DRAFT GHG Emissions Report

CITY OF SNOQUALMIE

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PREPARED BY CASCADIA CONSULTING GROUP

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King County - Cities CLIMATE COLLABORATION

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Introduction

Background

As part of the King County – Cities Climate Collaboration (K4C), the city of Snoqualmie has committed to reducing greenhouse gas (GHG) emissions within its community and building resiliency to climate change effects. The following report provides a summary of current communitywide greenhouse gas emissions for Snoqualmie in 2022 and 2023 and compares these totals to 2019. The city of Snoqualmie's communitywide greenhouse gas inventory is a critical step in understanding the past, current, and future GHG emissions to effectively reduce GHG emissions. Greenhouse gas analyses allow jurisdictions to better understand their greenhouse gas emissions trends over time and prioritize engagement with community and implementation activities on the largest sources of emissions. This summary is intended to provide insight into the sources of the city of Snoqualmie's greenhouse gas emissions, highlighting key areas where emission reductions are needed.

Methodology

Snoqualmie's GHG emissions inventory was performed using guidance from the *U.S. Community Protocol for Accounting and Reporting of GHG Emissions* (USCP).[1] This protocol is the industry standard for quantifying emissions produced by the activities of Snoqualmie's residents, businesses, and visitors. Snoqualmie's communitywide emissions were quantified for the 2022 and 2023 calendar year and compared to 2019 GHG emissions calculated through the Puget Sound Regional Emissions Analysis.

Emission sources included in the K4C GHG inventories include energy, transportation, solid waste, and fugitive emissions. These sectors are aligned with recommended protocols and industry best practices. This inventory represents emissions occuring as a result of the activities of the city of Snoqualmie's residents, employees, and visitors. This inventory is not intended to represent the City's municipal operations carbon footprint.

[1] US Community Protocol | ICLEI USA.

Inventory Findings & Trends

Communitywide GHG Emissions

In 2022 and 2023, the city of Snoqualmie community produced an estimated 126,233 and 122,985 metric tons of CO_2 emissions ($MTCO_2e$), respectively. The community's largest sources of emissions as of the 2023 communitywide GHG inventory came from the built environment and transportation & other mobile sources sectors. The largest emission sources included electricity (25%), aviation (24%), and natural gas (23%). Since 2019, overall communitywide emissions in Snoqualmie have decreased by 9%. A detailed summary of emissions can be found in Figure 1 and Table 1.

In addition, Table 1 reports "core" emissions sources, emissions produced by sectors commonly included in community greenhouse gas inventories. Core emission sources are sources which city governments typically have the most influence over (e.g., through local policy mechanisms such as local codes/regulations). Core emissions in this inventory include electricity, natural gas, on-road vehicles, and solid waste generation and disposal.

Figure 1. Total communitywide GHG emissions profile ($MTCO_2e$).

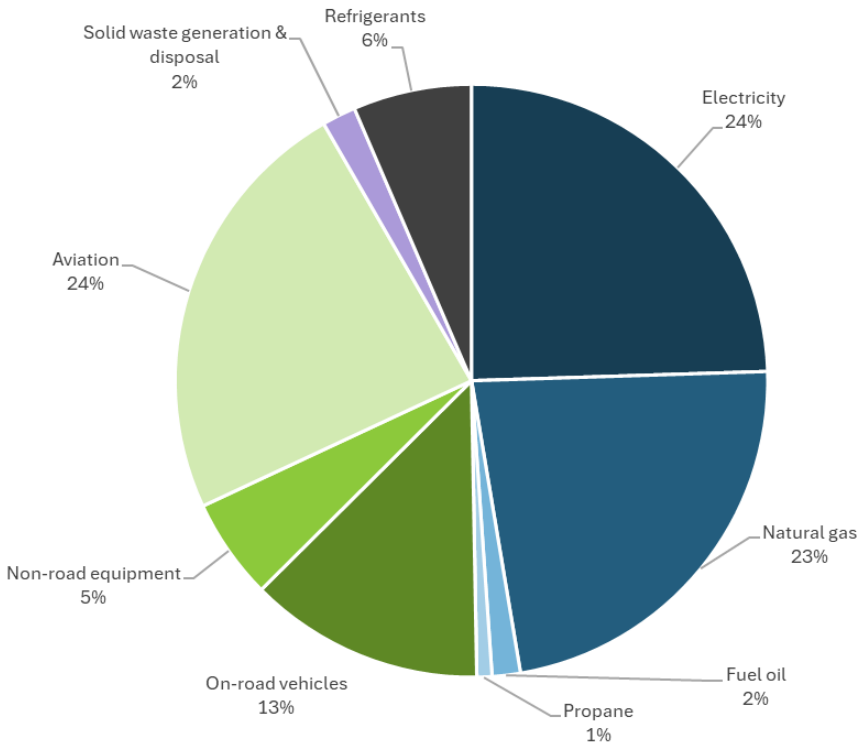
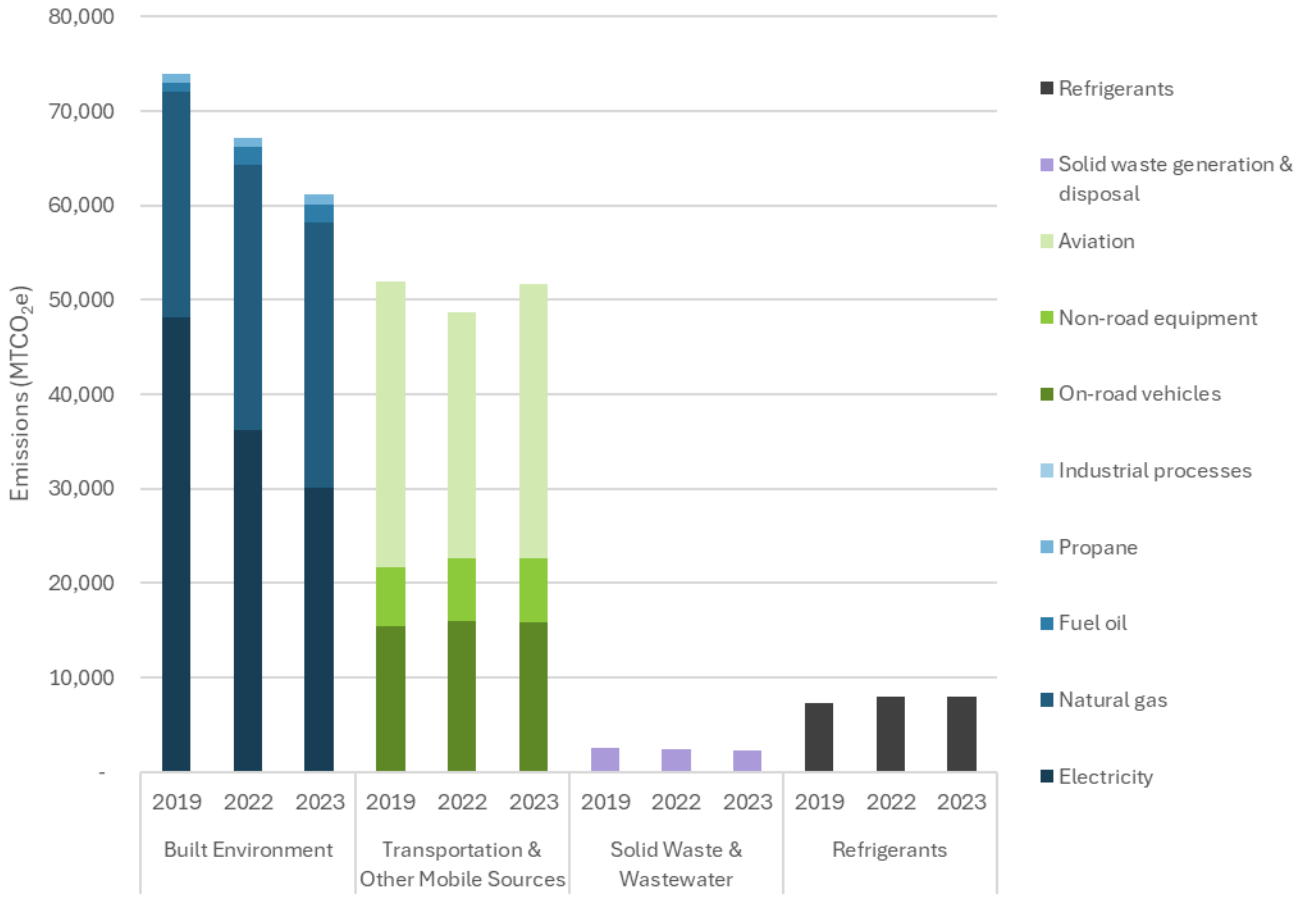


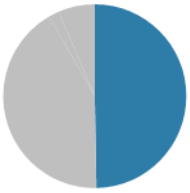
Table 1. Total communitywide GHG emissions, by sector ($MTCO_2e$).

GHG Emissions Sector	2019 Emissions ($MTCO_2e$)	2022 Emissions ($MTCO_2e$)	2023 Emissions ($MTCO_2e$)	2023 % of Total Emissions	2019 to 2023 % Change	2023 Per-Capita ($MTCO_2e$)
Built Environment	**73,985**	**67,205**	**61,143**	**50%**	**-17%**	**4.2**
Electricity	48,116	36,192	30,135	40%	-37%	2.1
Natural Gas	23,909	28,156	28,098	37%	+18%	1.9
Propane	983	1,038	1,016	1%	+3%	<1
Fuel Oil	978	1,818	1,894	2%	+94%	<1
Industrial Processes	N/A	N/A	N/A	0%	N/A	0
Transportation	**51,953**	**48,691**	**51,622**	**42%**	**-<1%**	**3.6**
On-Road Vehicles	15,403	13,895	15,785	21%	+2%	1.1
Non-Road Equipment	6,239	6,716	6,776	9%	+9%	<1
Aviation	30,312	26,029	29,061	38%	-4%	2.0
Solid Waste	**2,563**	**2,389**	**2,267**	**2%**	**-12%**	**<1**
Landfill	2,271	2,066	1,957	3%	-14%	<1
Compost	292	310	310	<1%	+6%	<1
Process & Fugitive Emissions	**7,271**	**7,948**	**7,953**	**6%**	**+9%**	**<1**
Refrigerants	7,271	7,948	7,953	6%	+9%	<1
Total Emissions	**135,772**	**126,233**	**122,985**	**100%**	**-9%**	**8.5**
Core Emissions	*89,990*	*82,684*	*76,286*	*62%*	**-15%**	*5.3*

Figure 2. Total communitywide GHG emissions, by sector and source ($MTCO_2e$).



Built Environment

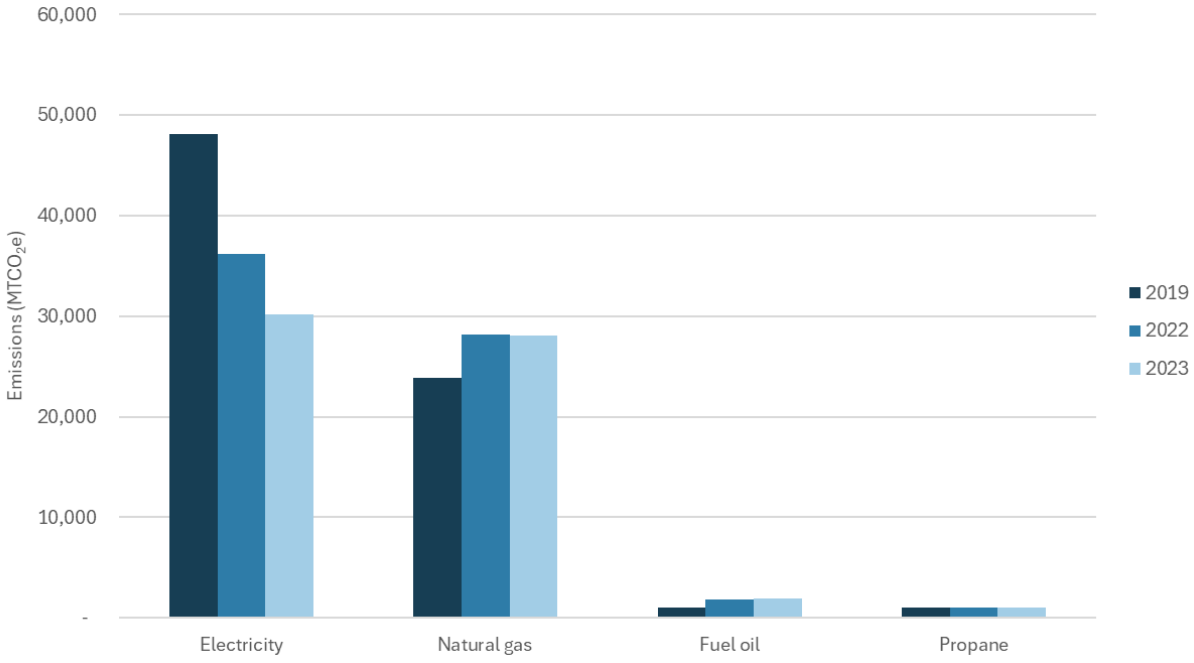


The built environment sector includes emissions from the consumption of **electricity, natural gas, and other fuel sources (fuel oil and propane)** within residential, commercial, and industrial buildings. The built environment sector made up 50% of Snoqualmie's 2023 communitywide emissions. A detailed overview of emissions from these sources is provided below.

SUMMARY

- Since 2019, Snoqualmie's built environment emissions have decreased by 17%. The largest change to built environment emissions came from the industrial sector, in which emissions decreased by 38%.
- Emissions from electricity consumption accounted for 40% of Snoqualmie total communitywide GHG emissions in 2023, which has decreased by 37% since 2019.
- Natural gas accounted for 28,098 $MTCO_2e$ in 2023, making up 37% of Snoqualmie total communitywide GHG emissions, which increased by 18% since 2019.
- Fuel oil and propane emissions in 2023 made up 2% and 1% of 2023 emissions, which increased by 94% and increased by 3% since 2019.

Figure 3. Total energy emissions trends by year.



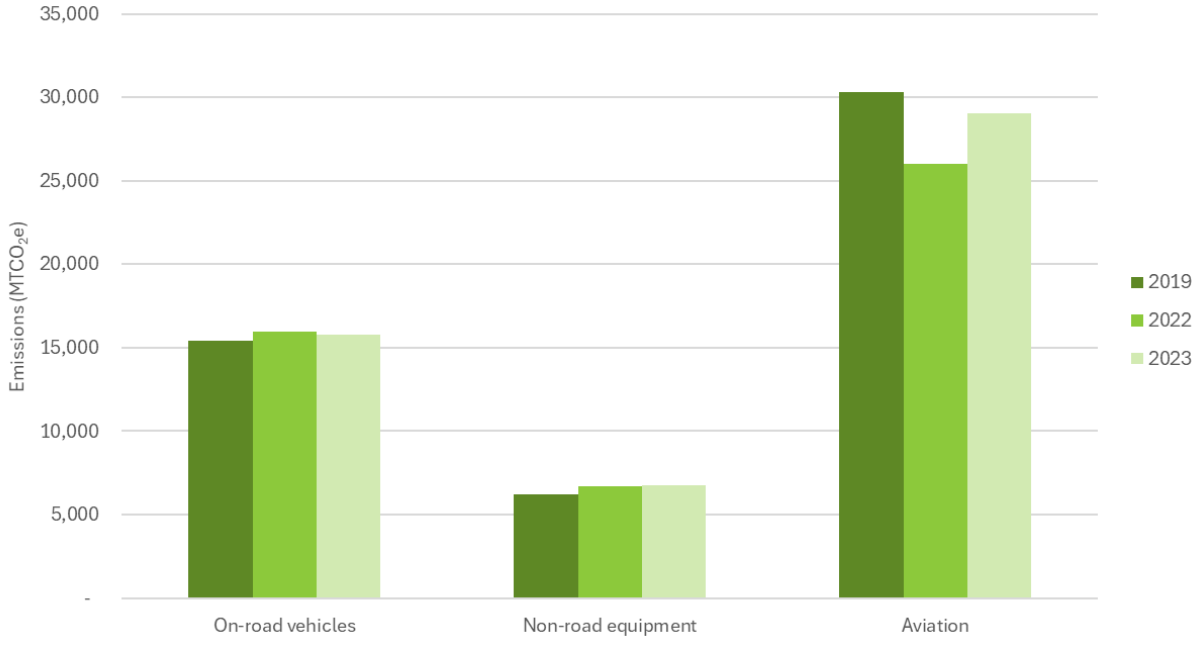
Transportation

The transportation sector includes emissions from communitywide transportation mobile sources including **on-road vehicles, non-road equipment, and aviation**. The transportation sector made up 42% of Snoqualmie's 2023 communitywide emissions. A detailed overview of emissions from these sources is provided below.

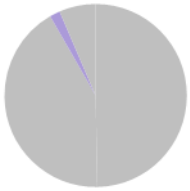
SUMMARY

- Since 2019, transportation emissions have decreased by <1%.
- On-road vehicles – which include passenger vehicles, freight, and service vehicles (heavy, medium, and light vehicles) - represent 21% of Snoqualmie's 2023 communitywide GHG emissions, which increased by 2% since 2019.
- Non-road equipment—which includes recreational, construction, industrial, lawn/garden, agriculture, commercial, logging, airport support, oil field, pleasure craft, and railroad related equipment—made up 9% of Snoqualmie 2023 communitywide GHG emissions, which increased by 9% since 2019.
- Aviation emissions account for estimated fuel consumption from Seattle-Tacoma International Airport (SeaTac) by Snoqualmie residents. Aviation emissions accounted for 38% of Snoqualmie's 2023 communitywide GHG emissions, which decreased by 4% since 2019.

Figure 4. Total transportation GHG emissions by year.



Solid Waste



Emissions from the solid waste sector include emissions produced from the **generation, transportation, and disposal** of landfilled and composted waste produced within Snoqualmie. The solid waste sector made up 2% of Snoqualmie's 2023 communitywide emissions. A detailed overview of emissions from these sources is provided below.

SUMMARY

- In 2023, solid waste accounted for 2% of communitywide emissions, which decreased by 12% since 2019.
- Emissions from landfill accounted for 3% of those emissions, while emissions from compost made up <1%, which decreased by 14% and increased by 6% since 2019.

Process & Fugitive Emissions

Greenhouse gas emissions can also stem from leaks from contained sources, such as from refrigeration and industrial equipment. This inventory estimated emissions from leakage of potent greenhouse gases from refrigerants used in buildings and vehicles.

SUMMARY

- Refrigerants emissions made up an estimated 6% of 2023 communitywide emissions in Snoqualmie—from leakage of hydrofluorocarbons (HFCs) and HFC substitutes used for cooling and refrigeration, which increased by 9% since 2019.

Key Terms

Table 2. Glossary of key terms in GHG analysis.

Term	Description
Activity data	Data on the magnitude of human activity resulting in emissions taking place during a given period of time. Data on energy use, fuel use, miles traveled, input material flow and product output are all examples of activity data that might be used to compute GHG emissions.
Base year	A specific year against which an entity's emissions are tracked over time.
CO_2 equivalent (CO_2e)	The universal unit for comparing emissions of different GHGs expressed in terms of the global warming potential of one unit of carbon dioxide.
Emission factor	A unique value for determining an amount of a GHG emitted on a per unit activity basis (for example, metric tons of CO2 emitted per million Btus of coal combusted, or metric tons of CO2 emitted per kWh of electricity consumed).
Fugitive emissions	Emissions that are not physically controlled but result from the intentional or unintentional release of GHGs. They commonly arise from the production, processing, transmission, storage and use of fuels or other substances, often through joints, seals, packing, gaskets, etc. Examples include hydrofluorocarbons from refrigeration leaks, SF6 from electrical power distributors and CH4 from solid waste landfills.
Greenhouse gases (GHGs)	Defined in the Local Government Operations Protocol as GHGs are the six gases identified in the Kyoto Protocol: carbon dioxide (CO2), nitrous oxide (N2O), methane (CH4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF6).
Inventory	A comprehensive, quantified list of an organization's GHG emissions and sources.
Kilowatt hour (kWh)	The electrical energy unit of measure equal to one thousand watts of power supplied to, or taken from, an electric circuit steadily for one hour. (A Watt is the unit of electrical power equal to one ampere under a pressure of one volt, or 1/746 horsepower.)
Metric ton (MT, ton)	Common international measurement for the quantity of GHG emissions, equivalent to about 2,204.6 pounds or 1.1 short tons.

Term	Description
Natural gas	A naturally occurring mixture of hydrocarbons (e.g., methane, ethane or propane) produced in geological formations beneath the earth's surface that maintains a gaseous state at standard atmospheric temperature and pressure under ordinary conditions.
Protocol	A defined methodology for calculating and reporting GHG emissions.
Stationary combustion	Emissions from the combustion of fuels to produce electricity, steam, heat or power using equipment (boilers, furnaces, etc.) in a fixed location.
Therm	A measure of one hundred thousand Btu.

Appendix: K4C GHG Inventory Methodology

Calculating Snoqualmie's GHG emissions inventories involved identifying and applying emissions factors to activity data, summarized in Table 2 and detailed in the following sections:

- Activity data quantify levels of activity that generate GHG emissions, such as vehicle miles traveled, and kWh of electricity consumed.
- Emission factors (EFs) translate activity levels into emissions (e.g., $MTCO_2e$ per kWh).

Table 2. Key approaches and data sources for city GHG emissions inventories.

Sector	Activity Data	Emissions Factors (EFs)
Transportation		
On-road vehicles	Vehicle miles traveled data and estimated emissions from Puget Sound Regional Council (PSRC)	U.S. Environmental Protection Agency (EPA) Emission Factors Hub[2] vehicle EFs (by vehicle & fuel type)
Non-road equipment	EPA Motor Vehicle Emission Simulator (MOVES) model outputs for King County	N/A (data reported in emissions)
Aviation	Two approaches, depending on data availability: 1) Volume of fuel (jet-A and aviation gasoline) loaded onto all planes departing from airports within county; volume of all fuel used in helicopters, light aircraft operating within county boundaries (e.g., police, sightseeing, training) 2) Number of landing and takeoff cycles that could be used to estimate fuel based on similar airports Emissions from Seattle-Tacoma International Airport (SEA) were attributed to individual counties using Approach 1 (described above), in combination with passenger survey data, population, and household income data from the U.S. Census.	U.S. EPA EF Hub average emission factors, by fuel type
Built Environment		
Electricity	City-specific consumption provided by utilities	1) Utility-specific emission factors (from Department of Ecology Clean Fuel Standard program utility-specific electricity calculations) 2) Emissions & Generation Resource Integrated Database (eGRID) EFs (for informational purposes only)
Natural gas	City-specific consumption provided by utilities	Utility-specific emission factors (from Department of Ecology Clean Fuel

[2] EPA Emission Factors Hub

Sector	Activity Data	Emissions Factors (EFs)
		Standard program utility-specific electricity calculations)
Fuel oil	WA fuel oil consumption by sector from U.S. Energy Information Administration (EIA)	U.S. EPA EF Hub average EFs
Propane	WA propane consumption by sector from U.S. EIA	U.S. EPA EF Hub average EFs
Industrial processes	EPA Facility Level Information on Greenhouse Gases Tool	N/A - data reported in terms of emissions
Solid Waste		
Solid waste generation & disposal	City-specific tonnage and King County waste characterization data	EPA Waste Reduction Model (WARM) EFs, customized for landfill attributes.
Compost generation & disposal	City-specific tonnage and King County waste characterization data	EPA WARM EFs
Refrigerants		
Refrigerants	EPA Inventory of U.S. Greenhouse Gas Emissions and Sinks	N/A - reported in terms of emissions