202-179
That report INS-2021-031, Greenhouse Gas (GHG) Emissions Inventory and Reduction Targets be received;

And that the Town adopt a community GHG emissions reduction target of net zero by 2050 in alignment with the ambitiousness of the Paris Agreement;

And that staff develop and set an interim community emissions reduction target once specific mitigation actions are prioritized dependent on level of impact, available resources, and support.

Result: Carried

Report

Subject: **Greenhouse Gas (GHG) Emissions Inventory and Reduction Targets**

Department: **Infrastructure Services**

Division: **Environment**

Report #: **INS-2021-031**

Meeting Date: **2021-05-10**

Recommendations

That report INS-2021-031, Greenhouse Gas (GHG) Emissions Inventory and Reduction Targets be received;

And that the Town adopt a community GHG emissions reduction target of net zero by 2050 in alignment with the ambitiousness of the Paris Agreement;

And that staff develop and set an interim community emissions reduction target once specific mitigation actions are prioritized dependent on level of impact, available resources, and support.

Background and Analysis

The Town has recognized the importance of reducing local greenhouse gas (GHG) emissions through its commitments to the Partners for Climate Protection (PCP) program and the Global Covenant of Mayors for Climate and Energy (GCoM). Additionally, the endorsement of the Town's Sustainable Neighbourhood Action Plan (SNAP) committed to encouraging emission reductions across the corporation and community.

The PCP program supports and guides municipalities in reducing GHG emissions through a Milestone Framework to achieve each of the required deliverables. In order to track these commitments, measure future progress and limit local contributions to climate change, the Town must identify a baseline year for their GHG emissions inventory.

This report provides the Town's first complete GHG emissions inventory for the baseline year of 2016 and proposes a net zero GHG target by 2050 in order to remain within 1.5°C of global warming to prevent catastrophic impacts from climate change.

By collecting data and developing an inventory of community GHG emissions, the Town of Orangeville has successfully completed Milestone One of the PCP program and their first badge of the GCoM. The GHG inventory reveals sources of emissions and tracks energy usage by sector. It is an important first step that will help the Town take action to reduce both energy use and local GHG emissions.

Baseline Inventory:

In 2016, the Town of Orangeville emitted a total of 223,974 tonnes of carbon dioxide equivalent (tCO_2e), resulting in a per-capita emissions value of 7.75 tCO_2e/person. The baseline inventory revealed the following sources of emissions:

- The Residential Sector emitted 39,209 tCO_2e accounting for 17.5% of total community emissions;
- The Commercial and Institutional Sector emitted 23,558 tCO_2e accounting for 10.5% of total emissions;
- The Industrial Sector emitted 7,179 tCO_2e accounting for roughly 3.2% of total emissions;
- Transportation including on-road and off-road modes, emitted 148,673 tCO_2e accounting for 66.4% of total emissions;
- The Waste Sector emitted 4,427 tCO_2e accounting for 2.0% of Orangeville's total emissions; and
- Fugitive emissions from natural gas use account for the remaining 0.4% or 928 tCO_2e.

By understanding the sources of local GHG emissions, the Town can identify and implement measures to improve energy efficiency and reduce Orangeville's contribution to climate change. The inventory also provides a valuable reference point for setting emissions reduction targets, and for forecasting and tracking progress over time.

As noted above, the Intergovernmental Panel on Climate Change (IPCC) indicates that global emissions must reach net zero by 2050 in order to remain within 1.5°C warming to prevent catastrophic impacts from climate change. Under a business-as-usual scenario, the Town's trajectory of emissions overtime are projected to rise by 130%, increasing to 290,300 tCO_2e annually by 2030. This translates to a 10 tCO_2e per capita rate for the Town. In order to effectively reach net zero emissions by 2050 as recommended by the IPCC, a per capita emissions rate of 3.2 tCO_2e per person should be achieved by 2030, decreasing to 0 tCO_2e per person by 2050.

Municipalities have control over much of the GHG emission in their jurisdiction, through land use planning, development oversight, transportation planning, waste services, and economic development. However, support from provincial and federal governments and participation from the community will be imperative to meet the net zero target successfully.

Both the federal and provincial governments have set a short-term target of 40% and 30% below 2005 emissions levels by 2030 respectively, and the federal government has set a long-term target of net zero emissions by 2050. It was found in a community survey conducted by the Town that over 80% of respondents feel that Orangeville's GHG reduction targets should be ambitious, either matching or going beyond provincial and federal targets. Examples of targets set by other municipal governments include the following:

Municipality	Community GHG Reduction Targets
City of Burlington	49% below 2016 by 2030 84% below 2016 by 2040 90% below 2016 by 2050
City of Kawartha Lakes	20% below 2015 by 2030
Town of Oakville	50% below 2016 by 2041
City of Windsor	40% below 2014 by 2041
Town of Caledon	Net Zero by 2050
Dufferin County	10% below 2016 levels by 2030 40% below 2016 levels by 2040 Net Zero by 2050

The Town has already identified and started implementing a range of actions that will reduce community and corporate GHG emissions through the SNAP, Corporate Energy Conservation and Demand Management Plan and the recently adopted Corporate Climate Change Adaptation Plan. Additionally, the update of the Official Plan review will include climate considerations, working to limit emissions from future growth and development.

The sectors with the greatest reduction potential include on-road transportation and residential and commercial buildings. Keeping this in mind, Attachment 2 summarizes actions and measures found in existing Town plans and strategies that will contribute to local emissions reduction.

In alignment with the ambitiousness of the Paris Agreement and current scientific evidence, it is recommended that the Town adopt an ambitious target of net zero emissions by 2050. This target will reflect the Town's commitment to reducing local GHG emissions where possible, with sequestration options used as a complimentary action.

Due to the extensive and immediate level of effort that is needed, it is also recommended that the Town adopt an interim target, using the 2016 inventory as a baseline. This target should reflect existing commitments and actions being taken at the Town, as well as additional mitigative actions to be implemented. The interim target will be developed through the next phase of the project once actions have been assessed and prioritized by staff.

Strategic Alignment

Orangeville Forward – Strategic Plan

Priority Area: Sustainable Infrastructure

Objective: Support Innovation

Sustainable Neighbourhood Action Plan

Theme: Energy and Climate Change

Strategy: Encourage emission reductions through energy efficiency, conservation and renewable energy generation

Notice Provisions

None.

Financial Impact

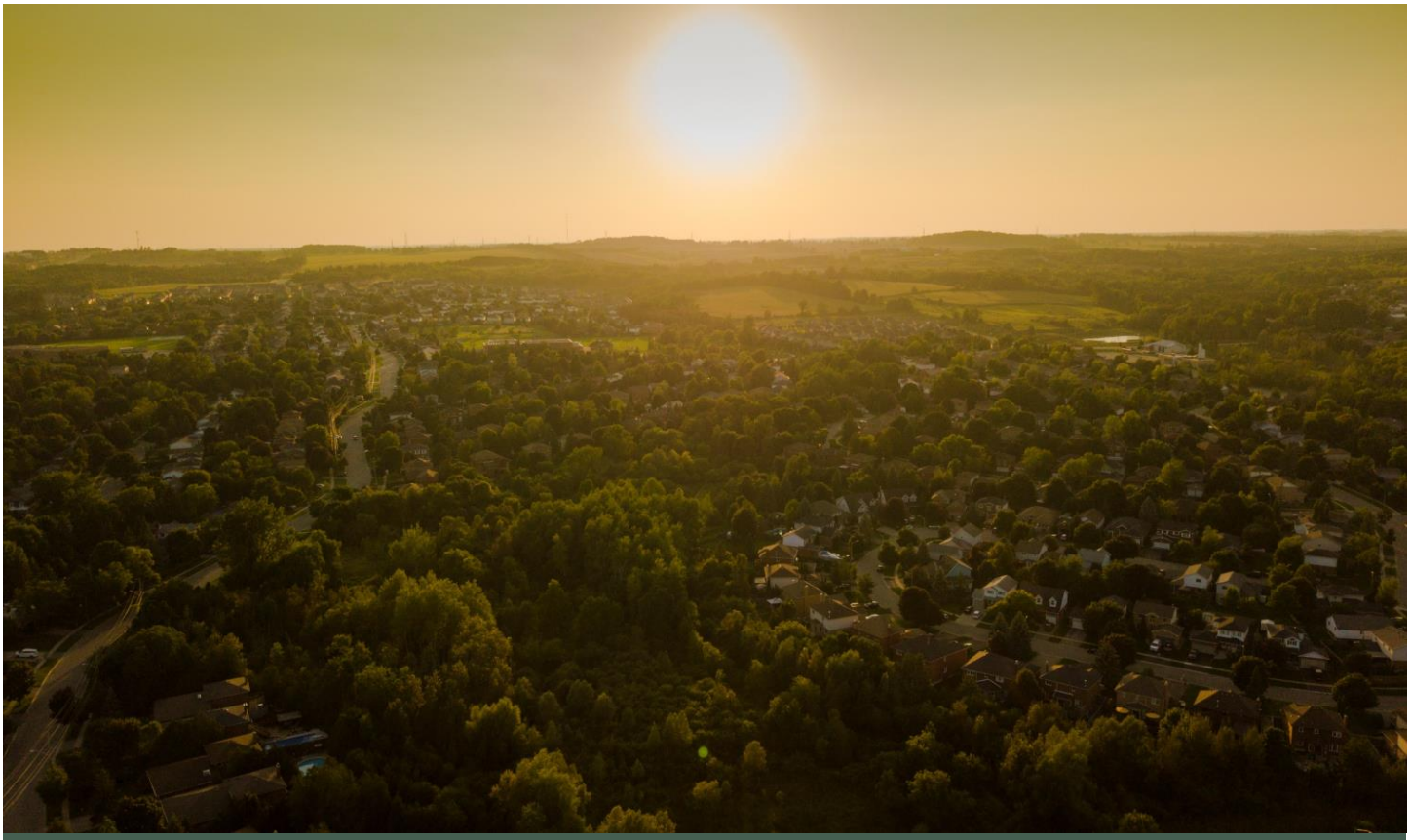
There is no financial impact as a result of this report.

Respectfully submitted
Douglas G. Jones, M.E.Sc., P. Eng.
General Manager, Infrastructure Services

Prepared by
Allison Myles
Climate Change Co-ordinator

Attachments:

1. Town of Orangeville's Community Greenhouse Gas Inventory (2016)
2. Existing Mitigation Efforts



Town of Orangeville's Greenhouse Gas Inventory

2016 Community Inventory

2021

1.0 Introduction

The Town of Orangeville has recognized the importance of reducing local greenhouse gas (GHG) emissions through their commitments to ICLEI Canada's Partners for Climate Protection (PCP) program and the Global Covenant of Mayors for Climate and Energy (GCoM). Both programs require the development of ambitious climate change mitigation targets and strategies to reduce local emissions. In order to track these commitments and limit local contributions to climate change, the Town must identify a baseline year for their GHG inventory to measure future emissions.

The PCP program supports and guides the municipality in reducing GHG emissions through a Milestone Framework to achieve each of these deliverables. The five milestones are:

Milestone 1: Creating a baseline emissions inventory and forecast
Milestone 2: Set emissions reduction target
Milestone 3: Develop a local action plan
Milestone 4: Implement the local action plan
Milestone 5: Monitor progress and report results

This report summarizes the baseline inventory of community GHG emissions in Town of Orangeville, fulfilling the requirement of Milestone 1 of the PCP program.

2.0 Greenhouse Gas Inventory

A GHG inventory summarizes and tracks the GHG emissions released by corporate and community activities. For Orangeville, 2016 was selected as the baseline year for the inventory based on available Census data. The following sectors are included in the inventory[1]:

- Residential Buildings
- Institutional and Commercial Buildings
- Industrial Buildings
- Transportation
- Waste

The total energy use for 2016 in the Town of Orangeville was 3,435,489 GJ, translating to 223,974 tCO_2e[2]/yr. This results in a per-capita emissions value of 7.75 tCO_2e/person in 2016.

[1] AFOLU and IPPU were not included in Orangeville's inventory as these activities are negligible within Town boundaries.

[2] In this report GHG emissions are measured in tons of carbon dioxide equivalent (tCO_2e). CO_2e means the number of metric tons of CO_2 emissions with the same global warming potential as one metric ton of another greenhouse gas.

2.1 Data Sources

In order to compile and complete a thorough community GHG emissions inventory, complete, accurate and real consumption data were used (see Table 1). In the absence of consumption data, assumptions were made using downscaled provincial data. Once the energy consumption and waste generation data were collected, GHG emissions were calculated using the PCP Milestone Tool.

Table 1: Summary of Data Sources

Data Type	Data Source	Description
Electricity	Orangeville Hydro	Electricity consumption for customer type and postal code (residential, commercial, industrial) (kWh)
Natural Gas	Enbridge Gas	Natural gas consumption for customer type and postal code (residential, commercial, industrial) (m^3)
Transportation	Kent Data Group	Total fuel sales within Town boundaries
	Natural Resources Canada	Canada's National Inventory Report Part 2 (emissions for railway - length and usage)
Waste	Dufferin County Waste Services	Waste generation amount (tonnes) per capita
	Wastewater Pollution Control Plant	Annual reporting/specific data requests from plant operators

2.2 Inventory Summary

After reviewing the data by energy type and sector, the inventory reveals that on-road transportation from gasoline consumption is the leading source of GHG emissions in Orangeville. This does not come as a surprise as many Town residents commute outside of the municipality for work. Following on-road transportation in annual emissions is the residential sector, with natural gas usage as the leading source of emissions. This is quite common for municipalities in Ontario as there are significant heating and cooling needs throughout the year.

Table 2 summarizes the GHG inventory, breaking down values by sector and energy type. These findings reveal the sectors and energy sources with the greatest reduction potential. This information will help to inform the Town in setting ambitious and strategic reduction targets and implementing actions to reduce energy usage and community emissions.

Table 2: Summary of Inventory

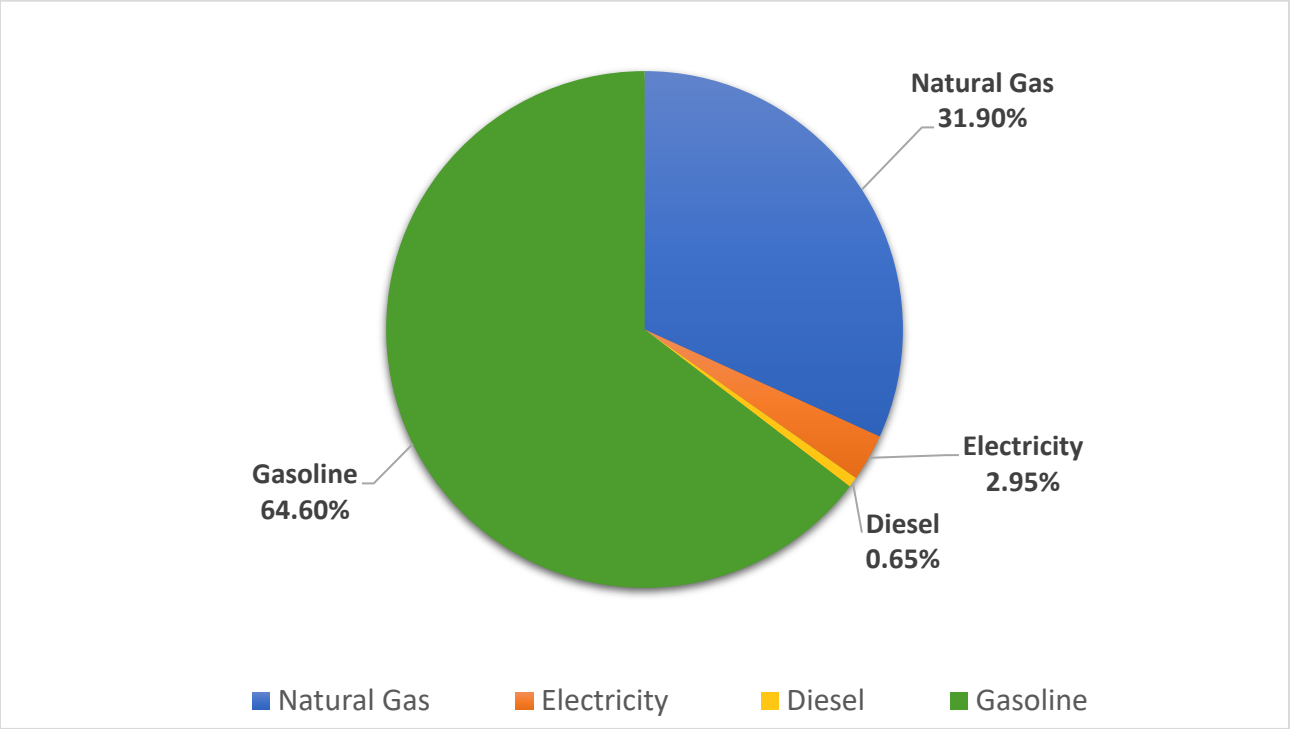
Category	Sector/Type	Energy Type	Energy Consumed	Units	Tonnes of CO_2e
Stationary Energy	Residential	Electricity	74,148,300	kWh	2,710
		Natural Gas	19,216,651	m^3	36,499
	Commercial and Institutional	Electricity	62,115,145	kWh	2,270
		Natural Gas	11,207,898	m^3	21,288
	Industry	Electricity	26,134,000	kWh	955
		Natural Gas	3,276,790	m^3	6,224
	Energy Industries	NO[3]			
	Agriculture, forestry and fishing activities	NO			
	Non-specified sources	NO			
	Fugitive emissions oil and natural gas	Derived from total natural gas usage			928
Transportation	On-road	Gasoline	64,474,569	L	130,030
		Diesel	4,074,858	L	1,309
	Off-road	Per capita estimate			17,019
	Railway	Length of rail estimate			315
	Waterborne Navigation	IE[4]			
	Aviation	NO			
Waste	Solid Waste	Waste	3,324	Tonnes	3,889
	Wastewater	Per capita estimate			2
	Biological treatment	Compost	1,459	Tonnes	276
		Anaerobic digestion	10,432	Tonnes	260
	Incineration	NO			
Total	**GJ/year**		**tCO_2e/year**		
	3,435,489		**223,974**		

2.3 Emissions by Source

Emissions can be broken down by three main sources in Orangeville: fuel (gasoline and diesel), natural gas and electricity (see Figure 1). As mentioned, heating oil has been excluded from this inventory due to low usage and data limitations. In summary, gasoline and natural gas are the largest sources of community emissions in Orangeville. Electricity power generation has a much lower carbon intensity compared to natural gas, majorly due to Ontario's phase out of coal earlier this decade.

[3] NO – Not occurring or negligible within Town boundaries
[4] IE –Included elsewhere in the inventory

Figure 1: Emissions by Energy Source



2.3.1 Natural Gas

As noted above, Enbridge provided data for natural gas consumption within Town boundaries in 2016. The dataset was organized by sector (residential, commercial and institutional and industrial). Large consuming customers were separated out from the data, which were analyzed and then added to their respective sectors. The data were converted from m^3 units to GJ, then entered into the PCP tool by sector to generate the respective emissions values.

Table 3: Natural Gas Usage by Sector

Sector	m^3	tCO_2e
Industrial	3,276,790	6,224
Commercial and Institutional	11,207,898	21,288
Residential	19,216,651	36,499
Total	**33,701,339**	**64,011**

2.3.2 Electricity

Orangeville Hydro provided the electricity usage data organized by postal code and sector for the emissions inventory. Orangeville Hydro provides electricity to Orangeville and Grand Valley municipalities. In order to filter out any usage data outside of Town boundaries, postal codes were mapped geographically and any data outside of the Town was removed. The data was then

inputted into the PCP Tool in kWh units by sector (residential, commercial and institutional and industrial) to calculate the total emissions for total electricity usage.

Table 4: Electricity Usage by Sector

Sector	kWh	tCO_2e
Industrial	26,134,000	955
Commercial and Institutional	62,115,145	2,270
Residential	74,148,300	2,710
Total	**162,397,445**	**5,935**

2.3.3 Fuel Sources

Total gasoline and diesel sales in liters for 2016 was acquired through Kent Group Limited. This data group houses data from fuel station across the province. The data provided included fuel sales from all fuel stations located within Town boundaries. These values were then inputted into the PCP Tool to find the associated emissions values.

Table 5: Fuel Usage by Type

Fuel Type	Litres	GJ	tCO_2e
Gasoline (Unleaded)	64,474,569	1,964,152	130,030
Diesel	4,074,858	18,228	1,309
Total	**68,549,427**	**1,982,380**	**131,339**

2.4 Emissions by Sector

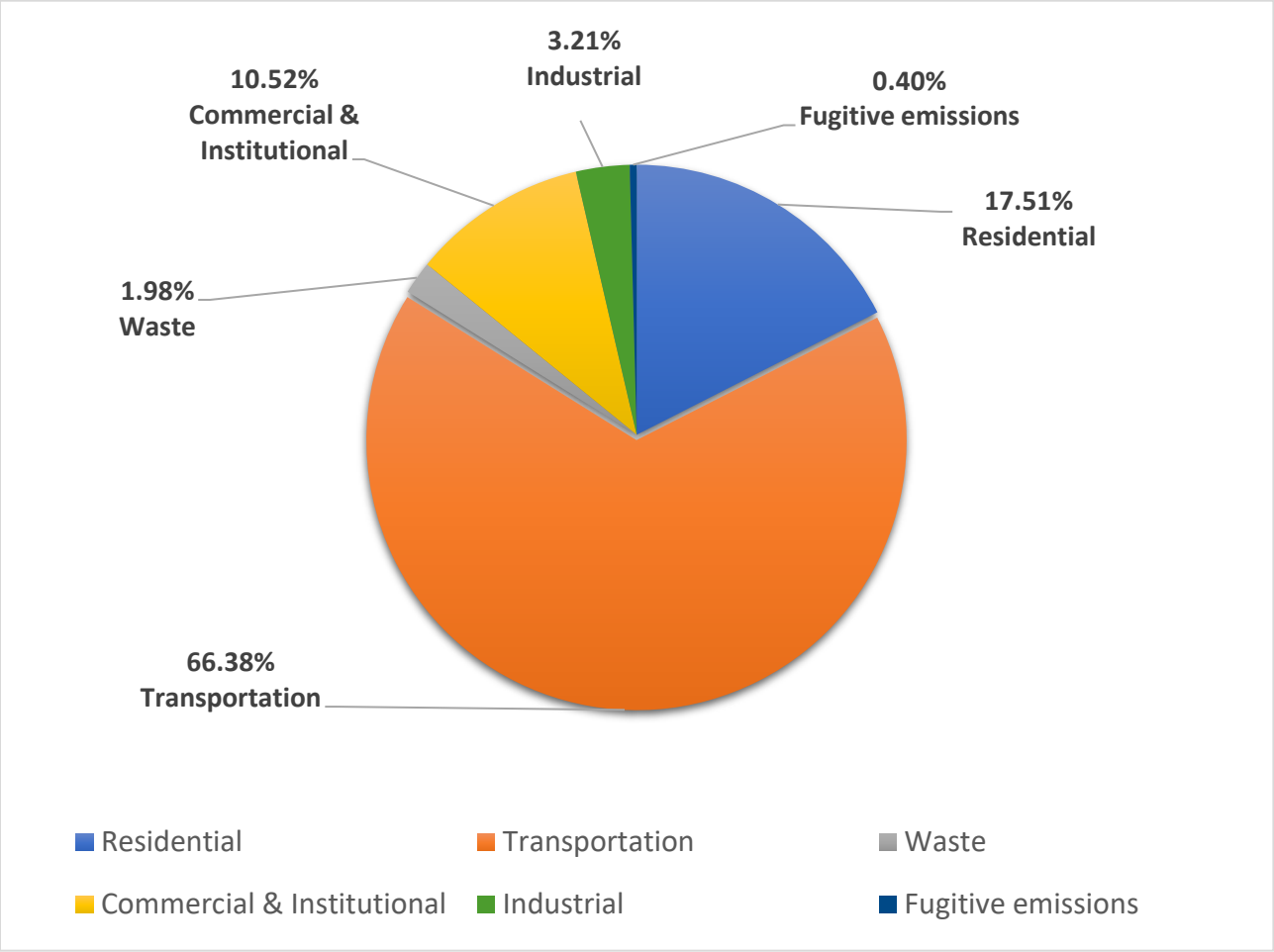
As noted above, a total of 223,974 tCO_2e was emitted by the Town of Orangeville in 2016. The emissions are broken down by sector in Table 6 and displayed in Figure 2.

Table 6: Community Emissions by Sector

Sector	tCO_2e Produced	%
Residential Buildings	39,209	17.51%
Institutional and Commercial Buildings	23,558	10.52%
Industrial Buildings	7,179	3.21%
Transportation	148,673	66.38%
Waste	4,427	1.98%
Other[5]	928	0.40%
Total	**223,974**	**100%**

[5] This category captures fugitive emissions.

Figure 2: Community Emissions by Sector



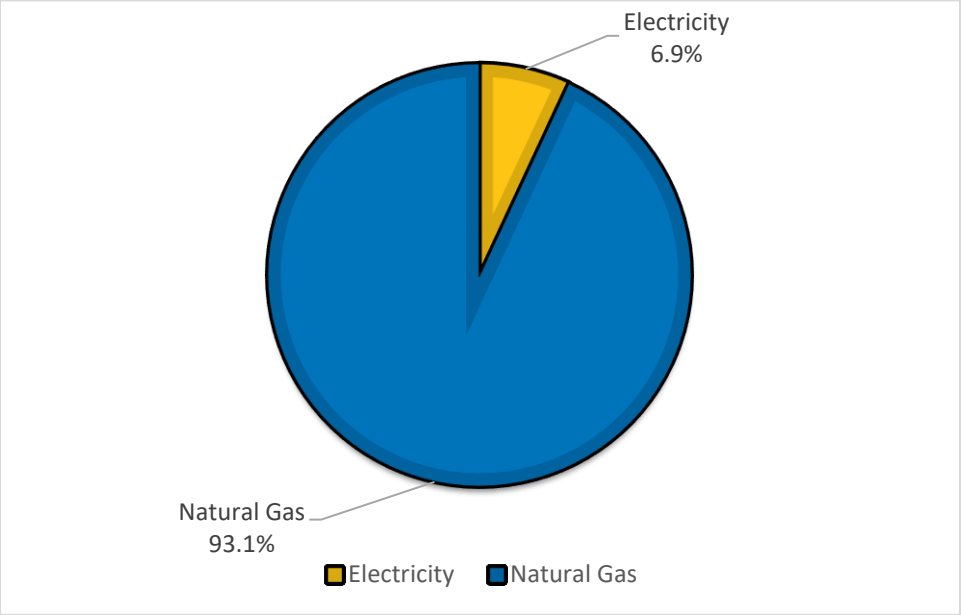
2.4.1 Stationary Energy

Within the stationary energy category, four sectors are included in the 2016 inventory: residential buildings, commercial and institutional buildings, manufacturing and industrial and fugitive emissions from natural gas consumption. There were only two main energy sources that were included to calculate the greenhouse gas emissions for this section: electricity and natural gas. Energy industries; agriculture, fishing, and forestry activities; and fugitive emissions coal and oil were identified as not occurring within Town boundaries.

Residential

Residential buildings accounts for 17.51% of Orangeville's community emissions. In 2016, the residential sector was responsible for a total of 39,209 tCO2e. As displayed in Figure 3, 2,710 tCO2e or approximately 7% of emissions within this sector come from electricity consumption, and 36,499 tCO2e or approximately 93% of total residential emissions is sourced from natural gas.

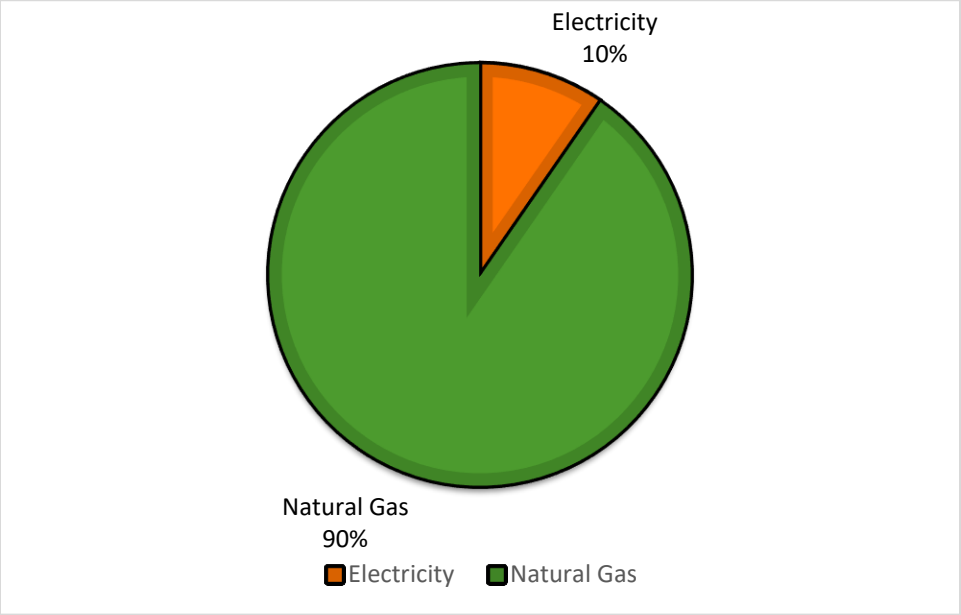
Figure 3: Residential Energy Usage



Commercial and Institutional

Commercial and institutional buildings make up 10.52% of Orangeville's community emissions. This sector was responsible for a total of 23,558tCO_2e in 2016. As Figure 4 highlights, 2,270 tCO_{2e} or approximately 10% of these emissions is from electricity usage and 21,288 tCO_2e or 90% is from natural gas.

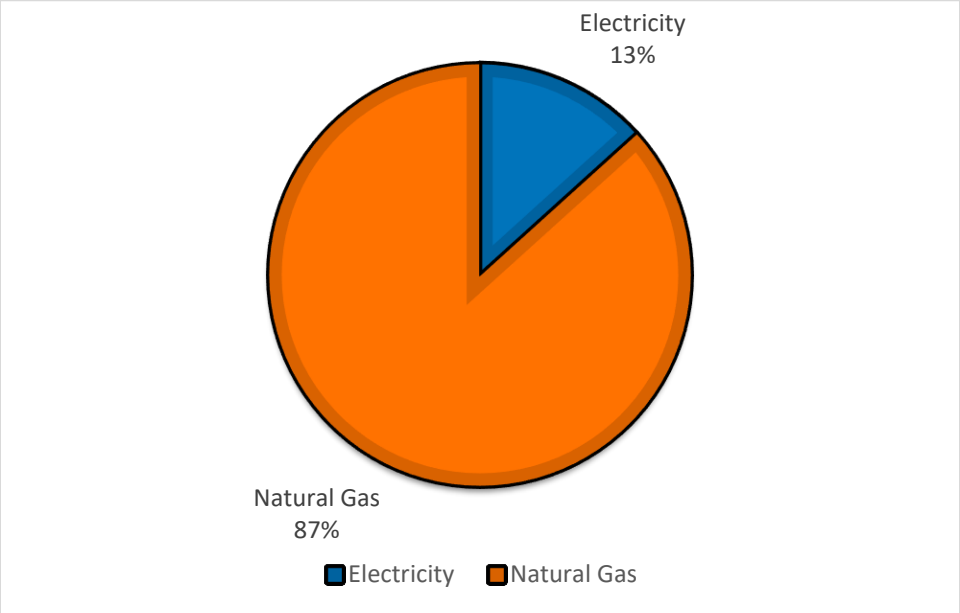
Figure 4: Commercial and Institutional Energy Usage



Industrial

Manufacturing and industrial buildings make up 3.21% of Orangeville's community emissions. This sector was responsible for a total of 7,179 tCO_2e in 2016, with 955 tCO_2e coming from electricity usage and the remaining 6,224 tCO_2e from natural gas consumption in this sector.

Figure 5: Industrial Energy Usage



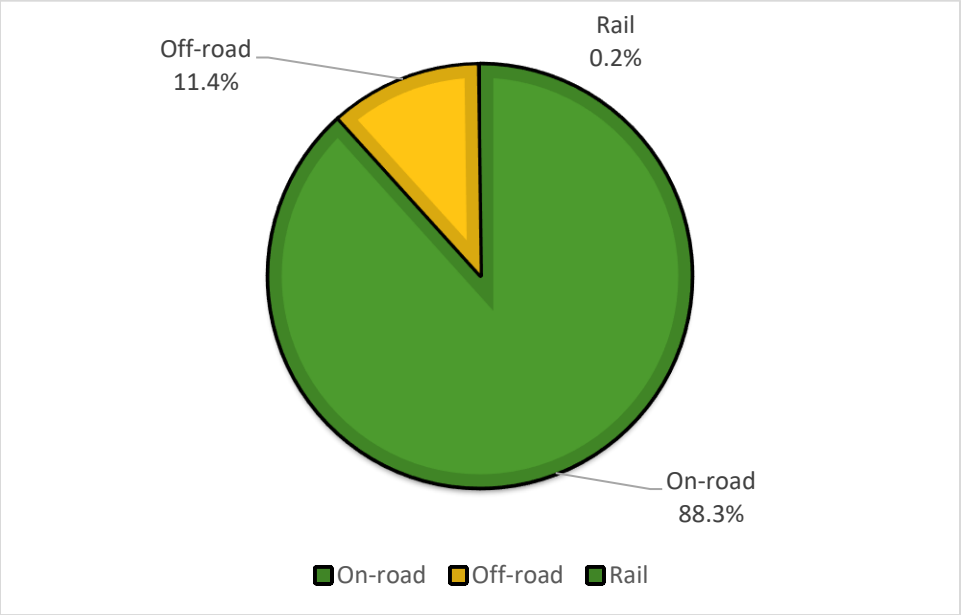
Fugitive emissions oil and natural gas

This subsector captures emissions released directly into the atmosphere during the extraction, production, processing and delivery of natural gas. It is calculated based on the total natural gas usage. For 2016, this source of emissions accounted for 928 tCO_2e.

2.4.2 Transportation

Transportation is the largest contributing sector to Orangeville's GHG emissions, accounting for 66.38% of all emissions. This sector has been divided into subsectors, with on-road transportation representing the greatest amount. Due to the limited nature of water course transportation and aviation, these subsectors were either considered as included elsewhere, or as not occurring within this inventory.

Figure 6: Transportation Emissions by Type



On-road

On-road transportation data was collected through the Kent Data Group fuel sales. This data includes all fuel sales from gas stations within the Town's boundaries. Orangeville is also covered in the Transportation Tomorrow Survey completed by the University of Toronto Data Management Group. This survey attempts to estimate the vehicle kilometers travelled (VKT) within certain jurisdictional boundaries. However, due to the size of Orangeville (15.61 km^2), the VKT did not capture accurate emissions from vehicle travel. Therefore, fuel sales data was the chosen method for on-road transportation as it is the more representative data source. On-road transportation used 64,474,569L of gasoline and 4,074,858L of diesel which accounts for 131,338.75 tCO_2e in 2016. Table 7 breaks down total emissions by vehicle type.

Table 7: Emissions by Vehicle Type

Vehicle Type	GHG Emissions (tCO_{2e})
Cars	79,448
Light Trucks	48,910
Heavy Trucks	2,981
Total	**131,339**

Off-road

Off-road transportation captures emissions from vehicles designed or adapted for travel on unpaved terrain, such as all-terrain vehicles, landscaping and construction equipment, forklifts, amphibious vehicles, and snowmobiles. Since fuel sale data only captured on-road transportation, a provincially downscaled per capita approach was taken to calculate these

emissions. This resulted in an estimate of approximately 17,019 tCO_2e emitted from off-road vehicles within Orangeville in 2016.

Railway

Orangeville's rail line is used primarily by local industries for moving goods. The main line track length is 2,500m and the branch/spur line length is 1,225m (servicing the plants in surrounding industrial areas). Using this information, a downscaled approach using Canada's National Inventory Report was able to be calculated. Based on this calculation the estimated emissions from Orangeville rail line in 2016 is 316 tCO_2e.

2.4.3 Waste

Waste accounted for 1.98% of the total GHG emissions for the Town in 2016. This sector includes not only solid waste but also accounts for nitrous oxide (N_2O) and methane (MH_4) produced through the anaerobic treatment of wastewater and sludge as well as organic waste such as food waste, garden and park waste.

Solid Waste

Community solid waste accounts for 3,889 tCO_2e in 2016. Dufferin County Waste Services collect county wide waste data which includes residential, institutional, industrial, commercial and corporate solid waste. The waste is delivered to Pine Tree Acres in Lenox, Michigan, where the landfill gas is captured through a landfill gas system.

To determine solid waste emissions for the Town of Orangeville, solid waste emissions were calculated on a per capita basis. The amount of emissions was calculated through the PCP Milestone Tool. The total amount of solid waste produced in Orangeville in 2016 is approximately 3,324 tons/year, accounting for 3,889 tCO_2e.

Wastewater

The aerobic and anaerobic treatment of wastewater produces nitrous oxide through the nitrification and denitrification of sewage nitrogen. Methane is also released during anaerobic treatment. To calculate this value, the PCP Tool was used to estimate total emissions from wastewater processes based on population. Due to Orangeville's relatively small population, this method resulted in 2.58 tCO_2e produced annually in 2016.

Biological Treatment

Compost data was acquired through the County. Organic waste from the County is composted at Region of Peel's Caledon Composting Facility. The total compost quantity for the Town of Orangeville was calculated per capita from the County's total of 3,118 tons. This resulted in a total of 1,459 tons of compost for the Town in 2016.

Sludge is digested anaerobically in two primary digesters operated in parallel; however, one of the digesters was out of service in 2016 and in undergoing repairs to its roof. Sludge loading facilities provide for transfer of digested anaerobic sludge to trucks. Digested sludge is land-

applied as farm fertilizer, de-watered on site with a press, or hauled to an off-site treatment facility. The total quantities of sludge haulage and sludge de-watering in 2016 was 29,539m^3.

2.5 Data Limitations and Considerations

Stationary Energy

Based on limited access to data, to improve the accuracy of future inventories, it would be ideal if more data was collected from local commercial and industrial uses. By working with local companies and businesses, this information will become more robust overtime.

Transportation

For on-road transportation, fuel sales data was used as it was seen to be more representative of travel habits in Orangeville. For future inventories, it is recommended that Google's Environmental Insights Explorer is used if data is available at that time. Additionally, a more robust methodology for calculating off-road transportation would be preferred as opposed to the current provincially downscaled method used.

Waste

For the solid waste sector, due to the unavailable data regarding the annual landfill gas captured for Pine Tree Acres, the emissions may be overestimated. For future inventories, if this value is available, the emissions from the solid waste sector will be drastically reduced due to the appropriate calculation method.

Plan/Strategy	Action/Measure	Reduction Potential	Sector
Sustainable Neighbourhood Action Plan	Conduct energy-efficiency audits and benchmarking to identify retrofit opportunities for Town buildings.	Medium	Buildings
	Develop a corporate Green Building Policy that includes minimum energy performance levels for new Town buildings.	Low	
	Adopt an established energy performance labelling program for new and existing Town buildings.	Medium	
	Undertake feasibility study for renewable energy generation for municipally owned buildings.	High	
	Support energy-efficiency retrofits of homes and community buildings (such as LED lighting, solar PV, or EV charging) through incentive programs.	High	
	Establish green building standards for new homes and buildings.	Medium	
	Formalize the Town's vehicle purchasing policy to assess vehicle needs and ensure high-efficiency vehicles are selected for purchase.	Low	Transportation
	Strengthen policy that encourages compact, mixed use, pedestrian-oriented development.	Medium	
	Provide information on low-carbon vehicle options, incentives and opportunities to increase fuel-efficiency.	Low	
	Increase the number of electric vehicle parking spaces and charging stations, incrementally as demand grows.	High	
	Install bike racks on transit buses to promote intermodal transportation.	Medium	
	Promote cycling through a complete bicycle network, bike racks, and free bike parking.	Medium	
	Explore renewable energy options for transit buses, at the time of replacement and/or purchasing.	Low	
	Development of a Tree Preservation Plan and/or by-law.	Low	Environment/ Sequestration
	Maintain or increase natural buffers to protect and connect wetlands, water courses, water bodies, forests, and woodlands	Low	
	Promote the planting of native plants and trees which can adapt to a changing climate.	Low	
Corporate Conservation and Demand Management Plan	Undertake a training needs assessment to address capacity gaps and coordinate general energy management training for employees.	Low	Buildings
	Develop Standard Guidelines for Buildings, Controls, Maintenance (all buildings).	Low	
	Install energy efficient equipment where possible in Town facilities.	Low	
	Create a Corporate Guidebook for Energy Efficiency Purchasing.	Low	
Corporate Climate Change Adaptation Plan	Work with community partners and local businesses to share best practices and resources to build climate resilience and reduce local greenhouse gas emissions	Low	Buildings
	Promote building standards that reflect updated climate projections and energy efficiency standards.	Medium	
	Follow energy efficiency best practices, standards and guidelines for all corporate infrastructure projects.	Low	
	Prioritize the electrification of the Town's fleet and expand charging infrastructure.	Low	Transportation
	Promote the planting of native vegetation along lakes, creeks and ravines to reduce erosion, maintenance needs, and enhance local biodiversity	Low	Environment/ Sequestration
	Develop an Urban Forest Management Plan that incorporates future climate considerations.	Low	
	Incorporate climate change mitigation and adaptation into the next update of the Strategic Plan.	Low	Corporate
	Incorporate climate change considerations into the Town's Official Plan.	Medium	
	Investigate best practices and update corporate procurement policy to incorporate climate change and sustainability considerations.	Medium	