

Community Energy Use & Greenhouse Gas Emissions Inventory

Executive Summary

2020



London
CANADA




Introduction

The purpose of this document is to provide an overview on energy consumption in London and associated greenhouse gas emissions during the period from 1990 to 2020. The details in the document provide a useful source of information to strengthen existing projects/programs, or to help identify new business and academic opportunities for energy efficient products and technologies, energy conservation and demand management products and services, biofuels, and renewable energy generation.



There are many factors that influence how much energy a modern city uses to function and thrive:

- Land use and development
- Urban design
- Transportation
- Buildings
- Personal choices and actions
- Local climate & economy



Previous annual reports for 2012 through to 2018, as well as 2006 to 2008, 1998, and 1990 are available upon request.



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Community energy use inventory

The three most common benchmark dates being used for reporting on overall progress are:



1990

The first year that for which London's community-wide GHG emissions and energy use were determined, as well as Ontario's previous baseline year.



2005

the baseline year used for the Government of Canada's and the Province of Ontario's greenhouse gas (GHG) reduction targets



2010

the first year for which total energy cost data has been determined in London



Previous annual reports for 2012 through to 2019, as well as 2006 to 2008, 1998, and 1990 are available upon request.

COVID's big impact on transportation in 2020

The impact of the COVID-19 pandemic on transportation energy use was significant, which was 20 percent lower than 2019 overall. In particular:



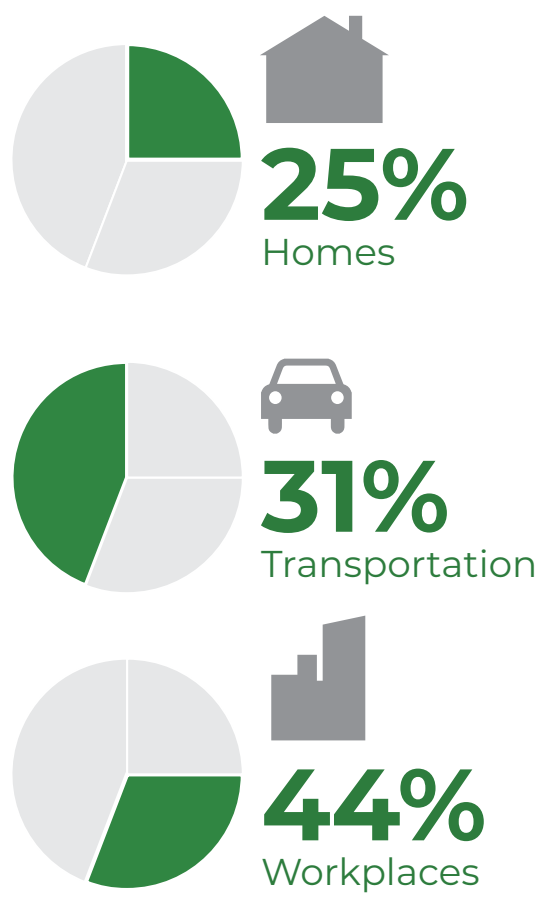
It is anticipated that the shift to working-from-home will remain in place at London's workplaces after the COVID-19 pandemic is over, although this is not likely to be a full-time shift for everybody. It is also anticipated that the interest in cycling for transportation will continue to grow.

Energy used in London's single-family homes was down by four percent overall. Electricity use in homes did increase due in part to shifting to work from home as well as warmer summer temperatures increasing the demand for air conditioning. However, natural gas use decreased due to warmer winter and autumn weather reducing the demand for space heating.

Energy used by London's industrial, commercial, and institutional sector remained relatively unchanged in 2020.

Total energy use in London in 2020 was 55,100 terajoules, an eight percent decrease from the previous year (2019).

Energy Use by Sector in 2020



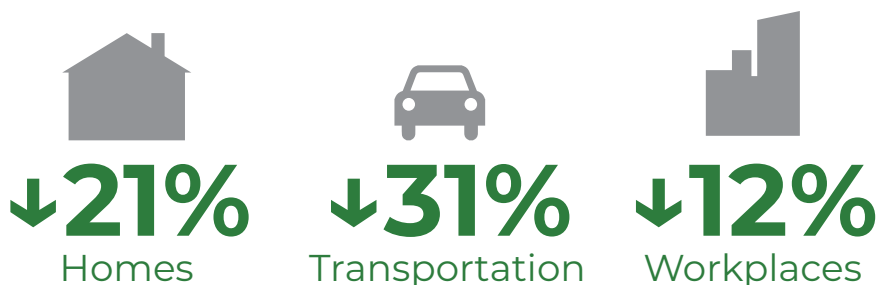
Energy efficiency trends

In 2020, energy use per person in London was 21 percent below 1990 levels.

As noted earlier, COVID-19's impact on transportation in 2020 was dramatic. However, it is too early to consider this a long-term trend.

The biggest long-term trend seen since 1990 is in residential energy use per person, which was 21 percent lower in 2020 than 1990. This may be attributed to improvements in the energy efficiency of consumer appliances, space heating and cooling systems, home retrofits, and new home construction.

Reduction In Energy Use Per Person Since 1990



Energy use per person in 2020 related to workplaces was 12 percent lower than 1990. However, London's energy productivity – dollars of real gross domestic product generated per unit energy used by London's employment sector – looks even more impressive with a 37 percent improvement between 1990 and 2020, even when adjusting for inflation.

Energy productivity, measured in terms of dollars of local Gross Domestic Product (GDP - adjusted for inflation)

1990

\$524

2020

\$717

of value /gigajoule of energy used

= 37%

more value for every gigajoule used!

Transportation fuel use is decreasing even as vehicle ownership increases

Prior to COVID-19, vehicle ownership in London had grown by over four percent every year on average between 2010 and 2019, much faster than London's overall population growth. As of December 2019, there were almost 292,000 light-duty vehicles registered in London – an increase of almost 89,000 since 2010. When compared to Census data on Londoners between the age of 20 and 84, vehicle registration increased from 0.75 per person in 2010 to an estimated 0.94 per person in 2019.

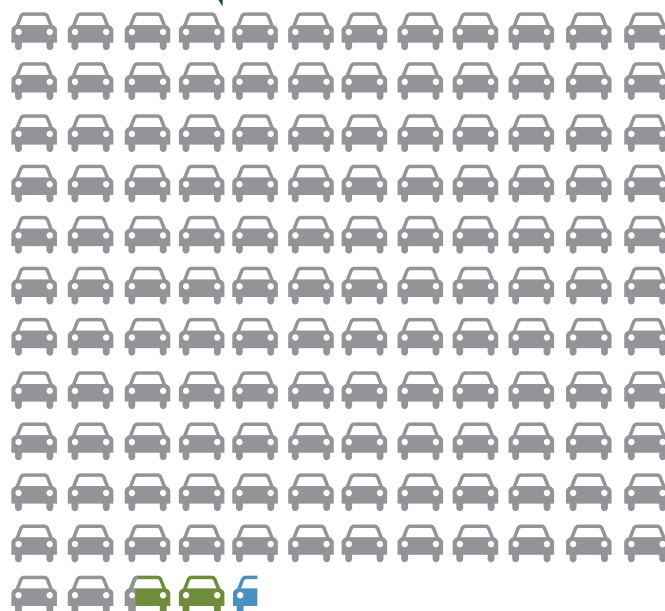
However, as of December 2020, the number of light-duty vehicles registered in London dropped by six percent down to just over 273,000 vehicles. This works out to about 0.86 vehicles per person aged 20 to 84.

The number of hybrid and/or electric vehicles in London are almost six times higher in 2020 compared to 2010. There are also now over 1,000 electric vehicles registered in London.

Almost one percent of new 2020 Model Year vehicles registered were electric vehicles and four percent were hybrid vehicles.

On the negative side, high gas consumption sport utility vehicles and large pick-ups continue to gain in popularity as the relative number of minivans and mid-sized sedans decline.

273,000 vehicles in London (2020)



1,020 vehicles are electric

3,720 vehicles are hybrids

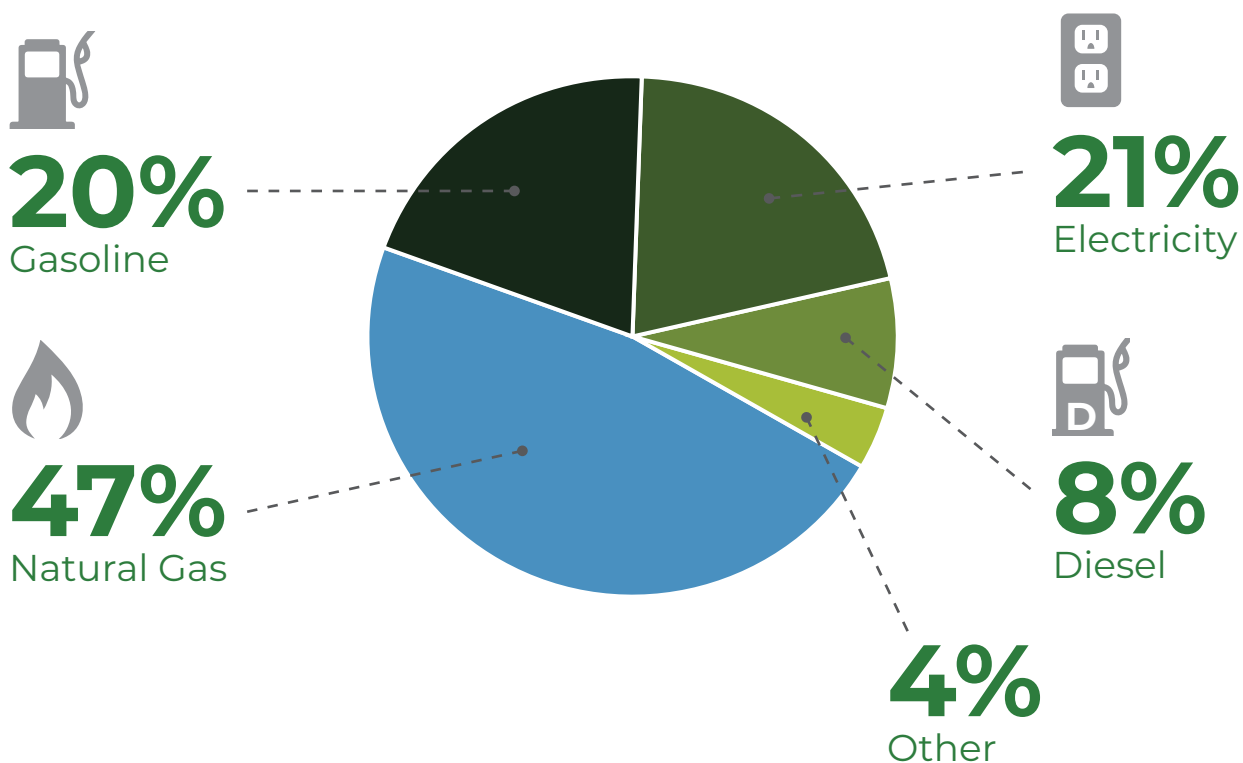
 = 2000 vehicles

 **0.86** Vehicles per adult Londoner

 **↓24%** Fuel use per vehicle since 2010

Sources of energy used in London

What sources of energy were used in London?



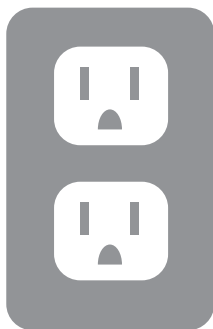
In terms of sources of energy, natural gas is the largest source of energy used in London, accounting for 47 percent of all energy used in 2020. Natural gas is used primarily for heating buildings, heating water, and providing heat for industrial processes.

Electricity was the second largest source of energy, accounting for 21 percent of London's energy use.

Gasoline accounted for 20 percent of all the energy used in London.

Electricity generation in London

London has almost 90 megawatts (MW) of local electricity generation capacity installed to date, an increase of about one megawatt from 2019. As of April 2021, there was 68.3 megawatts of gas-fired co-generation, 17.9 megawatts of solar photovoltaic (PV), 2.85 megawatts of biogas, and 0.675 megawatts of hydro-electric power generation in operation in London.



Most of London's local generating capacity is associated with natural gas combined heat and power cogeneration plants, used in four different applications:

- **District energy** - London District Energy (38.7 MW) provides power to the grid plus steam and chilled water to downtown buildings from its Colborne Street facility.
- **Industrial** - Ingredion (14.1 MW) and Labatt Brewery (4.2 MW) generate steam as well as electricity "behind-the-meter" for use in their operations.
- **Campus** – the London Health Sciences Centre (9.6 MW) Victoria Hospital campus generates both steam and electricity for hospital buildings.
- **Micro-scale** – small scale systems (under 100 kilowatts) are in use at the Canada Games Aquatic Centre and H.B. Beal Secondary School for pool heating as well as electricity "behind-the-meter" for use in their operations.

Translating energy use into economic and business development opportunities

It is estimated that Londoners spent about \$1.35 billion on energy in 2020, a decrease of 11 percent from 2019.

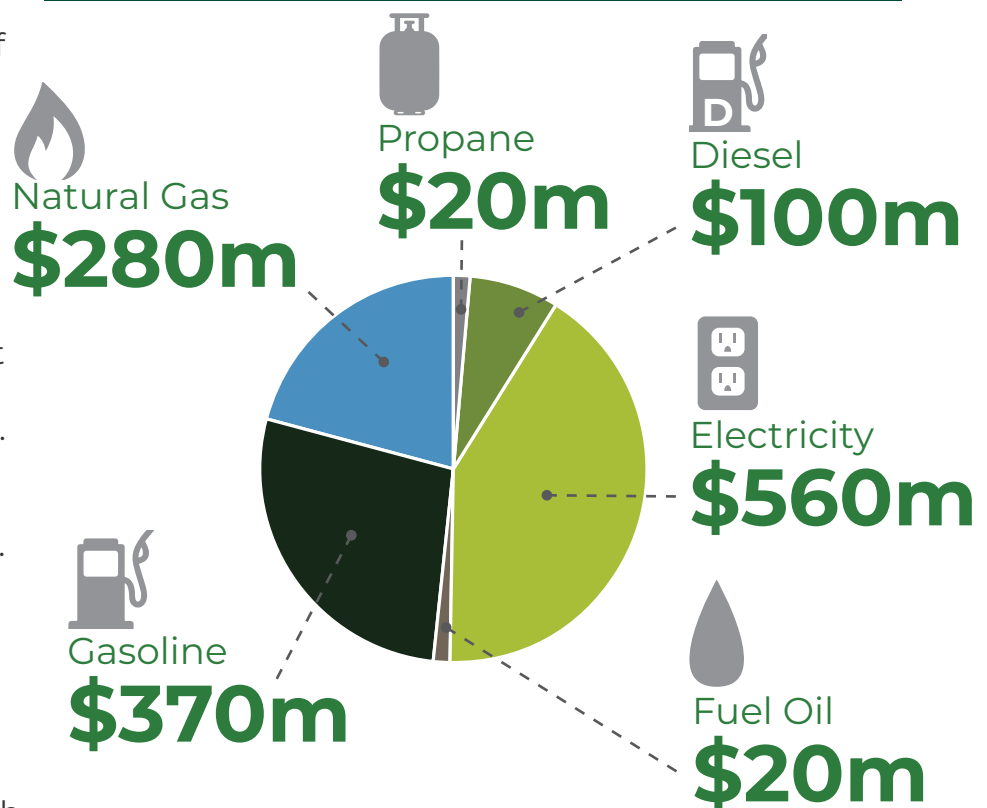
As noted earlier, COVID-19 reduced the demand for gasoline. As a result, the price for gasoline in 2020 decreased by 13 percent. In total, Londoners spent about \$170 million less on gasoline in 2020 than they did in 2019.

Electricity accounts for 42 percent of total energy costs.

Natural gas use accounts for only 21 percent of energy costs, even though it is the largest source of energy we use. This is due to the low price of natural gas, even with the \$30 per tonne carbon price in place during 2020.

On average, every percentage that Londoners reduce their energy use results in around \$13 million staying in London.

1.35 Billion Spent



The improvements in energy efficiency seen since 2010, combined with COVID-19, are estimated to have saved London \$380 million in avoided energy costs in 2020. Added up year-over-year, London has avoided over \$1.3 billion in energy costs due to improved efficiency since 2010.

Please note: due to rounding of numbers, individual numbers illustrated above may not add up to the rounded total.

Translating energy use to greenhouse gas impact

Total greenhouse gas emissions in 2020 were about 2.7 million tonnes of equivalent carbon dioxide, or 22 percent lower than the 1990 level. This is well below the 15 percent reduction target set for 2020. However, it is important to note the extraordinary impact of the COVID-19 pandemic on emissions.

Energy use is responsible for 95 percent of all GHG emissions from human activity in London. Not only does burning fossil fuels such as gasoline, diesel, and natural gas produce carbon dioxide – the most common GHG associated with human activity – but the use of electricity also contributes to GHG emissions.

Over 90 percent of Ontario’s electricity was generated from emissions-free sources in 2020, such as nuclear and hydro-electric generating stations as well as renewable sources (wind and solar).

However, Ontario still relies on fossil fuels such as natural gas to generate almost seven percent of the electricity we use.

In summary, energy related GHG emissions are:

- 51 percent from natural gas
- 29 percent from gasoline
- 11 percent from diesel
- 4 percent from electricity
- 5 percent from other fuels

The remaining five percent of GHG emissions are methane emissions from the anaerobic decomposition of organic materials in the active and closed landfills located in London as well as commercial sector waste disposed in landfills outside London, and nitrous oxide emissions from sewage sludge incineration.

GHG emissions from energy sources



Electricity
8kg



Natural Gas
51kg



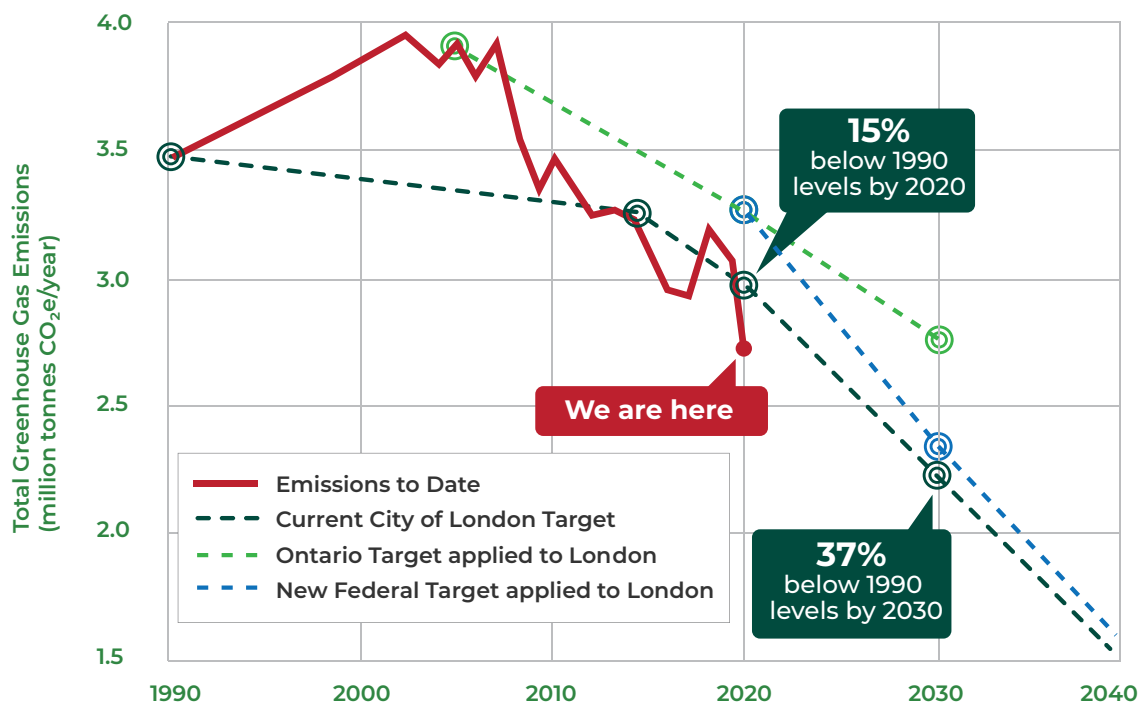
Gasoline
64kg



Diesel
70kg

Measured in kilograms (kg) of equivalent carbon dioxide CO₂E per unit of energy gigajoule

London's greenhouse gas emissions versus CEAP targets and Federal & Provincial reduction targets



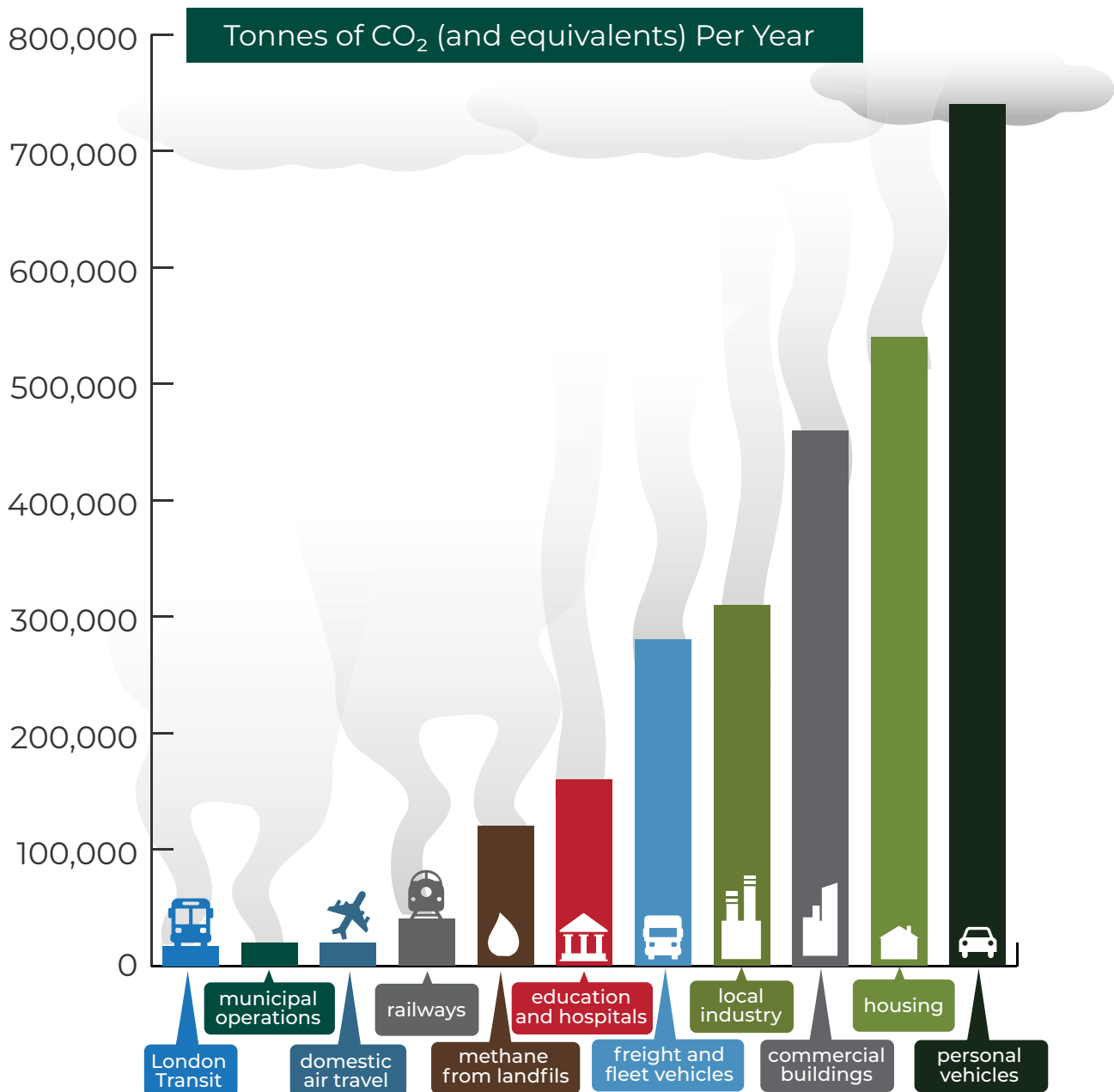
London's Climate Emergency Action Plan (CEAP) currently has the following greenhouse gas emission reduction goals:

- 15 percent reduction from 1990 levels by 2020
- 37 percent reduction by 2030, and
- Net-zero emissions by 2050.

In April 2021, the federal government revised its 2030 target to aim for a minimum 40 percent reduction in GHG emissions from 2005 levels as well as net-zero emissions by 2050. To date, the provincial government has not revised its 2030 target for a 30 percent reduction from 2005 levels and has not established an emission reduction target beyond 2030.

Compared to 2005, total greenhouse gas emissions from London in 2020 have decreased by 30 percent.

The following figure illustrates the estimated breakdown of greenhouse gas emissions in terms of human activity, with half of the emissions coming from personal transportation and energy use at home.





As mentioned earlier, the COVID-19 pandemic had a significant impact on transportation fuel use, with an associated 20 percent drop in transportation GHG emissions between 2019 and 2020. Warmer weather in the winter and autumn also reduced the demand for natural gas used for heating, with an associated seven percent drop in residential GHG emissions between 2019 and 2020.

Seasonal weather variations can affect energy use and associated emissions significantly on a year-by-year basis. However, over the last ten years, winter average temperatures and most summer average temperatures have been warmer than normal.

Since 2005 there has been a downward trend in community-wide emissions driven by a combination of cleaner electricity generation in Ontario and improved energy efficiency.



Whether emissions continue to decrease depends upon the impact of City-led actions as well as energy and fuel conservation efforts from Londoners, provincial and federal climate change policies, climate trends, economic growth, and consumer choices.

Household energy use and greenhouse gas emissions

It is estimated that the average household in London, living in a single-family home, spent over \$380 every month on energy in 2020. Almost half of this, about \$170 a month, was spent on gasoline. Note that this was \$70 a month lower than 2019.

Electricity accounted for around \$120 per month, while natural gas was around \$70 per month.

In terms of household greenhouse gas emissions, the average household emitted over nine tonnes per year. As with cost, almost half of this came from burning gasoline. Natural gas used for space heating and water heating accounted for 42 percent of emissions. Organic waste in the landfill accounts for about seven percent. Given Ontario's clean electricity grid, using electricity in the home only accounts for under two percent of household GHG emissions.

It is important to recognize the fact that the production and transportation of the consumer goods purchased do have an environmental impact, and that some types of goods (e.g., meat and dairy products) do have a larger impact than others. At this point in time, there is no

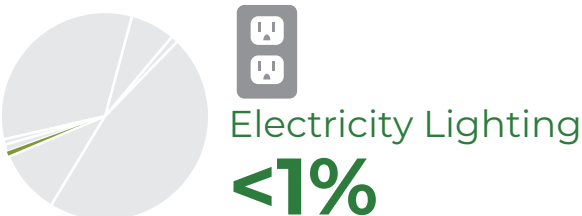
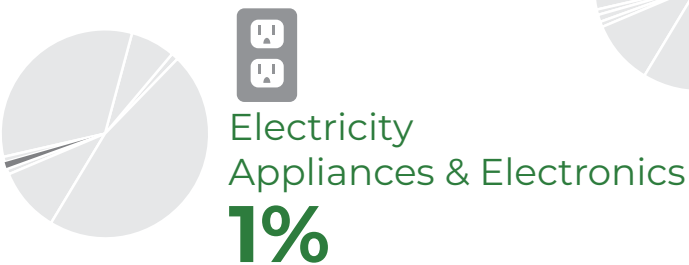
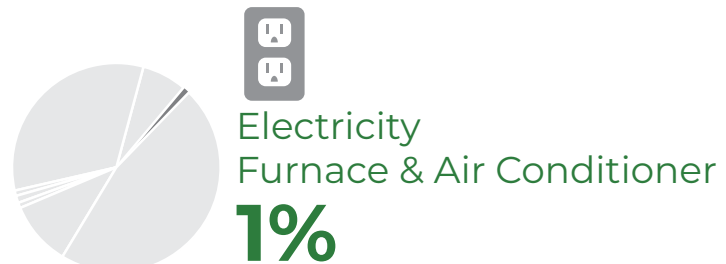
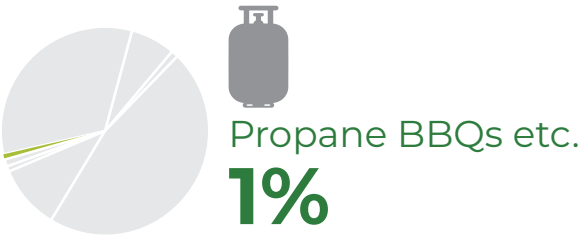
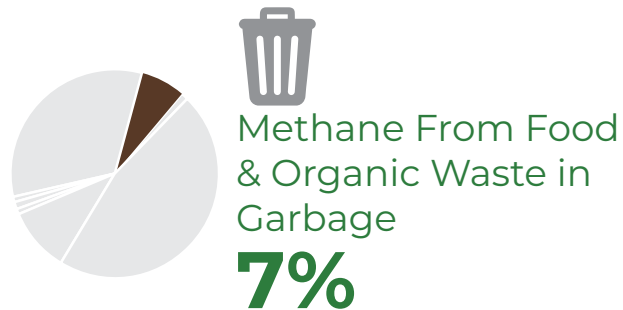
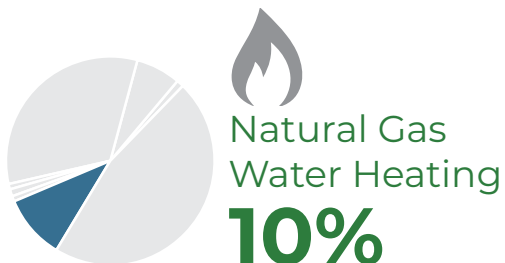
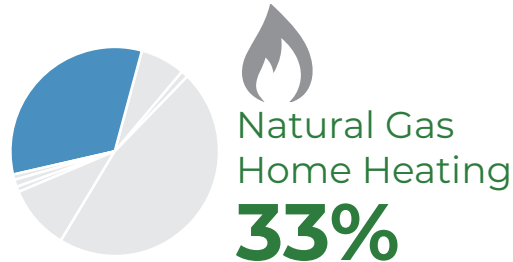
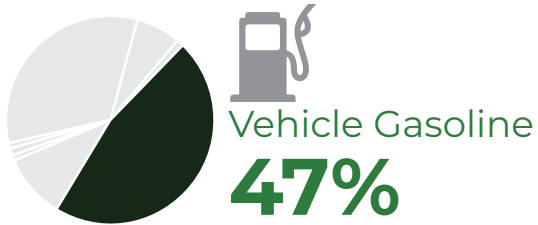
easy-to-use methodology to estimate this at the community-wide scale.

However, the Environmental Commissioner of Ontario report, *Climate Pollution: Reducing My Footprint*, provides estimates of consumption related GHG for Ontario residents. Using the information in this report, it is estimated that the average household's consumption related GHG emissions are about 18 tonnes per year. This is larger than the emissions from the direct use of energy and from waste.

This highlights the climate change mitigation of several environmental initiatives such as:

- Food waste reduction
- Buying durable products
- Buying local products and local "staycations"
- Recycling and the circular economy
- Repurposing and renovating existing buildings

Where do your greenhouse gas emissions come from?



The average home in
London emits

9.3
tonnes per year.

Based on 2020 average energy use for residential customers of London Hydro and Enbridge (formerly Union Gas), combined with retail sales of gasoline data.





Glossary – what do these mean?

Gigajoule – (or, one billion joules) is a metric unit for measuring energy, and is approximately equivalent to energy provided by burning 26 litres of gasoline (roughly half a tank of gas in a car)

Terajoule – (or, one trillion joules) is equal to 1,000 gigajoules, or approximately 26,000 litres of gasoline (roughly the amount of gasoline in 500 cars).

Megawatt – (or, one million watts) is a metric unit for measuring power output, usually for electricity, and is approximately the amount of power needed to light 200,000 LED light bulbs (at 5 watts each).

Greenhouse gas - a gas that contributes to the greenhouse effect in our atmosphere by absorbing infrared radiation, similar to the glass in a greenhouse that traps heat. Carbon dioxide is the most common greenhouse gas produced by human activity, but methane from decomposing garbage and nitrous oxides from incinerating sewage sludge are also potent greenhouse gases. Emissions of greenhouse gases are reported in terms of “equivalent carbon dioxide.”

Tonne – is the alternate metric unit of mass used to represent one megagram (one million grams or 1,000 kilograms), which is roughly the same (about 10% different) as a “ton” in the old Imperial system of measurement. Emissions of greenhouse gas emissions are reported in terms of “tonnes of equivalent carbon dioxide”. Given that carbon dioxide is an invisible gas, the best way to picture what a tonne of carbon dioxide like is to imagine this as a balloon about ten metres wide.



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