AADT

# occupied housing units:	1,526
Total AADT for roads not accounted for above:	9,156
Days per year:	365
Average AADT for roads not accounted for above:	201.7
Total Annual VMT for manually calculated roads:	**3,341,940**

Table 5: 2019 Town of Owasco Traffic Data for Road Segments without Available AADT

Emissions from transportation in the Town of Owasco in 2019 totaled 7,557 $MTCO_2e$, with 5,340 $MTCO_2e$ from gasoline (10% ethanol) and 2,217 $MTCO_2e$ from diesel.

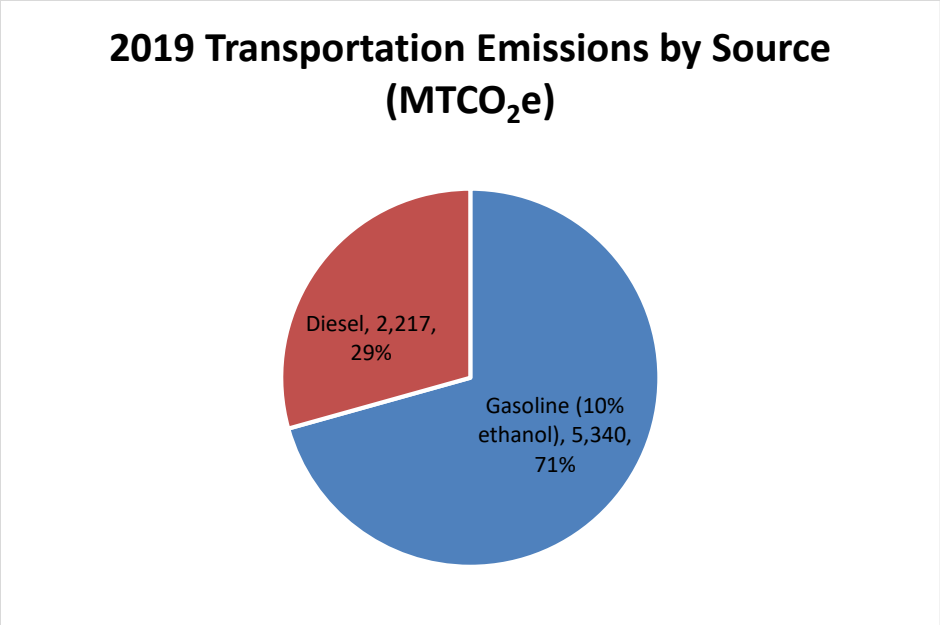


Figure 11: 2019 Transportation Emissions by Source

Waste Sector

Methods and inputs

Waste emissions from the Town of Owasco were calculated using waste information provided by Dependable Disposal and extrapolating to other households in the town that are served by other means, such as Casella (who did not have residential/commercial hauling data available). According to Steve Morgan, President of Morgan Rubbish Removal Inc. & Dependable Disposal, Dependable Disposal makes 660 stops in the Town of Owasco with approximately 670 tons per year of municipal solid waste. In 2019, about 50% of the waste was trucked to the Alpco Transfer Station in Macedon, NY with the other 50% trucked to the Auburn Landfill for disposal.[27] This was estimated to serve about 1,575 residents in the town based on average household size as per the American Community Survey, and therefore approximately 0.425 tons disposed per person. This was applied to the rest of the town population (2,081 additional people) to estimate about 1,555 total tons of waste disposed of from within the Town of Owasco.

Hauler	Town households served	Town of Owasco population	Estimated Town population served	Tons of waste disposed per person	Total tons disposed
Dependable Disposal	660	3656	1,575	0.425	670
Casella and others (estimated)			2,081	0.425	885
				Total	1554.81

Table 6: 2019 Town of Owasco Waste and Disposal Location

[27] The Auburn Landfill has since stopped receiving waste for final disposal and now only operates as a transfer station.

Waste data was entered into ICLEI's ClearPath software using the "Waste Generation" calculator, assuming a typical methane collection scenario and moderate moisture content and the solid waste default characterization.

Results

Waste emissions for the Town of Owasco in 2019 totaled 3,573 $MTCO_2e$.

Wastewater Sector

Methods and inputs

According to Tammy Flaherty, Town Clerk, there are 1,343 housing units on municipal sewer and 386 on private septic tanks. Since the wastewater treatment facility is located outside of town boundaries, only emissions from septic systems are included in the Town of Owasco's community inventory.

Fugitive emissions from septic systems within the Town of Owasco were calculated using the Population Based method in ClearPath. 386 households using septic tanks were multiplied by the average household size of owner-occupied units within the town (from the American Community Survey 2019 5-year table for Selected Housing Characteristics) to estimate 921 people using septic in the Town of Owasco.

Households using septic (2019):	386
Average household size of owner-occupied unit in town:	2.39
Population using septic in (2019):	921

Table 7: 2019 Estimation for Town of Owasco Population using Septic Systems

Results

Fugitive emissions from septic systems in the Town of Owasco totaled 340 $MTCO_2e$ in 2019.

Agricultural Sector

Methods and inputs

Agricultural emissions from enteric fermentation and manure management were estimated using ICLEI's Community Protocol, Appendix G: Agricultural and Livestock Emission Activities and Sources. Since updated information was not available, livestock counts that were used for the 2010 inventory were again used. Livestock counts were multiplied by each animal type's emissions factor (kg CH_4/head/year as provided by ICLEI), then by 1/1000 to convert kg to metric tons. Metric tons of CH_4 from all animal sources was then input into ClearPath to calculate metric tons of carbon dioxide equivalent produced by enteric fermentation from all animal types within the Town of Owasco.

Emissions associated with manure management were calculated using equations A.2.1 Methane Associated with Manure management, A.2.3 Direct Nitrous Oxide Associated with Manure Management, and A.2.4 Indirect Nitrous Oxide Associated with Manure Management from ICLEI's Community Protocol, Appendix G: Agricultural and Livestock Emission Activities and Sources, assuming daily spread management techniques.

Results

Agricultural emissions from the Town of Owasco totaled 1,049,645 $MTCO_2e$ in 2019 with 37,057 $MTCO_2e$ from enteric fermentation and 1,012,588 $MTCO_2e$ from manure management.

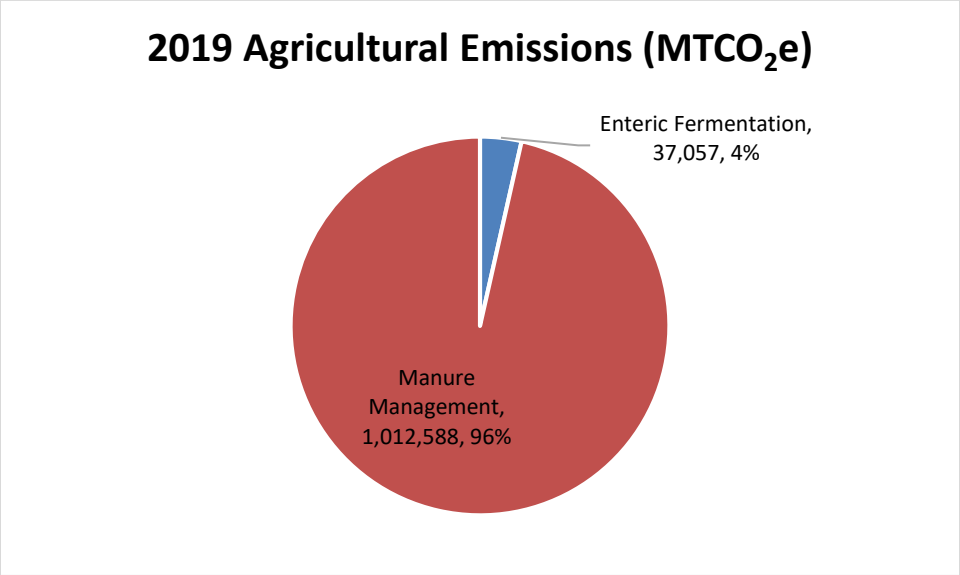


Figure 12: Town of Owasco 2019 Agricultural Emissions

V. Municipal Operations Emissions Forecast

Methods and inputs

A municipal operations emissions forecast is included here to provide a sense of what emissions might look like in 2030 for municipal operations under a business-as-usual scenario. The forecast was compiled using ICLEI's protocol for forecasting and entering data into the ClearPath tool online. Data from the 2019 municipal inventory above was used as a baseline for this forecast. Compound Average Growth Rates were used to forecast emissions in all sectors using the inputs noted below.

To forecast emissions from the municipal buildings and facilities sector, population growth rates from 2010 to 2019 as well as mandates of the **Climate Leadership and Community Protection Act** (i.e. 70% electricity from renewables by 2030) were used. It is assumed that as population of the town decreases, energy used by municipal operations at facilities decreases in a proportional manner.

To forecast emissions from municipal streetlights, mandates of the **Climate Leadership and Community Protection Act** (i.e. 70% electricity from renewables by 2030) were used. It is

assumed that as population of the town decreases, energy used by municipal operations for streetlight facilities remains the same for safety.

To forecast emissions from the municipal vehicle fleet, population growth rates as well as Federal rules on vehicle fuel mileage standards were used.[28] It is assumed that as population of the town decreases, energy used by the municipal vehicle fleet decreases in a proportional manner.[29]

To forecast emissions from water and sewer facilities, population growth rates as well as mandates of the **Climate Leadership and Community Protection Act** (i.e. 70% electricity from renewables by 2030) were used. It is assumed that as population of the town decreases, energy used by municipal operations at water delivery facilities decreases in a proportional manner.

Results

Assuming a business-as-usual scenario, emissions in the Town of Owasco in 2030 are expected to decrease from 309 $MTCO_2e$ in 2019 to 219 $MTCO_2e$ in 2030, a decrease of about 29%. Each sector's forecast is explained further below.

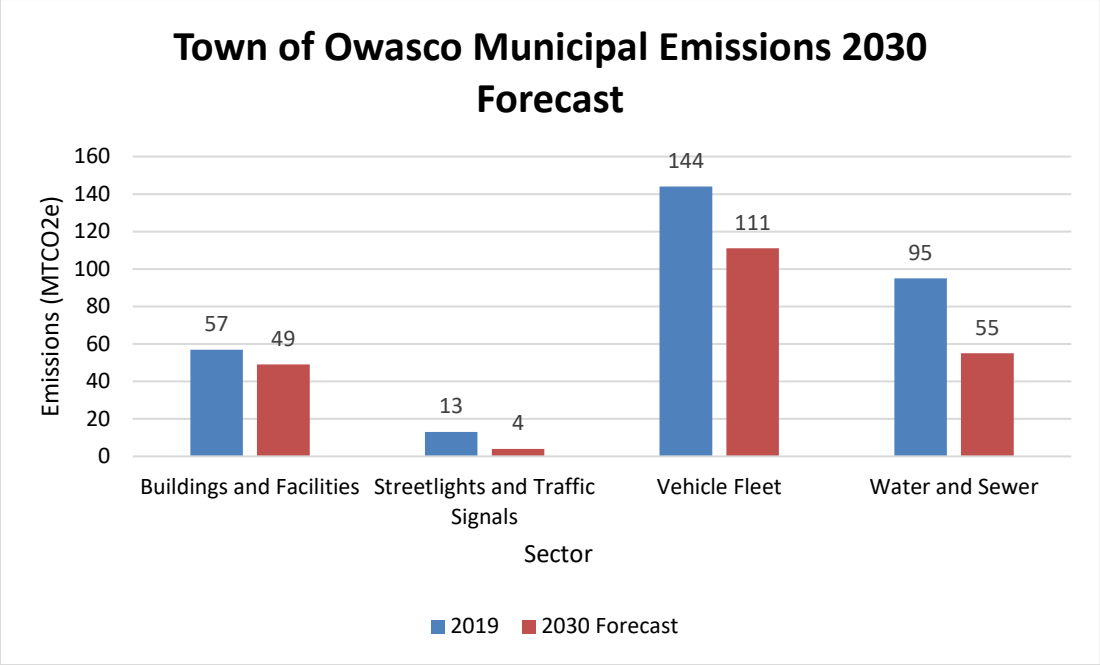


Figure 13: Town of Owasco Municipal Operations 2030 Emissions Forecast

[28] This forecast uses the March 2020 Safer Affordable Fuel Efficient (SAFE) Vehicles Rule, which projects combined passenger and light duty vehicle fuel efficiency to be 40.4 mpg by 2026, according to https://www.c2es.org/content/regulating-transportation-sector-carbon-emissions/ accessed 10/19/21.

[29] Since ClearPath requires VMT inputs for municipal vehicle fleet forecasts, National Default Vehicle Fuel Efficiencies provided by ICLEI at https://docs.google.com/spreadsheets/d/1KXmtHoxI-mPXz0ujidtj76woUcK-RN9ITMRy-gMoUls/edit#gid=1929834944 were utilized to calculate estimated VMT for the Town's fleet, using average light trucks for gasoline and heavy duty trucks for diesel.

Discussion

Electric and natural gas used at municipal buildings and facilities is expected to decrease slightly in accordance with the town population growth trend (which has decreased slightly since 2010), but since the **Climate Leadership and Community Protection Act** requires the state to achieve 70% renewable electricity by 2030, emissions from municipal operations electricity use are expected to drop from 8 $MTCO_2e$ to 2 $MTCO_2e$. Overall emissions from municipal buildings and facilities are therefore expected to increase from 57 $MTCO_2e$ in 2019 to 49 $MTCO_2e$ by 2030.

Emissions from the municipal vehicle are expected to decrease because of estimated less vehicle miles traveled in accordance with the town's population growth trend, and also because the carbon intensity of the vehicle miles traveled is expected to decrease as federal transportation policies require vehicle fuel mileage standards to improve over time. Emissions from municipal vehicle fleet at therefore expected to decrease from 144 $MTCO_2e$ in 2019 to 111 $MTCO_2e$ by 2030.

Emissions from streetlights are expected to decrease from 13 $MTCO_2e$ to 4 $MTCO_2e$ in accordance with CLCPA goals of achieving 70% renewable electricity by 2030, despite no estimated change in energy use.

Finally, emissions from water and sewer facilities are expected to decrease from 95 $MTCO_2e$ to 55 $MTCO_2e$ by 2030 because electric and natural gas use are expected to decrease slightly based on the population growth rate, and because emissions from electricity are expected to decrease significantly, from 53 $MTCO_2e$ to 15 $MTCO_2e$, in accordance with the CLCPA goals of achieving 70% renewable electricity by 2030.

VI. Community Emissions Forecast

Methods and inputs

A community emissions forecast is included here to provide a sense of what emissions might look like in 2030 under a business-as-usual scenario. The forecast was compiled using ClearPath guidance. Compound Average Growth Rates were used to forecast emissions in all sectors, using the inputs noted below.

To forecast emissions from the residential and commercial/industrial sectors, State energy use trends as described in the 2015 **New York State Energy Plan** and mandates of the **Climate Leadership and Community Protection Act** (i.e. 70% electricity from renewables by 2030) were used.

To forecast emissions from the transportation sector, State energy use trends as described in the 2015 **New York State Energy Plan** and Federal rules on vehicle fuel mileage standards were used.[30]

[30] This forecast uses the March 2020 Safer Affordable Fuel Efficient (SAFE) Vehicles Rule, which projects combined passenger and light duty vehicle fuel efficiency to be 40.4 mpg by 2026, according to https://www.c2es.org/content/regulating-transportation-sector-carbon-emissions/ accessed 10/19/21.

To forecast emissions from the waste sector, population growth rates for the Town of Owasco from the American Community Survey from 2010 vs. 2019 were used, assuming population would continue to grow at a similar rate through 2030 and waste production would increase proportionally to population growth.

To forecast emissions from the wastewater sector, population growth rates for the Town of Owasco from the American Community Survey from 2010 vs. 2019 were used, assuming population would continue to grow at a similar rate through 2030 and wastewater emissions would increase proportionally to population growth.

For the purposes of this forecast, agricultural emissions are assumed to remain constant, assuming similar animal counts and manure management practices within the town. Agriculture is therefore not included in the emissions forecast discussion below.

Results

Assuming a business-as-usual scenario, emissions in the Town of Owasco in 2030 are expected to decrease from 24,905 $MTCO_2e$ in 2019 to 21,572 $MTCO_2e$ in 2030, a decrease of about 13%. Emissions are expected to decrease in all sectors. Each sector's forecast is explained further below.

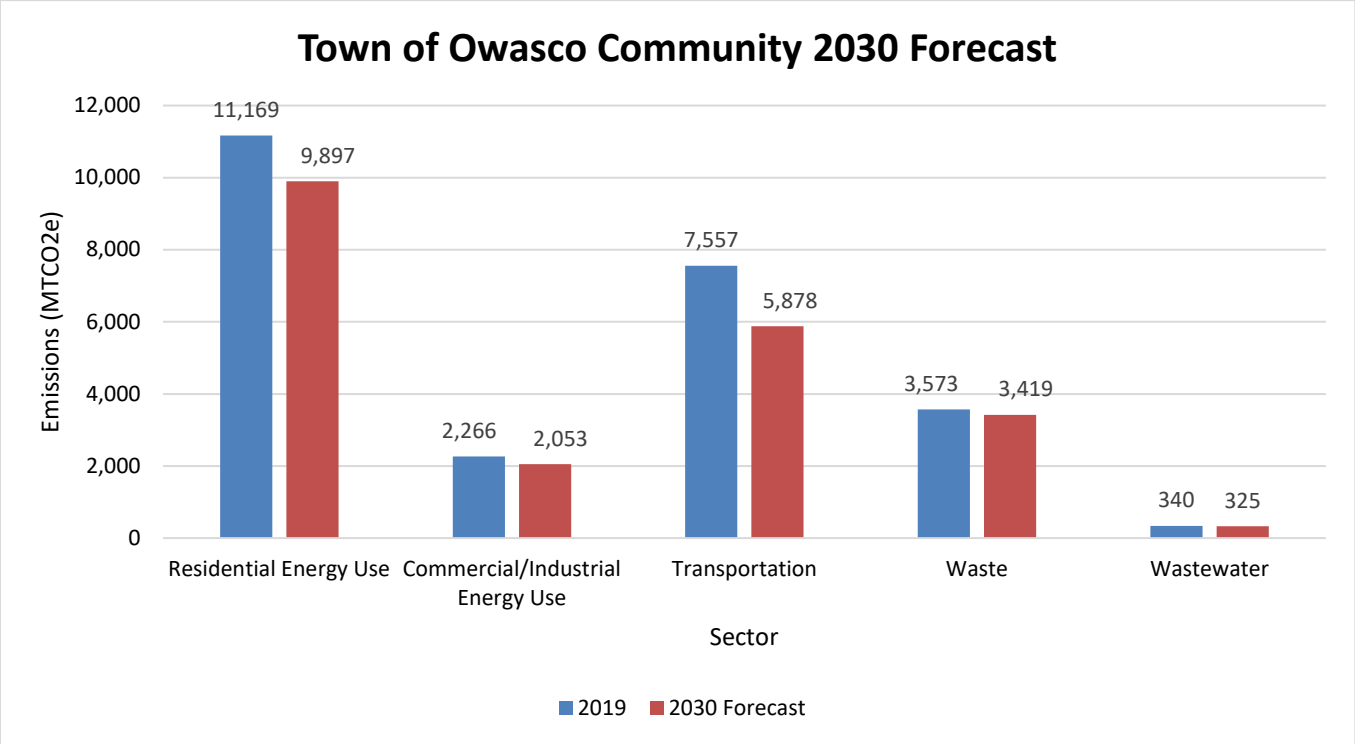


Figure 14: Town of Owasco Community 2030 Emissions Forecast

Discussion

Emissions from the residential sector are expected to decrease from 11,168 $MTCO_2e$ in 2019 to 9,897 $MTCO_2e$ by 2030.

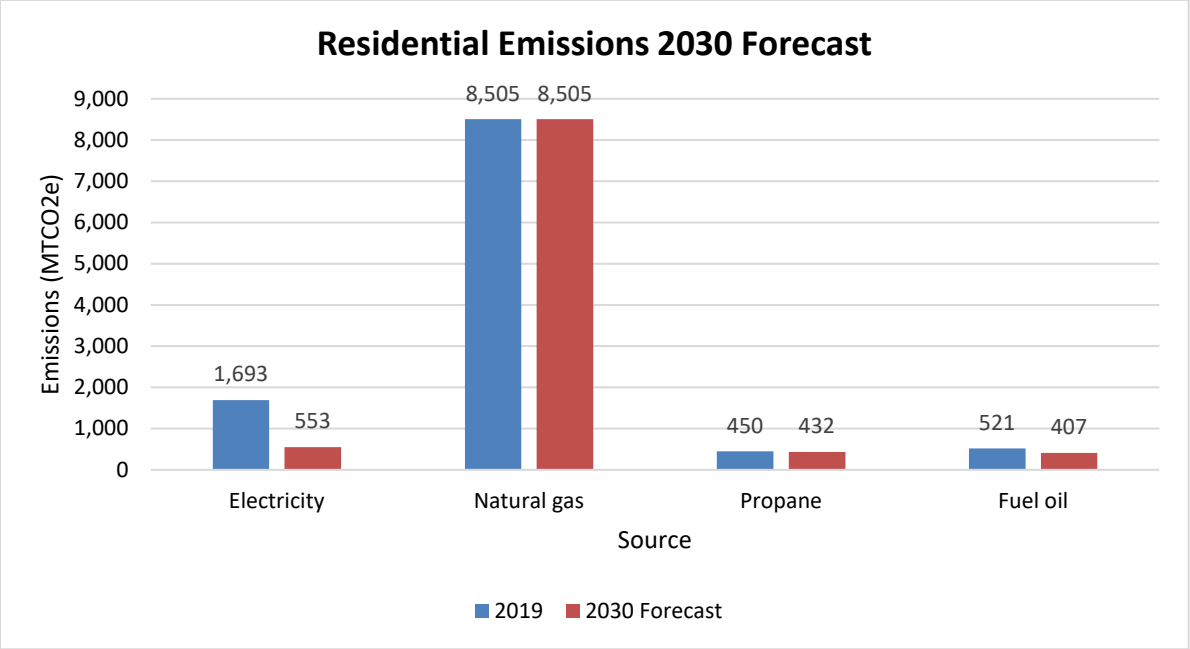


Figure 15: Forecasted Residential Emissions in the Town of Owasco for 2030

Since the **Climate Leadership and Community Protection Act** has set a goal of 70% electricity coming from renewables by 2030, emissions from residential electricity use are expected to drop significantly. Residential propane and fuel oil use are projected to decrease slightly as well, with natural gas use staying about the same, according to the 2015 **New York State Energy Plan**.

Emissions from the commercial/industrial sector are expected to decrease overall, from 2,266 $MTCO_2e$ in 2019 to 2,053 $MTCO_2e$ by 2030.

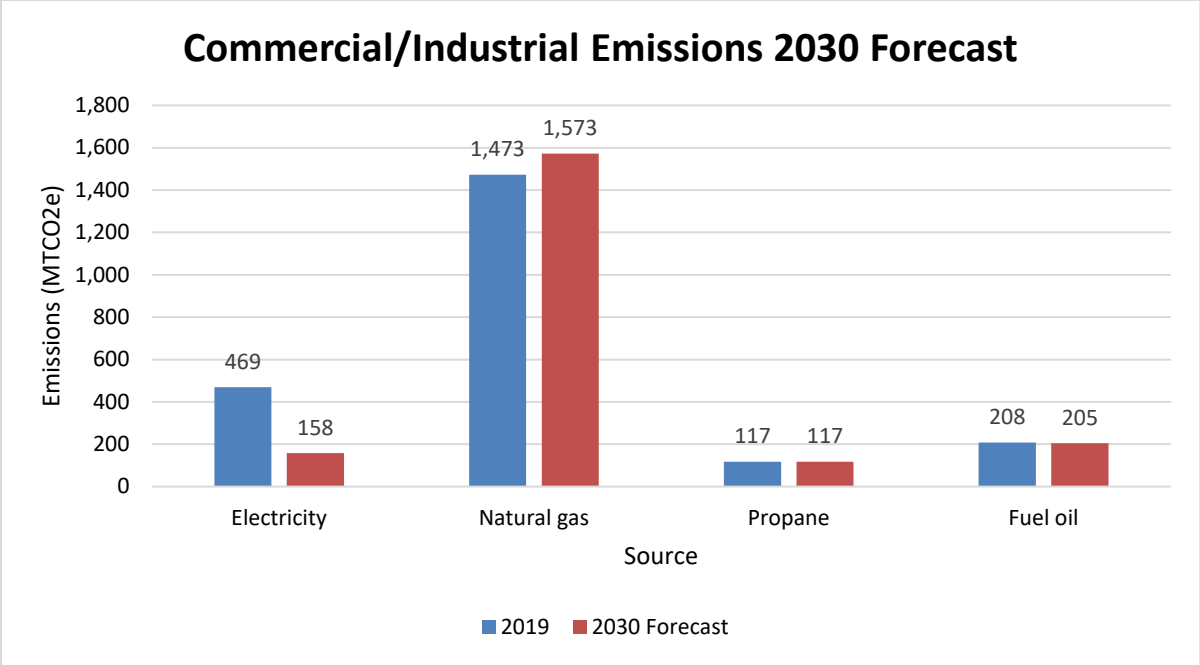


Figure 16: Forecasted Commercial/Industrial Emissions in the Town of Owasco for 2030

Since the **Climate Leadership and Community Protection Act** has set a goal of 70% electricity coming from renewables by 2030, emissions from commercial/industrial electricity use are expected to drop significantly. Commercial/industrial fuel oil use is projected to decrease as well, with propane use staying about the same and natural gas use increasing slightly over time, according to the 2015 **New York State Energy Plan**.

Emissions from the transportation sector are expected to decrease overall as well, from 7,557 $MTCO_2e$ in 2019 to 5,878 $MTCO_2e$ by 2030.

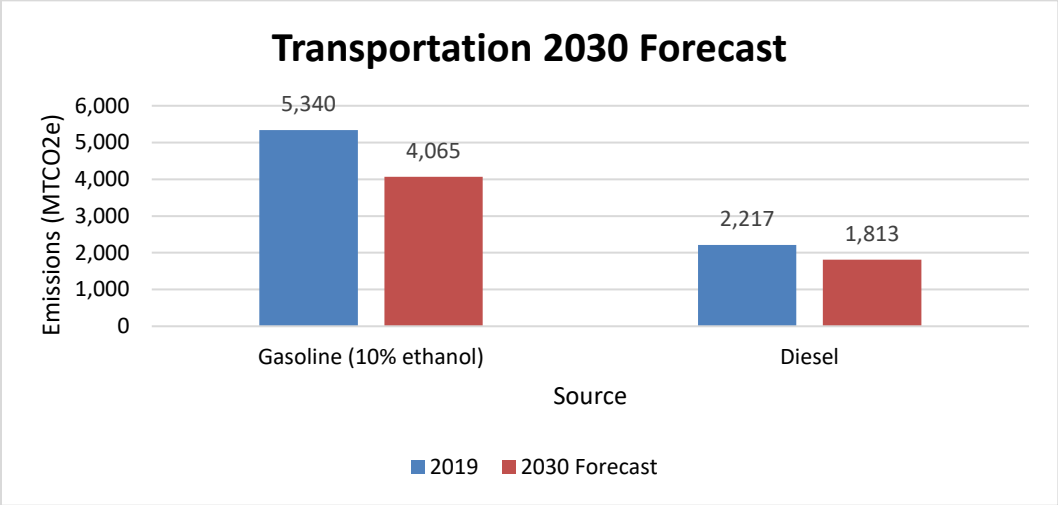


Figure 17: Forecasted Transportation Emissions in the Town of Owasco for 2030

According to the 2015 **New York State Energy Plan**, gasoline and vehicle miles traveled are expected to decrease over time, with diesel use and vehicle miles traveled increasing. However, the carbon intensity of the vehicle miles traveled for all fuel types is expected to decrease as federal transportation policies require vehicle fuel mileage standards to improve over time, so emissions from all fuel sources are expected to decrease.

Emissions from the waste sector are expected to decrease slightly, from 3,573 $MTCO_2e$ in 2019 to 3,419 $MTCO_2e$ by 2030. This forecast is directly related to estimated population growth rate in the town.

Emissions from the wastewater sector are expected to decrease, from 340 $MTCO_2e$ in 2019 to 325 $MTCO_2e$ in 2030. This forecast is directly related to estimated population growth rate in the town.

VII. Discussion: 2010 vs 2019 Inventory

As noted above, the Town of Owasco compiled a greenhouse gas inventory in 2015 with a baseline year of 2010. Below is a discussion comparing emissions for both the municipal operations and the community as reported in 2010 vs this report.

It should be noted that the 2010 inventory was compiled using the current standards at the time, which meant using Global Warming Potentials (GWPs) from the IPCC's 4th Assessment Report compared to the current standard of using the 20-year GWPs in IPCC's 5th Assessment Report. Therefore, Figures 18 and 19 below shows what emissions totals would be for 2019 using the same GWPs as were used to calculate 2010 emissions (noted as "2019 IPCC 4th").

The IPCC 4th assessment report assumes a GWP of 25 for methane over a 100-year period, meaning that the impact of 1 unit of methane in the atmosphere creates 25 times more warming potential than 1 unit of CO_2 over a 100-year time period. However, methane typically remains in the atmosphere for closer to 12 years as opposed to CO_2 which can remain in the atmosphere for over 100 years, meaning that methane's impact while it remains in the atmosphere is much stronger than that of CO_2. Therefore, the IPCC 5th assessment report includes both a 100 year and 20-year GWP for methane of 28 and 84, respectively.[31] The IPCC 5th assessment report's 20-year GWP for nitrous oxide is 264 as compared to 298 from the IPCC 4th assessment report, 100-year GWP.

As illustrated in Figures 18 and 19, there is not much difference between the two GWP scenarios for most sectors, but there is a more noticeable increase in emissions for waste and wastewater using the IPCC 5th assessment 20-year GWPs. Therefore, it is important to consider the methodology used in creating this and future inventory updates, as well as when comparing data from this inventory to inventories from other communities.

[31] IPCC. Climate Change 2014 Synthesis Report. https://ar5-syr.ipcc.ch/ipcc/ipcc/resources/pdf/IPCC_SynthesisReport.pdf

Municipal Comparison

Table 8 below compares municipal energy use in 2010 to municipal energy use in 2019.

Municipal Energy Use	Source	2010	2019	Difference	
Buildings and Facilities	Electricity (kWh)	76,260	74,548	-1,712	-2%
	Natural gas (therms)	7,997	9,112	1,115	14%
Streetlights and Traffic Signals	Electricity (kWh)	182,870	121,937	-60,933	-33%
Vehicle Fleet	Gasoline (gallons)	4,746	5,576	830	17%
	Diesel (gallons)	8,043	9,807	1,764	22%
Water and Sewer Facilities	Electricity (kWh)	493,584	501,180	7,596	2%
	Natural gas (therms)	7,696	7,813	117	2%

Table 8: Town of Owasco Municipal Energy Use 2010 v 2019

As indicated in Table 8, each sector's energy use information is a bit different from 2010 to 2019. This could be attributed to data gathering methodology and accuracy/availability of data, although some differences could be caused by behavior changes and/or energy efficiency projects as well. Other reasons for significant changes are discussed below.

In 2010, emissions from the Town of Owasco municipal operations totaled 379 $MTCO_2e$, compared to 309 $MTCO_2e$ in 2019.

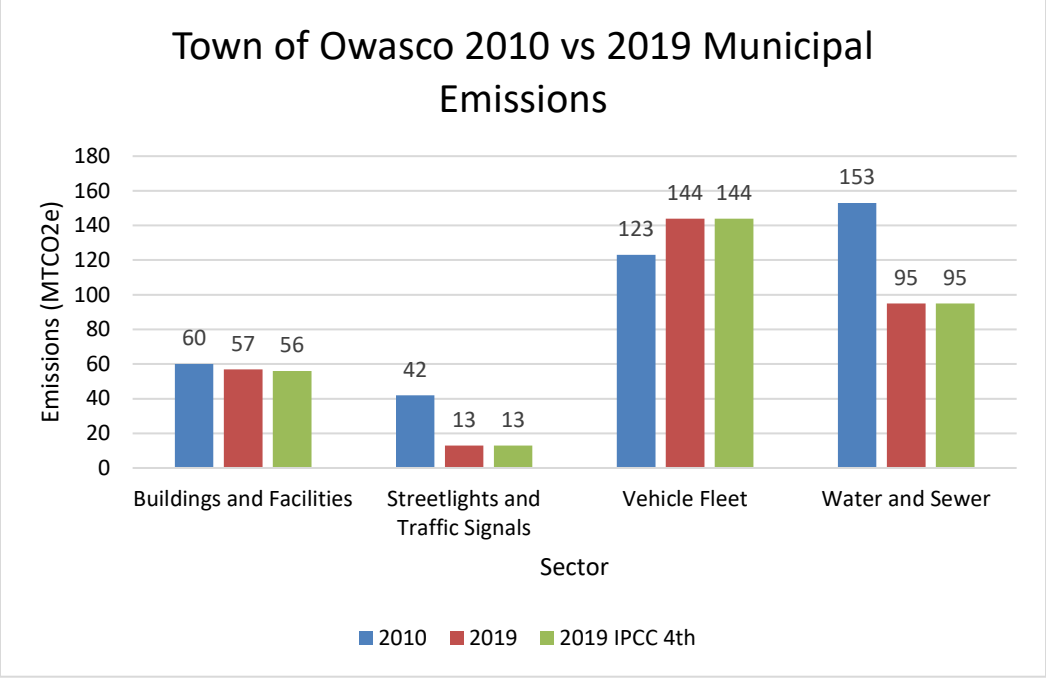


Figure 18: Town of Owasco 2010 vs 2019 Municipal Emissions

As illustrated in Figure 18, the largest difference in emissions and energy use from 2010 to 2019 are in the streetlights and water and sewer sectors. The significant decrease in emissions from streetlights is likely because the town's streetlights were converted to LED during the first half of 2019, resulting in significantly less energy use in that sector compared to 2010. Decreases in emissions factors for electricity as a result of less carbon-intensive sources of electricity supplied by the state's utilities have also impacted the decrease in emissions over time.

Since energy use in the water and sewer facilities sector increased very slightly yet emissions decreased, the decrease can be attributed to less carbon-intensive sources of electricity supplied by the state's utilities have also impacted the decrease in emissions over time.

We don't see as significant of a decrease in emissions from the buildings and facilities sector because there was a 14% increase in natural gas usage which offsets the emissions reductions from electricity. Natural gas usage may have been higher in 2019 since it was a colder year with more heating degree days than 2010, and/or it may be attributed to thermostat set points or behavior changes in the buildings. There also appears to be an additional account using natural gas in 2019 that was not included in the 2010 inventory, account 1003-5547-396 on Archie Street.

Energy use and emissions from the vehicle fleet sector appear to have increased since 2019. This could be due to accuracy of data used for the 2010 inventory compared to this report, as the information used for the 2010 inventory was based on some assumptions, as opposed to the information used for this report which includes actual gallons of gasoline and diesel fuel used by the municipal fleet in 2019. Otherwise, an increase in emissions could be explained by additional vehicles, additional vehicle miles traveled by the fleet, and/or lower average fuel economy for the vehicles in the fleet.

Community Comparison

Table 9 below compares community energy use in 2010 to community energy use in 2019.

Community Energy Use	Source	2010	2019	Difference	
Residential Energy Use	Electricity (kWh)	14,756,387	15,928,913	1,172,526	8%
	Natural gas (therms)	1,410,000	1,590,606	180,606	13%
	Propane (MMBtu)	228	7,178	6,950	3042%
	Fuel oil (MMBtu)	11,254	6,946	-4,308	-38%
Commercial/Industrial Energy Use	Electricity (kWh)	2,055,785	4,416,144	2,360,359	115%
	Natural gas (therms)	504,692	275,406	-229,286	-45%
	Propane (MMBtu)	533	1,860	1,327	249%
	Fuel oil (MMBtu)	19,116	2,766	-16,350	-86%
Transportation	Vehicle Miles Traveled	14,867,620	15,631,007	763,387	5%
Waste	Total tons	3,018	1,555	-1,463	-48%

Table 9: Town of Owasco Community Energy Use 2010 v 2019

As indicated in Table 9, each sector's energy use information is quite different from 2010 to 2019. This is likely attributed to data gathering methodology and accuracy/availability of data (this is likely the case for residential propane use estimates, for example), although some differences could be caused by behavior changes, energy efficiency, and/or renewable energy projects installed by homes and businesses as well.

In 2010, emissions from the Town of Owasco community totaled 24,614 $MTCO_2e$, compared to 24,905 $MTCO_2e$ in 2019. It should be noted that wastewater emissions were not included in the 2010 baseline inventory, hence the missing information in Figure 19 below.

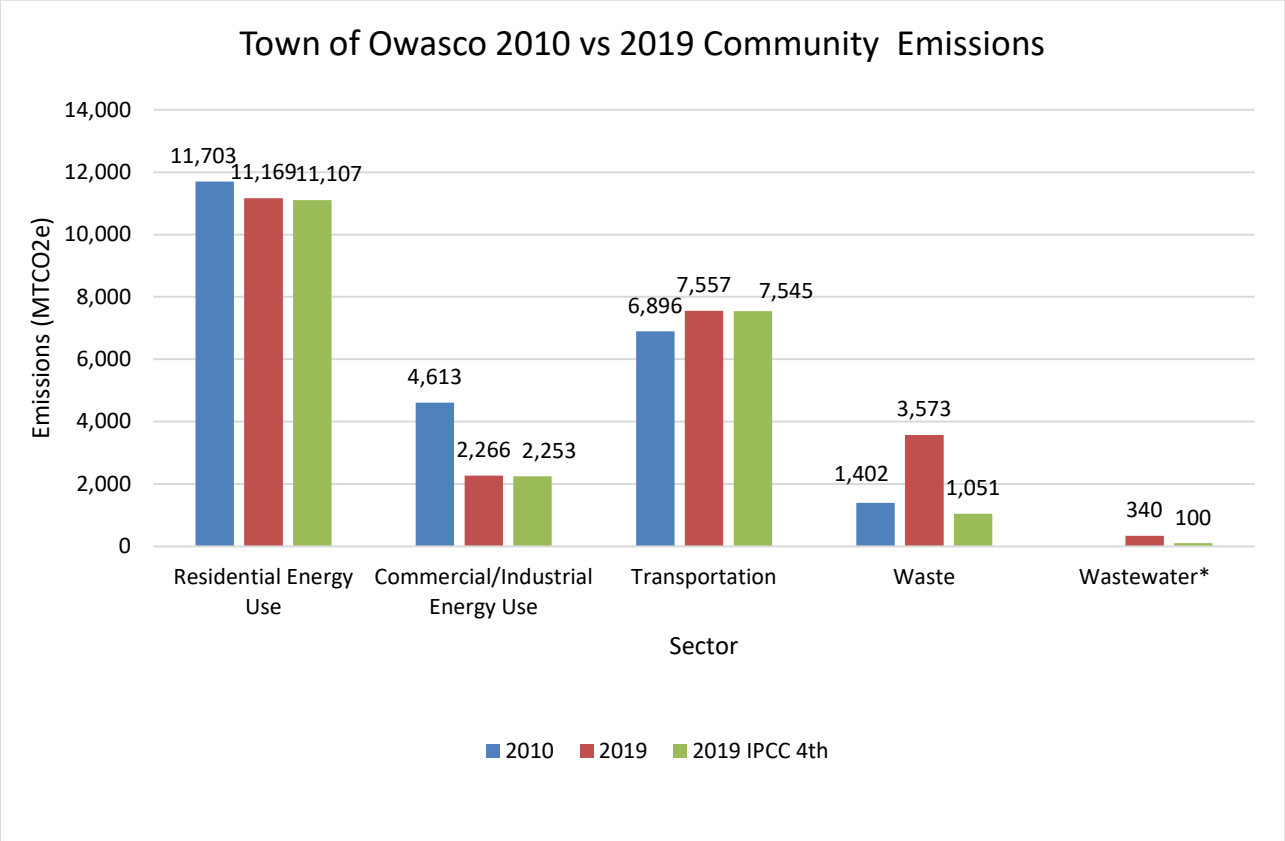
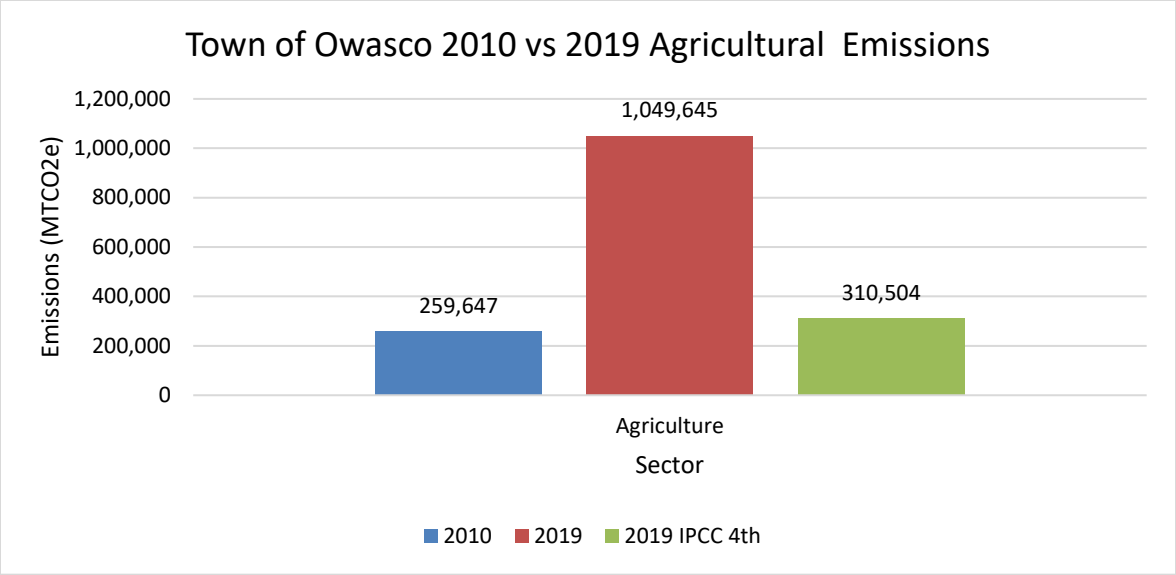


Figure 19: Town of Owasco 2010 vs 2019 Community Emissions

As illustrated in Figure 19, emissions in the residential and transportation sectors were relatively similar in 2010 and 2019, whereas emissions for commercial/industrial sector appears to have decreased and emissions in the waste sector appears to have increased. This could be due to a difference in methodology, as commercial/industrial natural gas use had to be estimated for 2019. It could also be due to a decrease in emissions factors for electricity (as a result of less carbon-intensive sources of electricity supplied by utilities). Waste generated by the town appears to have decreased but emissions have increased, which can be attributed to different global warming potentials used to calculate emissions and the larger GWP of methane in the 2019 accounting method. This is illustrated by the IPCC 4th emissions being a slight decrease from 2010 emissions corresponding to the decrease in waste generated.



In 2010, agricultural emissions from the Town of Owasco totaled 259,647 $MTCO_2e$, compared to 1,049,645 $MTCO_2e$ in 2019. This is likely due to the IPCC 5th 20-year higher global warming potentials for methane, since the number of animals and manure management techniques were assumed to be the same (due to lack of updated data available).

VIII. Conclusion

This greenhouse gas inventory update can help inform a Climate Action Plan update, which can help the Town to better understand energy use and emissions from both municipal operations and the community-at-large.

The results of this study indicate that the largest percentage of municipal emissions came from the vehicle fleet and the largest percentage of community emissions came from agriculture, followed by the residential energy use sector for 2019. Municipal vehicle fleet and residential energy use should be targeted in the town's future Climate Action Plan Update so that energy use from these sectors can be reduced, therefore lowering both energy costs and GHG emissions. Reducing emissions from enteric fermentation and manure management are more difficult, but should be considered as well since these emissions make up the vast majority of emissions from the town. It should be noted that buildings continue to be the second largest source of emissions for the community, as it is for the state, and that efforts could be directed towards cleaner sources of heating and cooling, including implementing local community campaigns for clean heating and cooling and energy efficiency, which could be completed in coordination with HeatSmart CNY and with the assistance of the CNY RPDB.

It is recommended that the town participate further in the Clean Energy Communities program and other state and utility incentive programs to help achieve additional energy and emissions savings. The CNY RPDB is available to provide technical assistance to implement projects and to secure grants and other financial support for projects.

As a Climate Smart Community, the Town of Owasco has partnered with state and local agencies to combat climate change and pledge to reduce greenhouse gas emissions. Conducting an emissions inventory update is an important step in climate action planning, mitigation, and adaptation. This inventory will provide a benchmark for planning purposes with the goal of setting an emissions reduction target and updating the Town/Village Climate Action Plan.

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