Government of Yukon greenhouse gas emissions: 2019

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Climate Change Secretariat
Department of Environment
Government of Yukon

Table of Contents

Overview

The Government of Yukon is committed to tracking the greenhouse gas emissions (GHGs) from our internal operations. This report communicates the Government of Yukon's total GHGs in 2019, identifies major emission sources and provides an analysis regarding the major factors that have influenced emissions over time. The report also presents the methodology used to calculate the Government of Yukon's GHG inventory.

Third party verification

We undertake rigorous work each year to calculate the Government of Yukon's emissions. Every five years, these calculations are verified by an independent third party to ensure the data is accurate and adheres to all greenhouse gas reporting standards. This is done through The Climate Registry, a non-profit organization that designs and operates global GHG corporate reporting programs.

This quality assurance step provides a higher level of confidence in the methodology used to calculate the Government of Yukon's emissions inventory and ensures that emissions reductions are being tracked against an accurate baseline. Currently, the Government of Yukon's greenhouse gas emission reports for the calendar years 2010 and 2015 are available through the Climate Registry Information System. The Government of Yukon's 2020 GHGs will be verified in 2022.

Methodology

All greenhouse gas emission calculations were undertaken in adherence to the principles and standards set by The Climate Registry. These standards specify the types of emission sources that must be included and the specific methods to be used to calculate GHGs based on its source. This includes the emissions factors that must be used to calculate GHGs from each source. Emission factors are the conversion factors used to measure the amount of GHGs emitted per unit of fuel or energy consumed. The Climate Registry's guidance is based on national and international GHG reporting standards. As a result, The Climate Registry emission factors used to calculate the Government of Yukon's GHGs come from Environment and Climate Change Canada's National Inventory Report. GHGs are reported in tonnes of **carbon dioxide equivalent**

(CO_2e). This means that greenhouse gases other than carbon dioxide (such as methane and nitrous oxide) are included in the calculations on the basis of how much more potent than carbon dioxide they are. For example, one tonne of methane is equal to 28 tonnes of carbon dioxide equivalent in terms of its climate impact. The measure of a GHG's potency relative to CO_2 is known as its **global warming potential (GWP),** and is used as a multiplier to convert volumes of non-CO_2 gases into their volume in CO_2e.

Reporting boundary and scope

In GHG reporting, a defined inventory boundary is key to ensure consistency between reporting years so that progress can be measured over time. Reporting boundaries clearly define what emission sources are counted within an organization's GHG inventory and what sources are not included. The Government of Yukon reports our emissions using a "Financial Control Boundary." This means that only entities for which we control financial policies are included in our inventory.

Under this boundary, all entities that are included under the Government of Yukon's annual consolidated financial reports (collectively referred to as government reporting entities) are included. Therefore, the Government of Yukon's greenhouse gas inventory includes emissions from the following entities:

- all Government of Yukon departments;
- Yukon University;
- Yukon Development Corporation;
- Yukon Energy Corporation;
- Yukon Hospital Corporation;
- Yukon Housing Corporation; and
- Yukon Liquor Corporation.

The Government of Yukon began collecting greenhouse gas emissions data for departments and Yukon University (previously Yukon College) in 2010. Up until 2018, we only reported on emissions from Government of Yukon departments. Emissions from government corporations and Yukon University were newly added to this reporting process in 2019 according to the requirements of the Financial Control Boundary.

The Government of Yukon's reporting boundary also defines which emission sources within each entity are to be included. Each emission source is classified as one of the three scopes:

- **Scope 1:** Direct GHG emissions from assets owned by Government of Yukon reporting entities. This includes emissions from building heating, transportation, waste management and refrigeration.
- **Scope 2:** Indirect GHG emissions from the generation of purchased electricity.
- **Scope 3:** Other indirect GHG emission sources. This includes emissions from leased buildings and vehicles.

The Government of Yukon's emissions reporting includes Scope 1 and 2 emissions only. Scope 3 emissions include upstream and downstream emissions that occur as an indirect result of the Government of Yukon's operations, including emissions from leased buildings and vehicles and emissions from staff commuting. These emission sources are addressed through other policies implemented as part of *Our Clean Future: a Yukon strategy for climate change, energy and a green economy*; however, they are not included in Government of Yukon emissions reporting, as they are considered out of scope.

In this report, we will present emissions from Government of Yukon departments and Yukon University first. Since data for these entities dates back to 2010, their 2019 emissions inventory will be compared against previous years. Next, the emissions from government corporations are reported on, with a focus on the key emissions sources for each entity. Comparisons to previous years are not possible at this time, and 2019 will be treated as the base year against which future emissions will be compared.

Data sources

Two main sources of information are used to calculate the greenhouse gas emissions from Government of Yukon departments and Yukon University:

- **Public Building Energy Tracker (PBET)**: tracks the amount of heating fuel and electricity used in each Government of Yukon department and Yukon University building. Given that more than half of departmental and Yukon University GHGs

come from heating buildings, this database is the most significant source of information for our greenhouse gas inventory.
- **KEYS database**: tracks the volume of fuel used by departmental and Yukon University fleet vehicles, which account for nearly one-quarter of the government's emissions.

The remaining emission sources for departments and Yukon University that are not captured in these two databases are:

- **Fuel associated with non-fleet vehicles**: fuel usage from vehicles not managed through the Government of Yukon's Fleet Vehicle Agency are collected via direct correspondence with the responsible branches. The main source of non-fleet vehicle emissions are heavy-duty vehicles used to maintain Yukon's transportation infrastructure.
- **Waste management** (landfilling, waste water treatment, solid waste incineration): includes emissions from Government of Yukon-owned landfills, septic pits, sewage lagoons, and sites where waste is incinerated. This makes up a relatively small proportion of total emissions, and is estimated based on the population that each site services.
- **Refrigeration**: includes stationary refrigeration systems and air conditioning in fleet vehicles. As part of The Climate Registry reporting standards, all refrigerants that are regulated under the Kyoto Protocol must be reported. These include common refrigerants such as hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs).

All data on government corporation emission sources are collected via direct correspondence with each corporation.

Methodology updates

The Government of Yukon continuously improves the quality of our reported emissions. When more precise methodologies or more accurate data sources become available, they are retroactively applied to all previous annual GHG inventories. This ensures that the emissions reported each year are calculated in the same way, and therefore are directly comparable to one another. Table 1 summarizes the changes to historical emissions in this report as compared to those reported last year.

Table 1: Changes to historical departmental and Yukon University emissions due to methodology updates

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Emissions reported in 2018	30.95	31.32	32.25	33.73	33.72	32.88	31.89	32.42	32.46
Current emissions	32.92	33.2	33.87	35.95	35.49	36.18	33.58	34.34	36.46
% change	6.4	6	5	6.6	5.2	10.0	5.3	5.9	12.3

As seen in Table 1, there was a consistent increase in historical GHG emissions. This is due to the two methodology updates outlined below.

Grid-specific electricity emissions

We have updated the way the Government of Yukon calculates emissions from purchased electricity to reflect the carbon intensity of electricity generation in different parts of the territory. In previous years, one emission factor was used for all purchased electricity regardless of where that electricity was generated and consumed, which reflected the average carbon intensity of electricity generation across the entire territory.

This year, in collaboration with the Department of Highways and Public Works' Energy Management Unit, we developed separate emission factors for the Yukon Integrated System (energy produced by the Yukon Energy Corporation) and each off-grid community (energy produced by ATCO Electric Yukon). These emission factors are developed based on the total amount of electricity generated with hydro power and the total amount of electricity generated with thermal (diesel or LNG) sources during the reporting year. Table 2 shows the emission factors used to calculate emissions from purchased electricity in 2019. Yukon's five off-grid communities (Old Crow, Watson Lake, Beaver Creek, Destruction Bay and Burwash Landing), and the Swift River

highway camp each have their own emission factor to reflect their specific carbon intensity. All other Yukon communities use the Yukon Integrated System emission factor.[1] The territory-wide average electricity emissions factor, which was not used, is included for comparison.

Table 2. Yukon average and grid-specific electricity emission factors in 2019.

Electricity grid	Carbon intensity (gCO_2e/kWh)
Yukon Integrated System	53.1
Old Crow	772.7
Watson Lake	711.9
Beaver Creek	811.6
Destruction Bay/Burwash Landing	784.8
Swift River	980.8
Yukon average	101

As can be seen in Table 2, the Yukon Integrated System (predominantly hydro electricity) emission factors and the off-grid community (predominantly diesel generation) emission factors are substantially different from the Yukon average. This highlights the importance of using distinct emission factors, because the Government of Yukon purchases different amounts of electricity in different communities.[2] A more detailed accounting of the emissions from purchased electricity means that our emissions inventory will more accurately reflect our hydroelectricity legacy

[1] Note that grid-specific emission factors apply to electicity **purchased** by Government of Yukon reporting entities. They are not used calculate Yukon Energy Corporation's emissions from electricity generation.

[2] Conversely, when reporting Yukon's total GHGs from electricity generation, this level of specificity is not necessary. For Yukon-wide emissions reporting, we look at the total amount of fossil fuels combusted for electricity generation across the territory and do not need to factor in the location where these fuels are combusted.

infrastructure and updates, investments in energy efficiency and renewable energy in different locations.

Moving forward, grid-specific electricity emission factors will be developed annually, given that the carbon intensity of electricity generation varies year-to-year based on factors such as annual rainfall, drought, winter temperatures, demand or the integration of new renewable electricity sources.

Inclusion of Yukon University

GHGs from Yukon University and Government of Yukon departments are reported and analyzed together for the 2019 reporting year. Although Yukon University is a separate reporting entity from Government of Yukon departments, the Department of Highways and Public Works performs building management services for Yukon University and therefore historical GHG emission data for Yukon University is available dating back to 2010 along with data for Government of Yukon departments. To ensure a thorough and complete analysis of year-over-year variation in the Government of Yukon's GHG emissions, greenhouse gas emissions from Yukon University have been added to departmental emissions for the reporting years 2010 to 2018, resulting in GHGs for these years being higher than previously reported.

Results

Total Government of Yukon greenhouse gas emissions

GHGs from the Government of Yukon's operations, including all departments, Yukon University and government corporations, were 71.2 kilotonnes of CO_2e in 2019. Government of Yukon departments and Yukon University collectively made up 52 per cent of total emissions (48 per cent from departments and 4 per cent from Yukon University); government corporations[3] were responsible for 15 per cent and electricity generation by Yukon Energy Corporation comprised the remaining 33 per cent (Figure 1).

[3] Excluding emissions from electricity generated by the Yukon Energy Corporation.

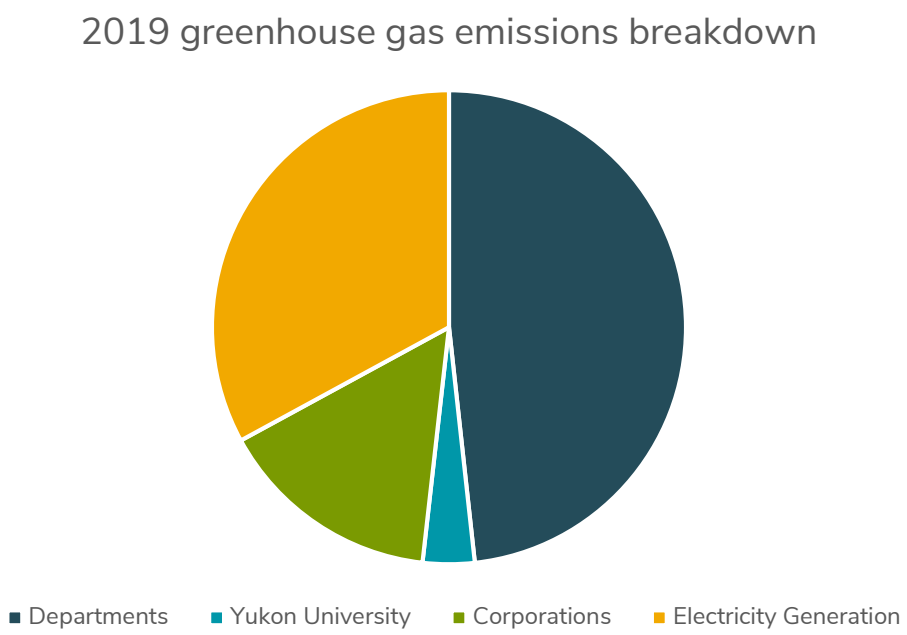

Figure 1: Breakdown of the Government of Yukon's 2019 greenhouse gas emissions.

As shown in Figure 2, emissions from Government of Yukon departments and Yukon University were 36.9 kilotonnes of CO_2e in 2019, which is a 12 per cent increase over 2010 emissions and a 1.1 per cent increase over 2018 emissions. Departmental and Yukon University emissions were slightly higher than the previous peak of 36.2 kilotonnes in 2015. Emissions data from Yukon's government corporations was collected for the first time in 2019, so no historical comparisons can be made.

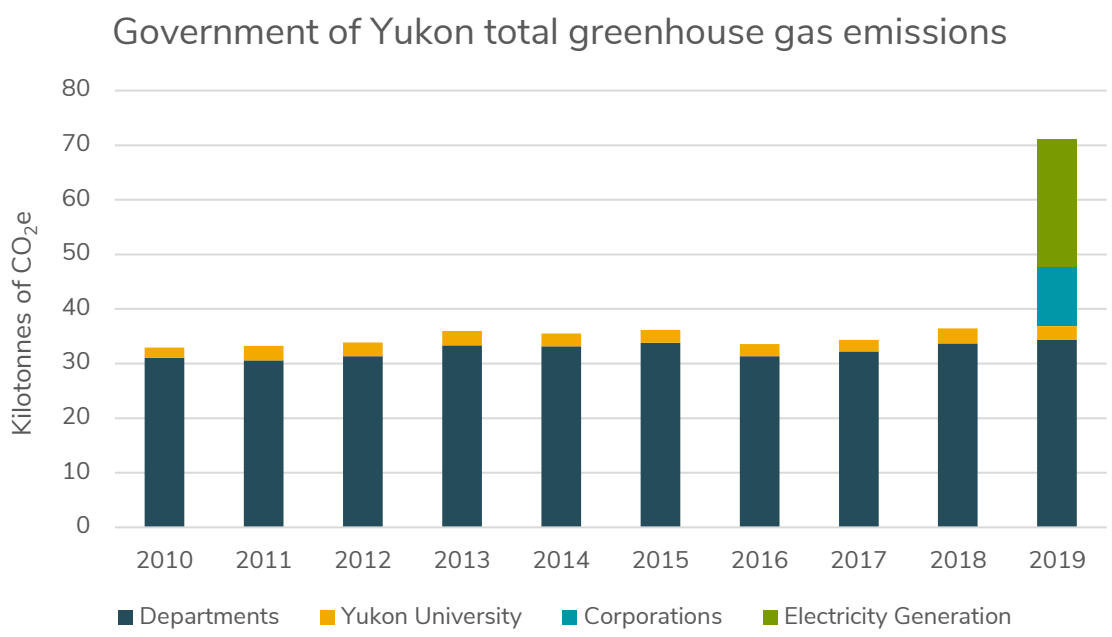

Figure 2. Total greenhouse gas emissions from the Government of Yukon's operations from 2010 to 2019.

Department and Yukon University emissions

Emissions by source

Together, buildings and transportation made up 97 per cent of emissions from Government of Yukon departments and Yukon University in 2019. Although there was some variation between 2010 and 2019 in the proportion of emissions from each source type, the remaining emissions sources (waste management and refrigeration) consistently make up a small percentage of the Government of Yukon's total emissions, as seen in Figure 3.

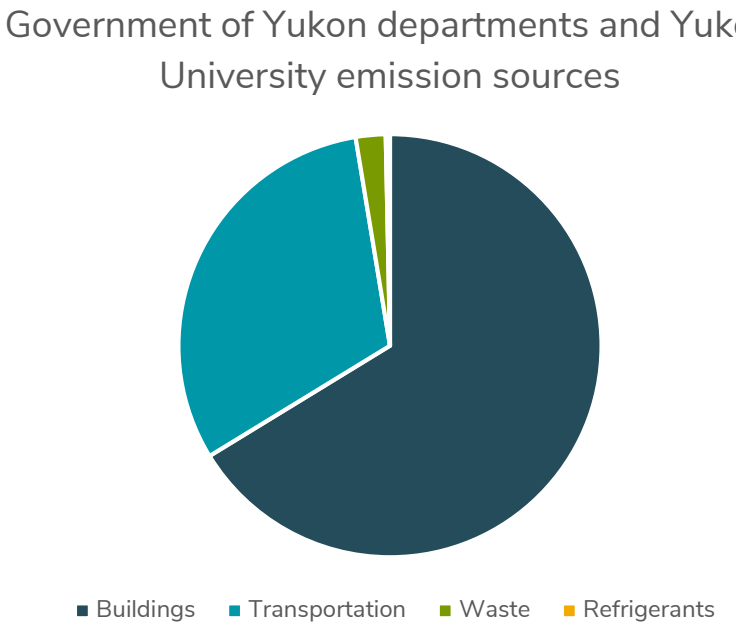

Figure 3: Government of Yukon departments and Yukon University emissions sources in 2019.

As shown in Figure 4, greenhouse gas emissions from both buildings and transportation increased from 2010 to 2019, while emissions from waste treatment and refrigerants decreased slightly. Trends observed in each of these four categories are discussed below.

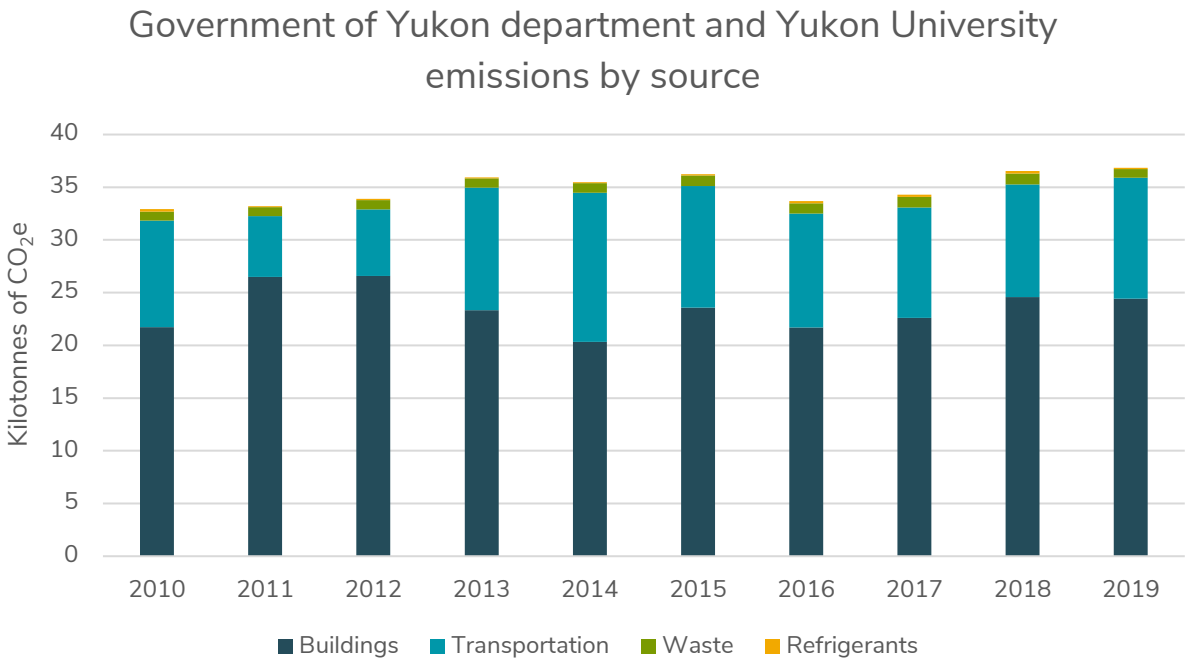

Figure 4: Government of Yukon departments and Yukon University emissions by source, 2010 – 2019

Building emissions

Heating and powering buildings consistently makes up the largest proportion of Government of Yukon departments and Yukon University emissions, comprising 66 per cent of 2019 emissions.

Government buildings such as schools, healthcare facilities and office buildings continue to be the largest emission category for Government of Yukon departments and Yukon University. Although building emissions have increased somewhat since 2010, 2019 building emissions were 7.5 per cent lower than their 2012 peak, which we expect is at least partly due to the success of energy conservation and GHG emissions reduction measures (Figure 5). Further analysis is needed to determine the impact of annual temperatures or other variables on the decreased use of heating fuel seen over this period.

In 2019, Government of Yukon department buildings made up 92 per cent of total departmental and Yukon University emissions.

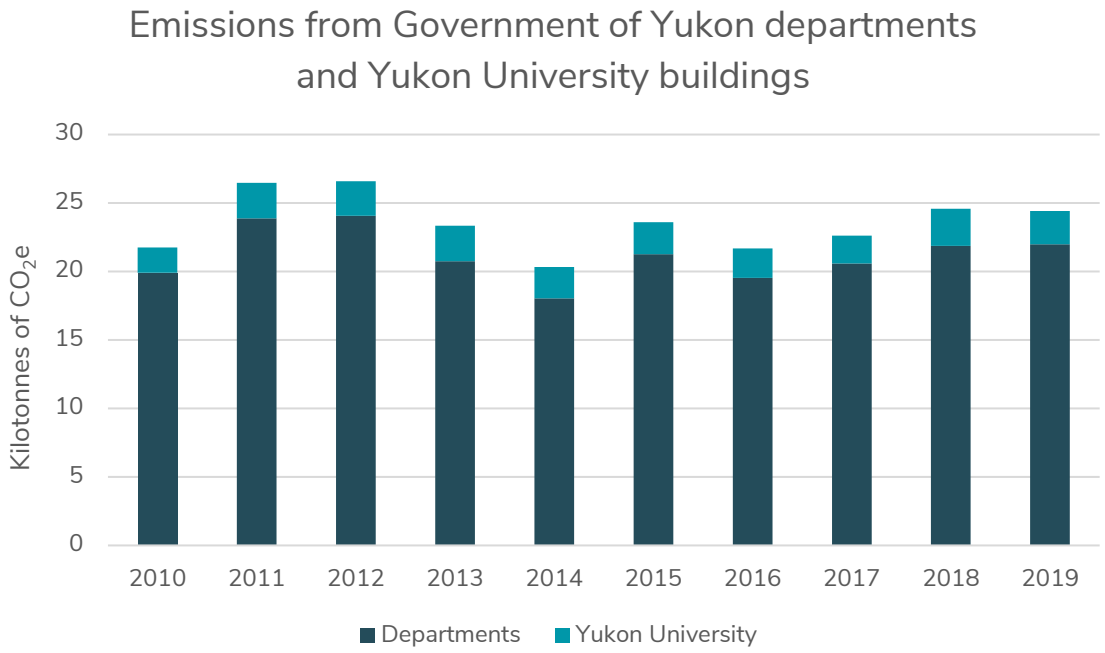

Figure 5. Greenhouse gas emissions from Government of Yukon buildings from 2010 to 2019.

Approximately two-thirds of Government of Yukon departments and Yukon University building emissions come from buildings in Whitehorse, as seen in Figure 6. The next most significant contributors are buildings in Watson Lake and Dawson City, making up 7 and 6 per cent, respectively. These communities are notable contributors because they have the highest populations in Yukon outside of Whitehorse, and Watson Lake relies on diesel-generated electricity.

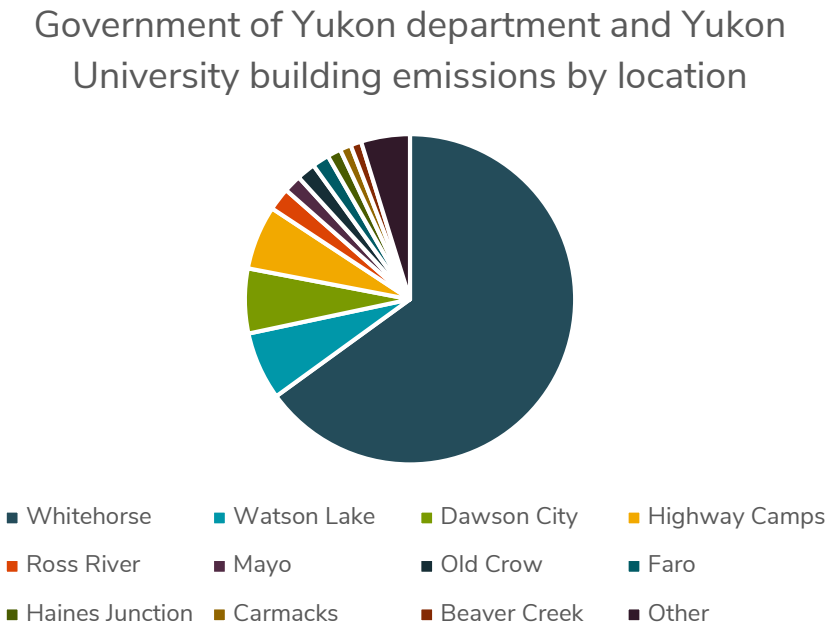

Figure 6. Greenhouse gas emissions from Government of Yukon departments and Yukon University buildings by location in 2019.

Remote highway maintenance camps and structures located outside of communities represent the next largest emission source by location. These remote camps have higher emissions since they are isolated from electrical grids and rely exclusively on on-site diesel generators for power. These camps consist of grader stations, living complexes, and other related facilities along Yukon's highways. After highway maintenance camps, Government of Yukon buildings in Ross River, Mayo and Old Crow are also notable contributors.

Transportation emissions

The second largest source of departmental and Yukon University emissions is transportation, which made up 31 per cent of 2019 emissions.

This includes fleet vehicles (on- and off-road) a well as heavy-duty vehicles used to maintain Yukon's road network. On-road fleet vehicles are those registered for use on official roadways, while off-road fleet vehicles are not used on official roadways and include vehicles used for maintenance and construction purposes. Transportation emissions were lowest in 2011-2012, then peaked in 2014. Transportation emissions

in 2019 were 14 per cent higher than 2010 levels, but 19 per cent lower than the 2014 emissions peak.

Emissions from Yukon University fleet vehicles make up 0.6 per cent of total Government of Yukon department and Yukon University transportation emissions.

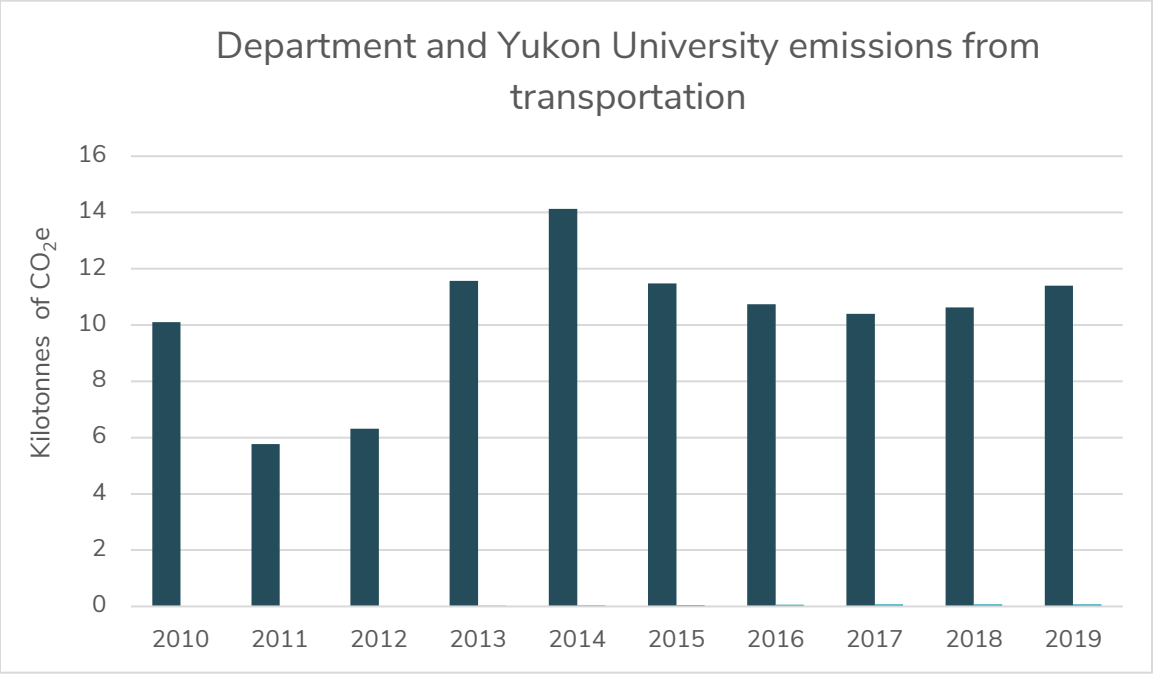

Figure 7: Government of Yukon departments and Yukon University greenhouse gas emissions from transportation from 2010 to 2019.

On-road and off-road vehicle emissions were fairly consistent between 2010 and 2019, whereas emissions related to transportation maintenance (specifically vehicles and equipment used to maintain road equipment) are more varied year to year according to the amount of maintenance required in a given year. This explains some of the variance seen in the overall transportation category over the last decade. The net increase in transportation emissions seen between 2010 and 2019 is likely due in part to an increasing scope and frequency of road infrastructure maintenance work. Other potential reasons for the observed inter-annual variation are weather volatility and an aging fleet of transportation maintenance vehicles.

Waste management emissions

Waste management makes up a relatively small percentage of Government of Yukon department and Yukon University emissions, comprising 2 per cent of 2019 emissions.

As discussed, the Government of Yukon reports its GHGs using a Financial Control Boundary, meaning that all sites owned by the Government of Yukon fall within this boundary. This includes a number of community landfills, sewage treatment sites, and waste incineration sites across the territory.

Figure 8: Government of Yukon emissions from waste management (including government-owned landfills, septic/sewage treatment sites and waste incineration) from 2010 to 2019.

Waste management emissions have been gradually increasing as a result of Yukon's growing population. Emissions in 2019 are an exception to this trend due to the temporary closure of the Old Crow Gasifier and Marsh Lake Septic Pit.

Refrigerant emissions

Refrigerants are the smallest and most variable emissions source, making up 0.3 per cent of emissions in 2019.

Refrigerants such as hydrofluorocarbon (HFC) and perfluorocarbon (PFC) are used for Government of Yukon refrigeration systems in buildings, and air conditioning in fleet vehicles. These refrigerants have high Global Warming Potential values, meaning that they are significantly more potent than carbon dioxide.

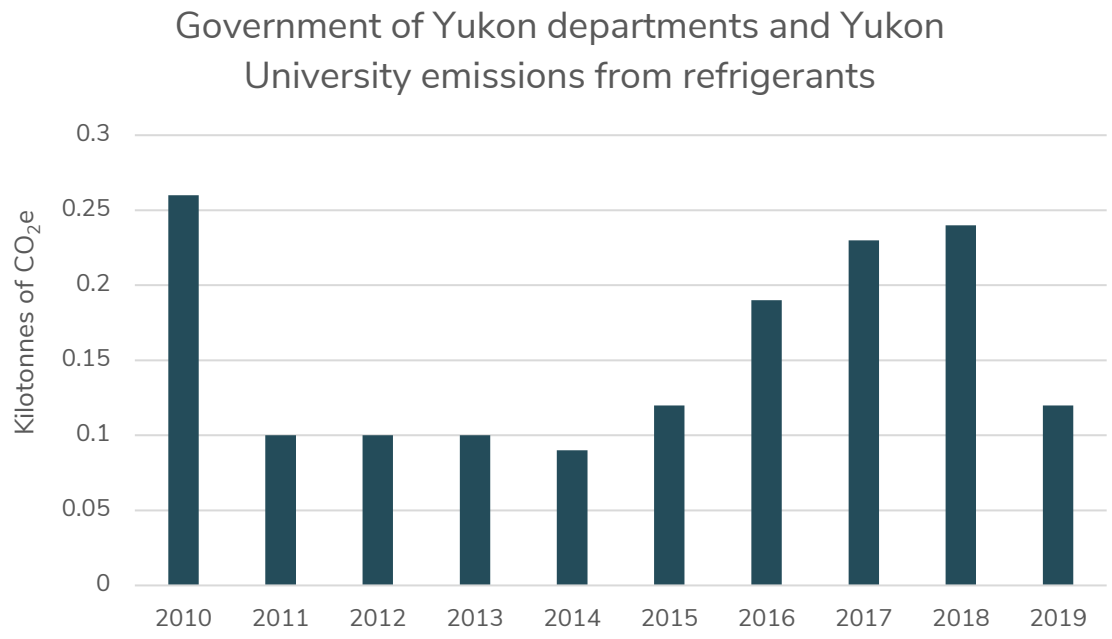

Figure 9: Government of Yukon departments and Yukon University emissions from refrigerants from 2010 to 2019.

For refrigerants used in Government of Yukon buildings, emissions are included in the year in which systems are serviced as this is when the volume of refrigerant added to the system is recorded. This leads to the variable nature of this GHG source, making inter-annual comparisons challenging.

Drivers of emissions

Economic and population growth are well-known drivers of greenhouse gas emissions and are fairly well correlated with emissions from Government of Yukon departments and Yukon University.

Yukon's gross domestic product (GDP) consistently increased from 2010 to 2019, with the exception of a dip in 2015[4] (Figure 10). Given that the Public Administration sector makes up 24 per cent of Yukon's GDP[5], GDP growth is linked to a greater scope of government operations, and by extension, to increased greenhouse gas emissions. This increase in scope of government operations is reflected in the 15 per cent increase in full time equivalent Government of Yukon jobs (between 2010 and 2017) and 17 per cent increase in the square metres of departmental and Yukon University building floor space (between 2010 and 2019).

[4] The lower GDP value in 2015 corresponds to a dip in the mining industry. The total value of mineral production in Yukon in 2015 was 49 per cent lower than its previous peak in 2015 (Source: Natural Resources Canada, Mineral Production of Canada Annual Statistics).

[5] Source: Yukon Bureau of Statistics, Gross Domestic Product (GDP) by Industry at Basic Prices, 2019.

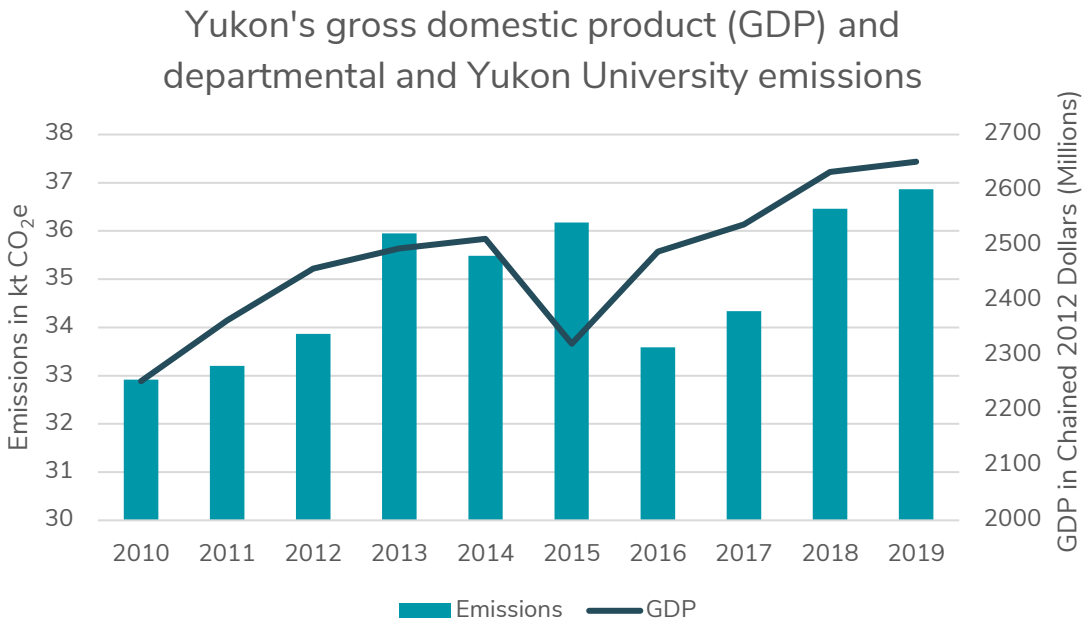

Figure 10. Yukon's gross domestic product[6] and departmental and Yukon University greenhouse gas emissions from 2010 to 2019.

Between 2010 and 2019, Yukon's GDP increased by 17 per cent (Figure 10). This rate of growth is more substantial than that of the Government of Yukon's GHGs, leading to a 5 per cent decrease in emissions per unit of GDP over the same period (Figure 11).

[6] Source: Statistics Canada table 36-10-0402-01.

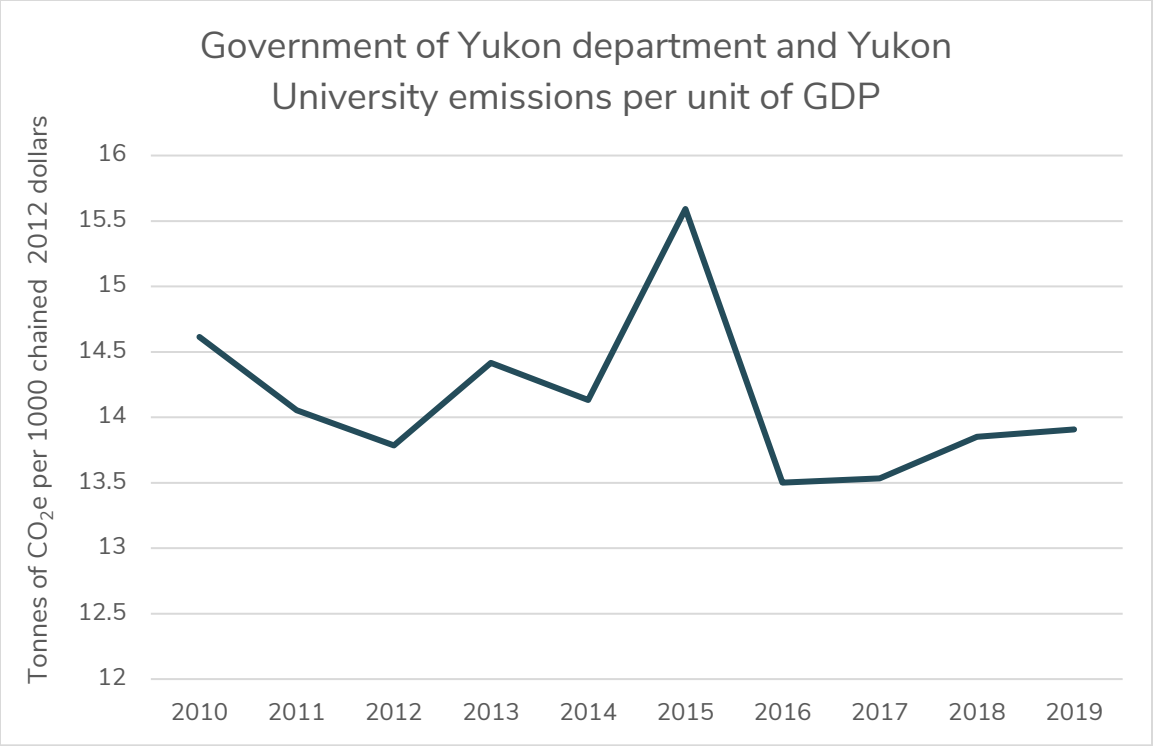

Figure 11. Government of Yukon department and Yukon University greenhouse gas emissions per unit of gross domestic product from 2010 to 2019.

Similarly, Yukon's population increased 18 per cent between 2010 and 2019 (Figure 12). A growing Yukon population is linked to a greater scope of government operations due to an increased occupancy in schools and healthcare facilities, growth of government programs, and a greater need for permits, licences, and other government services. This likely contributed to the increase in greenhouse gas emissions from Government of Yukon departments and Yukon University from 2010 to 2019.

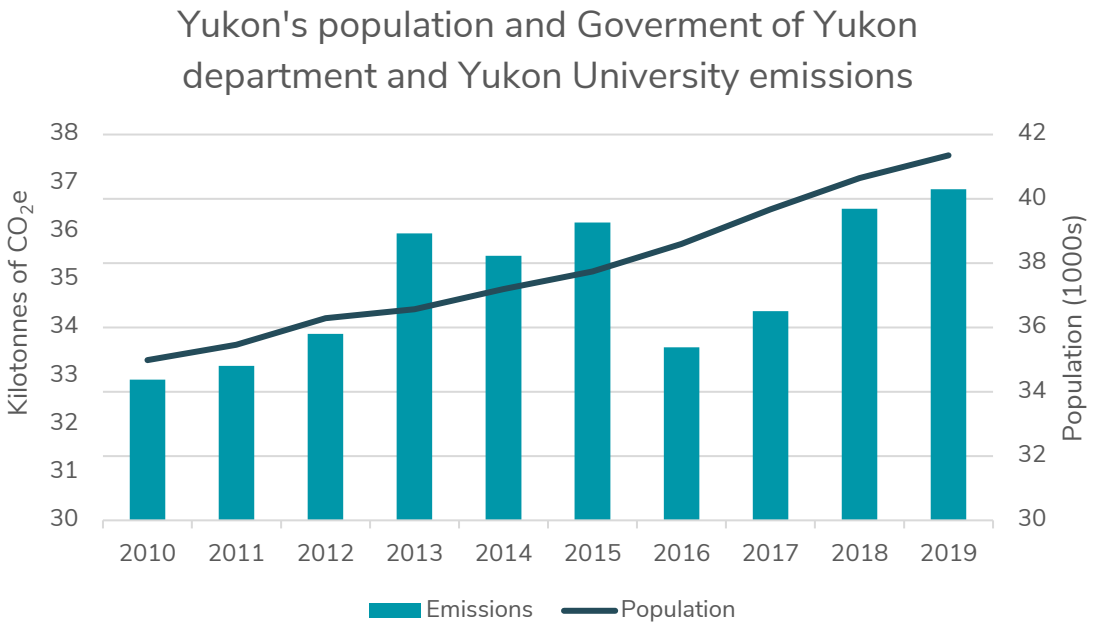

Figure 12. Yukon's population[7] and Government of Yukon department and Yukon University greenhouse gas emissions from 2010 to 2019.

However, the department and Yukon University greenhouse gas emissions per capita (relative to Yukon's total population) decreased by 5 per cent over this period, demonstrating that emissions have not grown as rapidly as the territory's population.

[7] Source: Yukon Bureau of Statistics, Population as of June 31 of each year.

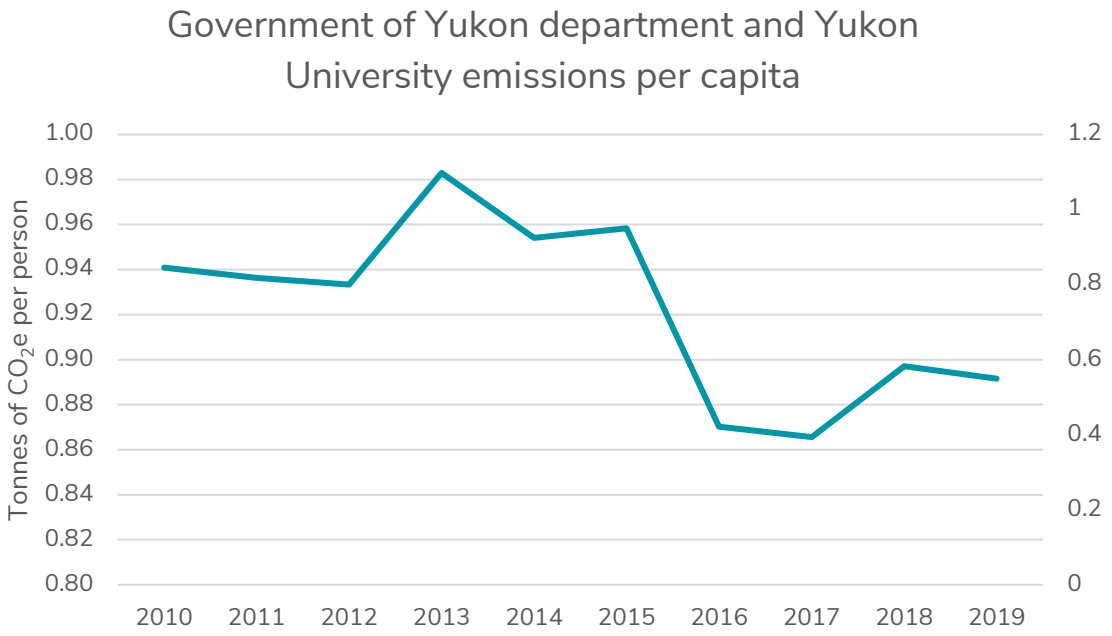

Figure 13. Government of Yukon department and Yukon University emissions per capita (relative to Yukon's total population) from 2010 to 2019.

While economic and population growth appear to be strong drivers of greenhouse gas emissions from Government of Yukon departments and Yukon University, emissions are also influenced by factors like the condition of Government of Yukon buildings and the fuel efficiency of Government of Yukon vehicles. Over time, we plan to decouple[8] the Government of Yukon's emissions from economic and population growth by investing in improvements to our buildings and vehicles that enable us to provide growing services with fewer emissions.

Corporation emissions

As discussed, the Government of Yukon's GHG emissions are reported using a Financial Control Boundary, meaning that all organizations falling within Government of Yukon's consolidated financial reporting are considered to be within its GHG reporting boundary. As such, data for the 2019 calendar year was collected for all government corporations that meet this criterion. This is the first year that emissions data from

[8] Decoupling refers to having continued economic growth without a corresponding increase in GHG emissions.

Yukon's government corporations were collected and analyzed. As a result, we are not yet able to evaluate trends over time. However, this snapshot of government corporation emissions gives us important insight into the scale and sources of GHG emissions from each entity and will be our baseline for comparisons moving forward. The emission sources for each corporation are summarized below.

Yukon Development Corporation

The Yukon Development Corporation (YDC) has a mandate to work with the private sector to support Yukon's development. YDC falls within Government of Yukon's reporting boundary; however, it does not own any GHG-producing assets outside of its subsidiary Yukon Energy Corporation, which is discussed below. As a result, the Yukon Development Corporation's GHG inventory for 2019 is zero.

Yukon Energy Corporation

The Yukon Energy Corporation (YEC) is responsible for the majority of electricity generation and transmission in Yukon. Most of YEC's greenhouse gas emissions are from the electricity that it generates and sells to others in accordance with the accounting rules of The Climate Registry.[9]

Although most electricity generated by YEC comes from hydro power, supplemental thermal generation is needed at times when electricity demand is high. In 2019, 84 per cent of electricity produded by Yukon Energy was from renewable sources. The remaining 16 per cent of energy generated was from liquid natural gas and diesel, which was responsible for 95 per cent of YEC's total emissions in 2019 (Figure 14). The remaining percentage of GHG emissions come from assets required for YEC to operate and maintain electricity generation infrastructure (including buildings and fleet vehicles), as well as fugitive emissions from electricity generation.

[9] Electricity generation emissions discussed in this report overlap with electricity generation emissions reported for territory-wide emissions; they do not represent additional emissions in this sector.

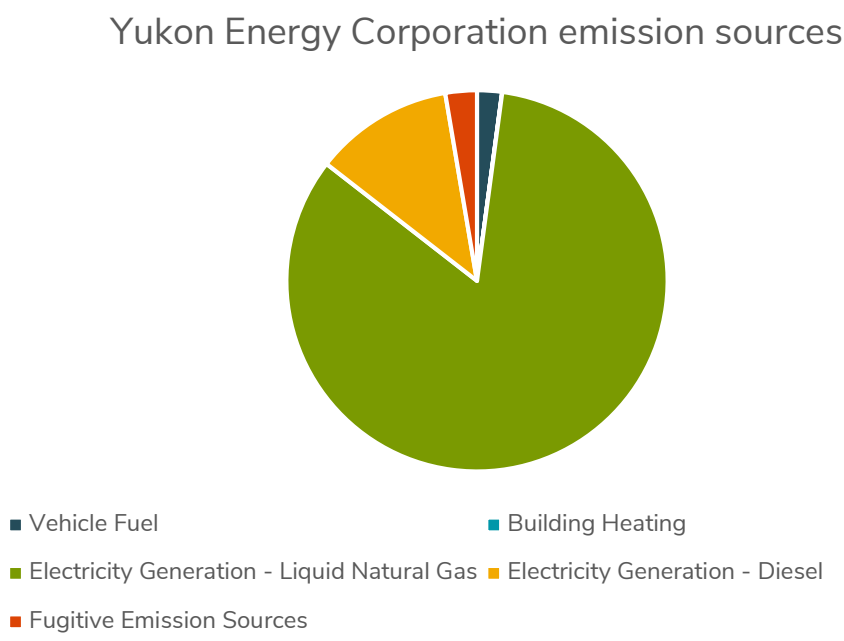

Figure 14: GHG emission sources from the Yukon Energy Corporation in 2019.

Yukon Hospital Corporation

The Yukon Hospital Corporation provides medical services throughout Yukon. Its three sites are located in Whitehorse, Dawson City and Watson Lake. 79 per cent of its emissions come from heating buildings at these sites, and 16 per cent comes from electricity (Figure 15). The remaining emissions come from fleet vehicles (0.5 per cent) and direct emissions from refrigerants and medical gasses (4 per cent).

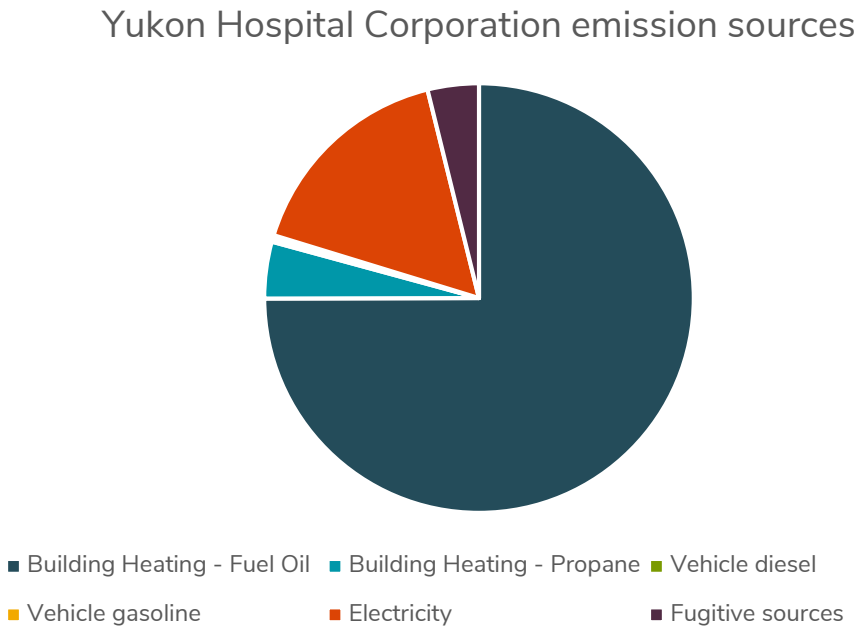

Figure 15: GHG emission sources for the Yukon Hospital Corporation in 2019.

Yukon Housing Corporation

The Yukon Housing Corporation's mandate is to ensure Yukoners have access to affordable housing. As a result, most of its assets are residential buildings and the majority of its emissions come from heating and powering these homes. Specifically, 73 per cent of the Yukon Housing Corporation's emissions are from building heating and 26 from electricity (Figure 16). The remaining 2 per cent of emissions are from fleet vehicles.

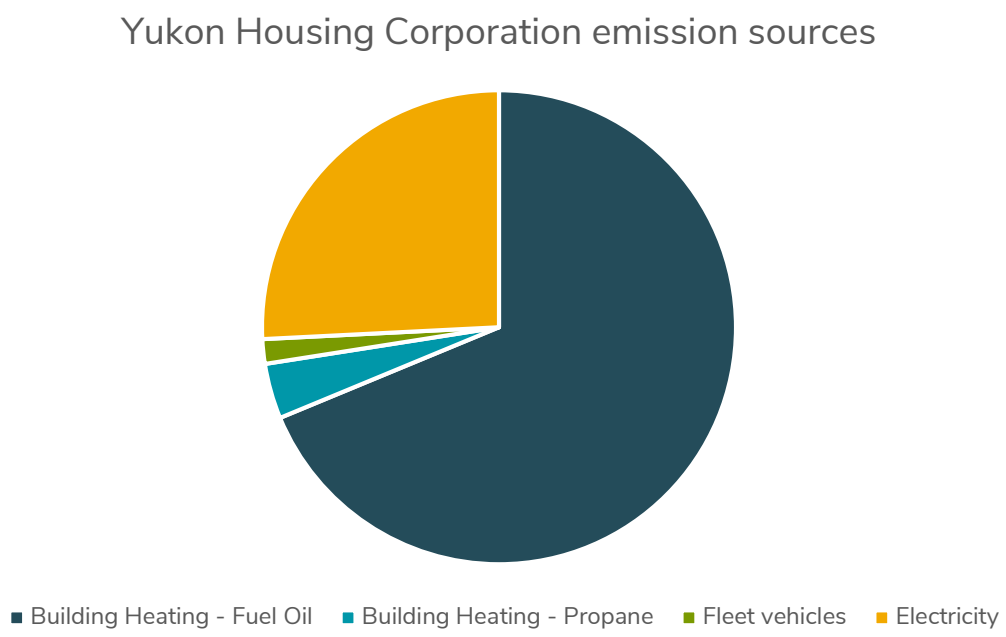

Figure 16: GHG Emission sources for Yukon Housing Corporation in 2019.

Yukon Liquor Corporation

The Yukon Liquor Corporation manages liquor sales in Yukon. It is a relatively small source of GHGs as it only owns a few buildings across the territory. It is anticipated that most of its emissions come from heating these buildings; however, we are currently lacking data on emissions from purchased electricity for these buildings. A complete inventory for the Yukon Liquor Corporation will be available for the 2020 calendar year.

Conclusions and next steps

Overall, emissions from Government of Yukon's departments and Yukon University increased 12 per cent between 2010 and 2019, due largely to significant GDP and population growth over this period. However, the actions the Government of Yukon has taken, such as building retrofits, has decreased emissions on a per capita and per unit of GDP basis.

As of 2019, the Government of Yukon's emissions (excluding electricity generation) contributed approximately 6 per cent of Yukon's total emissions. The Government of Yukon is committed to reducing our emissions and showing leadership in efforts to reduce Yukon's territory-wide emissions.

The Government of Yukon recently created the Green Infrastructure Program to accelerate our efforts to reduce greenhouse gas emissions from government buildings. Since the majority of department and Yukon University emissions come from heating buildings, the program is largely focused on reducing fossil fuel consumption through renewable heating sources such as biomass.