Village of Tully, New York 2021 Municipal Greenhouse Gas Inventory

Prepared by: Zachary Greschler, Patrick Kenny, Adam Perry, Sofia Rater, Sachi Segan

#

#

#

#

# Table of Contents

[**Acknowledgments**](#_oz61x9v0bf0o) **2**

[**Introduction**](#_cespd8az9u54) **3**

[**Methods**](#_raeqqy4ug13x) **4**

[**Emissions Sectors**](#_3x6wob4noeuu) **7**

[Vehicle Fleet](#_i44sp6j68src) 7

[Streetlights](#_4riv1jafbgto) 7

[Buildings and Facilities](#_rmekehcxregh) 8

[Water and Wastewater](#_t183pp5pk9nh) 8

[**Results**](#_ev0zgz8g8nh5) **8**

[**Discussion**](#_dckao719tett) **9**

[**Recommendations**](#_q57roc23zy4h) **9**

[**Conclusions**](#_3qj4i56nggln) **10**

[**Citations**](#_gj7t6yau772t) **10**

# Acknowledgments

Our team would like to extend a thank you to the following people and organizations for their contributions to this project.

**Village of Tully, New York**

The Village of Tully Board

Kathy Vernay, Village Trustee

**Central New York Regional Planning and Development Board**

Amanda Mazzoni

**SUNY College of Environmental Science and Forestry**

Dr. Joshua Cousins

**Environmental Protection Agency**

Local Government Greenhouse Gas Inventory Module created under the Clean Energy Program

# Introduction

Greenhouse gasses (GHGs) are gas emissions that trap heat in the atmosphere. This is a natural process that is necessary to keep the Earth at a normal average of 59 degrees Fahrenheit. Human activities such as burning fossil fuels have sped up this process, causing a rapid change in the Earth's temperature. (Danchak 2019) This problem has caused calls for change to reduce human GHG emissions. Places like cities and towns that want to address their GHG emissions first have to understand where they are coming from and how much. This is where making a GHG inventory comes in. The planner will scope and plan what sectors are going to be measured and inventoried. Then, using the data showing the details of GHG emissions, the planners will then create a plan on where they want to go from there.

The EPA has created a GHG inventory development guide that outlines the basics. It can be broken down into a 4-step plan. The first step is to scope and plan the inventory. The community will develop methods, choose a base year, and determine boundaries. The data will then be collected and quantified. Finally, a management plan can be created, along with emissions reduction targets. This is a very broad inventory outline for different organizers, but it highlights the basics. (EPA) It’s a way to understand where emissions are coming from and to help figure out how to lower them.

The three most prevalent greenhouse gases, and therefore the focus of this analysis, are carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O). The unit used to discuss these gases in aggregate is carbon dioxide equivalent (CO2e), 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 CO2 (see Table 1). This inventory uses the 20-year GWP values published by the IPCC’s 5th Assessment Report.

|  |  |
| --- | --- |
| **Greenhouse Gas (GHG)** | **Global Warming Potential (GWP)** |
| Carbon Dioxide (CO2) | 1 |
| Methane (CH4) | 85 |
| Nitrous Oxide (N2O) | 264 |

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

The state of New York has ambitions to reach an 85% reduction in greenhouse gas emissions by 2050, a 100% zero-emission electricity grid by 2040, and reach 70% renewable energy by 2030. To reach these goals, the state has created programs to help municipalities implement climate mitigation projects, including the New York State Energy Research and Development Authority’s (NYSERDA) Clean Energy Communities program and the Department of Environmental Conservation’s (DEC) Climate Smart Communities program.

NYSERDA’s Clean Energy Communities program includes fourteen high-impact areas that communities could address. One of these high-impact actions is Climate Smart Community certification. The Climate Smart Communities program is a program run by the Department of Environmental Conservation (DEC) that seeks to help local governments in reducing greenhouse gas emissions and adapting to climate change. To become a registered Climate Smart Community, communities must first take the Climate Smart Communities pledge and submit paperwork to DEC. Participation in this program benefits the municipality because it shows great leadership, provides priority funding status for certain grant programs, and provides statewide recognition. Communities who take the pledge are committing to reducing greenhouse gas emissions, saving taxpayer dollars, increasing energy security and reliability, building resilience to the effects of climate change, advancing community goals for public health and safety, and supporting a green innovation economy.

A community can move towards certification by completing actions to mitigate and adapt to climate change. There are over 100 different actions that a community can take. Funding for these actions is available from the Climate Smart Communities Grant program and the Municipal Zero emission Vehicle Infrastructure Rebate Program.

The village of Tully is a 0.6 square mile village in Onondaga County, New York. It is located 19 miles South of Syracuse, New York along I-81. As of 2019, the town had a population of 926 people. Tully currently has ambitions to earn Climate Smart Community Bronze Certification. Tully has already made great strides towards this certification. In October 2019, they adopted the pledge to become a Climate Smart Community (CSC), and in December 2019, they became a Clean Energy Community by completing four high impact clean energy actions in NYSERDA’s program. The village will be able to use actions completed in NYSERDA’s Clean Energy Communities program towards Climate Smart Communities Certification, as well as other sustainability initiatives they have completed. Becoming a Certified Climate Smart Community will also help the village to earn points towards additional grant opportunities, including in the Clean Energy Communities program.

In order to earn points towards CSC Certification for a community greenhouse gas inventory, specific requirements must be met. The local government operations GHG inventory report must have been created within five years prior to the application submission date. The report must show methodology that is compliant with ICLEI’s Local Government Operations Protocol, which this report follows, and there must be evidence that the report was provided publicly. (NY.GOV 2022)

The village is working with the Central New York Planning and Development Board (CNY RPDB) in combination with this ESF class to compile a municipal greenhouse gas inventory and analysis for the 2021 year. This report will include energy use and emissions from municipal buildings and facilities, streetlights, vehicle fleet, and water and wastewater sectors. This report focuses on municipal emissions, whereas the CNY RPDB is working to compile a community-wide GHG emissions report in parallel to this effort. A presentation of the findings of this municipal operations inventory was given to the village board meeting on May 4, 2022, at 7:00 pm.

# Methods

The village of Tully, New York, has requested a greenhouse gas inventory report for their municipal operations in 2021 in order to comply with the Climate Smart Community (CSC) Certification program. To calculate GHG emissions from municipal operations, this report uses ICLEI’s Local Government Operations Protocol. This protocol outlines three different scopes of emissions:

a) Scope 1- All direct GHG emissions from equipment owned and operated by a municipality.

b) Scope 2- Indirect GHG emissions associated with the consumption of purchased or acquired electricity, steam, heating, or cooling for municipal operations.

c) Scope 3- All other emissions not covered in Scope 2, such as emissions from vehicles not owned or operated by the city, waste disposal, or emissions from agriculture.

This inventory focuses on Scope 1 and Scope 2 emissions from municipal operations in the Village of Tully. The analysis uses the United States Environmental Protection Agency’s (EPA) Local Greenhouse Gas Inventory Tool Government Operations Module[[1]](#footnote-1).

To begin the GHG inventory, one must create the control sheet. This requires one to add the name of the municipality (Village of Tully), inventory year (2021), and the population of the town (926 people). We can see this in **Figure 1.**


**Figure 1.** Step 1 of setting up the control sheet.

After completing step 1 on the control sheet, the available data can be divided into four sectors to quantify the emissions associated with each sector individually. The sectors are:

a) Buildings and facilities- electricity, natural gas and diesel consumption from buildings, facilities and generators within the village of Tully.

b) Water and wastewater treatment- electricity and natural gas usage from the water pumping and wastewater treatment facilities in the village of Tully, and process emissions from wastewater treatment.

c) Streetlights- electricity associated with the streetlights within the village of Tully.

d) Vehicle fleet-emissions associated with the use of both gasoline and diesel vehicles owned by the village of Tully, also including off-road vehicles and lawn equipment.

We can see this breakdown in **Figure 2.**





**Figure 2.** Steps 2 and 3 of setting up the control sheet.

Once these conditions are established, the Emissions and Generation Resource Integrated Database (eGRID) subregion needs to be set. eGRID is a cumulative data source for the environmental characteristics of electric power generated throughout the United States. The subregion for the village of Tully is Upstate New York. This region is known as NYUP in the eGRID section of the EPA tool. After selecting the eGRID region, the GHG inventory tool returns the following data seen in **Figure 3.**



**Figure 3.** Step 4 of setting up the control sheet.

**Figure 3.** shows that for every MWh of electricity consumed in the village of Tully, it emits 232.31 lb. CO2, 0.017 lb. CH4, and 0.002 lb. N2O. All three gasses are greenhouse gasses. However, it is very common to notate emissions in terms of their CO2 equivalent (CO2e). When these three gasses are scaled this way, we find that the village of Tully emits 234.28 lb. CO2e/MWh. This is the ultimate step of setting up the control sheet.

There are a multitude of tabs to use on the GHG inventory sheet. For this inventory, the tabs that were required were as follows:

a) Control sheet- establishes baselines for the calculations to be done by the GHG inventory tool.

b) Stationary entry- natural gas, and gasoline and diesel combustion from lawn equipment was accounted for on this tab. Diesel and gasoline were measured in gallons and natural gas was measured in mcf.[[2]](#footnote-2)

c) Stationary data- overview of all data entered.

d) Stationary calcs- Overview of data calculated for stationary combustion.

e) Mobile entry- data from the vehicle fleet was entered in this tab. Vehicles were separated by fuel type and vehicle type. Once broken down into those categories, the gallons of fuel were converted into vehicle miles traveled by using the conversion factors given on the sheet.

f) Mobile data- overview of all data entered.

g) Mobile summary- overview of data calculated from the vehicle fleet.

h) Electricity entry- electricity use by site was entered in this tab. Entries in this tab came from the water and wastewater treatment sector, the buildings and facilities sector and the streetlights sector.

i) Electricity location based calcs- displayed emissions from each sector.

j) Additional emission sources- additional emissions from wastewater process emissions were added here.[[3]](#footnote-3)

j) Summary emissions- A summary of all emissions from each sector was produced on this tab.

# Emissions Sectors

## Vehicle Fleet

The Village’s on-road fleet includes two gasoline pick-up trucks and two diesel dump trucks. In addition to the on-road fleet, the Vehicle Fleet sector in this report also includes emissions from off-road gasoline and diesel fuel for lawn equipment. The Village of Tully provided the fuel consumption data measured in gallons, and Vehicle Miles Traveled (VMT) was calculated for input into the EPA Tool for the on-road vehicles. Lawn equipment used approximately 83 gallons of gasoline and 747 gallons of diesel, while the on-road vehicles used approximately 1,580 gallons of gasoline and 1,091 gallons of diesel. Overall, the Vehicle Fleet sector emitted 33.39 MTCO2e in 2021.

## Streetlights

There are 98 LED cobra-head streetlights in the Village of Tully. Energy consumption for 2021 in the Streetlights sector was provided by the Village of Tully in the form of calculations including dates, total kWh, and charges for each month of the year. December, January, February, March, and April were the months with the highest electricity consumption, likely because there are more dark hours in a day, thus requiring streetlights to run longer. The annual electric usage for the Streetlights sector in 2021 was 13,069 kWh, creating 1.39 MTCO2e in emissions.

## Buildings and Facilities

Emissions from the Buildings and Facilities sector consist of diesel fuel used by a backup generator and natural gas and electricity used by the Grove St. Park, Precinct Gas and Electric, and Shop Electric village accounts. Stationary combustion of natural gas and diesel for the Buildings and Facilitiessector produced 4 MTCO2e, while the electricity use for this sector produced 0.77 MTCO2e for the year of 2021. In total, the Buildings and Facilities sector emitted 5 MTCO2e, or 4% of emissions.

## Water and Wastewater

Water and Wastewateris by far the largest emitter of GHGs from village operations, making up 69 percent of gross GHG emissions in 2021. Water and Wastewatersector consumed 476,082 kwh of electricity and 3,983 therms of natural gas. Stationary combustion of natural gas in this sector emitted 21.45 MTCO2e, electricity use emitted 50.59 MTCO2e, and process emissions totaled 8 MTCO2e, for a total of 88.59 MTCO2e from the Water and Wastewater sector

# Results

Total emissions for the Village of Tully municipal operations for 2021 equaled 128.37 MTCO2e. The most significant emitting sector is the Water and Wastewater sector with a total of 88.59 MTCO2e, or 69% of gross emissions for the village of Tully in 2021. The vehicle fleet sector emitted a total of 33.39 MT CO2e, equating to 26% of gross emissions for the year 2021. The streetlights sector emitted 1.39 MT CO2e or 1% of total emissions. Buildings and facilities released 5 MTCO2e, or 4% of village emissions. **Figure 4** shows gross emissions.

**Figure 4.** Gross Emissions for Village of Tully for 2021.

# Discussion

Global warming's effects on its surrounding environments are devastating and have directly led to intense climate change. As normal temperatures rise it can cause several events such as more frequent and severe weather, higher death rates of all species, toxic air, higher wildlife extinction rates, pH change in our waterways/oceans and higher sea levels accompanied by the melting of arctic ice. These effects ripple throughout the global environment, causing millions of past, present and future events to be traced back to global warming.

New York’s Emission Reduction Requirements are some of the most aggressive nationwide, including an 85% reduction in GHG emissions by 2050, zero emission electricity by 2040, 70% Renewable energy by 2030, etc. New York has options for loans, rebates, grants, and other funding opportunities to encourage innovative emissions reduction actions. This report can be used by the Village of Tully as a baseline for a municipal operations climate action plan.

# Recommendations

The sector that produced the most emissions for Tully, NY in 2021 were Water and Wastewater, followed by the Vehicle Fleet. These sectors make sense as the largest emitters when looking at the bigger picture. Transportation is the largest GHG source in the US, and water-related energy consumption makes up about 13% of US electricity use.

There are some ways in which the village can reduce water usage:

1. Reduce outdoor watering,
2. Use watersense fixtures,
3. Harvest rainwater, and
4. Audit the wastewater facility.

A lot of water usage is associated with watering outdoor areas. For residential areas, this is usually lawns and gardens. For commercial or village property, this could be things like golf courses, parks, and other landscaped areas.

Fixing a house with highly efficient water sensitive equipment can decrease water use, and in turn, decrease wastewater. According to an EPA study, implementing measures like this can reduce home water consumption by 20%. (Redmond, 2020)

These would be very helpful actions to take; however, for Tully, most of the emissions came from energy use directly from powering the wastewater treatment facility. An energy audit of the wastewater facility might be a good start to better understand its energy use and ways the village could become more efficient at that facility.

For the village's vehicle fleet, it might be helpful to dig further. If the village doesn’t already, they could keep an inventory of vehicles including age of vehicle, weekly miles traveled, and fuel use. Tully could also educate its employees on how to use the village vehicles more efficiently.

Some actions that could be taken include:

1. Optimize routes,
2. Carpool,
3. Regular vehicle maintenance,
4. Consider electric vehicles, and
5. Don’t idle.

# Conclusions

Greenhouse gas emission must be reduced in our atmosphere if humans wish to prolong the Earth's sustainable environment. We must be able to provide future generations with the same environment that we hold dear to us today. The EPA’s Local Greenhouse Gas Inventory Tool was used to calculate the emissions from four different sectors in the village of Tully, New York. These sectors included Vehicle Fleet, Streetlights, Buildings and Facilities, and Water and Wastewater. The GHG inventory tool revealed that the Water and Wastewater sector was the highest emitting sector, followed by Vehicle Fleet, Buildings and Facilities, and streetlights in that order. This report will help the Village of Tully in crafting a climate action plan for municipal operations, and it is recommended that the village focus first on addressing emissions from the Water and Wastewater sector.

# Citations

Redmond, T. (2020, January 31). *Climate Action Strategies for Cities to Reduce Water and*

*Wastewater Emissions*. paleBLUEdot Llc.

<https://palebluedot.llc/carbon-copy/2019/11/6/climate-action-strategies-for-cities-to-reduce-solid-water-wastewater-emissions>

*IPCC — intergovernmental panel on climate change*. (2014). Retrieved May 4, 2022, from <https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf>

PE2 Action: Government Operations GHG Inventory. (2021, December 17). Retrieved May 4, 2022, from <https://climatesmart.ny.gov/actions-certification/actions/#open/action/6>

1. The EPA tool was modified by Amanda Mazzoni to utilize IPCC 5th Assessment Report 20-year values for Global Warming Potentials (GWPs). [↑](#footnote-ref-1)
2. Consumption from the Shop Gas account was attributed to the water and wastewater treatment sector; however, this natural gas account is split between the wastewater treatment facility building and another non-wastewater building. Since it is impossible to know how much natural gas was used at each facility since they are not separately metered, please note that a small amount of the emissions from natural gas attributed in this inventory to the water and wastewater sector can actually be attributed to the buildings and facilities sector. [↑](#footnote-ref-2)
3. Data was calculated and provided to the group by Amanda Mazzoni using ICLEI protocols in the Local Government Operations Protocol. [↑](#footnote-ref-3)