2019 Greenhouse Gas Emissions Inventory

Summary

Published: December 2022

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Partners for Climate Protection Program

The City of Temiskaming Shores joined the Partners for Climate Protection (PCP) program in 2018. The PCP program is organized by ICLEI – Local Governments for Sustainability (ICLEI Canada) and the Federation of Canadian Municipalities (FCM). Together they have developed a 5-milestone framework to help municipalities reduce the emissions they produce. The 5 milestones are as follows:

- Milestone 1: Create a baseline emissions inventory and business-as-usual forecast
- Milestone 2: Set emissions reductions targets
- Milestone 3: Develop a local climate action plan
- Milestone 4: Implement a local climate action plan
- Milestone 5: Monitor and report results

This program helps municipalities reach ambitious goals that align with the Intergovernmental Panel on Climate Change's (IPCC) scientific targets. The program is designed to be user friendly and offers many resources and tools to members for no cost at all. Through the program, municipalities get access to the PCP Secretariat for guidance, the PCP hub which is an online network of over 500 other member municipalities and the PCP Milestone Tool, which is a resource to assist in quantifying, monitoring, and measuring GHG emissions in both the corporate and community sectors. Overall, the PCP program is a free resource that simplifies and encourages climate action from Canadian municipalities, all who have a large role to play in the fight against climate change.

The greenhouse gas inventory and business-as-usual forecast created in milestone 1 lays the foundation for the remainder of the PCP program. The emissions inventory provides the municipality with a baseline which they can use to monitor and track progress moving forward. The PCP protocol outlines five key elements to accomplish for milestone 1:

- Completing a corporate and/or community inventory which follows the PCP protocol
- Providing the emissions intensity values or coefficients for all energy types that were used to complete the emissions inventory
- A summary of data sources
- A description of any assumptions made with respect to the data
- A business-as-usual (BAU) forecast of emissions approximately 10 years into the future

On November 2nd, 2022, the PCP program awarded milestone 1 to the City of Temiskaming Shores for successful completion of a GHG inventory and BAU forecast compliant with their protocol.

Partners for Climate Protection Milestone Tool

The PCP protocol outlines how to complete the calculations for each sector to determine their corresponding emissions. You can complete these calculations independently in a spreadsheet or by using the PCP Milestone Tool. The PCP Milestone tool allows you to enter your consumption data into each sector required by the protocol. It computes all the emissions calculations for you, using the most current emissions factors and grid data. Using the PCP Milestone Tool can help to reduce human error in calculations and makes the process very quick and easy. Once you have finished inputting your data, the tool creates different graphs which visualize your municipality's energy usage, and it allows you to export

your completed inventories into Excel. The tool also gives you the opportunity to submit your completed inventory directly to the PCP Secretariat for approval, streamlining that process for you. Though it is beneficial to have spreadsheets that hold your inventory data and complete minor data manipulation before data entry, the PCP Milestone Tool simplifies the process of the calculations, visualizations, and submission.

For our 2019 emissions inventory we used the PCP Milestone Tool to complete all calculations and would recommend doing so for any new inventories in the future. For this we inputted all our gathered data into the tool and included all sources, assumptions, and estimations within the notes section of each data entry. This way all our information is in a uniform format and will be easily accessible to the PCP Secretariat for review and approval. The PCP Milestone tool also helps to create the business-as-usual (BAU) forecast for your inventory which is another requirement of the PCP Protocol. This process allows you to select your baseline year, set a mid-term target year and a forecast year. Then you need to add the annual population growth rate, and the tool will project the BAU forecast for you.

We found that using the PCP Milestone Tool greatly simplified the entire process for us and allowed us to focus on gathering accurate data and properly listing our assumptions. We created a spreadsheet to hold all the consumption data in one location and then inputted it into the tool from there for the emissions calculations.

Overview

The purpose of the baseline GHG inventory is to provide us with an initial measurement of what our city's GHG emissions are. Using 2019 as our baseline, we collected data on our energy consumption in both the corporate and community sectors. With that data we were able to calculate the corresponding GHG emissions. With the inventory complete, our next steps include setting ambitious GHG reduction targets, creating a detailed GHG reduction plan, and monitoring our progress as we implement sustainable changes within the municipality.

The PCP program provides members with access to an online tool that simplifies the calculation process. This tool allows members to navigate to each desired sector of the inventory and input the energy consumption data. The tool will then use the correct emission factors and energy source to calculate what the corresponding GHG emissions would be in tonnes of carbon dioxide equivalent (tCO2e). Detailed descriptions of each calculation and the required assumptions can be found in the PCP protocol. Once all the data, sources, methodology and assumptions have been entered into the PCP tool, you are able to analyze the results and submit for approval.

Corporate Inventory

The corporate inventory is a subset of the greater community inventory. It looks at all emissions produced by city operations. In 2019, our corporate operations produced an estimated 1,956 tCO2e. Though we cannot perfectly account for every emission produced by city operations, we can now use 2019 as our baseline and focus on reducing from that amount. From our city's operations, our fleet produces the most GHG emissions, making up 49.9% of the total corporate emissions in 2019. The fleet includes transit buses, on-road vehicles, and off-road equipment. Buildings are the next largest source of emissions in our corporate inventory, making up 41.6% of the total emissions. The use of natural gas significantly increases

GHG emissions in comparison to electricity use, which is why we see such high emissions from this sector. Water facilities make up 8.1% of our corporate inventory. Though they use a lot of energy, they are relatively low emitters because of their specific use of electricity. Our electricity grid in Ontario is considered low-carbon and so though our water facilities are large energy consumers, they still produce significantly lower emissions in comparison to the other fossil fuel dependent sectors. Finally, streetlights make up about 0.5% of our total corporate GHG emissions. A summary of all data sources can be found in table 1 below.

Table 1: Corporate Inventory Data Sources

Sector	Energy Source	Data Source	Data Scope
Buildings	Electricity	Hydro One	Electricity usage (kWh)
	Natural Gas	Union Gas/ Enbridge	Natural gas usage (m^3)
Streetlights	Electricity	Hydro One	Electricity usage (kWh)
Water	Electricity	Hydro One	Electricity usage (kWh)
	Natural Gas	Union Gas/ Enbridge	Natural gas usage (m^3)
Fleet	Fuel	City of Temiskaming Shores: Manager of Transportation Services	Fuel volume purchased (L), fuel type (gas, clear diesel, dyed diesel)
		Grant Fuels	Propane volume purchased (L)
	Transit	City of Temiskaming Shores: Website	Transit Route Map, Hours of Operation
		Google Maps	Distance Travelled (km)
		Alexander Dennis: Website	Bus fuel economy (L/100 km)

Buildings

Corporate buildings and facilities make up 41.6% of our 2019 corporate emissions within the City of Temiskaming Shores. This was calculated following the PCP protocol and using the PCP Milestone Tool. To calculate this, we gathered all our energy use data from 2019 and separated out the buildings and facilities, which includes parks and marina facilities. From there we input each individual building, their gross floor area, electricity use, natural gas use, expenditure, and any applicable assumptions. The tool then calculated the total energy consumption in GJ and the total greenhouse gas emissions in tCO_2e (see table 2). Analyzing this data allows us to see which buildings created the most emissions and which were the most energy intensive - these will be priority targets for reduction programs.

Table 2: Building and Facilities Summary

Buildings and Facilities	GHG Emissions	Energy Consumption	Expenditure
	813 tCO_2e/year	22,070 GJ/year	$663,181/year

Streetlights

Streetlights make up only 0.5% of our 2019 corporate greenhouse gas emissions in Temiskaming Shores. This was calculated following the PCP protocol and using the PCP Milestone Tool. The data was gathered from our 2019 Hydro One bills and then separated by different lighting categories: decorative, streetlights, traffic signs and other. Each of these categories were inputted into the PCP Milestone Tool with their total electricity consumption, expenditure, and any applicable assumptions. The tool then calculated the total energy consumption in GJ and the total greenhouse gas emissions in tCO_2e (see table 3).

Table 3: Streetlights Summary

Streetlights	GHG Emissions	Energy Consumption	Expenditure
	9 tCO_2e/year	1100 GJ/year	$84,711/year

Many streetlights in the city are unmetered and are instead paid on a monthly fee schedule based on wattage and number of hours used. This required us to make estimates on the electricity usage for the unmetered lights. To do this we first calculated an average cost/kWh for the metered lights and then using that value we were able to estimate how much electricity they roughly used based on how much we paid for each of the unmetered lights. This is just an estimate but will allow us to repeat this calculation for unmetered lights in future inventories to better understand our streetlight energy use.

Water

Water and sewage make up 8.1% of the 2019 corporate greenhouse gas emissions in Temiskaming Shores. This was calculated following the PCP protocol and using the PCP Milestone Tool. This data was collected from our 2019 Hydro One and Union Gas bills and was separated by each facility. Each facility was then inputted into the PCP Milestone Tool with their total electricity consumption, natural gas consumption, expenditure, and any applicable assumptions. The tool then calculated the total energy consumption in GJ and the total greenhouse gas emissions in tCO_2e (see table 4). With this data we can see which specific water facilities are using the most energy to help us uncover some potential energy saving opportunities.

Table 4: Water and Sewage Summary

Water and Sewage	GHG Emissions	Energy Consumption	Expenditure
	158 tCO_2e/year	12,217 GJ/year	$595,656/year

Fleet

Corporate fleet vehicles make up 49.9% of our 2019 corporate greenhouse gas emissions within the City of Temiskaming Shores. This was calculated following the PCP protocol and using the PCP Milestone Tool.

For 2019, we do not have the fuel usage for each vehicle operated by the city, so this data comes from the total volume of fuel purchased in 2019. The data was separated by fuel type: gasoline, clear diesel, and dyed diesel. To estimate the volume of fuel used by transit buses, we used the average number of kilometers the buses travel in a year and their advertised fuel economy. Each of these categories were inputted into the PCP Milestone Tool with their total volume (L), expenditure and any applicable assumptions. The tool then calculated the total energy consumption in GJ and the total greenhouse gas emissions in tCO_2e (see table 5). We also gathered propane usage data for our city's two ice-resurfacers. This data was sourced from Grant Fuels and was inputted into the PCP tool with the total volume (L) used and any applicable assumptions.

Table 5: Fleet Vehicles Summary

Fleet Vehicles	**GHG Emissions**	**Energy Consumption**	**Expenditure**
	976 tCO_2e/year	13,969 GJ/year	$312,249/year*

*Does not include costs associated with transit or propane use

Community Inventory

The community inventory includes emissions produced within the municipal boundary. This value is only an estimate as we cannot perfectly account for every emission produced in the city. In 2019, our community produced 103,744 tCO2e. Stationary energy use consists of 3 sub-sectors; residential, commercial, and industrial energy use. Residential energy use makes up 19.0% of total community emissions. Commercial energy use makes up 14.2% and industrial energy use makes up 3.8%. These sub-sectors consider electricity, natural gas, and propane usage. The community inventory also includes on-road transportation, and this makes up a majority of our community emissions at 54.3%. Though it is difficult to perfectly track the emissions from on-road transportation in the community, using fuel sales data we were able to determine an estimate. The final sector in the community inventory is solid waste. We can calculate the emissions from our waste by using the mass of the solid waste and the provincial averages for waste composition. With that information we were able to determine that solid waste makes up 8.7% of the community inventory. A summary of all data sources can be found in table 6.

With this information we can uncover projects and programs to help reduce emissions from our community. Public education and community programming will be important as reducing our community emissions is much more complex than reducing corporate emissions.

Table 6: Community Inventory Data Sources

Sector	**Energy Source**	**Data Source**	**Data Scope**
Residential Energy	Electricity	Hydro One	Electricity usage (kWh)
	Natural Gas	Union Gas/ Enbridge	Natural gas usage (m^3)
	Propane	Natural Resources Canada's Comprehensive Energy Use Database	Propane Usage (L)

	Population	Statistics Canada	Number of people
	Households	Statistics Canada	Number of households
Commercial Energy	Electricity	Hydro One	Electricity usage (kWh)
	Propane	Natural Resources Canada's Comprehensive Energy Use Database	Propane Usage (L)
	Natural Gas	Union Gas/ Enbridge	Natural gas usage (m^3)
Industrial Energy	Electricity	Hydro One	Electricity usage (kWh)
	Natural Gas	Union Gas/ Enbridge	Natural gas usage (m^3)
On-road Transportation	Gas Station Fuel Sales	Kalibrate Canada, Inc.	Fuel volume sold (L), fuel type sold (gas, diesel)
	Vehicle Type	Natural Resources Canada's Comprehensive Energy Use Database	Percentage by type (%)
Solid Waste	Solid Waste Produced	City of Temiskaming Shores: Manager of Environmental Services	Volume of uncompacted waste (m^3)
	Waste Composition	National Waste Characterization Report created by the ECCC	Percentage by type (%)

Residential Energy

Residential energy is the energy consumed by the residential sector in Temiskaming Shores. In 2019 the residential sector produced 19,683 tCO2e. This includes electricity, natural gas, and propane consumption. Actual electricity consumption (kWh) data in 2019 was collected from Hydro One. Actual natural gas consumption (m^3) in 2019 was collected from Enbridge and propane consumption (L) was estimated by scaling down the provincial propane use in 2019 for the residential sector in Temiskaming Shores. This data was inputted into the PCP tool including all methodology, data sources and assumptions. The PCP tool calculated the total GHG emissions and energy consumption for this sector (See table 7).

Table 7: Residential Energy Summary

Residential Energy	**GHG Emissions**	**Energy Consumption**	**Expenditure**
	19,683 tCO_2e/year	519,523 GJ/year	No data

Commercial Energy

Commercial energy is the energy consumed by the commercial and institutional sector in Temiskaming Shores. In 2019 the commercial sector produced 14,769 tCO2e. This includes electricity, natural gas, and propane consumption. Actual electricity consumption (kWh) data in 2019 was collected from Hydro One. Actual natural gas consumption (m^3) in 2019 was collected from Enbridge and propane consumption (L) was estimated by scaling down the provincial propane use in 2019 for the commercial sector in Temiskaming Shores. This data was inputted into the PCP tool including all methodology, data sources and assumptions. The PCP tool calculated the total GHG emissions and energy consumption for this sector (See table 8).

Table 8: Commercial Energy Summary

Commercial Energy	**GHG Emissions**	**Energy Consumption**	**Expenditure**
	14,769 tCO_2e/year	457,375 GJ/year	No data

Industrial Energy

Industrial energy is the energy consumed by the manufacturing industries and construction sector in Temiskaming Shores. In 2019 the industrial sector produced 3,928 tCO2e. This includes electricity and natural gas consumption. Actual electricity consumption (kWh) data in 2019 was collected from Hydro One and Actual natural gas consumption (m^3) in 2019 was collected from Enbridge. This data was inputted into the PCP tool including all methodology, data sources and assumptions. The PCP tool calculated the total GHG emissions and energy consumption for this sector (See table 9).

Table 9: Industrial Energy Summary

Industrial Energy	**GHG Emissions**	**Energy Consumption**	**Expenditure**
	3,928 tCO_2e/year	201,380 GJ/year	No data

On-road Transportation

On-road transportation data was calculated following the fuel sales method in the PCP protocol. For this we were able to purchase data from Kalibrate Canada, Inc. on the volume of fuel sold from our gas stations within the city. Unfortunately, Kalibrate only collected data from 5 out of 7 gas stations in the city. To represent the 2 missing gas stations in our data we made the assumption that each of the missing stations sold the average volume of fuel from the 5 stations with available data. Though this is not the most precise approach, this will allow us to generally represent these values. With fuel sales we also have to note that not all fuel sold within our municipality will be used within our boundary. This means that the values used to calculate emissions from on-road transportation is likely an over-estimate. With this being said as long as we continue to use the fuel sales approach in our inventory into the future, the results of our calculations should remain consistent and allow us to properly measure changes in on-road transportation into the future.

Vehicle type data was also required for this sector of the community inventory. Kalibrate does not collect this data, but we were able to pull it from Natural Resource Canada's Comprehensive Energy Use

Database, which was what was recommended in the PCP protocol. Table 10 shows the percentage of fuel type used by each vehicle.

Table 10: Percentage of Fuel Type Used by Each Vehicle

Fuel Type	Cars	Light Trucks	Heavy Trucks
Gasoline	43.8%	48.1%	2.4%
Diesel	0.6%	0.6%	3.7%
Propane	0.4%	0.4%	0.0%
Compressed Natural Gas	0.0%	0.0%	0.0%
Ethanol	0.0%	0.0%	0.0%
Electricity	0.0%	0.0%	0.0%

For this sector, the total volume of gas sold (L) and the total volume of diesel sold (L), the percentage of fuel type used by each vehicle, the assumptions and the estimations were inputted to the PCP Milestone Tool. From there the tool was able to calculate the total GHG emissions in tCO2e and the total energy consumption in GJ (See table 11).

Table 11: On-road Transportation Summary

On-road Transportation	GHG Emissions	Energy Consumption	Expenditure
	56,324 tCO2e/year	850,262 GJ/year	No data

Solid Waste

Solid waste emissions were calculated using the methane commitment approach through the PCP Protocol. This approach required the amount of solid waste in tonnes, the composition of solid waste in percentages, and the type of landfill (managed, unmanaged, or uncategorized). Our municipality does not have a scale, so we don't collect data for waste weight sent to landfill. By using a volume to weight conversion for uncompacted solid waste provided by Manitoba's Waste Reduction and Recycling Support Program, we were able to estimate how much waste was produced in tonnes. The conversion was as follows:

$$1000\ m^3 = 190\ tonnes$$

For the composition of solid waste, we used the 2019 National Waste Composition Values from the National Waste Characterization Report created by Environment and Climate Change Canada (ECCC). We used national percentages as the City of Temiskaming Shores does not collect data on waste composition (See table 12).

Table 12: National Waste Composition Values 2019

Food	23.00 %
Paper and Cardboard	18.00 %
Wood Products	10.00 %
Diapers and Pet Waste	6.00 %
Garden and Plant Debris	5.00 %

Textiles	1.00 %
Rubber and Leather	1.00 %

*Only materials with degradable organic carbon are considered. Percentages will not sum to 100.

The City of Temiskaming Shores does not collect separate data on corporate waste, therefore the values inputted into the community inventory also represent that subset of corporate solid waste. After inputting all the relevant data into the PCP tool such as, an estimate of waste weight (tonnes), waste composition, landfill type, and any applicable assumptions into the notes section, the tool provided us with the GHG emissions from waste in the year 2019 (see table 13).

Table 13: Solid Waste Summary

Solid Waste	GHG Emissions	Energy Consumption	Expenditure
	9040 tCO2e/year	No data	No data

Business-as-Usual Forecast

The business-as-usual (BAU) forecast is an estimate of what future GHG emissions would look like if there was no climate action moving forward. This is done by applying the annual population growth rate to baseline emissions levels. The PCP Tool completes these calculations for you after you input your baseline inventory year, mid-term target year and forecast year which should be around 10 years into the future. For the purposes of this inventory, we used 2019 as the baseline year, 2027 as the mid-term target year and 2032 as the forecast year as it is 10 years from when the inventory is being created (2022). The annual population growth rate was calculated using the census populations from the 2016 and 2021 Statistics Canada Census reports. The first step was to calculate the population percent change and then calculate the annual population growth rate using that value. Inputting this into the PCP milestone tool gave us a BAU forecast for milestone 1.

Annual Population Growth Rate Calculations

Step 1: Population % Change

$$C = \frac{(x_2 - x_1)}{x_1} \times 100$$
$$C = \frac{(9634 - 9920)}{9920} \times 100$$
$$C = -2.9\%$$

C = Population % Change
X_1 = initial population = 9920 (2016 census)
X_2 = final population = 9634 (2021 census)

Step 2: Annual Population Growth Rate

$$P_r = \frac{C}{t}$$
$$P_r = \frac{-2.9\%}{5\ years}$$
$$P_r = -0.58\%\ annually$$

P_r = Annual Population Growth Rate (%/year)
C = Population % Change = -2.9%
t = Time (years) = 2021 – 2016 = 5 years

Based on these calculations we see that our growth rate is actually decreasing for Temiskaming Shores. Because of this our BAU forecast also decreases from 1756.02 in our baseline year (2019) to 1628.13 in our forecast year (2032). This is a -7% decrease in tonnes of carbon dioxide equivalent emitted. With decreasing population, it is expected that emissions will also decrease, but there are still many opportunities for the city to create deeper reductions in greenhouse gas emissions that will have a much larger impact on tackling climate change.

Limitations and Areas of Uncertainty

GHG Inventories are restricted by the availability of quality data. In this inventory we were not able to quantify all potential sources of GHGs. Due to the exclusion of certain sources of GHGs, our actual emissions will be higher than what we report in this inventory. Understanding where the gaps are in our data will inform municipal staff on potential opportunities for further data collection in the future.

Excluded Corporate GHGs

In our corporate inventory we excluded some data that was not available to us. One exclusion was all travel by municipal staff that did not occur in a corporate fleet vehicle. This data is not readily available and so it was felt that because the corporate inventory is a subset of the community inventory these emissions would likely have been accounted for in the community inventory instead. This means that we could expect our fleet emissions to be higher than what we actually see in the corporate inventory.

We also excluded data on solid waste generated within city facilities. Because we do not openly track this information our estimate for how much waste is produced in corporate facilities would not be accurate enough for it to be worth including in the inventory. Because of this we decided to only report on our solid waste in the community inventory. In the future it might be useful to track more detailed information to include in reports.

Excluded Community GHGs

As a smaller municipality it was difficult to gather additional data on community GHG emissions. Though we covered the basic representative sectors of residential energy, commercial energy, industrial energy, transportation, and waste, we excluded other information due to the lack of available quality data. One of our exclusions was fugitive emissions, which includes GHG emissions from discharges or leaks in wastewater treatment and refrigerants. This data wasn't available and therefore wasn't possible to include in the inventory. We also didn't include transportation emissions that came from sources other than on-road transportation. We found it difficult to include accurate on-road transportation data, which deterred us from roughly estimating other areas of transportation data such as recreational vehicles, railways, watercrafts, and aviation. Though this data could potentially be estimated, we felt that the lack of accuracy would take away from the impact of our inventory. These sources of GHGs are not required to be reported on by PCP protocol, so excluding them does not greatly impact the quality of our inventory.

Notable Areas of Uncertainty

One of the most notable areas of uncertainty in this report is the community GHGs for on-road transportation. The data collected for this sector doesn't account for the Temiskaming Shores residents and visitors that are fueling their vehicles in other communities, and alternatively people who are passing through the city and stop just for fuel. We also were not able to gather fuel sales data for all 7 of our gas stations. This forced us to estimate values for 2 missing stations and increased our uncertainty further. With that being said, we strictly followed the PCP protocol which accepts fuel sales as an appropriate method to quantify on-road GHG emissions. Potentially we could reduce this uncertainty by installing traffic counters or conducting traffic count studies, which could be something for the municipality to consider for future inventories.

Another notable area of uncertainty is for the community stationary energy propane consumption in the residential and commercial sectors. Propane consumption data wasn't available from the service provider and so this inventory used a scaled down version of the provincial data. We first determined the provincial per capita propane use in 2019 for both the residential and commercial sector. Then multiplied that per capita value by the Temiskaming Shores population to determine an estimate. Though this is not a perfect way to account for all propane consumption in the area, it does provide us with a baseline value that we can work towards reducing.

Finally, the transit data in our corporate fleet is also notably uncertain. We were unable to retrieve actual fuel consumption records for our transit buses in 2019, so we calculated an estimate using the data we did have available. We first used the bus route to calculate the estimated number of kilometers travelled a year. Then using the make and model of the buses we were able to find an average fuel economy. Using these two values we could calculate an estimate for fuel consumption in the year 2019. There are many factors that could create differences from this estimate in real life. Idle time, detours, number of passengers, unexpected closures, and maintenance issues. All of these scenarios would make a difference in the actual fuel consumption of our transit buses. Because of this we have to assume that this difference and uncertainty between our estimation and our true value is negligible for the purposes of this inventory.