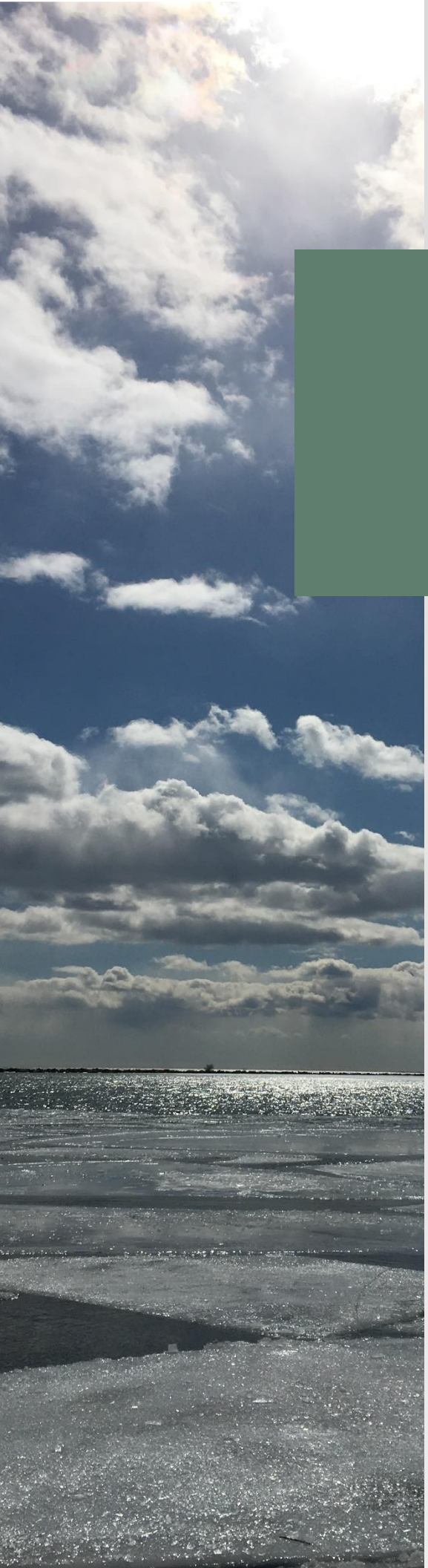


City of Kingston Community GHG Inventory Report – 2019

Prepared By:

Greenscale Inc.

Nathan C. Manion

Prepared For:

City of Kingston

Julie Salter-Keane, Manager, Climate Leadership

April 21, 2022

Executive Summary

This report provides updated greenhouse gas (GHG) emissions inventory for the community-wide scope of the City of Kingston for the years 2018 and 2019. The scope of the report includes residential and ICI energy use, transportation fuel use, wastewater emissions, solid waste, and agriculture and forests. Energy and emissions are measured in the report as total energy consumption (GJ), total GHG emissions (tCO_2e), and energy expenditures ($).

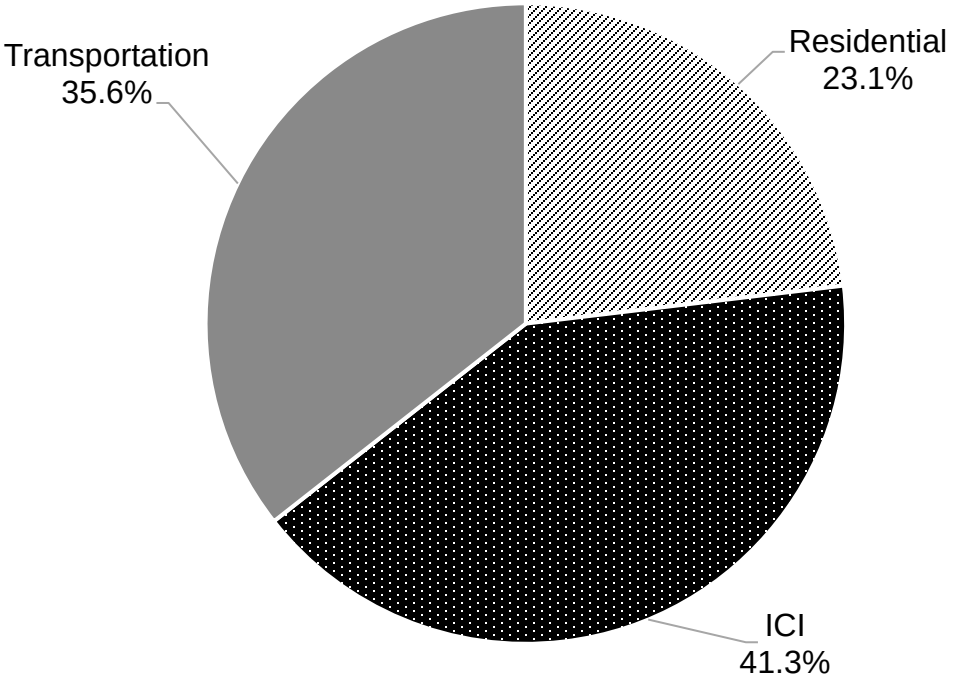
Input data sources used for emission calculations within the report were provided by the City of Kingston, Utilities Kingston, Hydro One, Enbridge and Kalibrate Technologies Ltd. for fuel data. All emission factors used were derived using published emission factors from the National Inventory Report 1990-2019 and 1990-2018 (ECCC 2020; ECCC 2021) for 2018 and 2019. Agriculture emissions were calculated the same way as previous reports as the agriculture census has yet to be updated. Energy conversions were derived from the Canada Energy Regulator (2021). A complete description of methods, data, and emission factors used for these results are available in the Supplemental Information Report submitted along with this results-focused report.

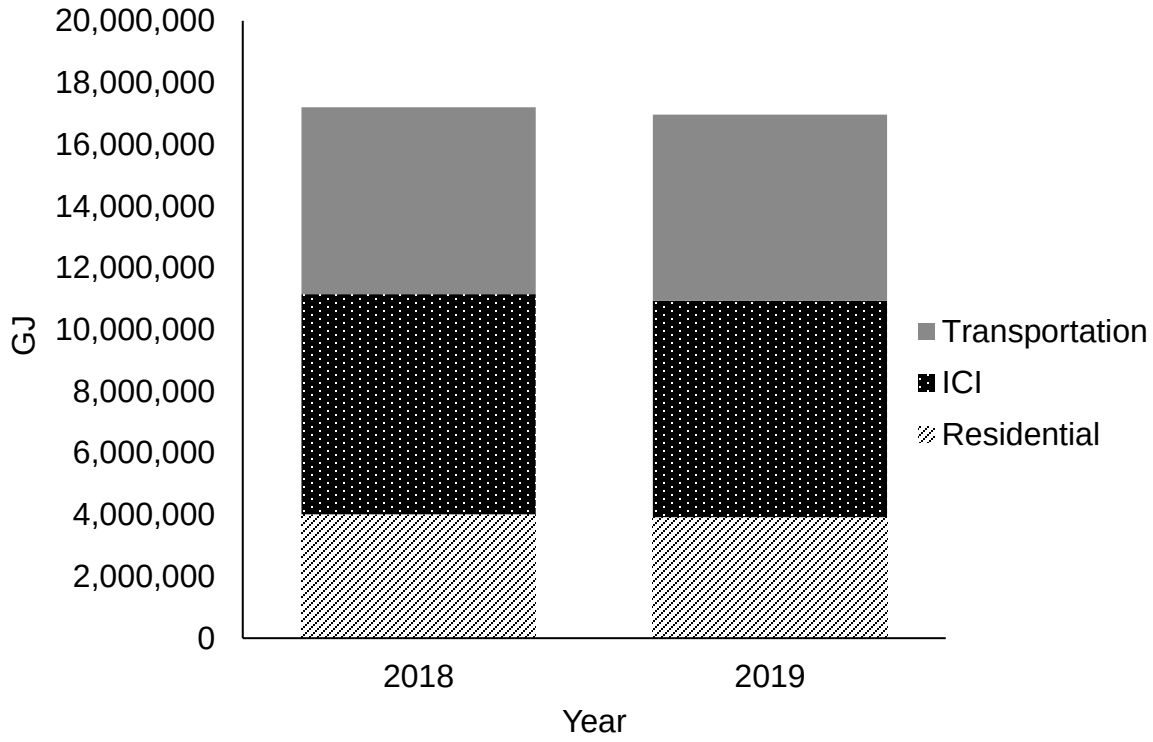
Re-calculation and restatement of 2018 results was performed for energy consumption (GJ) and GHG emissions ($t\ CO_2e$) due to availability of updated emission factors and application of enhanced methodologies to improve the accuracy of the previously reported 2018 results. Wastewater emissions were also re-calculated using enhanced methodologies to improve accuracy of results for both 2018 and 2019. A new tree and forest sequestration factor was employed to represent an average value across the region. The newly derived values for 2018 are recommended as the new baseline with which to benchmark progress in GHG emissions reductions. Figures are presented in this report to allow for comparison with the 2018 report.

Summary of Results

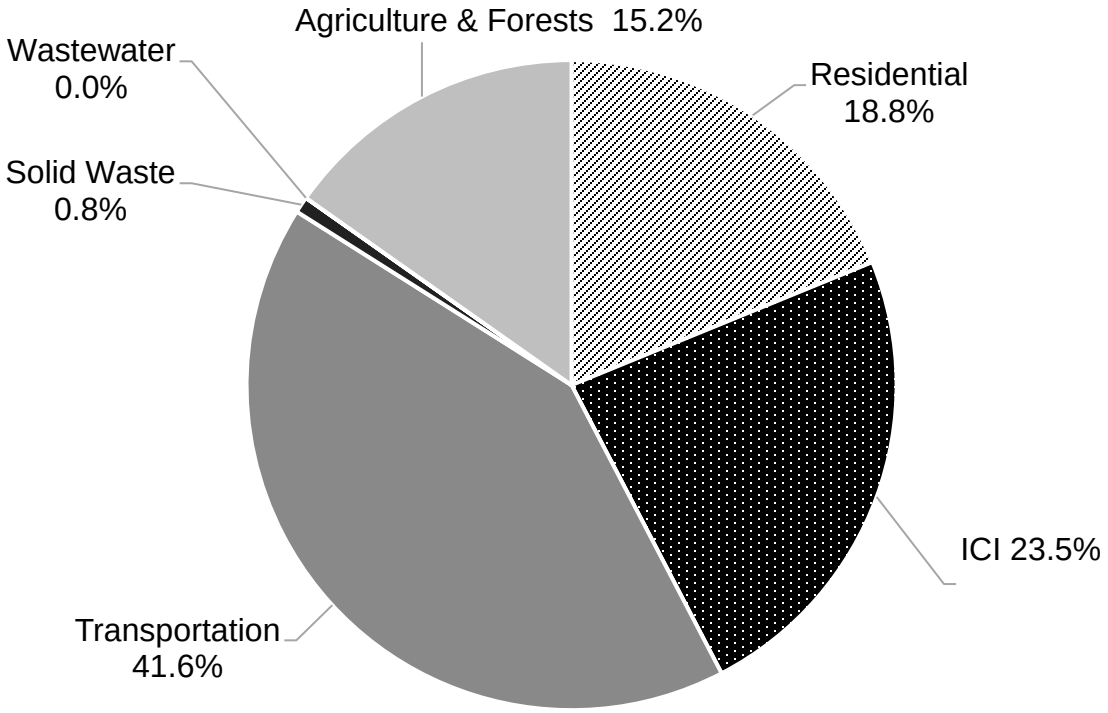
1. Overall, community annual GHG emissions were reduced by 7,299 tonnes from 2018 to 2019.
2. The most significant sources of emissions remain from transportation, or consumption of gasoline, and natural gas consumption by residential and ICI sectors.
3. The most significant reductions in emissions occurred in the transportation sector, and reductions in the use of heating oil and propane.
4. Total energy consumption was reduced city-wide by 237,829 GJ (1.4%) from 2018 results.

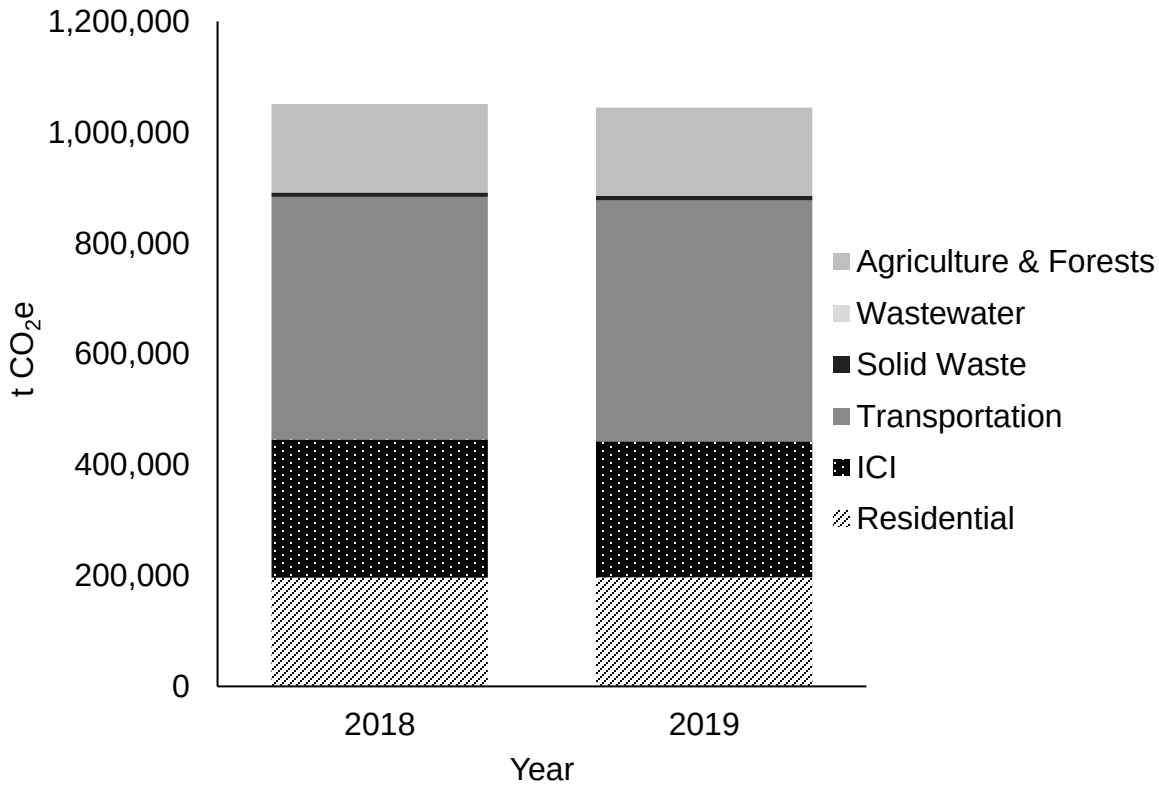
2019 Energy Consumption by sector (total: 16,965, 953 GJ) and historical trend



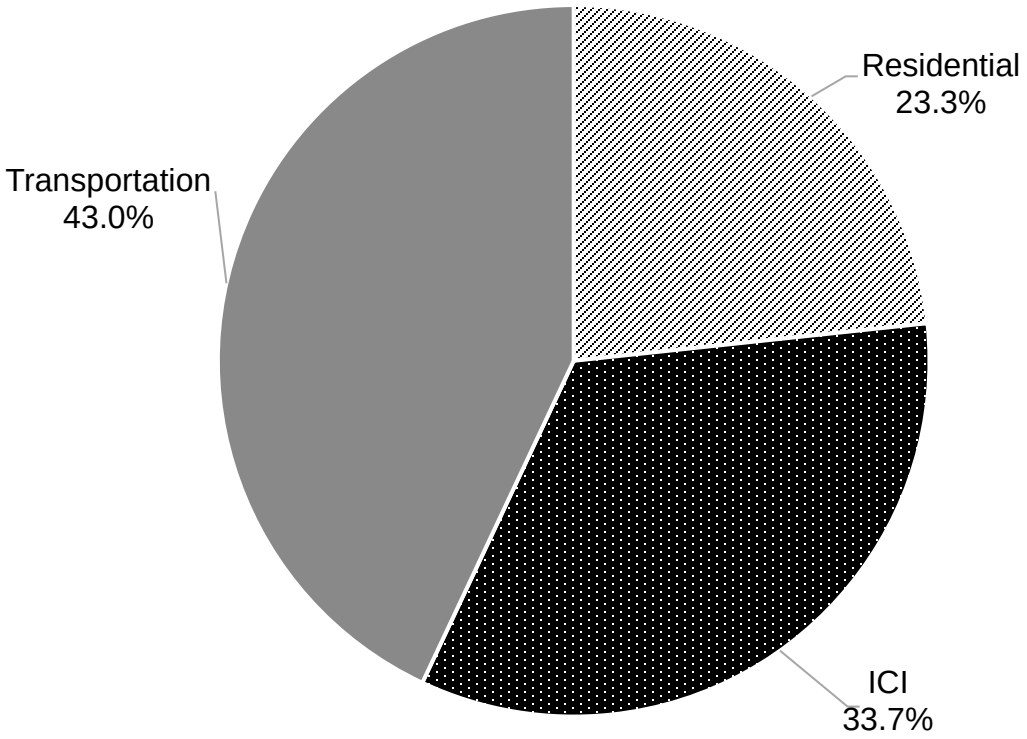


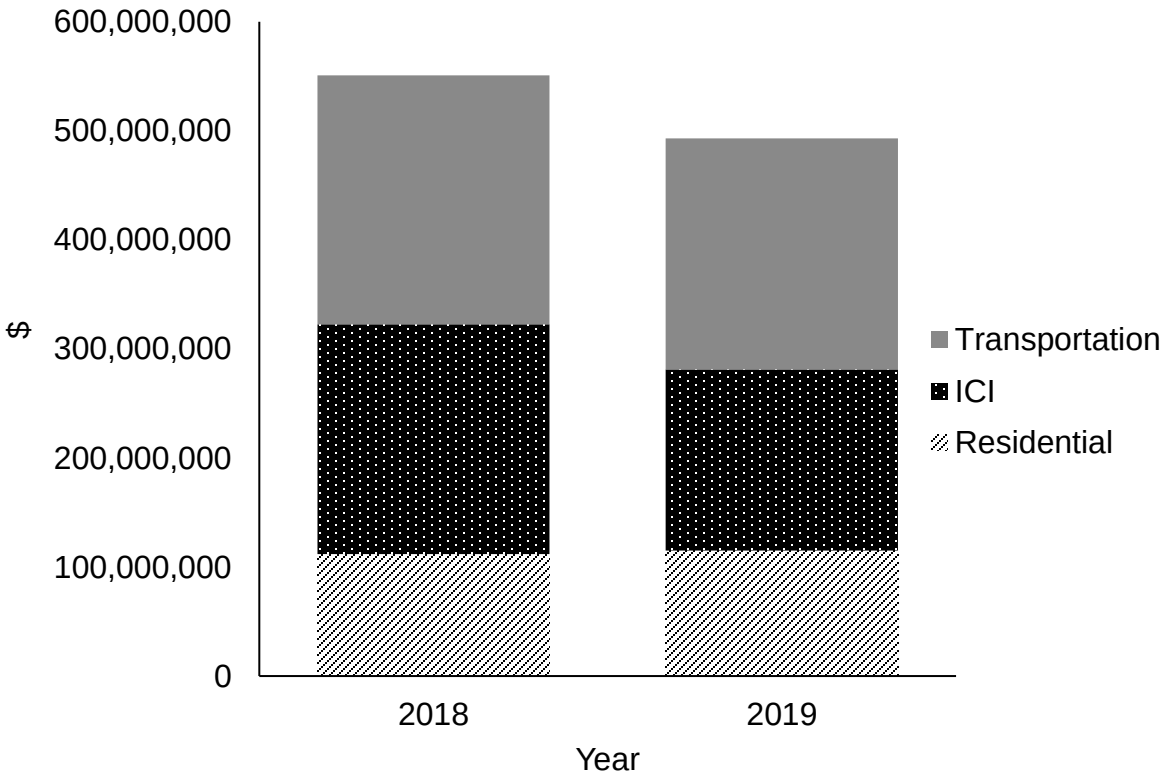
2019 GHG Emissions by sector (total: 1,029,020 tonnes CO_2e) and historical trend



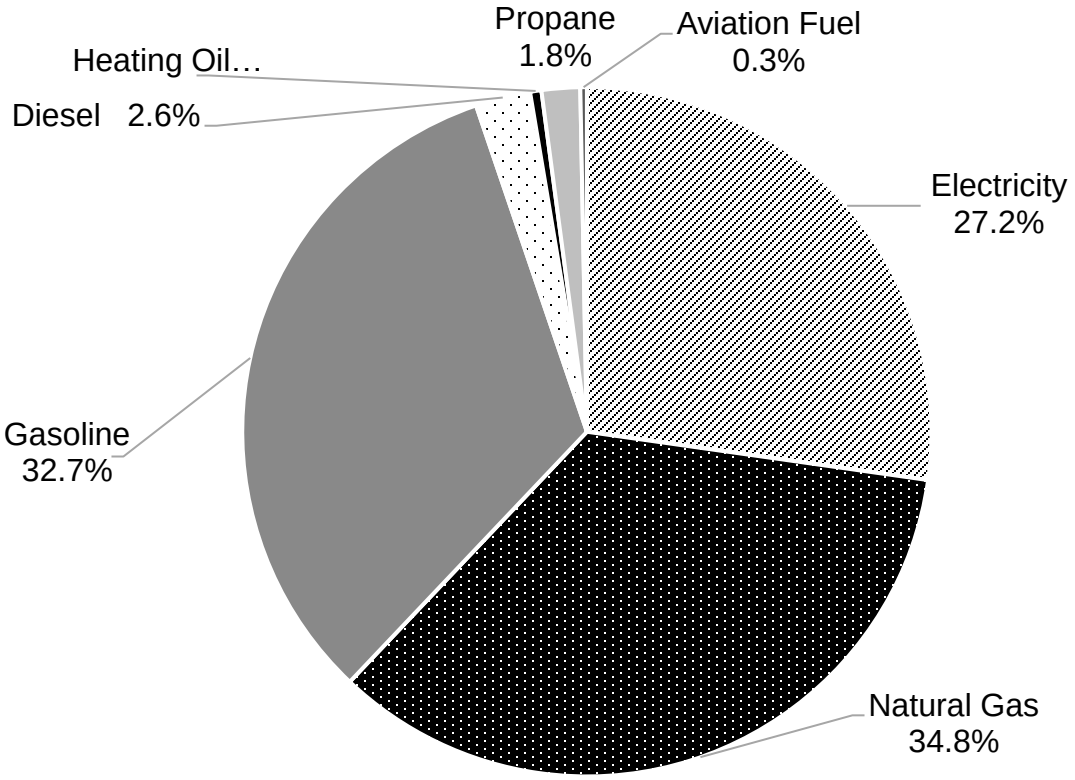


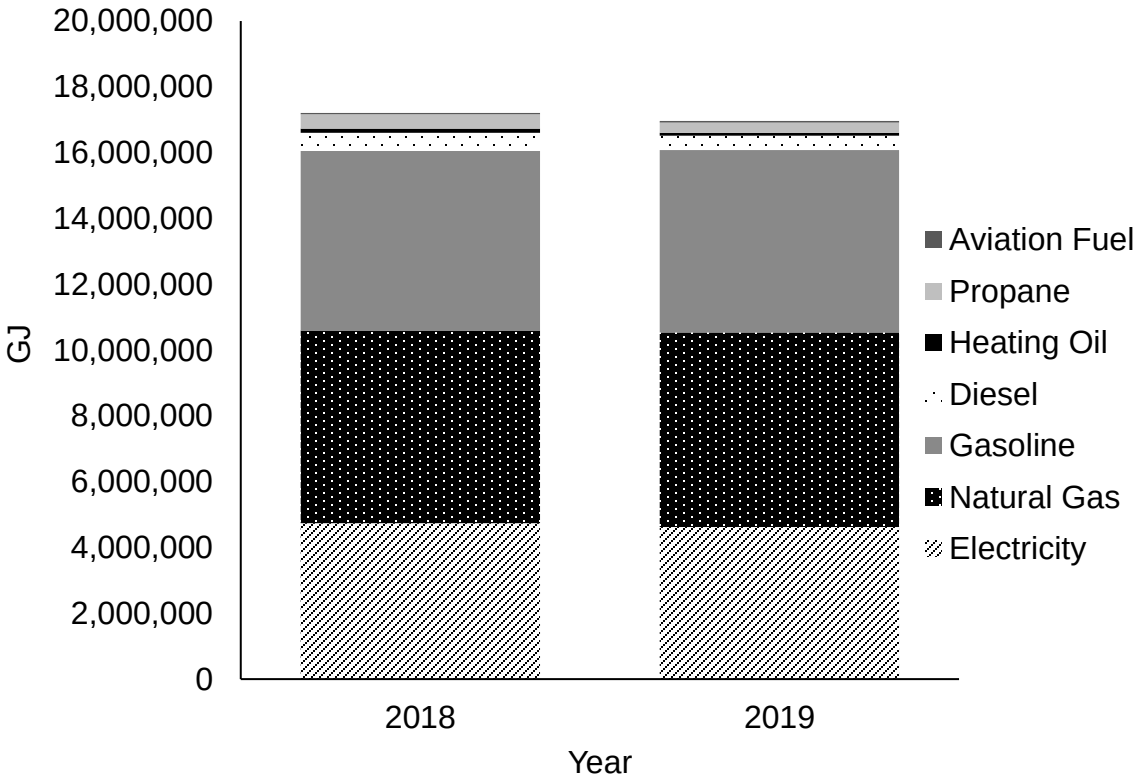
2019 Expenditures by sector (total: $493,159,156) and historical trend



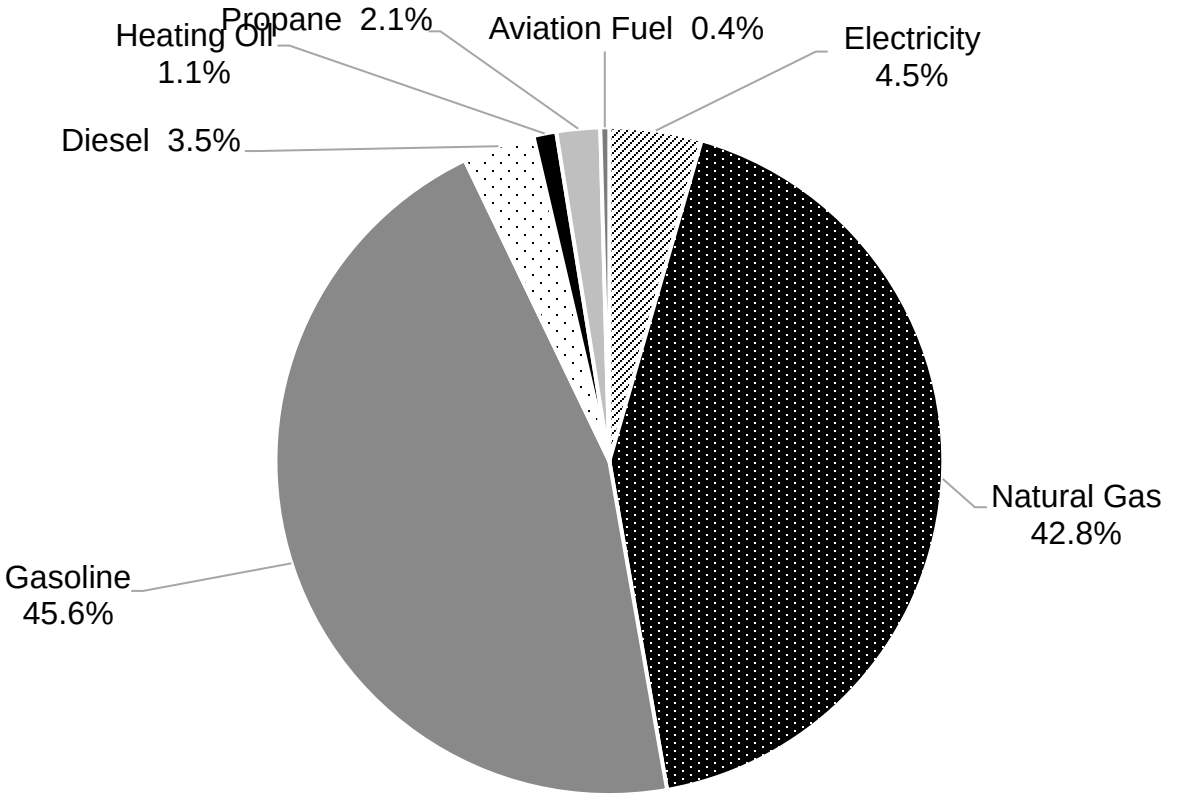


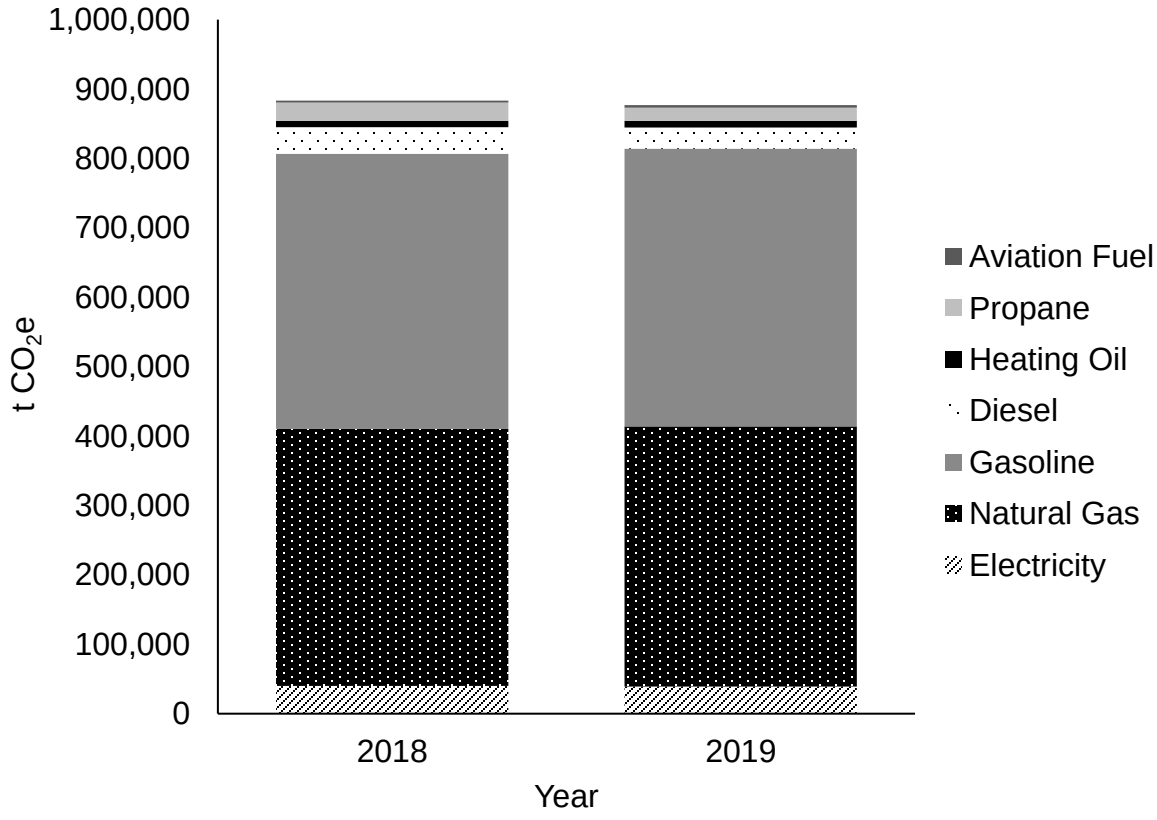
2019 Energy Consumption by source (total: 16,965,953 GJ) and historical trend





2019 GHG Emissions by source (total: 876,808 tonnes CO_2e) and historical trend





2019 Expenditures by sector (total: $493,159,156) and historical trend

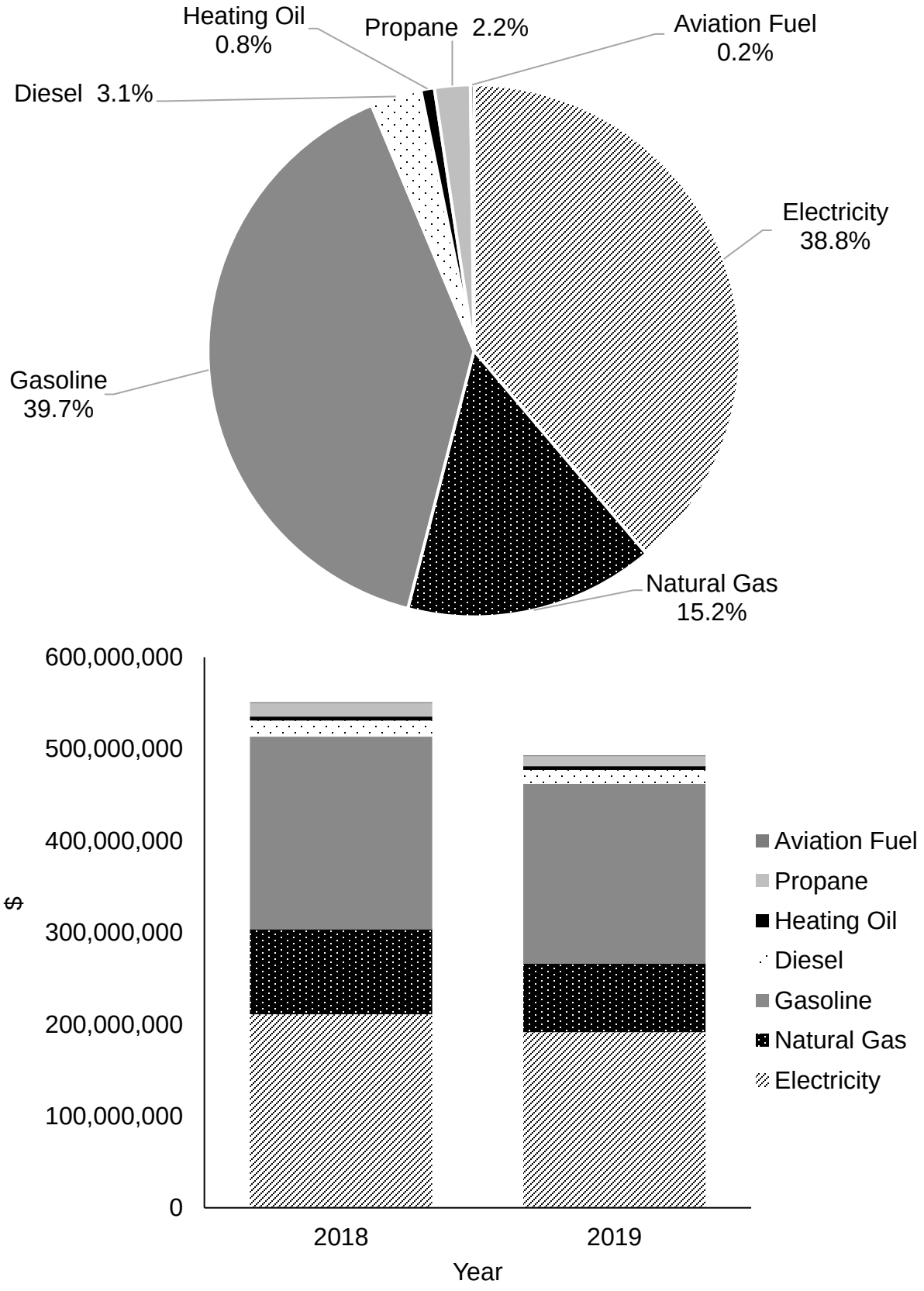


Table 1. Summary of energy consumption (GJ), GHG emissions (tCO_2e), & expenditure ($) of 2018 & 2019 for all sectors.

	2018			2019					
Sector	**Energy Consumption (GJ)**	**GHG Emissions (t CO_2e)**	**Expenditure ($)**	**Energy Consumption (GJ)**	**GHG Emissions (t CO_2e)**	**Expenditure ($)**	**Energy Change**	**GHG Change**	**Change ($)**
Residential	4,013,648	196,025	111,911,234	3,920,460	196,565	114,981,734	-93,188	540	3,070,499
ICI	7,136,030	249,932	210,685,598	7,007,646	245,796	166,089,828	-128,384	-4,136	-44,595,770
Transportation	6,054,105	437,516	228,330,772	6,037,847	434,447	212,087,594	-16,257	-3,068	-16,243,178
Solid Waste	0	8,048	0	0	8,442	0	0	394	0
Wastewater	0	11	0	0	11	0	0	1	0
Agriculture & Forests	0	144,787	0	0	143,758	0	0	-1,029	0
TOTAL	17,203,783	1,036,319	550,927,604	16,965,953	1,029,020	493,159,156	-237,829	-7,299	-57,768,449

Table 2. Summary of energy consumption (GJ), GHG emissions (tCO_2e), & expenditure ($) for 2018 & 2019 for all energy sources.

	2018			2019					
Source	**Energy Consumption (GJ)**	**GHG Emissions (t CO_2e)**	**Expenditure ($)**	**Energy Consumption (GJ)**	**GHG Emissions (tonnes CO_2e)**	**Expenditure ($)**	**Energy Change**	**GHG Change**	**Change ($)**
Electricity	4,739,820	40,121	210,868,504	4,621,262	39,118	191,297,011	-118,557	-1,004	-19,571,494
Natural Gas	5,854,057	370,310	92,647,731	5,910,775	375,002	75,025,788	56,718	4,692	-17,621,943
Gasoline	5,477,505	396,477	209,944,701	5,549,527	400,185	195,805,248	72,022	3,708	-14,139,453
Diesel	535,935	38,018	17,537,057	436,405	30,470	15,213,675	-99,530	-7,548	-2,323,382
Heating Oil	124,499	9,347	4,230,259	89,957	9,726	4,042,635	-34,542	379	-187,624
Propane	431,303	26,179	14,850,338	306,112	18,516	10,706,128	-125,191	-7,663	-4,144,210
Aviation Fuel	40,665	3,021	849,014	51,916	3,793	1,068,671	11,251	771	219,657
TOTAL	17,203,783	883,473	550,927,604	16,965,953	876,808	493,159,156	-237,829	-6,665	-57,768,449

Report Takeaways

- The total reduction in GHGs from 2018 to 2019 at the community level was 7,299 tonnes. This represents a reduction of 0.7% from 2018.
- An additional 148,149 tonnes of CO_2e will need to be reduced to get emissions 15% below 2018 levels.
- One of the highest emission sources from the community operations is from gasoline fuel in transportation. Large emissions reductions could be achieved through more sustainable transportation modes and reduced reliance on personal vehicle use.
- Natural gas emissions grew by 1.3%, which should be considered in the context of weather variability during the same time period. For example, heating degree days during 2019 also increased by 4% in comparison to 2018 which may partially explain the increase in natural gas consumption. Cooling degree days decreased by 36% during the same time period which may partially explain the 2.5% decrease in electricity consumption. Energy consumption changes are not always explained explicitly by changes in heating and cooling degree days as energy consumption covers a large range of uses in the other sectors besides heating and cooling of buildings.
- Natural gas is the second largest contributor to GHG emissions, suggesting that the programs aimed at improving building and home performance and switching to lower GHG emitting heating technologies and energy sources will substantially aid the community in achieving its GHG reduction targets.
- Trees contribute to carbon reductions, and are estimated to sequester as much as 96,676 tonnes of CO_2e, or 9.3% of all emissions annually. Sustainable management of existing forests have the potential to significantly offset carbon emissions.
- GHG emissions from sector sources has a slightly higher value than emissions from energy sources because there are no energy source emissions associated with the solid waste, wastewater, and agriculture and forests sectors.

References

Canada Energy Regulator. 2021. Energy Unit Conversion Table. Webpage: https://apps.cer-rec.gc.ca/Conversion/conversion-tables.aspx?GoCTemplateCulture=fr-CA

Environment and Climate Change Canada (ECCC). 2020. National Inventory Report 1990-2018: Greenhouse Gas Sources and Sinks in Canada. Canada's Submission to the United Nations Framework Convention on Climate Change. Parts 1-3. https://publications.gc.ca/site/eng/9.506002/publication.html

Environment and Climate Change Canada (ECCC). 2021. National Inventory Report 1990-2019: Greenhouse Gas Sources and Sinks in Canada. Canada's Submission to the United Nations Framework Convention on Climate Change. Parts 1-3. https://publications.gc.ca/site/eng/9.506002/publication.html