Government of Yukon greenhouse gas emissions: 2021

December 2023

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Government of Yukon: 2021 greenhouse gas emissions

2021 emissions:

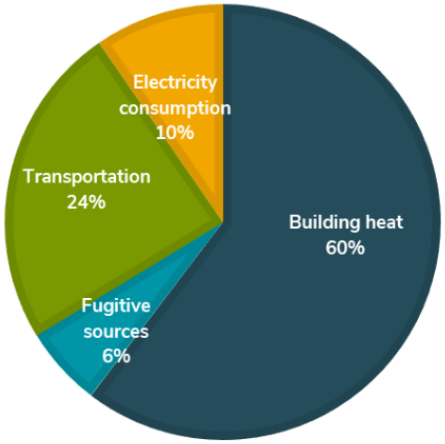
Total operations:

49.9

kilotonnes of CO_2e

Comparison to 2020:

2% increase ↑



Emissions from electricity generation:

Electricity generation:

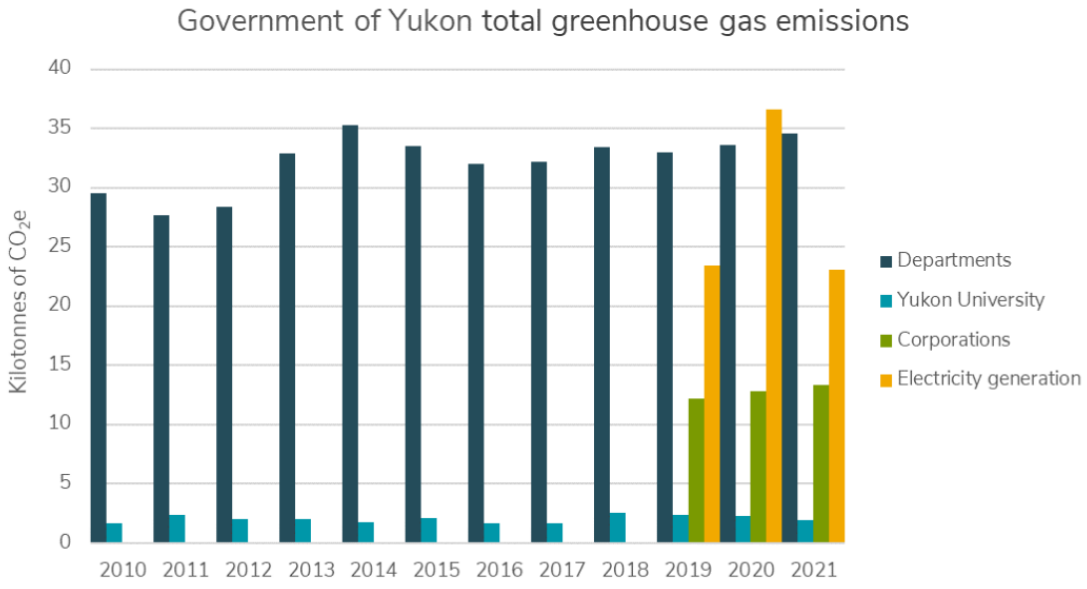
23.1

kilotonnes of CO_2e

Comparison to 2020:

37% decrease ↓

Emissions from electricity generation were lower in 2021 than the previous year due to higher hydro energy availability linked to high water levels.



Connection to Our Clean Future goals:

Our Clean Future Goal 1 is to reduce the Yukon's greenhouse gas emissions. This includes a target of reducing emissions from Government of Yukon buildings by 30 per cent below 2010 levels. This report shares information on Government of Yukon's operational emissions.

Overview

The Government of Yukon is committed to tracking greenhouse gas emissions from our internal operations. This report communicates the Government of Yukon's total greenhouse gases in 2021, including identifying major emission sources and providing an analysis of the factors that have influenced emissions over time. This report also presents the methodology used to calculate the Government of Yukon's greenhouse gas inventory. This report, along with the report on Greenhouse Gas Emissions in the Yukon: 2021, provides supplemental information to support the Our Clean Future Annual Report for 2022.

Third party verification

Every year we 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 greenhouse gas reporting programs for organizations to accurately track their emissions.

Verification by The Climate Registry is an important quality assurance step. It provides a higher level of confidence in the methodology used to calculate the Government of Yukon's emissions. It also helps ensure we track emissions reductions against an accurate baseline. Currently, the Government of Yukon's 2010, 2015 and 2020 greenhouse gas emission reports are available through the Climate Registry Information System.
The Government of Yukon was awarded Platinum Status through the Climate Registered™ program for our 2020 emissions report in recognition of our consistent and transparent reporting.

Methodology

All greenhouse gas emission calculations are 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 greenhouse gas emissions based on the source. This includes the emissions factors that must be used to calculate greenhouse gas emissions from different sources.

Emission factors are the conversion factors used to measure the amount of greenhouse gases emitted per unit of fuel or energy consumed. The Climate Registry provides guidance based on national and international greenhouse gas emission reporting standards. As a result, The Climate Registry uses emission factors that come from Environment and Climate Change Canada's National Inventory Report to calculate the Government of Yukon's greenhouse gas emissions.

Greenhouse gas emissions are reported in tonnes of **carbon dioxide equivalent (CO_2e)**. This metric includes the six greenhouse gases that are regulated under the Kyoto Protocol, and how they compare to CO_2 in terms of potency. To convert non-CO_2 greenhouse gases into a carbon dioxide equivalent, a conversion factor called the **global warming potential (GWP)** is used. For example, methane has a GWP of 28, which means that one tonne of methane is equal to 28 tonnes of CO_2e.

Grid-specific electricity emissions

Given the Yukon's unique electricity generation context, the Department of Highways and Public Works' Energy Management Unit produces annual emission factors for the Yukon Integrated System (electricity produced by the Yukon Energy Corporation) and each off-grid community (electricity produced by ATCO Electric Yukon) based on data from these entities. This ensures the actual carbon intensity of purchased electricity throughout the territory is accurately reflected and captures year-to-year variations.

These variations are based on factors such as annual rainfall, drought, winter temperatures, demand, and the integration of new renewable electricity sources.

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 1 shows the emission factors used to calculate emissions from purchased electricity in 2021. 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 1. Yukon average and grid-specific electricity emission factors in 2021.

Electricity grid	Carbon intensity (gCO_2e/kWh)
Yukon Integrated System	43.0
Old Crow	862.3
Watson Lake	712.0
Beaver Creek	693.5
Destruction Bay/Burwash Landing	685.2
Swift River	1027.1
Yukon average	70

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

As can be seen in Table 1, 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 for each community, 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 infrastructure and updates and investments in energy efficiency and renewable energy in different locations.

Reporting boundary and scope

In greenhouse gas emission 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 greenhouse gas emission inventory and what sources are not included. The Government of Yukon reports our emissions using a "Financial Control Boundary." This means that only entities we control financial policies for are included in our inventory. Organizations which fall under this boundary are referred to as reporting entities.

Under this boundary, all entities that are under the Government of Yukon's annual consolidated financial reports 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 and its subsidiary Yukon Energy Corporation;
- Yukon Hospital Corporation;
- Yukon Housing Corporation; and

[2] Conversely, when reporting Yukon's total emissions 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.

- 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 three scopes:

- **Scope 1:** Direct emissions from assets owned by Government of Yukon reporting entities. This includes emissions from:
  - building heating;
  - transportation;
  - waste management; and,
  - refrigeration.
- **Scope 2:** Indirect emissions from the generation of purchased electricity.
- **Scope 3:** Other indirect emission sources. This includes emissions from leased buildings, government air travel 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. These include emissions from leased buildings and vehicles, and emissions from staff commuting. They are not included in Government of Yukon emissions reporting, as they are considered out of scope.

The greenhouse gas emissions reported in this document are not additional to those reported in the Greenhouse Gas Emissions in the Yukon: 2021 report; they are a sub-set of the Yukon's emissions which come from Government of Yukon's operations. This information is calculated using completely different data sets and methodologies for the purpose of examining this subset of the Yukon's emissions in greater detail.

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

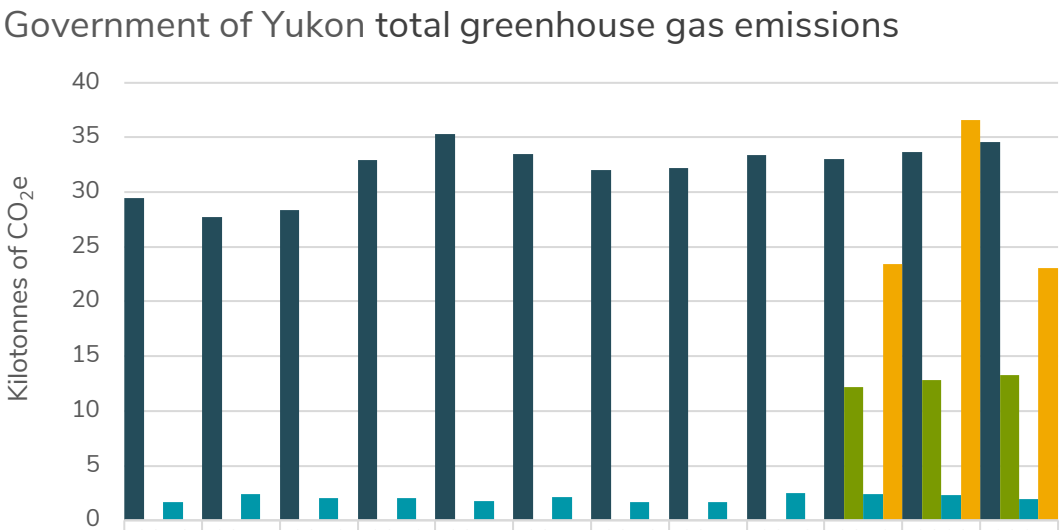
The remaining emission sources that are not captured in these two databases are:

- **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, such as highways and air strips.
- **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. It is estimated based on the population that each site services.
- **Refrigeration**: includes air conditioning in fleet vehicles and building refrigeration systems. 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 correspondence with each corporation.

Results

Greenhouse gas emissions from the Government of Yukon's operations, including all departments, Yukon University and government corporations, were 49.9 kilotonnes of CO_2e in 2021. Emissions from electricity generation, which will be reported separately from the main total, were 23.1 kilotonnes of CO_2e.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Departments	29.5	27.7	28.4	32.9	35.3	33.5	32.0	32.2	33.4	33.0	33.6	34.6
Corporations										12.2	12.8	13.3
Yukon University	1.7	2.4	2.0	2.1	1.7	2.1	1.7	1.6	2.5	2.4	2.3	2.0
Electricity generation										23.4	36.6	23.1

Figure 1: Total greenhouse gas emissions from the Government of Yukon's operations from 2010 to 2021.

Figure 1 displays Government of Yukon emissions by organization, dating back to 2010 where data is available. Between 2010 and 2021, emissions from Government of Yukon Departments and Yukon University increased by 17 per cent. Total Government of Yukon emissions (excluding electricity generation) increased five per cent between 2019 and 2021. Electricity generation emissions were particularly high in 2020 due to a low snowpack and exceptionally low temperatures in January to April of 2020, and decreased by 37 per cent in 2021.

Government of Yukon emission sources

Excluding electricity generation from Yukon Energy Corporation, which is addressed separately (see Figure 8), 60 per cent of total Government of Yukon emissions came from heating its buildings, 24 per cent came from transportation assets, ten per cent come from electricity consumed and the remaining six percent came from fugitive sources such as waste management and refrigerants (Figure 2).

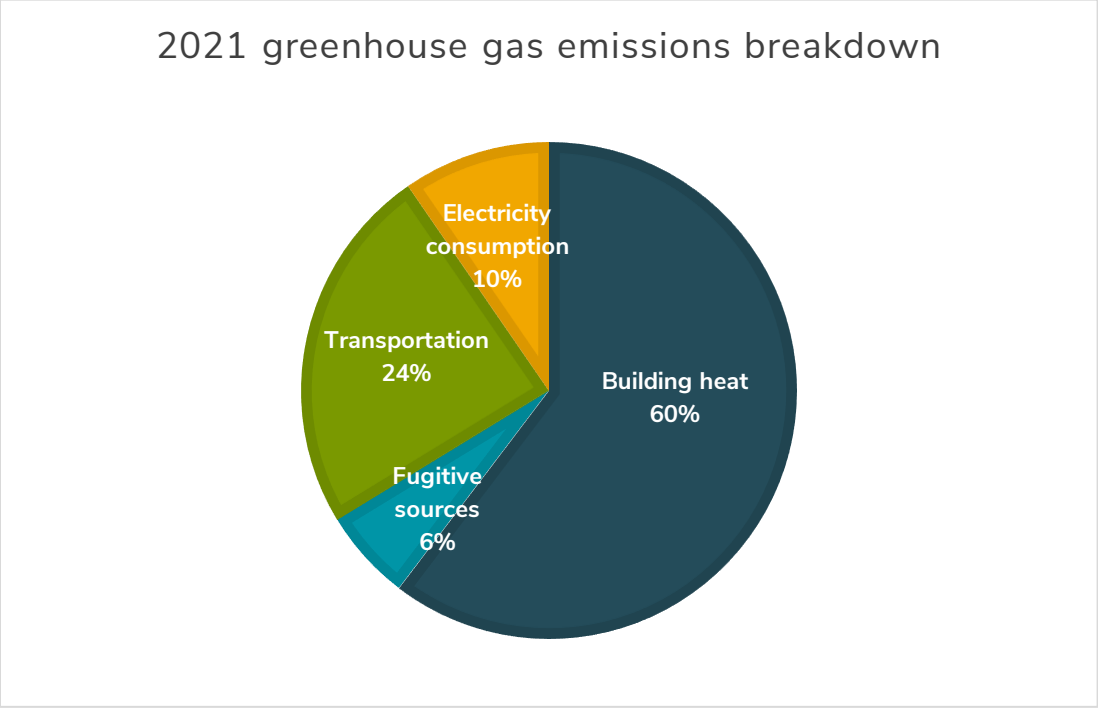


Figure 2: Breakdown of the Government of Yukon's 2021 greenhouse gas emissions by source (excluding electricity generation).

Each of these emission sources will be explored in more detail in the sections below.

Building emissions

Heating and powering buildings consistently makes up the largest proportion of Government of Yukon emissions, comprising 70 per cent of 2021 emissions.

In 2021, just under two thirds of Government of Yukon building emissions (63 per cent) come from its departments (Figure 3). This includes schools, long-term care facilities

and office buildings. Yukon Hospital Corporation buildings, which consist mainly of the territory's three hospitals, make up 21 per cent of Government of Yukon's building emissions. Yukon Housing Corporation and Yukon University are notable contributors as well. All other reporting entities collectively make up the remaining two per cent of building emissions.

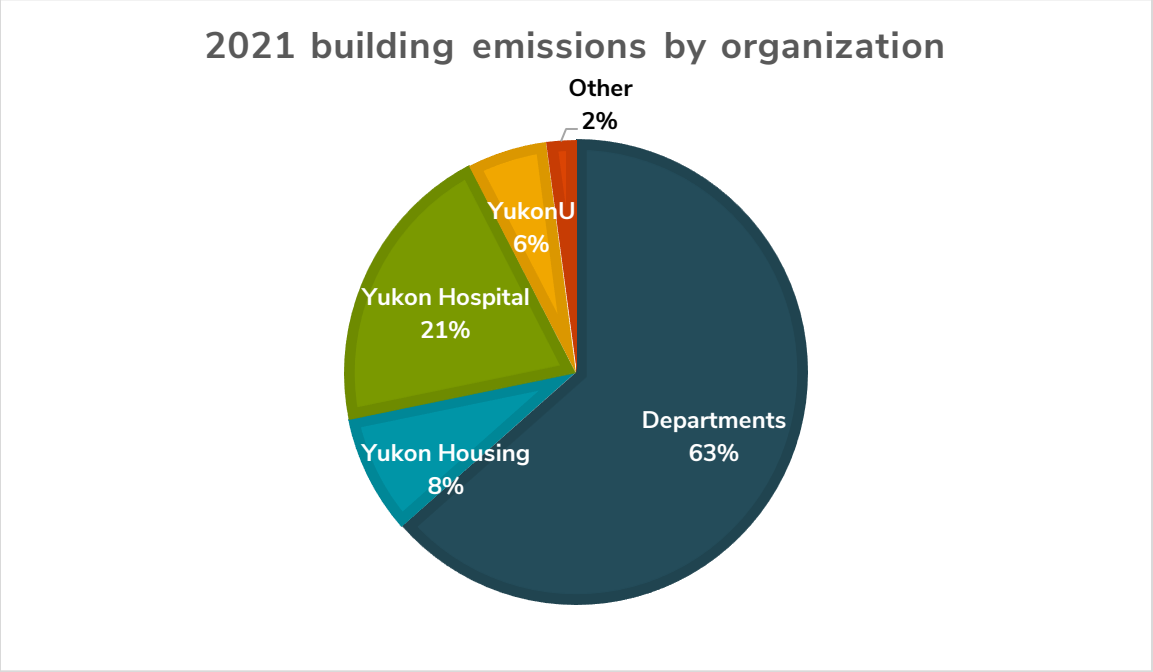
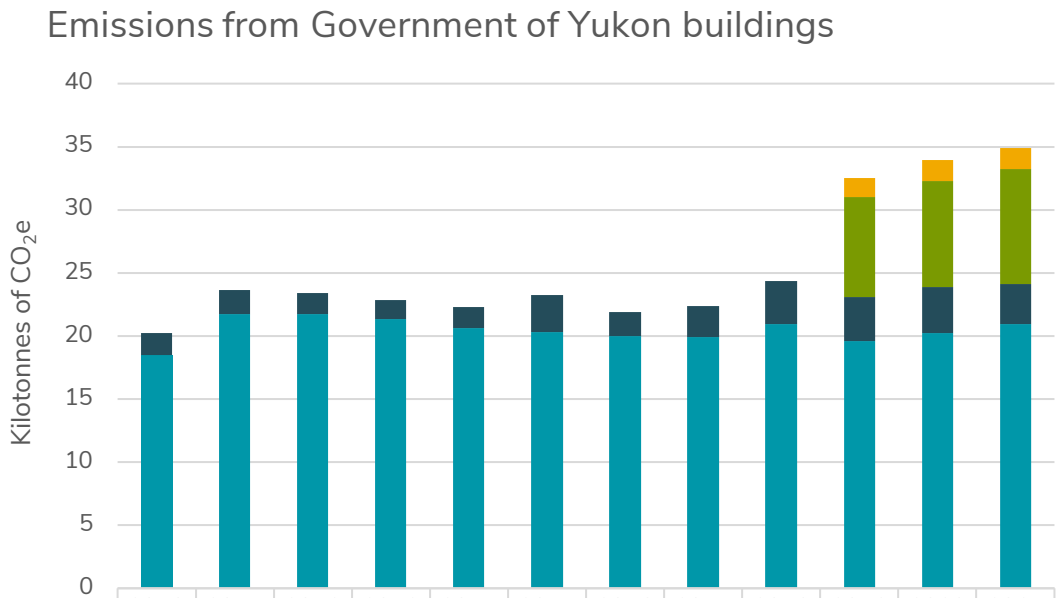


Figure 3. Government of Yukon building emissions by organization



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Electricity (Corp)										1.5	1.7	1.7
Heating (Corp)										8.0	8.4	9.1
Electricity (Dept + YU)	1.7	1.9	1.6	1.6	1.6	2.9	1.9	2.4	3.5	3.5	3.7	3.1
Heating (Dept + YU)	18.5	21.8	21.7	21.3	20.6	20.3	20.0	19.9	20.9	19.6	20.2	21.0

Figure 4. Greenhouse gas emissions from Government of Yukon department buildings from 2010 to 2021.

Transportation emissions

The second largest source of Government of Yukon emissions is transportation, which made up 24 per cent of 2021 emissions.

A majority (95 per cent) of the Government of Yukon's transportation emissions come from its core departments. This includes fleet vehicles used by government staff as well as heavy-duty vehicles used to maintain the Yukon's road network. The remaining five per cent of transportation emissions come from fleet vehicle use by government corporations.

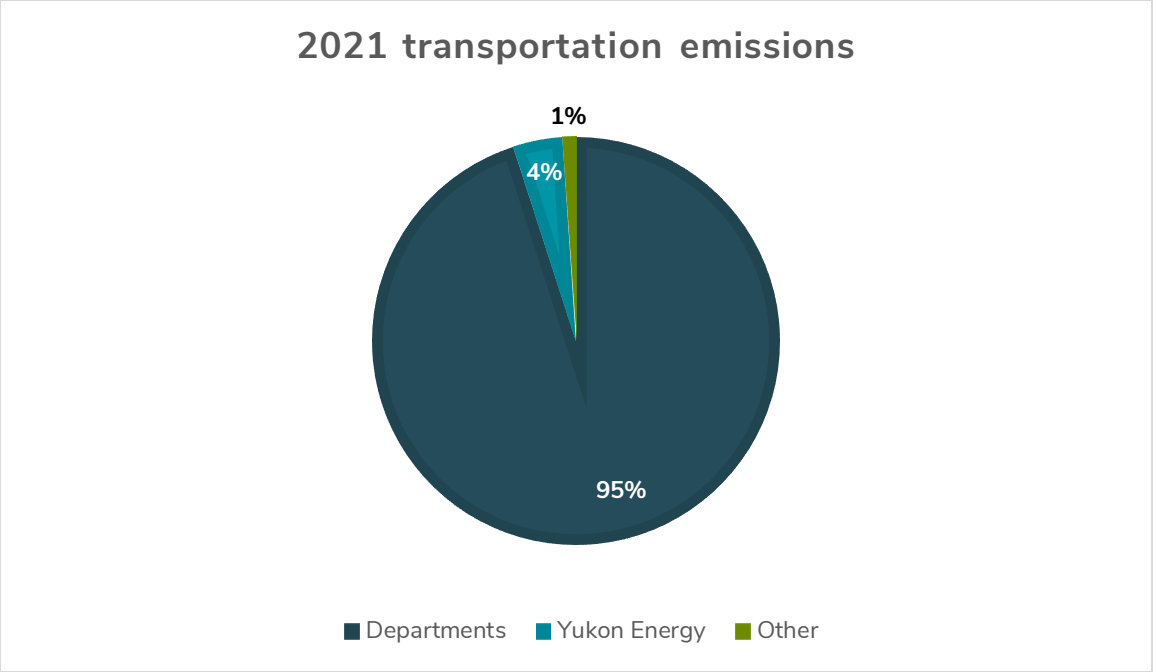


Figure 5. Government of Yukon transportation emissions by organization

Emissions related to maintenance of transportation infrastructure (including the Yukon's roads and airports) typically make up about two thirds of the Government of Yukon transportation emissions, with the remaining one third coming from fleet vehicles used by government staff (Figure 6).

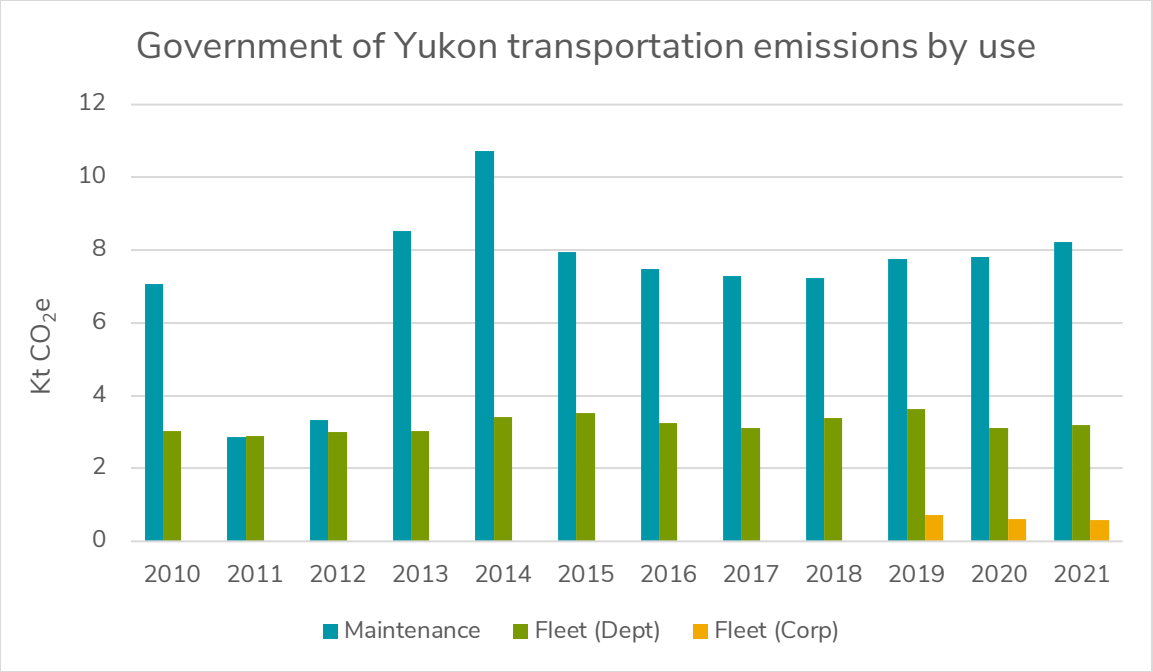


Figure 6. Government of Yukon greenhouse gas emissions from transportation from 2010 to 2021.

Fugitive emissions

Fugitive emissions made up the remaining six per cent of Government of Yukon emissions in 2021.

Fugitive emissions include greenhouse gases which are released directly, and not through the combustion of fossil fuel products for heat or electricity. This includes refrigerants such as hydrofluorocarbon (HFC) and perfluorocarbon (PFC); medical gases; waste management emissions and process emissions from the electricity generation sector. Fugitive emissions typically have high GWP values, meaning that they are significantly more potent than carbon dioxide.

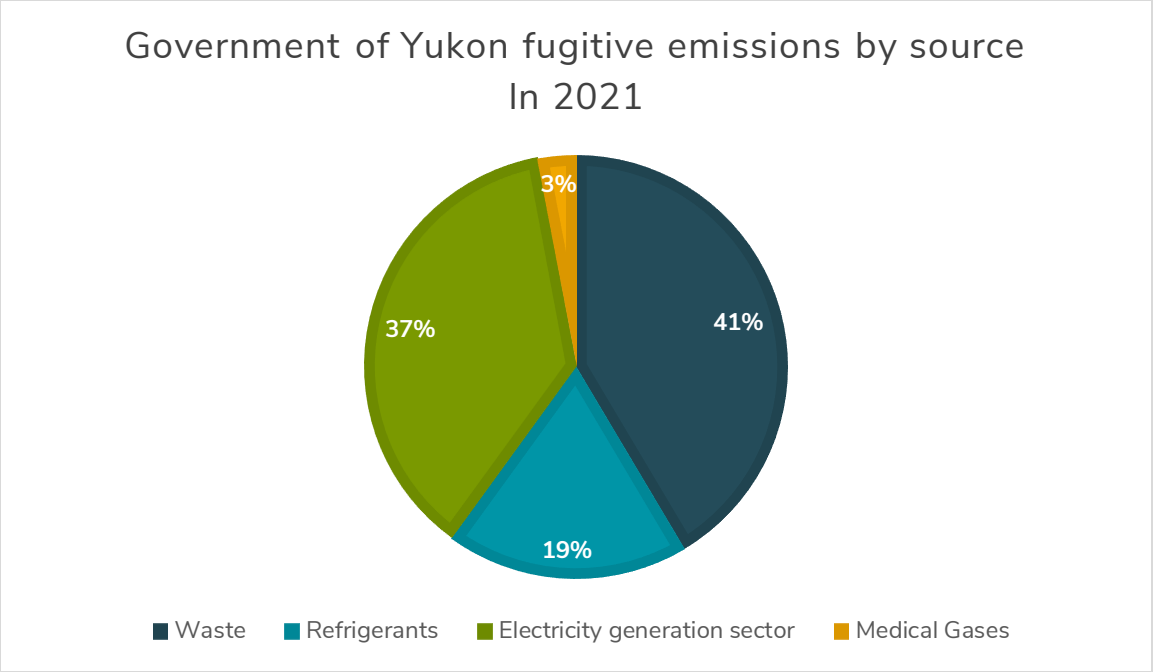


Figure 7. Government of Yukon's fugitive emissions by source in 2021.

Emissions from Government of Yukon owned waste management sites make up just under half (42 per cent) of total fugitive emissions, or 1.8 per cent of overall Government of Yukon emissions. These sites include a number of community landfills, sewage treatment sites, and waste incineration sites across the territory.

Electricity generation sector fugitive emissions make up 37 percent of overall fugitive emissions. This includes the use of electrical insulators with high GWP values, and any electricity losses during transmission and distribution.

Refrigerants made up 29 per cent of Government of Yukon's fugitive emissions. Refrigerant emissions are included in the year in which systems are serviced and reflect the volume of refrigerant added to the system, making inter-annual comparisons challenging.

Lastly, medical gases made up just three per cent of fugitive emissions. This includes medical CO_2 and N_2O used in the Yukon's hospitals.

Electricity generation emissions

Lastly, emissions from Yukon Energy Corporation's (YEC) electricity generation are significant relative to other Government of Yukon emission sources. These emissions are not included in Government of Yukon emission totals to avoid counting the same electricity emissions twice. The YEC is responsible for the majority of electricity generation and transmission in the 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.

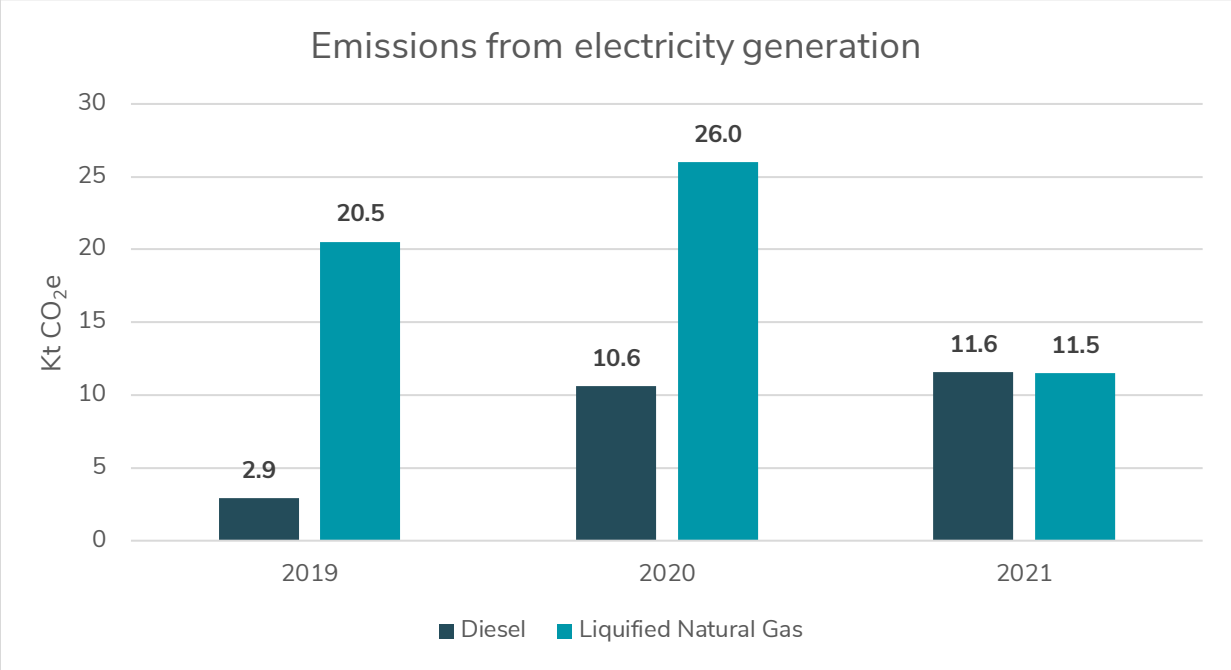


Figure 8. Yukon Energy Corporation's electricity generation emissions

Electricity emissions are largely dependent on how much electricity Yukoners need and the availability of renewable electricity sources. Although most electricity is generated from hydro power, supplemental thermal generation is needed at times when electricity demand is high. In 2021, 92 per cent of electricity produded by YEC was from renewable sources. The remaining electricity was generated from liquid natural gas (four per cent) and diesel (four per cent). The emissions from this supplemental generation were 23.1 kilotonnes of CO_2e in 2021.

Drivers of emissions

Firstly, variation in annual temperatures appear to be linked to changes in the Government of Yukon's heating emissions over the past several years (Figure 9). Heating degree days (HDDs) are a measure of how far below 18 degrees Celsius each day's average temperature is[3]. Higher HDD values indicate colder weather and higher heating demand. Between 2019 and 2021, the 15 per cent increase in HDDs may be one driver of the increase in building emissions over the same period.

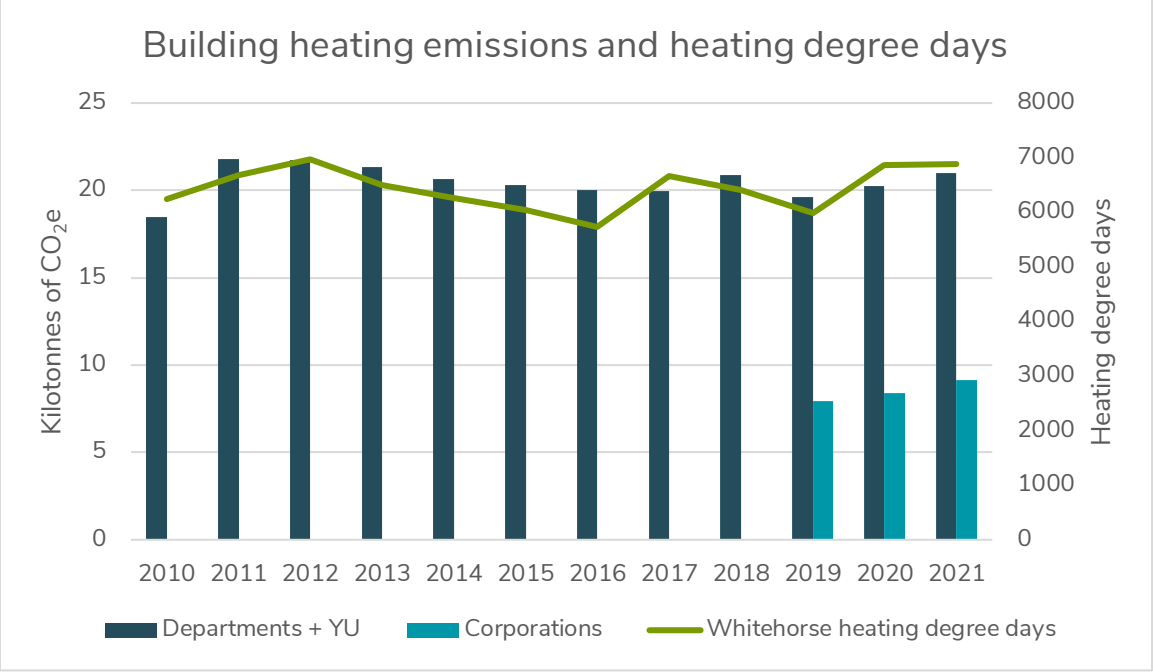


Figure 9. Building heating emissions relative to heating degree days.

Secondly, while we plan to continue decoupling[4] the Government of Yukon's emissions from economic and population growth, these external factors remain important considerations for historical emission patterns. Through Our Clean Future we continue

[3] A heating degree day is a measurement designed to quantify the demand for energy needed to heat a building.

[4] Decoupling refers to having continued economic growth without a corresponding increase in greenhouse gas emissions.

to invest in improvements to our buildings and vehicles in order to provide growing services with fewer emissions.

Given that the Public Administration sector makes up 23 per cent of the Yukon's GDP[5], GDP growth has historically been linked to a greater scope of government operations, and by extension, to increased greenhouse gas emissions. The Yukon's economy, as measured by its Gross Domestic Product (GDP), increased 14 per cent between 2019 and 2021[6], while emissions only increased three per cent (Figure 10). This led to a ten per cent decrease in Government of Yukon emissions per unit of GDP. Although this is not a long enough time period to draw meaningful conclusions, this represents a promising step towards decoupling the emissions of Government of Yukon's emissions from the Yukon economy.

[5] Source: Yukon Bureau of Statistics, Gross Domestic Product (GDP) by Industry at Basic Prices, 2021.
[6] 2019 is the first year that this more comprehensive dataset was used. For the purpose of this section 2019 is used as a baseline.

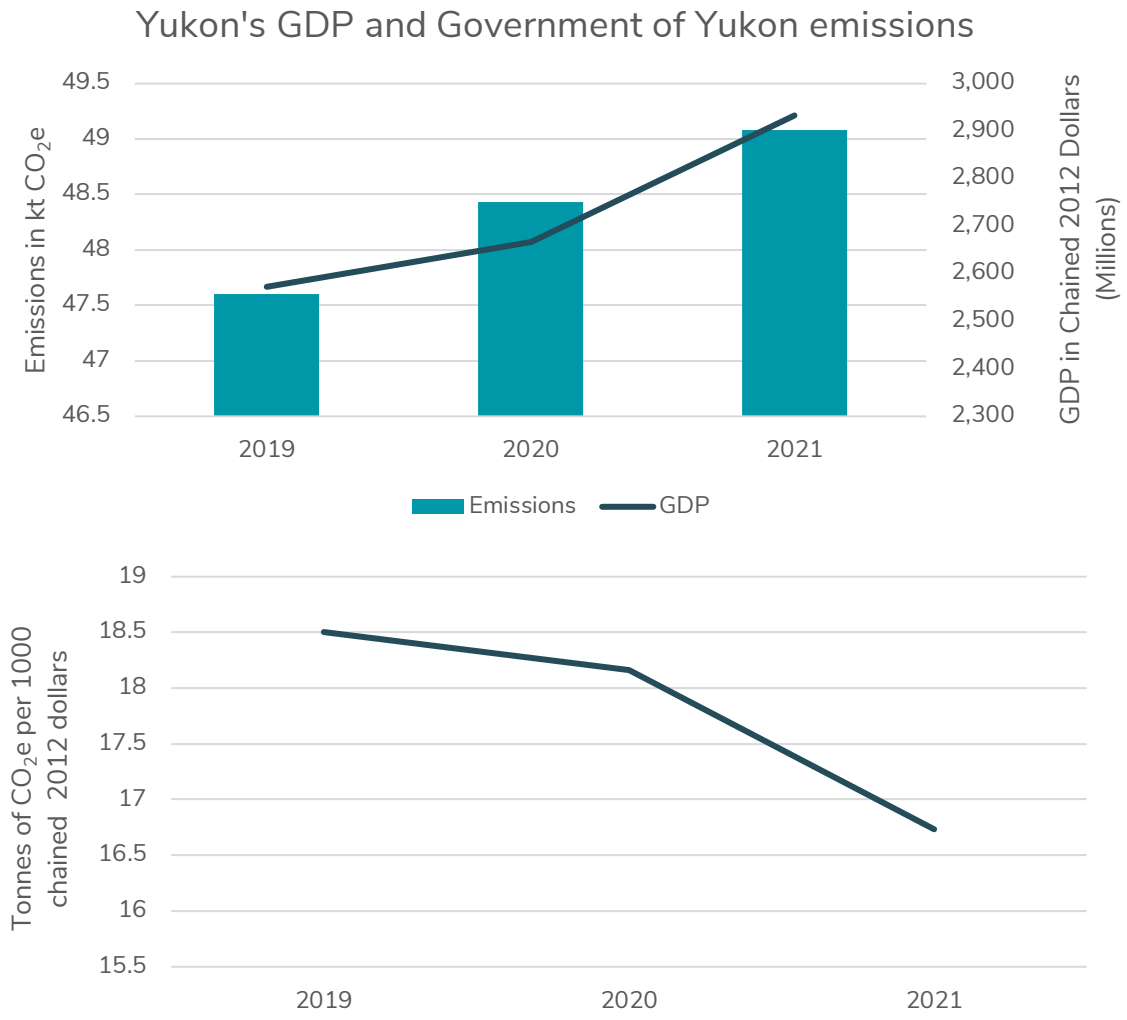


Figure 10. GDP[7] and Government of Yukon greenhouse gas emissions from 2019 to 2021.

The Yukon's population increased four per cent between 2019 and 2021, which is just slightly higher than the three per cent emissions increase over this same period. This led to largely unchanged Government of Yukon per capita emissions, which decreased one per cent (Figure 11).

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

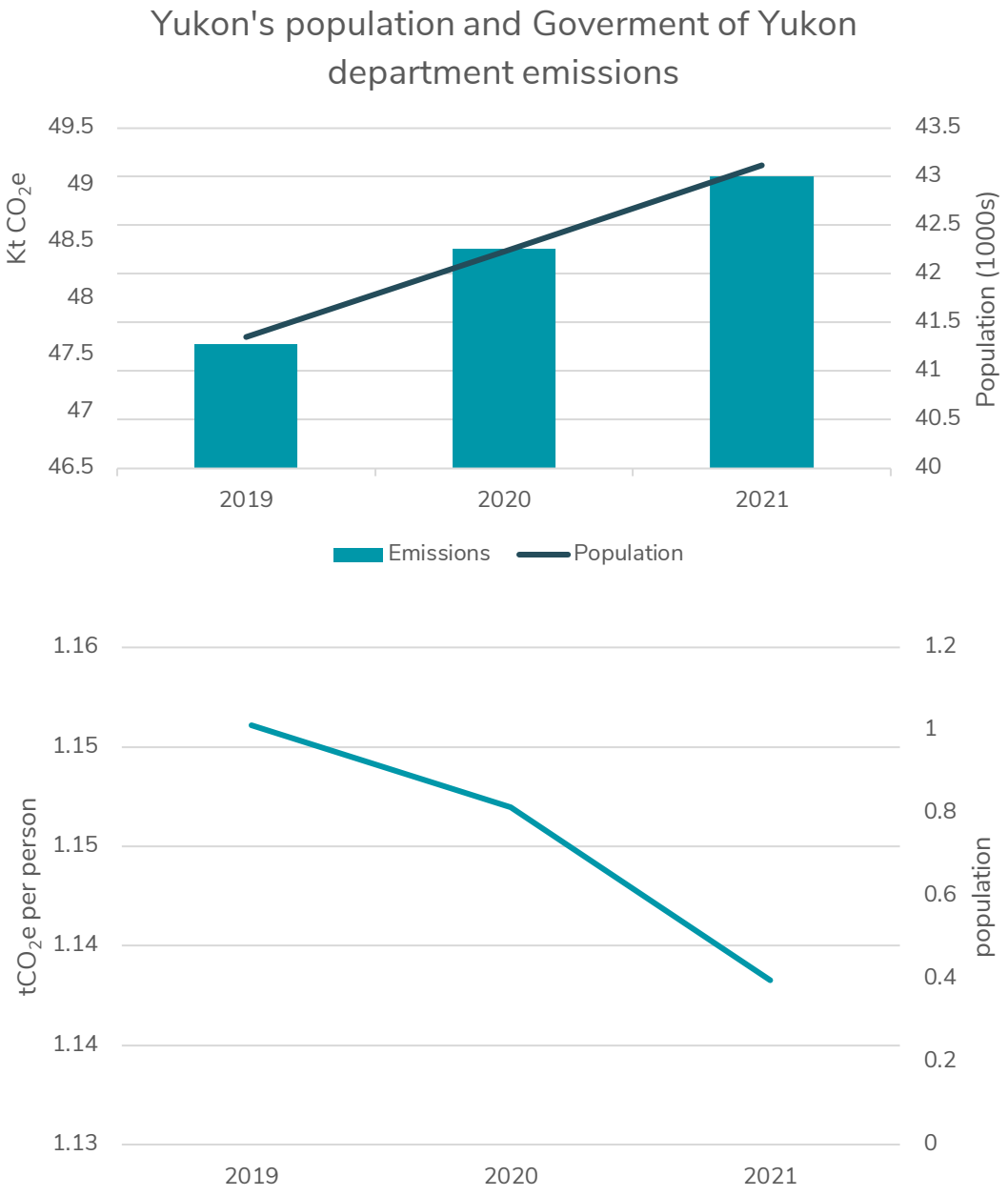


Figure 11. The Yukon's population[8] and Government of Yukon greenhouse gas emissions from 2019 to 2021.

A growing Yukon population has historically been linked to a greater scope of government operations due to increased occupancy in schools and healthcare facilities, growth of government programs and a greater need for permits, licences, and other government services. Similar to the Yukon's economy, longer-term data is needed to

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

confirm the preliminary trend towards population growth outpacing emissions growth. However, this represents a promising step towards decarbonization.

Conclusions

As of 2021, the Government of Yukon's emissions[9] contributed approximately seven per cent of the Yukon's total emissions. The Government of Yukon is committed to reducing its emissions and showing leadership in efforts to reduce the Yukon's territory-wide emissions.

Overall, emissions from Government of Yukon's total operations increased one per cent between 2020 and 2021, and emissions from Government of Yukon department buildings increased two per cent. This is despite continuing growth of the Yukon's population and economy, and may indicate that we are beginning to see decoupling of the scope of Government of Yukon operations and our emissions as a result of taking actions such as building retrofits and renewable energy heating systems. More information on the actions that the Government of Yukon is taking to reduce the carbon intensity of its operations can be found in the Our Clean Future 2022 Annual Report.

[9] Excluding electricity generated by Yukon Energy Corporation for consumption by end users other than Government of Yukon.