**Town of Hector, New York: Greenhouse Gas Emissions Inventory:**

 **A Comparison of 2019, 2020, and 2021**

Compiled by:

Southern Tier Central Regional Planning and Development Board

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**Introduction**

This comparison of 2019, 2020, and 2021 greenhouse gas (GHG) emissions from government operations in the Town of Hector, New York, serves as a preliminary step in creating strategies to reduce GHG emissions. It is important for local governments to understand their Town emission levels and their impacts as it allows them to prioritize actions when creating a local Climate Action Plan for Government Operations to mitigate the effect of these emissions.

This information was compiled per the Local Government Operations Protocol (LGOP), version 1.1. The LGOP is a policy framework that provides guiding methodologies to help local governments calculate and understand the GHG emissions of their operations. The LGOP was developed by the International Council for Local Environmental Initiatives (ICLEI) and the Climate Registry in collaboration with the California Climate Action Registry and the California Air Resources Board.

This Greenhouse Gas Inventory was prepared as a component of the Town of Hector’s participation in the Climate Smart Communities program of the New York State Department of Environmental Conservation. The inventory was prepared by Matthew Sullivan, Climate Smart Communities Coordinator, on behalf of the Town of Hector. Additional assistance was provided by the Town of Hector CSC Task Force and Town staff members who provided the data necessary to complete this inventory.

Communities that have been certified as Climate Smart Communities are committed to reducing GHG emissions and improving climate resilience, which allows them to reduce long-term costs and adapt to a changing climate.

**Greenhouse Gas Emissions and Energy Use in New York State**

Greenhouse gases are gases that trap heat in the Earth’s atmosphere when they accumulate in high concentrations. Common greenhouse gases include carbon dioxide, methane, nitrous oxide, and fluorinated gases, which are synthetic gases produced by industrial processes. These gases are released into the atmosphere in a number of ways: everyday activities of all kinds can have a direct impact on greenhouse gas emissions and climate change.

Some gases have a greater impact on the atmosphere than others, but together, these gases combine to “thicken the Earth’s blanket” and change climatic conditions. For example, methane gas has a higher warming effect on the atmosphere than carbon dioxide but dissipates more quickly. Some of these gases, such as water vapor, carbon dioxide, and methane, occur naturally in small percentages, and help the atmosphere retain enough heat to sustain life. This balance is disrupted, however, by greenhouse gas emissions from human activity, which cause the atmosphere to retain more energy from the sun than it normally would. This seemingly small change in the atmosphere’s composition has already led to big changes in temperature and weather all over the world.



*Image source: New York Department of Environmental Conservation* http://www.dec.ny.gov/images/administration\_images/ghgsrcsm.jpg

Greenhouse gas emissions in New York State come mostly from transportation (34%). This includes all travel of people and goods by cars, trucks, ships, airplanes, trains, and other vehicles. Greenhouse gases in the state are also largely produced by the industrial sector from the manufacturing processes that create the goods and raw materials that we use every day. Residential and commercial activity contributes as well, mostly resulting from heating, cooking, wastewater management, and refrigerant leaks. GHG emissions in rural areas of New York State also come from soil management of agricultural land that releases nitrous oxide into the atmosphere. These activities include the use of synthetic and organic fertilizers, growing nitrogen-fixing crops, and various irrigation processes. Livestock also contribute to GHG emissions, as their natural digestive processes produce methane. This can be exacerbated or mitigated by proper management of livestock waste.

A variety of research, including New York’s Climate Aid report (2011, 2014) and the National Climate Assessment (2014), has shown that impacts of climate change have already begun to occur in New York State. Climate change manifests as changes in temperature, precipitation, sea levels, seasonal changes, and severe weather events. These changes have direct effects on the health of humans, animals and plants in New York State.

Since 1970, the average annual temperature has risen by 2.4°F in New York State. Average winter temperatures have increased by over 4.4°F. Climate change has also resulted in increased precipitation in the winter, and less in the summer. Climate change also includes climactic events beyond global warming, namely an increase in severe weather events, such as superstorms and hurricanes. Between 1958 and 2010, the number of very heavy precipitation events increased by over 70% in the United States. New York’s coastal areas have seen a sea level rise of over a foot since 1900. Sea level rise is a result of climate change, which causes warmer temperatures that melt polar caps, glaciers, and land-based ice. Sea level rise is especially imminent in New York State, where the rate of rise (1.2 inches per decade) is nearly twice as high as the global rate (0.7 inches per decade). Climate change has also resulted in variation in seasonal patterns. In New York State, for example, spring begins a week earlier than it once did. The first leaf date in autumn is, correspondingly, over a week late.

Once greenhouse gases are emitted into the atmosphere, they can linger for decades or even centuries, even if emissions are reduced in the future. It is important to understand how greenhouse gas emissions are affecting our region in order to create strategies for reducing future greenhouse gas emissions. Modelling has projected that climate change will continue in New York State. The region will experience more precipitation, more variability in precipitation, and warmer temperatures. Specifically, the 2014 Climate Aid report projections for the region state that by the 2050s there will be an increase of 4.4 to 6.3 degrees in temperature and 4 to 10 percent more precipitation as compared to the 1971-2000 period.

Climate change also negatively impacts the availability of clean air, water, and food supplies. Changing environmental conditions in New York State also help insects, such as mosquitoes and ticks, spread infectious diseases such as West Nile virus and Lyme disease. Human health is also affected directly by the changing climate, especially those, like the elderly and children, who are already vulnerable. This can be caused by things such as increased pollen production, ground-level ozone formation, or the presence of other forms of air pollution. All of these factors exacerbate asthma, allergies, and other respiratory conditions.

In summary, greenhouse gas emissions and the climate change that they cause have already begun to affect the health and sustainability of communities in New York State. These negative effects can be partially mitigated, however, by reducing greenhouse gas emissions and the activities that create them. This Greenhouse Gas Inventory for the Town of Hector, New York, serves as a first step in taking action to plan for a healthier and more environmentally responsible town that may be enjoyed for generations to come.

**Methodology**

The calculations in this report were performed using the Climate Smart Communities Government Operations Greenhouse Gas Inventory Tool created by Climate Action Associates, LLC. The tool is based on the Local Government Operations Protocol, which serves as a national standard for municipal greenhouse gas inventories across the country. Buildings emission data for the Town of Hector was collected from the New York State Electric and Gas Corporation (NYSEG) through the benchmarking of municipal buildings. Vehicle emissions data was gathered through the municipal gas log compiled by the Town Clerk.

**Stationary Combustion of Fossil Fuels**

For the calendar year consisting of January 2019 – December 2019, the Town of Hector had four buildings using propane, which are the Town Hall, Highway Garage, Smith Park Office & North Bath, and Smith Park South Bath. These buildings used 4,910 gallons of propane over the course of the calendar year. In 2020, the Town saw an increase in propane use across facilities to 5,490 gallons used. Smith Park Office & North Bath and Smith Park South Bath did not have any propane use recorded in 2020, so usage can be attributed to the Town Hall and the Highway Garage. In 2021, the Town saw a decrease in propane usage to 4,362 gallons across all four facilities. Overall propane usage increased 11.8% from 2019 to 2020, and decreased 20.5% from 2020 to 2021.

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|  | **2019 v. 2020 v. 2021 Municipal Fuel and Energy Consumption (gallons)** |  |  |  |
|  | 2019 Natural Gas Energy Use | 2020 Natural Gas Energy Use | 2021 Natural Gas Energy Use | 2019 v. 2020 Natural Gas Use Difference | 2019 v. 2020 Natural Gas Use Percent Change | **2020 v. 2021** Natural Gas Use Difference | 2020 v. 2021 Natural Gas Use Percent Change | 2019 v. 2021 Natural Gas Use Difference | 2019 v. 2021Natural Gas Use Percent Change |
| **Total Stationary Combustion Energy Use** | 4,910 | 5,490 | 4,362 | ↑580 | ↑11.8% | ↓1,128 | ↓20.5% | ↓548 | ↓11.2% |

The result of the increase in propane usage from 2019 to 2020 is a corresponding increase in CO2 emissions. The decrease in propane usage from 2020 to 2021 results in a corresponding decrease in CO2 emissions. In 2019, the Town emitted 28.2 metric tons of CO2 equivalent (MT CO2e) from propane, compared to 31.6 MT CO2e in 2020, and 25.1 MT CO2e in 2021. These figures represent an increase of 3.4 MT CO2e from 2019 to 2020, or a 12.1% increase in emissions. From 2020 to 2021, there was a 6.5 MT CO2e decrease, or a 20.6% decrease in emissions. From 2019 to 2021, emissions decreased 3.1 MT CO2e, or 10.99%.

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|  |  |  | **2019 v. 2019 GHG Emissions from Propane (MT CO2e)** |  |  |
|  | **2019** CO2 Emissions | **2020** CO2 Emissions | **2021** CO2 Emissions | **2019 v. 2020** Emission Difference | **2020 v. 2021** Emission Difference | **2019 v. 2021** Emission Difference | **2019 v. 2020** Percent Change | **2020 v. 2021** Percent Change | **2019 v. 2021** Percent Change |
| **Total Stationary Combustion Emissions**  | 28.2 | 31.6 | 25.1 | ↑3.4 | ↓6.5 | ↓3.1 | ↑12.1% | ↓20.6% | ↓10.99% |

**Electricity Consumption**

Electricity consumption in buildings decreased from 39,819 kilowatt-hours (kwh) in 2019 to 37,667 kwh in 2020 to 35,728 kwh in 2021. Electricity consumption for streetlights and traffic signals increased slightly from 3,474 kwh in 2019 to 3,716 kwh in 2020. This figure decreased to 1,614 kwh in 2021. In 2021, the Town began receiving bills from Nexamp, Inc. instead of NYSEG. Nexamp, Inc. bills do not include kwh readings for each month of service, so incomplete data is skewing the data for 2021 streetlight usage. Total consumption was comparable on a monthly basis across all three years, so it is expected that a complete reading would indicate a similar total figure to 2019 and 2020. For water delivery facilities, electricity usage decreased from 328,215 kwh in 2019 to 302,863 kwh in 2020 to 191,893 kwh in 2021.

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|  |  | **2019 v. 2020 v. 2021 Electrical Consumption by Sector (kwh)** |  |  |
| **Sector** | **2019** Electrical Use | **2020** Electrical Use | **2021** Electrical Use | **2019 v. 2020** Electrical Use Difference | **2020 v. 2021** Electrical Use Difference | **2019 v. 2020** Electrical Use Percent Change | **2020 v. 2021** Electrical Use Percent Change | **2019 v. 2021** Electrical Use Percent Change |
| Buildings | 39,819 | 37,667 | 35,728 | ↓2,152 | ↓1,939 | ↓5.4% | ↓5.1% | ↓10.2% |
| Streetlights and Traffic Signals | 3,474 | 3,716 | 1,614 | ↑242 | ↓2,102 | ↑6.9% | ↓56.6% | ↓53.5% |
| Water Delivery Facilities | 328,215 | 302,863 | 191,893 | ↓25,352 | ↓110,970 | ↓7.7% | ↓36.6% | ↓41.5% |
| **Total Electrical Consumption** | 371,508 | 344,246 | 229,235 | ↓27,262 | ↓115,011 | ↓7.4% | ↓33.4% | ↓38.3% |

The decrease in building electricity usage corresponds with a decrease in emissions across the three years. However, decreases from 4.2 in 2019 to 4.1 in 2020 to 3.8 in 2021 represent small changes not driven by any targeted emission reduction strategies. Emissions from streetlights and traffic signals decreased a negligible amount across all three years. These low emission levels of 0.4 MTCO2e in 2019 and 2020, and 0.2 MTCO2e in 2021 are likely due to the Town’s conversion of streetlights to LED in 2019, as well as the low number of streetlights in total that the Town operates.

Of the Town’s facilities, water delivery facilities are the main contributor to the GHG emissions of the Town. The Hector Water District is a municipally owned and operated water utility providing both domestic water and fire protection to a majority of the State Route 414 corridor in the Town of Hector. The Water Department is responsible for the maintenance and operation of a water treatment plant and a distribution system consisting of 3 storage tanks, 10 main line pressure regulating valves with 9 pressure zones, 4 pump stations, 198 fire hydrants, and 25 miles of distribution piping. The distribution area includes the hamlets of Valois, Hector, and Logan, as well as the Village of Burdett. The area also includes all of County Route 2, 1 mile of County Route 4, and all of County Route 5, Smith Memorial Park, and various roads throughout the Town. Given the size of the Water District and the operating area, it is expected that electricity usage and GHG emissions would be considerably higher and the major contributing factor to facility totals.

GHG emissions from electricity dropped 6.6% from 2019 to 2020, and 33.5% from 2020 to 2021. This major drop from 2020 to 2021 can be attributed to lower emissions from the water delivery facilities. The Water District notes that in 2021, the amount of water pumped has dropped from previous years, contributing to decreases in electricity consumption. Furthermore, upgrades to the metering system and the monitoring system decrease the amount of leak fixes. The Water District is now able to determine leak issues every 24 hours as opposed to every 2 months, leading to a reduction in total water loss. Overall, efficiency upgrades and decreases in water pumping have contributed to decreased CO2 emissions from the water delivery facilities, contributing to a large overall reduction in electricity consumption and emissions.

**2019 v. 2020 v. 2021 GHG Emissions from Electricity by Sector (MT CO2e)**

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|  |  | **2019 v. 2020 v. 2021 GHG Emissions from Electricity by Sector (MT CO2e)** |  |  |
| **Sector** | **2019** CO2 Emissions | **2020** CO2 Emissions | **2021** CO2 Emissions | **2019 v. 2020** Emission Difference | **2020 v. 2021** Emission Difference | **2019 v. 2020** Emission Percent Change | **2020 v. 2021** Emission Percent Change | **2019 v. 2021** Emission Percent Change |
| Buildings | 4.2 | 4.1 | 3.8 | ↓0.1 | ↓0.3 | ↓2.4% | ↓7.3% | ↓9.5% |
| Streetlights and Traffic Signals | 0.4 | 0.4 | 0.2 | → | ↓0.2 | 0% | ↓50% | ↓50% |
| Water Delivery Facilities | 34.7 | 32.2 | 20.4 | ↓2.5 | ↓11.8 | ↓7.2% | ↓36.6% | ↓41.2% |
| **Total Electrical Consumption** | **39.3** | **36.7** | **24.4** | ↓2.6 | ↓12.3 | ↓6.6% | ↓33.5% | ↓37.9% |

**Mobile Combustion of Fossil Fuels: Municipal Vehicle Fleet**

From 2019 to 2021, the Town of Hector did not purchase any new vehicles. The Town of Hector’s vehicle fleet consists of 24 vehicles; 10 are heavy equipment vehicles, 3 are park maintenance vehicles, 2 are water trucks for the Water District, and the remainder are standard vehicles. In 2019, the municipal vehicle fleet consumed 30,585 gallons of fossil fuel. In 2020, this value dropped to 22,902 gallons of fossil fuel, and in 2021, the value rose to 40,864 gallons of fossil fuel. The Town of Hector is the second largest township in New York State and is responsible for the maintenance of approximately 150 miles of roads. Thus, the size of the fleet and amount of fuel consumed is concurrent with the number of road miles the Highway Department is responsible for.

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| **2019 v. 2020 v. 2021 Vehicle Fossil Fuel Use by Type (gallons)** |
| **Year** | Gasoline | Diesel | **Total** |
| 2019 | 9,830 | 20,755 | 30,585 |
| 2020 | 9,066 | 13,836 | 22,902 |
| 2021 | 12,276 | 28,088 | 40,864 |
| 2019 v. 2020 Fossil Fuel Use Difference | ↓764 | ↓6,919 | ↓7,683 |
| 2020 v. 2021 Fossil Fuel Difference | ↑3,210 | ↑14,252 | ↑17,962 |
| 2019 v. 2020 Fossil Fuel Use Percent Change | ↓7.8% | ↓33.3% | ↓25.1% |
| 2020 v. 2021 Fossil Fuel Use Percent Change | ↑35.4% | ↑103% | ↑78.4% |
| 2019 v. 2021 Fossil Fuel Use Percent Change | ↑24.9% | ↑35.3% | ↑33.6% |

The fluctuations in fossil fuel use for the municipal vehicle fleet led to shifts in greenhouse gas emissions across 2019, 2020, and 2021. In 2019, carbon dioxide emissions were 297.8 MT CO2e. Emissions dropped to 220.6 MT CO2e in 2020, before rising to 394 MT CO2e in 2021. A 25.9% drop from 2019 to 2020, followed by a 78.6% increase from 2020 to 2021 can be explained by a few potential factors. One possible reason for this fluctuation may be different winter weather conditions across the three years. A harsh winter season results in the Town having to plow roads more frequently and therefore use more fuel. With 155 miles of road, the fuel usage in those instances is a great contributor to the emission results. A mild winter weather season would result in a reduction of fuel usage, and a reduction in emission results. Other reasons for a reduction include a temporary reduction in fleet size due to vehicle servicing or temporary gaps in projects relating to highway maintenance.

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|  | **2019 v. 2020 v. 2021 GHG Emissions from Municipal Vehicle Fleet (MT CO2e)** |  |  |
| **2019** CO2 Emissions | **2020** CO2 Emissions | **2021** CO2 Emissions | **2019 v. 2020** Emission Difference | **2020 v. 2021** Emission Difference | **2019 v. 2020** Emission Percent Change | **2020 v. 2021** Emission Percent Change | **2019 v. 2021** Emission Percent Change |
| 297.8 | 220.6 | 394 | ↓77.6 | ↑173.4 | ↓25.9% | ↑78.6 | ↑32.3% |

**Summary: Greenhouse Gas Emissions in the Town of Hector, New York**

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| **2019 v. 2020 v. 2021 GHG Emission Source (MT CO2e)** |
| **Year** | Stationary Combustion | Electricity | Mobile Combustion | **Total** |
| 2019 | 28.2 | 39.3 | 297.8 | 365.3 |
| 2020 | 31.6 | 36.6 | 220.6 | 288.8 |
| 2021 | 25.1 | 24.4 | 394 | 443.5 |
|  **% Change in Emissions** | ↓10.9% | ↓37.9% | ↑32.3% | ↑21.4% |

Overall, greenhouse gas emissions for the Town of Hector government operations increased by 21.4%, or 78.2 MT CO2e from 2019 to 2021. Stationary combustion, or the use of propane, saw a 10.9% decrease from 2019 to 2021. Electricity saw a decrease of 37.9% from 2019 to 2021. Mobile combustion was the main culprit in the increase in emissions, with a 32.3% increase from 2019 to 2021. The increase in mobile combustion emissions was too high to be offset by the decreases in stationary combustion and electricity emissions.

The Town of Hector is currently pursuing Climate Smart Communities certification. This report is written in support of this goal, and serves as a baseline for identifying areas where emissions could be decreased in the future. The Town of Hector has taken actions to reduce emissions, including converting all streetlights to LED Cobra Head Street Lights, benchmarking energy usage in municipal buildings, and energy code enforcement training. The implementation of emissions reduction measures will help the Town set an example for the broader community and lower emissions on a community-wide level as municipal government emissions contribute to emissions of the entire Town of Hector.

**Conclusions: Impacts and Further Action**

In 2021, the Town of Hector created 443.5 metric tons of carbon dioxide equivalent. This is approximately equivalent to 1,100,858 miles driving in an average passenger car, 55.9 homes’ energy use for one year, or the amount of carbon sequestered by 525 acres of U.S. forests in one year.

Opportunities for the Town to reduce emissions exist. With the conversion of streetlights to LED, the Town has taken a step in the right direction. However, with the small number of streetlights that the Town operates, there are opportunities for greater action to reduce emissions on a larger scale. Some actions that the Town has already accomplished include benchmarking municipal buildings, which provides a baseline for future actions, and energy code enforcement training, which teaches code enforcement officials how to enforce the Energy Code, a minimum building standard for energy efficiency applicable to new construction and renovation of commercial and residential buildings. The Town has also implemented a Town recycling program, put recycling bins in municipal buildings, and has started a residential organic waste program. The Town has also completed community campaigns to bring community solar as an option for interested residents, highlighting a commitment to cleaner energy production and a reduction in emissions.

As the Town pursues Climate Smart Certification, this Greenhouse Gas Inventory for Government Operations can be used as the framework for a Government Operations Climate Action Plan, a strategy document that sets goals and outlines initiatives to reduce GHG emissions. Some potential strategies include upgrading municipal buildings to higher energy efficiency standards, such as HVAC upgrades or installing heat pumps or solar panels to power buildings through renewable energy. Further, the Town could investigate potential funding sources for hybrid or electric vehicles as the municipal fleet turns over. Through the DEC, the Municipal Zero-emission Vehicle Program provides rebates and infrastructure grants designed to assist municipalities with acquiring zero-emission vehicles for their fleet. This is a potential avenue that the Town could explore as it looks to reduce future emissions. With the Climate Smart Communities Task Force, and the actions already taken to reduce emissions, the Town of Hector is well-positioned to implement further actions to reduce greenhouse gas emissions in the future.

**For Questions Regarding this Greenhouse Gas Inventory**

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**Sources and Further Information**

United States Environmental Protection Agency: Greenhouse Gas Overview

<https://www.epa.gov/ghgemissions/overview-greenhouse-gases>

New York State Department of Environmental Conservation: Impacts of Climate Change in New York

<http://www.dec.ny.gov/energy/94702.html>

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<http://css.umich.edu/factsheets/carbon-footprint-factsheet>

United States Environmental Protection Agency: Basic Information of Air Emissions Factors and Quantification

[www.epa.gov/air-emissions-factors-and-quantification/basic-information-air-emissions-factors-and-quantification](http://www.epa.gov/air-emissions-factors-and-quantification/basic-information-air-emissions-factors-and-quantification)