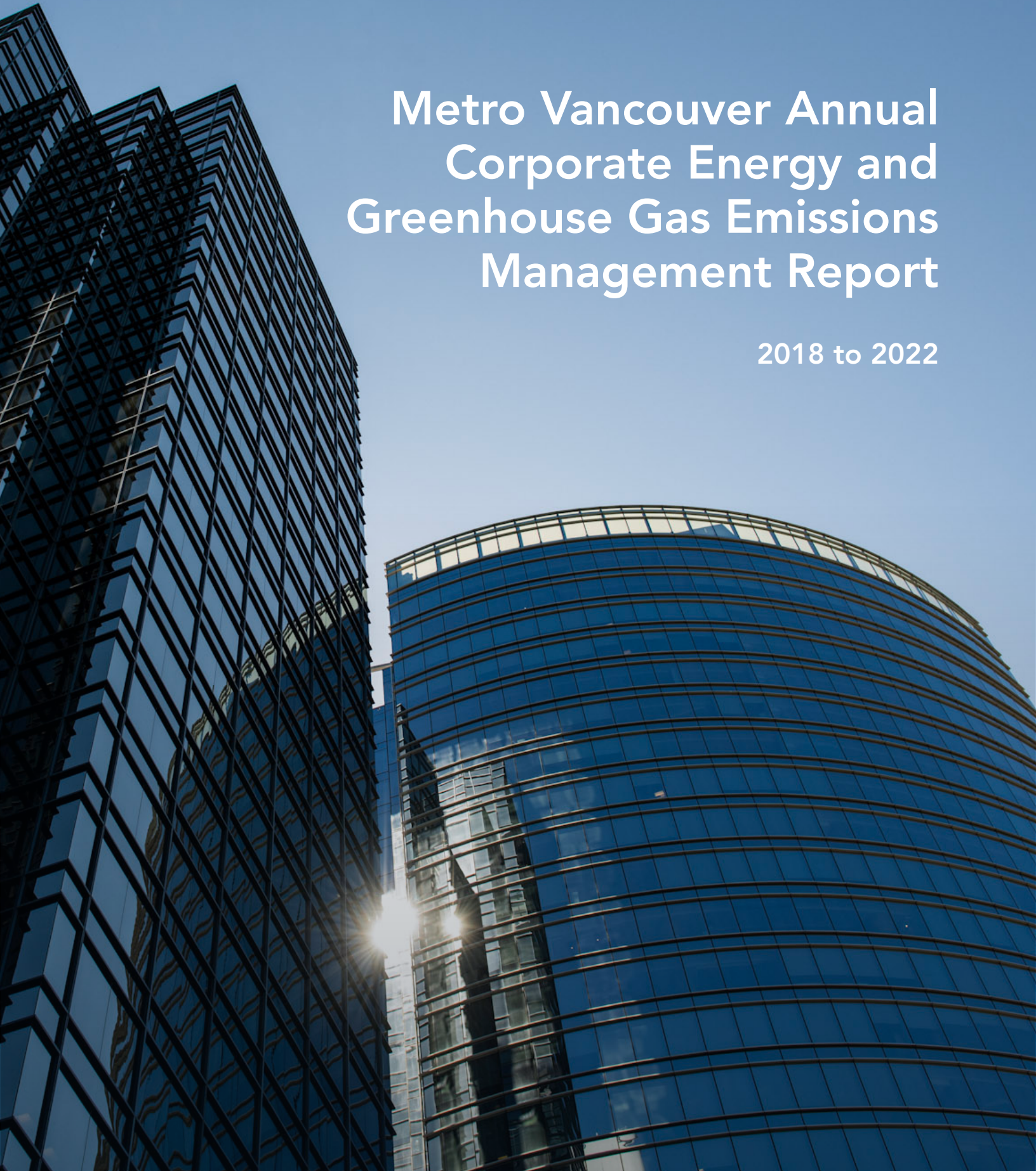


# Metro Vancouver Annual Corporate Energy and Greenhouse Gas Emissions Management Report

2018 to 2022



## Indigenous Territorial Recognition

Metro Vancouver acknowledges that the region's residents live, work, and learn on the shared territories of many Indigenous peoples, including 10 local First Nations: **qíćǎy** (Katzie), **q̓ʷa:ńłǎń** (Kwantlen), **k̓ʷik̓ʷǎłǎm** (Kwikwetlem), **máthxwi** (Matsqui), **x̓ʷmǎθk̓ʷǎyǎm** (Musqueam), **qíqéyt** (Qayqayt), **se'mya'me** (Semiahmoo), **Sk̓w̓x̓w̓ú7mesh** **Úxwumixw** (Squamish), **scǎ́wǎθǎn mǎsteyǎx̓ʷ** (Tsawwassen), and **sǎ́lílwǎta7ł** (Tsleil-Waututh).

Metro Vancouver respects the diverse and distinct histories, languages, and cultures of First Nations, Métis, and Inuit, which collectively enrich our lives and the region.

## About Metro Vancouver

Metro Vancouver is a federation of 21 municipalities, one electoral area and one treaty First Nation that collaboratively plans for and delivers regional-scale services. Metro Vancouver's core utility services include drinking water, sewage treatment, and solid waste management, along with regional services like regional parks, affordable housing, regional land use planning and air quality and climate action that help keep the region one of the most livable in the world.

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# Executive Summary

Metro Vancouver uses energy in the form of electricity, fossil and renewable natural gas, and fossil vehicle fuels to power its facilities and operations, and deliver essential services to a growing region of 2.8 million residents. While Metro Vancouver is able to take advantage of BC's clean electricity grid, the combustion of fossil fuels in our buildings, facilities and fleet vehicles produces greenhouse gas (GHG) emissions. As part of delivering its core services, Metro Vancouver also generates and uses renewable energy from its facilities, and provides this energy to the region. This report describes Metro Vancouver's use of energy to deliver services to the region, GHG emissions related to this energy use, initiatives to improve energy efficiency, reduce GHG emissions, and generation and use of clean energy.

In 2022, Metro Vancouver's total energy-related greenhouse gas emissions were 28,048 tonnes carbon dioxide equivalent (CO<sub>2</sub>e), compared to 26,354 tonnes CO<sub>2</sub>e in 2018, and up 26% compared to 2014 (baseline year). Increases in GHG emissions from 2018 through 2022 were driven by increased fossil fuel use by Liquid Waste Services (for transportation of historic land-dried biosolids and lagoon biosolids at Iona Island Wastewater Treatment Plant (WWTP) and by Solid Waste Services (for regulatory compliance increases in fossil natural gas use at the Waste-to-Energy facility and transportation of solid waste to out-of-region disposal facilities). Metro Vancouver spent over \$37 million in 2022 to purchase energy and maintain its energy generation systems, an increase of 49% over 2014. This increase was primarily due to the increased energy use by Liquid Waste Services and Solid Waste Services noted above, combined with increasing unit costs for energy. Regional population grew by 13% from 2014-2022. In addition to GHG emissions originating from corporate energy use, process emissions (primarily methane and nitrous oxide) are produced at solid waste and liquid waste facilities. Some of these emissions sources are

quantified, including emissions from combustion of municipal solid waste at the Waste-to-Energy Facility. In 2022, total fossil-based emissions from the facility (derived through the combustion of fossil-based solid waste such as plastics) were 109,365 tonnes CO<sub>2</sub>e, an increase of 6% over 2014. Metro Vancouver's operations have a number of currently unquantified sources of emissions, including fugitive methane and nitrous oxide (N<sub>2</sub>O) from wastewater collection systems and wastewater treatment plants. Work is underway to more accurately quantify and report these emissions.

Metro Vancouver's *Climate 2050 Strategy* commits to achieving a carbon neutral, resilient region by 2050, and also includes a commitment to corporate carbon neutrality by 2050. *Metro Vancouver's Climate 2050 Energy Roadmap* lays out the strategies and actions required to transition the region's energy system to clean, renewable energy. Metro Vancouver's *Corporate Energy Management Policy* articulates a corporate commitment to continuously improving the efficiency of energy use, production, generation, and recovery, as well as establishing energy targets, and regularly reporting on progress towards them. Metro Vancouver is advancing a number of initiatives to reduce its corporate carbon footprint, including electrifying fleet vehicles and deploying electric vehicle chargers; switching to lower-carbon fuel sources in our operations and contracted services, including renewable natural gas; and implementing deep energy retrofits to Metro Vancouver Housing buildings, among other efforts. Metro Vancouver is also advancing a number of initiatives to provide renewable energy to the region. These include a Waste-to-Energy Facility district energy project which will provide heat and hot water to up to 50,000 homes, and has the potential to reduce GHG emissions by up to 70,000 tonnes per year, and initiatives to produce low-carbon fuels from wastewater.

# Introduction

## 2.1. Metro Vancouver’s Energy and GHG Emissions Profile

Metro Vancouver is a diverse organization that plans for and delivers essential regional utility services, including water, sewers and wastewater treatment, and solid waste management. It also regulates air quality, plans for urban growth, manages a regional parks system, and provides affordable housing. Metro Vancouver uses energy in the form of electricity, fossil and renewable natural gas, and fossil vehicle fuels to power its facilities and operations, and deliver essential services to a growing region of 2.8 million residents.

This report provides an overview of Metro Vancouver’s annual energy-related greenhouse gas (GHG) emissions and energy use, as well as a breakdown by service area and five-year trends for a number of indicators. In 2022, Metro Vancouver’s total corporate GHG emissions from all energy use was 28,048 tonnes CO<sub>2</sub>e, compared to 26,354 tonnes CO<sub>2</sub>e in 2018, and up 26% compared to 2014 (baseline year).

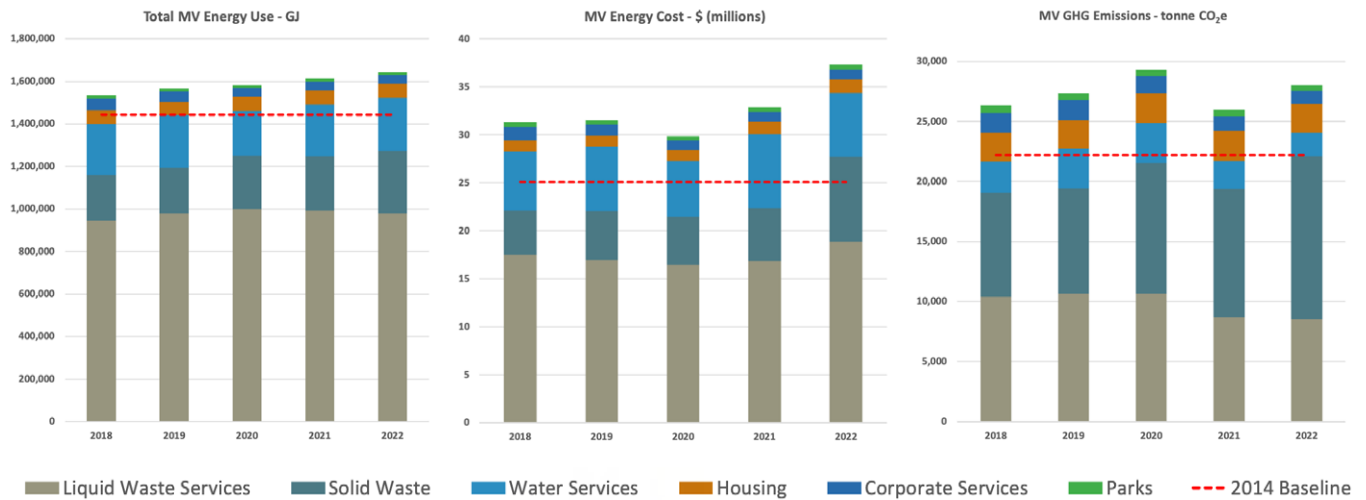
Increases in GHG emissions from 2018 through 2022 were driven by increases in contracted fossil fuel use by Liquid Waste Services (for transportation of historic and lagoon Iona biosolids) and by Solid Waste Services (for regulatory compliance increases in fossil natural gas use at the Waste-to-Energy facility and transportation of solid waste to out-of-region disposal facilities). Annual variability in GHG emissions is also the result of annual changes in electricity GHG emissions intensities. Metro Vancouver is working with the Province of BC to address the impacts of changing electricity emissions factors on local government emissions reporting. Metro Vancouver spent over \$37 million in 2022 to purchase energy and maintain its energy generation systems, an increase of 49% over 2014. Metro Vancouver’s total energy use for 2022 was 1.6 million GJ, up 14% from 2014. Regional population grew by 13% from 2014-2022.

TABLE 1: FIVE-YEAR ENERGY AND GHG EMISSIONS TRENDS- CORPORATE METRO VANCOUVER

METRO VANCOUVER							
	BASELINE (2014)	2018	2019	2020	2021	2022	% CHANGE 2014 TO 2022
Total Energy Use (GJ)	1,442,301	1,534,999	1,566,582	1,580,925	1,610,694	1,644,158	14%
Total Cost (\$)	\$25.1M	\$31.3M	\$31.5M	\$29.9M	\$32.8M	\$37.3M	49%
Total GHG Emissions (t CO <sub>2</sub> e)	22,225	26,354	27,345	29,318	25,857	28,048	26%
Population	2.52M	2.67M	2.71M	2.77M	2.81M	2.85M	13%
GJ/capita	0.573	0.576	0.577	0.571	0.574	0.576	1%
\$/capita	\$9.96	\$11.74	\$11.61	\$10.79	\$11.69	\$13.08	31%
kg CO <sub>2</sub> e/capita	8.8	9.9	10.1	10.6	9.2	9.8	11%

Improvement / Favourable (change less than zero)  
 Degradation / Unfavourable (change greater than zero)

FIGURE 1: FIVE-YEAR ENERGY AND GHG EMISSIONS TRENDS BY SERVICE AREA - METRO VANCOUVER



In addition to GHG emissions originating from corporate energy use, process emissions (primarily methane and nitrous oxide) are produced at solid waste and liquid waste facilities. Some of these emissions sources are quantified, including emissions from combustion of municipal solid waste at the Waste-to-Energy Facility. In 2022, total fossil-based emissions from the facility (derived through the combustion of fossil-based solid waste such as plastics) were 109,365 tonnes CO<sub>2</sub>e, an increase of 6% over 2014. Metro Vancouver’s operations have a number of currently unquantified sources of emissions, including fugitive methane and nitrous oxide (N<sub>2</sub>O) from wastewater collection systems and wastewater treatment plants, and work is underway to more accurately quantify and report these emissions to align Metro Vancouver’s corporate GHG inventory with international best practices. As part of this work, Metro Vancouver is considering revising the baseline year used for corporate energy and GHG emissions reporting, from 2014 to 2010, to align with regional energy and GHG targets and reporting.

Metro Vancouver uses purchased energy and also generates energy itself. Most of the self-generated energy, including biogas at wastewater treatment plants, is used by Metro Vancouver. Some is sold to others, including electricity generated at the Waste to-Energy facility sold to BC Hydro, or renewable natural gas sold to Fortis. Metro Vancouver has been reporting its annual corporate greenhouse gas emissions since 2007, and as a signatory to the provincial Climate Action Charter, works to reduce these emissions as part of its commitment to achieving corporate carbon neutrality. This report is complementary to Metro Vancouver’s [Climate 2050 Annual Report](#), which includes updates on corporate and regional initiatives to support implementation of *Climate 2050*. The report is also complementary to Metro Vancouver’s regional greenhouse gas emissions inventory, which is being updated for 2019-2022 throughout 2023, with results to be made available through a publicly accessible platform.

## 2.2. Corporate GHG and Energy Management Programs

Metro Vancouver's *Climate 2050 Strategy* commits to achieving a carbon neutral, resilient region by 2050, and also includes a commitment to achieving corporate carbon neutrality by 2050. As part of this strategy, Metro Vancouver's *Climate 2050 Energy Roadmap* lays out the strategies and actions required to transition the region's energy system to clean, renewable energy. Metro Vancouver has a Corporate Energy Management Program aimed at reducing its operational carbon footprint through energy efficiency improvements, energy recovery initiatives, and transitioning to lower-carbon energy sources. A number of corporate policies support energy and GHG emissions reductions, including the *Corporate Energy Management Policy*, *Carbon Price Policy*, *Fleet Planning and Acquisition Policy*, *Sewage and Waste: Heat Recovery Policy*, and *Sustainable Infrastructure and Buildings Policy*. Metro Vancouver is advancing a number of initiatives to reduce its corporate carbon footprint and provide renewable energy to the region, including:

- Providing clean, renewable energy to the region, including plans to provide waste heat from Metro Vancouver's sewer collections system, wastewater treatment plants, and the Waste-to-Energy facility to communities in the region, and production of renewable natural gas at our wastewater treatment plants.
- Electrification of Metro Vancouver fleet vehicles, and planning and deploying electric vehicle charging infrastructure at our operations to support this transition.
- Switching to lower-carbon fuel sources in our operations, including transitioning to renewable natural gas at our Parks, wastewater treatment plants, and Waste-to-Energy Facility.
- Exploring low carbon fuel options including renewable diesel, electrification and hydrogen fuel opportunities for contracted transportation and equipment operation services, which make up a significant portion of the energy-related GHG emissions for both Liquid Waste and Solid Waste.
- Implementing deep energy retrofits to Metro Vancouver Housing buildings, and designing new Housing buildings to be fully electric, helping to reduce GHG emissions in these buildings by up to 98%.

Metro Vancouver also implements a portfolio of non-energy related projects that have emissions reductions benefits, including avoided forest conversion, ecological area restoration, landfill gas capture, and solid waste reduction projects.

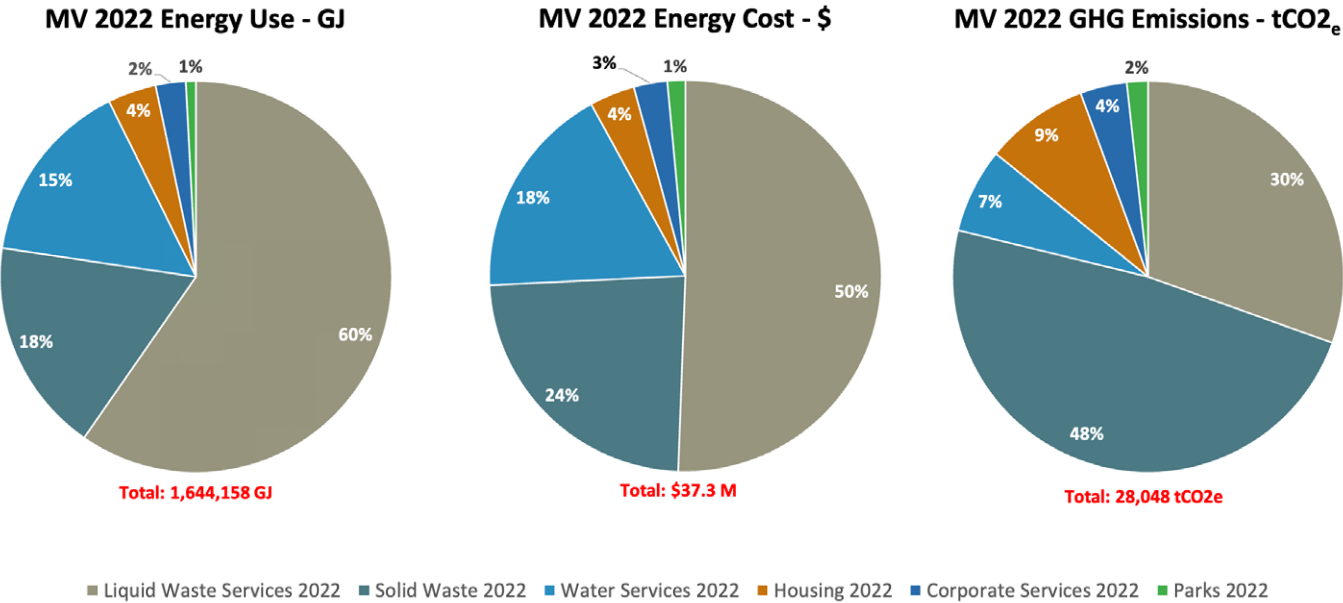


# Metro Vancouver's 2022 Corporate Energy Use and GHG Emissions by Service Area

In 2022, Liquid Waste Services was the largest corporate energy user followed in order by Solid Waste Services, Water Services, Housing, Corporate Services, and Regional Parks. Figure 2 represents the distribution of 2022 energy use, energy costs, and GHG emissions from energy use across Metro Vancouver's service areas. Cost figures include costs for purchased energy, as well as maintenance costs incurred in Metro Vancouver's energy generation systems.

The following sections present five-year trends in energy use, energy cost, and GHG emissions associated with energy use for each service area. Metrics are compared against 2014, Metro Vancouver's energy management baseline year.

FIGURE 2: METRO VANCOUVER 2022 ENERGY USE, ENERGY COSTS, AND GHG EMISSIONS BY SERVICE AREA





### 3.1. Liquid Waste Services

Liquid Waste Services (LWS) was Metro Vancouver’s largest energy user in 2022, and second-largest contributor to energy-related GHG emissions. LWS total energy use for 2022 was 980,954 GJ, up 3% from 2014. Total energy-related GHG emissions for 2022 from Liquid Waste Services was 8,544 tonnes CO<sub>2</sub>e, an increase of 13% from 2014. This increase is driven by increased use of fossil fuels for transportation of the historic land-dried biosolids and lagoon biosolids at Iona Island Wastewater Treatment Plant (WWTP) to beneficial use sites and landfill for non-conforming materials.

TABLE 2: FIVE-YEAR ENERGY AND GHG EMISSIONS TRENDS- LIQUID WASTE SERVICES

LIQUID WASTE SERVICES							
	BASELINE (2014)	2018	2019	2020	2021	2022	% CHANGE 2014 TO 2022
Total Energy Use (GJ)	948,600	944,658	979,803	999,026	991,322	980,954	3%
Total Cost (\$)	\$12.60M	\$17.53M	\$16.99M	\$16.46M	\$16.85M	\$18.89M	50%
Total GHG Emissions (t CO <sub>2</sub> e)	7,591	10,416	10,637	10,666	8,692	8,544	13%
ML Collected & Treated	440,763	455,545	434,466	459,118	451,732	435,177	-1%
GJ/ML Collected & Treated	2.15	2.07	2.26	2.18	2.19	2.25	5%
\$/ML	\$28.60	\$38.48	\$39.10	\$35.86	\$37.30	\$43.40	52%
kg CO <sub>2</sub> e/ML	17.2	22.9	24.5	23.2	19.2	19.6	14%

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

### Energy Efficiency, Energy Recovery and GHG Emissions Reduction Projects

**Using Sewage for Heating and Cooling:** Recovering heat from sewage can provide renewable, fossil fuel free heat to residents and businesses in the region, reducing greenhouse gas emissions, and there is enough excess heat in Metro Vancouver’s wastewater to heat about 700 high rises. These systems are capable of reducing greenhouse gas emissions by tens of thousands of tonnes per year by 2030, and potentially by hundreds of thousands of tonnes per year by 2050, assuming these projects displace heat that would have been generated by fossil natural gas. Several projects to recover heat from wastewater are currently under design or in construction, including at the North Shore wastewater treatment plant, Richmond, New Westminster, and Surrey.



### **Producing Renewable Natural Gas from Wastewater Treatment:**

Metro Vancouver's wastewater treatment plants produce biogas as part of their treatment processes. Biogas is a valuable resource that can be used instead of conventional natural gas, reducing greenhouse gas emissions. Biogas is a mixture of methane (CH<sub>4</sub>) and carbon dioxide (CO<sub>2</sub>), and can be burned directly in boilers or cleaned up so that the methane can be sold into the natural gas grid. Biogas is currently used at our wastewater treatment plants in a range of ways:

- At the Annacis Island and Iona Wastewater Treatment Plants, the biogas is used to produce both heat and electricity ("co-generation") that is used at the plants. The new North Shore Wastewater Treatment Plant will do this as well.
- At the Lulu Island Wastewater Treatment plant, the biogas is used to generate all plant heating needs. A facility was installed at the Lulu Island Wastewater Treatment Plant in 2021 to clean up excess biogas and sell the resulting renewable natural gas (RNG) to Fortis BC.
- Metro Vancouver is assessing how best to use the biogas at its other facilities, including the upgraded Northwest Langley and Iona Island Wastewater Treatment Plants.

### **Waste-to-Energy Facility Upgrade to Process**

**Biosolids:** Design is in progress for an upgrade to the Waste-to-Energy Facility, to allow the facility to process biosolids, which will create another local biosolids beneficial use option. This upgrade will reduce the need for long distance hauling of biosolids to out-of-region use sites, thus reducing the amount of GHG emissions associated with hauling.

### **Pilot Digestion Optimization Facility to Improve Biogas Production:**

The recently commissioned Pilot Digestion Optimization Facility at the Lulu Island Wastewater Treatment Plant consists of three small digesters that allow testing of different operating parameters for improving biogas production without disrupting the plant's full-scale digesters. The facility's modular design also allows pilot testing of emerging technologies including Metro Vancouver's patented SEED Reactor, which promotes the growth of specific microbes to produce additional biomethane that can be used as renewable natural gas. In addition, this facility will test the production of green hydrogen from ammonia in wastewater effluent.

### **Hydrothermal Liquefaction to Produce Low-Carbon Fuels from Wastewater:**

In 2022, detailed design progressed for the world's first hydrothermal liquefaction facility to process sewage sludge at Metro Vancouver's Annacis Island Wastewater Treatment Plant. Hydrothermal liquefaction uses temperature and pressure to convert wastewater sludge into biocrude, which can be refined into low-carbon transportation fuels. The biocrude from the demonstration facility will be sent to project partner Parkland's nearby refinery for processing. This project has the potential to reduce GHG emissions by 80%, at equivalent or lower costs than current processes.

### 3.2. Solid Waste Services

Solid Waste Services (SWS) was Metro Vancouver’s second-largest energy user in 2022, and largest contributor to energy-related GHG emissions. SWS total energy use for 2022 was 290,879 GJ, up 51% from 2014. Total energy-related GHG emissions for 2022 from Solid Waste Services was 13,559 tonnes CO<sub>2</sub>e, up 79% from 2014. These increases in energy use and GHG emissions are driven by increased fossil natural gas use at the Waste-to-Energy Facility starting in 2018, which are the result of regulatory changes requiring larger natural gas burners. Other factors contributing to the increase include higher contracted fuel use for road and rail hauling of solid waste to out-of-region landfills.

TABLE 3: FIVE-YEAR ENERGY AND GHG EMISSIONS TRENDS- SOLID WASTE SERVICES

SOLID WASTE SERVICES							
	BASELINE (2014)	2018	2019	2020	2021	2022	% CHANGE 2014 TO 2022
Total Energy Use (GJ)	192,026	214,927	213,575	250,167	257,387	290,879	51%
Total Cost (\$)	\$5.25M	\$4.60M	\$5.12M	\$4.99M	\$5.51M	\$8.83M	68%
Total GHG Emissions (t CO <sub>2</sub> e)	7,570	8,631	8,789	10,854	10,686	13,559	79%
Mass Disposed (tonnes)	542,477	590,805	577,950	572,222	589,929	607,728	12%
GJ/tonne disposed	0.35	0.36	0.37	0.44	0.44	0.48	35%
\$/tonne disposed	\$9.67	\$7.79	\$8.85	\$8.73	\$9.34	\$14.54	50%
kg CO <sub>2</sub> e/tonne disposed	14.0	14.6	15.2	19.0	18.1	22.3	60%

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

### Energy Efficiency, Energy Recovery and GHG Emissions Reduction Projects

**Energy Generation at the Waste-to-Energy Facility:** Since 1988, Solid Waste Services has generated steam, and later electricity, through burning municipal solid waste at its Waste-to-Energy facility that manages roughly a quarter of the region’s municipal solid waste. The facility produces enough electricity to power 16,000 homes per year, or roughly twice the total energy use of the solid waste function. The electricity is sold to BC Hydro generating more than \$7 million in revenue each year. Table 4 summarizes Waste-to-Energy Facility electricity generation trends from 2018 through 2022 with comparisons drawn to the 2014 energy management baseline year. Tonnage managed by the Waste-to-Energy Facility has decreased compared to 2014 while total electricity generation and electricity generation per tonne of municipal solid waste processed has increased compared to 2014.



TABLE 4: FIVE-YEAR ELECTRICITY GENERATION TREND- WASTE-TO-ENERGY FACILITY

WTEF ELECTRICITY GENERATION							
	BASELINE (2014)	2018	2019	2020	2021	2022	% CHANGE 2014 TO 2022
Inbound Tonnage (tonnes)	275,266	253,123	253,184	244,362	241,531	233,052	-15%
Electricity Generation (GJ)	537,110	587,633	621,374	544,558	599,656	578,521	8%
Electricity Generation per Tonne Municipal Solid Waste Burned (GJ/tonne)	1.95	2.32	2.45	2.23	2.48	2.48	27%

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

**Waste-to-Energy District Energy System:** Metro Vancouver is developing a Waste-to-Energy Facility District Energy system to supply heat and hot water to up to 50,000 homes in Vancouver, Burnaby and potentially New Westminister. The first phase of this project will be the construction of an energy centre and an approximately 6 km thermal energy transmission line from the Waste-to-Energy Facility to River District community in Vancouver, which is expected to take place from 2024 to 2026. The energy centre and piping systems will be sized to support future district energy systems in Burnaby and potentially other municipalities.

**Non-Ferrous Metals Recovery:** Metro Vancouver also works to advance the region’s zero waste goals, through projects such as the Non-Ferrous Metals Recovery project at the Waste-to-Energy Facility. The project uses magnetic separators and an eddy current separator to recover valuable non-ferrous metals such as aluminum and copper from bottom ash collected at the Waste-to-Energy Facility. This reduces GHG emissions by allowing these materials to stay in use. In 2022, this project recovered 286 tonnes of non-ferrous metals, and leads to avoided GHG emissions of approximately 1,000 tonnes CO<sub>2</sub>e annually.

**Beneficial Use of Bottom Ash:** Metro Vancouver is advancing a pilot to improve beneficial use of bottom ash at the Waste to Energy Facility. The pilot test will include processing 1,000 tonnes of bottom ash to remove recyclable metals, crushing, then use as a feedstock in cement production at the Lehigh Cement Plant in Delta BC. At full scale, beneficial use of bottom ash could reduce regional disposal requirements by approximately 5% and reduce greenhouse gas emissions associated with mining and transporting raw materials.

**Coquitlam Landfill Gas Capture:** Metro Vancouver captures methane emissions from the closed Coquitlam Landfill. By flaring the captured methane instead of letting it be released to atmosphere, the project reduces greenhouse gas emissions by approximately 1,000 tonnes CO<sub>2</sub>e annually.

### 3.3. Water Services

Total energy use for 2022 for Water Services was 251,932 GJ, up 39% from 2014. Total energy-related GHG emissions for 2022 from Water Services was 1,962 tonnes CO<sub>2</sub>e, down 27% from 2014. Increases in energy use and energy costs compared to 2014 is largely attributed to the commissioning of the Capilano Raw Water Pump Station in early 2015; this facility utilizes large pumps to transfer water from Capilano Lake to the Seymour Capilano Filtration Plant for treatment. Because energy use by Water Services is predominantly electrical energy, changes in the carbon intensity of electricity generated by BC Hydro has a large impact on Water Services annual GHG emissions. For this reason, the 27% reduction in total GHG emissions in WS from 2014 to 2022 is largely attributed to the declining carbon intensity of BC Hydro’s energy generation. As BC Hydro continues its efforts to reach carbon neutrality by 2030, this will lead to continued reduction in GHG emissions for the drinking water utility.

TABLE 5: FIVE YEAR ENERGY AND GHG EMISSIONS TRENDS- WATER SERVICES

WATER SERVICES							
	BASELINE (2014)	2018	2019	2020	2021	2022	% CHANGE 2014 TO 2022
Total Energy Use (GJ)	181,141	241,407	248,644	213,267	241,335	251,932	39%
Total Cost (\$)	\$4.56M	\$6.13M	\$6.68M	\$5.83M	\$7.69M	\$6.63M	45%
Total GHG Emissions (t CO <sub>2</sub> e)	2,698	2,633	3,324	3,343	2,355	1,962	-27%
ML Treated & Delivered	381,261	389,800	383,400	378,734	391,709	388,490	2%
GJ/ML Treated & Delivered	0.48	0.62	0.65	0.56	0.62	0.65	36%
\$/ML	\$11.97	\$15.73	\$17.43	\$15.38	\$19.63	\$17.08	43%
kg CO <sub>2</sub> e/ML	7.1	6.8	8.7	8.8	6.0	5.1	-29%

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

#### Energy Efficiency, Energy Recovery and GHG Emissions Reduction Projects

By capitalizing on the natural topography of the region and implementing innovative projects, Water Services continues to make significant progress in energy conservation and sustainability. In 2022, Metro Vancouver’s Water Services demonstrated a strong commitment to energy savings and sustainability, aligning with Metro Vancouver’s Corporate Energy Management Policy, which emphasizes carbon neutrality, fiscal responsibility, and reducing energy consumption. Noteworthy achievements include:

**Electrical Energy Generation/Offsets:** The Capilano Energy Recovery Facility harnesses hydroelectricity from treated drinking water flowing from the Seymour Capilano Filtration Plant. This water turns a turbine, generating electricity. The produced electricity offsets a portion of the purchased electricity needed to operate the large pumps at the Capilano Raw Water Pump Station. Similarly, the Cleveland Dam Pump House, Cleveland Dam Turbine, and Seymour Falls Turbine utilized surplus pressure within the water system to collectively generate 9.5 GWh, saving approximately \$803,000 in electricity costs.



**Energy Management Projects:** Since 2015, Water Services has undertaken various projects resulting in annual electrical energy savings of 2.1 GWh, equivalent to approximately \$208,000 in cost reductions. These projects encompassed upgrades and process automation improvements. Notable examples include the HVAC Control Improvements project at the Seymour Capilano Filtration Plant, resulting in annual electricity savings of 316,377 kWh, and the LED interior lighting upgrade at the same facility, resulting in an annual saving of 662,605 kWh.

Additionally, in 2022, significant progress was made in energy management-related projects including the following:

- A pump performance study at the Grandview Pump Station identified energy-efficient pumping strategies, slated for testing in 2023.
- A Capilano Raw Water Pump Station operating strategy was developed, with implementation scheduled in 2023.
- A BC Hydro-funded energy efficiency feasibility study on reducing sidestream pumping energy use at the Coquitlam Water Treatment Plant (CWTP) was completed in 2020. Implementation of the study's recommendations is targeted for 2023.
- A BC Hydro-funded energy efficiency feasibility study on the HVAC and lighting systems at CWTP was completed in 2021. Implementation of select energy conservation measures identified in the study commenced in 2022, with completion set for 2023.

### 3.4. Metro Vancouver Housing

Table 7 summarizes Housing gross energy and GHG emissions trends and those trends normalized against the Housing KPI: *per million square metres of conditioned floorspace per heating degree day* (HDD). Total energy use for 2022 for Metro Vancouver Housing was 65,806 GJ, down 2% from 2014. Total energy-related GHG emissions for 2022 from Metro Vancouver Housing was 2,403 tonnes CO<sub>2</sub>e, down 3% from 2014. Since 2014, Metro Vancouver Housing has made significant investments in energy-efficient space and hot water heating equipment, building envelope upgrades, tenant energy awareness campaigns, and other efforts. These investments have translated into the performance improvements noted in Table 6. Increases since 2019 in energy use and energy cost are partially a result of completing and opening Heather Place A, which uses natural gas for space heating and domestic hot water heating.

TABLE 6: FIVE-YEAR ENERGY AND GHG EMISSIONS TRENDS- METRO VANCOUVER HOUSING

HOUSING							
	BASELINE (2014)	2018	2019	2020	2021	2022	% CHANGE 2014 TO 2022
Total Energy Use (GJ)	66,969	62,263	61,917	63,965	67,363	65,806	-2%
Total Cost (\$)	\$1.13M	\$1.13M	\$1.11M	\$1.16M	\$1.34M	\$1.39M	23%
Total GHG Emissions (t CO <sub>2</sub> e)	2,490	2,357	2,365	2,476	2,509	2,403	-3%
Million m <sup>2</sup> *HDD	750	774	810	787	820	837	12%
kJ/(m <sup>2</sup> *HDD)	89.283	80.47	76.45	81.30	82.16	78.60	-12%
\$/ (million m <sup>2</sup> *HDD)	\$1,512	\$1,460	\$1,371	\$1,476	\$1,631	\$1,665	10%
g CO <sub>2</sub> e/(m <sup>2</sup> *HDD)	3.3	3.05	2.92	3.15	3.06	2.87	-14%

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

#### Energy Efficiency, Energy Recovery and GHG Emissions Reduction Projects

In its 10-Year Plan (published in 2019) Metro Vancouver Housing has committed to reducing GHG emissions by 45%, compared to 2010 levels, and to reduce energy consumption by 25% for major rehabilitations, such as comprehensive building envelope upgrades, and for new construction. As of 2022, Housing has already reduced its GHG emissions by 16% from 2010 levels. A number of projects are underway to evaluate and implement energy efficiency and GHG emissions reduction opportunities.

**Transitioning Metro Vancouver Housing Buildings to Zero Emissions:** Housing is advancing retrofits at several sites which will reduce GHG emissions by up to 98%, with some new buildings designed to be fully electric. All current development projects in the design

phase are pursuing high-performance building envelope designs along with the incorporation of energy efficient mechanical and electrical systems. Current projects are targeting operational energy usage values consistent with BC Energy Step Code level 3 and above.

**Reframed Initiative:** The [Reframed Initiative](#) is a multi-partner project to undertake deep energy retrofits on existing multi-unit residential buildings (MURBs) to reduce both energy use and GHG emissions. These projects demonstrate the feasibility of electric buildings today, and illustrate the benefits of low carbon buildings such as reduced GHG emissions, reduced energy use and costs, and increased resilience to extreme weather.



### 3.5. Corporate Services

Corporate Services includes Corporate Safety, Human Resources, Fleet Management, and Corporate Facilities. Throughout this report, energy use, energy costs, and GHG emissions associated with energy use specific to fleet vehicles and equipment have been allocated to individual service areas where specific vehicles and equipment are assigned to those service areas. Energy data for vehicles and equipment that are not assigned to individual departments (pool vehicles and loaner vehicles, for example) are reported in Corporate Services. For 2022, improvements in tracking of vehicle assignment has resulted in more accurate reporting across departments, reducing the total fleet energy data attributed to corporate services. Total energy use for 2022 for Corporate Services was 40,823 GJ, up 12% from 2014. Total energy-related GHG emissions for 2022 from Corporate Services was 1,082 tonnes CO<sub>2</sub>e, unchanged compared to 2014.

TABLE 7: FIVE-YEAR ENERGY AND GHG EMISSIONS TRENDS- CORPORATE SERVICES

CORPORATE SERVICES							
	BASELINE (2014)	2018	2019	2020	2021	2022	% CHANGE 2014 TO 2022
Total Energy Use (GJ)	36,556	56,933	49,280	41,795	42,118	40,823	12%
Total Cost (\$)	\$0.87M	\$1.42M	\$1.18M	\$0.99M	\$1.03M	\$1.03M	18%
Total GHG Emissions (t CO <sub>2</sub> e)	1,080	1,679	1,650	1,425	1,213	1,082	0%
Population	2.52M	2.67M	2.71M	2.77M	2.81M	2.85M	13%
GJ/capita	0.015	0.021	0.018	0.015	0.015	0.014	-2%
\$/capita	\$0.35	\$0.53	\$0.44	\$0.36	\$0.37	\$0.36	4%
kg CO <sub>2</sub> e/capita	0.429	0.630	0.608	0.515	0.432	0.379	-12%

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

Increases in all indicators up to 2018 are primarily the result of Metro Vancouver operating its new Head Office (purchased January 2016) in addition to its former two Head Office buildings, which were sold in early 2019.

#### Energy Efficiency, Energy Recovery and GHG Emissions Reduction Projects

Colliers International (Colliers) has managed Metro Vancouver’s Head Office building, Metrotower III, since mid-2018. Since then and to the end of 2022, Colliers completed several projects targeting energy efficiency improvements. These include programming adjustments of building systems (heating, ventilation, DDC and lighting controls), upgrading most of the base building lighting fixtures to LED, and improvement/repairs to the building’s three boilers. Projects completed to the end of 2022 have cumulatively reduced energy consumption by approximately 190 GJ despite building ventilation increases required in response to COVID-19. Collier’s water conservation initiatives have reduced building water usage by 7%.

Colliers has commissioned a series of studies to identify future projects that reduce energy use and GHG emissions in the future. These include a 2019 solid waste audit, a 2020 low carbon electrification study and a follow up Net Zero Roadmap study. In late 2022, Corporate Services approved proceeding with the two opportunities that demonstrated positive business cases in the Zero Carbon Roadmap, a Heat Recovery Chiller opportunity and Data Centre Heat Recovery Opportunity. Colliers is also considering future opportunities for further decarbonization, including electrification of kitchen cooking and domestic hot water equipment as well as the central heating plant boilers.



### 3.6. Regional Parks

Regional Parks is relatively low energy user. Total energy use for 2022 for Regional Parks was 13,652 GJ, down 20% from 2014. Total energy-related GHG emissions for 2022 from Parks was 491 tonnes CO<sub>2</sub>e, down 38% from 2014. These improvements are primarily attributed to energy efficiency upgrades at Regional Parks buildings and facilities - and a decision to implement a winter shut-down of the outdoor swimming pool at Capilano River Regional Park beginning in 2019.

TABLE 8: FIVE-YEAR ENERGY AND GHG EMISSIONS TRENDS- REGIONAL PARKS

PARKS							
	BASELINE (2014)	2018	2019	2020	2021	2022	% CHANGE 2014 TO 2022
Total Energy Use (GJ)	17,008	14,813	13,362	12,705	13,499	13,652	-20%
Total Cost (\$)	\$0.53M	\$0.48M	\$0.44M	\$0.42M	\$0.49M	\$0.55M	4%
Total GHG Emissions (t CO <sub>2</sub> e)	797	639	580	554	558	491	-38%
Population	2.52M	2.67M	2.71M	2.77M	2.81M	2.85M	13%
MJ/capita	6.756	5.555	4.922	4.592	4.808	4.783	-29%
\$/capita	\$0.21	\$0.18	\$0.16	\$0.15	\$0.18	\$0.19	-8%
kg CO <sub>2</sub> e/capita	0.3	0.2	0.2	0.2	0.2	0.2	-46%

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

#### Energy Efficiency, Energy Recovery and GHG Emissions Reduction Projects

Regional Parks has implemented a number of energy efficiency projects to reduce its energy use and GHG emissions. These include efficiency upgrades with LED lighting and double pane windows at parks buildings across the system, energy-efficient design of new buildings, and programs to reduce diesel use for lawn mowing by 30 to 50%. In 2022, Regional Parks began planning to replace fossil natural gas use at Parks facilities with renewable natural gas. This has been implemented for 2023.

The conversion of gas powered equipment to e-powered alternatives is well underway across the park system, and parks is working to promote the use of e-powered alternatives by Metro Vancouver member jurisdictions, industry, and others. Regional Parks houses the Metro Vancouver Film Office and has worked closely with the BC Film industry under their

“REEL Green” brand to create an incentive program for the use of battery powered electric generator usage in local film shoots. An initiative called “Lights, Camera, Climate Action” continues to encourage the industry to reduce its GHG emissions.

Regional Parks implements a number of projects which have carbon sequestration or avoided GHG emissions benefits that are outside of Metro Vancouver’s corporate emissions boundaries, including acquisition of new parkland and restoration of existing parks, reserves and conservancy areas in the region. Read more about these in Metro Vancouver’s *Climate 2050 Annual Report*.



### 3.7. Fleet Services

Table 9 compares trends in Metro Vancouver fleet energy and GHG emissions performance indicators. As described above, throughout this report, energy use, energy costs, and GHG emissions associated with energy use specific to fleet vehicles and equipment have been allocated to individual service areas where specific vehicles and equipment are assigned to those service areas. Total energy use for 2022 for Fleet Services was 31,557 GJ, down 21% from 2016. Total GHG emissions for 2022 from fossil fuel use for Fleet Services was 2,015 tonnes CO<sub>2</sub>e, down 26% from 2016. Since adoption of the Fleet Planning and Acquisition Policy in 2016, the size of the corporate fleet has increased by 7%, while the percentage of vehicles fueled only by fossil fuels has decreased from 87% to 80%.

TABLE 9: FIVE-YEAR ENERGY AND GHG TRENDS- FLEET

FLEET							
	BASELINE (2014)	2018	2019	2020	2021	2022	% CHANGE 2014 TO 2022
Fleet Size (no. vehicles)	420	452	456	494	476	451	7%
Percent Fuelled Solely from Fossil Sources	87.4%	84.5%	84.9%	83.8%	81.3%	80.5%	-8%
Fossil Fuel Use (GJ)	39,953	37,790	36,645	35,359	34,550	31,557	-21%
Fossil Fuel Cost	\$1,224,968	\$1,467,473	\$1,403,220	\$1,143,542	\$1,394,628	\$1,649,624	35%
GHG Emissions from Fossil Fuel Use (t CO <sub>2</sub> e)	2,722	2,571	2,492	2,404	2,349	2,015	-26%

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

#### Energy Efficiency, Energy Recovery and GHG Emissions Reduction Projects

Metro Vancouver’s Fleet Climate Action Strategy will support a goal of transitioning Metro Vancouver’s corporate on-road fleet to use only zero emission or low carbon fuels between 2035 and 2040, and to be fully zero emission by 2050. In 2022, progress included the acquisition of 10 EV pickup trucks and cargo vans; deployment of fleet EV charging infrastructure at our facilities, continuing to conduct a feasibility studies for EV infrastructure upgrades, and assessing the use of renewable fuels for Fleet vehicles.

## Other GHG Emissions (Process and Fugitive)

In addition to GHG emissions originating directly from energy use, Metro Vancouver's total corporate GHG emissions also include emissions originating from other sources. Solid Waste Services' Waste-to-Energy Facility is Metro Vancouver's largest source of quantified non-energy GHG emissions. The facility manages approximately 25% of the region's solid waste, turning waste into electricity and recovering about 5,000 tonnes of metal annually allowing these materials to stay in use. The facility emits GHGs through the combustion of municipal solid waste and fossil natural gas to fuel the process burners. Emissions from municipal solid waste are classified as either biogenic (derived through the combustion of organic material) or fossil-based (derived through the combustion of fossil-based materials such as plastics and natural gas). Table 10 summarizes the facility's trends in biogenic (organics-derived) and fossil-derived GHG emissions.

TABLE 10: FIVE-YEAR ENERGY AND GHG TRENDS- WASTE-TO-ENERGY FACILITY

GHG EMISSIONS (T CO <sub>2</sub> E) - SOLID WASTE SERVICES WASTE-TO-ENERGY FACILITY							
	BASELINE (2014)	2018	2019	2020	2021	2022	% CHANGE 2014 TO 2022
Inbound Tonnage (tonne)	275,266	253,123	253,184	244,362	241,531	233,052	-15%
Biogenic Emissions from MSW	158,383	147,857	152,646	151,015	171,214	170,011	7%
Fossil Emissions from MSW	108,171	122,201	115,154	135,269	131,820	109,365	1%
Fossil Emissions from Natural Gas	563	2,006	2,191	3,416	3,570	3,976	606%
Total GHG Emissions	267,117	272,064	269,991	289,700	306,605	283,352	6%
Total GHG Emissions from MSW	266,554	270,058	267,800	286,284	303,034	279,376	5%
Total GHG Emissions per Tonne MSW	0.97	1.07	1.07	1.19	1.27	1.22	25%

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

Biogenic emissions from waste combustion have decreased three out of the last five years, which can be attributed to the disposal ban on organic materials that Metro Vancouver introduced in 2015. This has led to a corresponding increase in fossil-based emissions from waste combustion as the proportion of non-biogenic material managed at the facility has increased. The biogenic fraction of the waste is based on four grab samples annually, and is therefore subject to variation due to the heterogenous nature of municipal solid waste. The increase in fossil natural gas emissions at the Waste-to-Energy Facility is due to the installation of larger capacity gas burners in 2018, as required by the facility's Operational Certificate. Note that these natural gas emissions are also included in totals reported for Solid Waste Services above (table 3).



Metro Vancouver's waste-to-energy related emissions are considered corporate, however near-term initiatives such as the implementation of a district energy heating system provides regional GHG reduction benefits to energy customers, and has the potential to reduce up to 70,000 tonnes of GHG emissions annually. See section 3.2. on Solid Waste Services initiatives for more information.

Liquid Waste Services has several other potential sources of other GHG emissions. Of these emissions, flared biogas are the only emissions source that have thus far been quantified and tracked. In 2022, Wasted Biogas was responsible for 315,942 GJ of energy wasted, and 66 tonnes CO<sub>2</sub>e of GHG emissions, down 12% from 2014.

Other potential sources of non-energy-related GHG emissions include fugitive emissions of biogas (mainly consisting of methane) and nitrous oxide – both very potent GHGs – from the wastewater collections system, the wastewater treatment process, lagoons, and historic biosolids. Metro Vancouver is investigating methods for more accurately quantifying these emissions, and is working to align Metro Vancouver's corporate GHG inventory reporting with international best practices.

# Conclusion

Metro Vancouver delivers a range of essential services to a growing region. The delivery of these services uses energy, which produces greenhouse gas emissions; in addition to energy-related emissions, “process emissions” (primarily methane and nitrous oxide) are produced at solid waste and liquid waste facilities. Metro Vancouver has been reporting on its energy-related GHG emissions since 2007. Metro Vancouver’s Climate 2050 Strategy commits to achieving a carbon neutral, resilient region by 2050, and also includes a commitment to corporate carbon neutrality by 2050. A number of other policies and programs including Metro Vancouver’s Corporate Energy Management Program, support corporate energy efficiency, GHG reduction, and clean energy initiatives.

*Metro Vancouver’s Annual Corporate Energy and Greenhouse Gas Emissions Management Report 2018-2022* provides an overview of energy use and energy-related GHG emissions for 2022, as well as five-year trends for energy use, GHG emissions, and costs, other indicators, for each of Metro Vancouver’s service areas. While Metro Vancouver actively works to reduce energy use and GHG emissions and increase energy efficiency, total energy use, GHG emissions, and energy costs increased from 2018 through 2022. In addition to serving a growing regional population, these increases were driven by higher electricity and fossil fuel use by Liquid Waste Services for transportation of historic and lagoon lona biosolids, and by Solid Waste Services, for Waste-to-Energy facility operation and transportation of solid waste to out-of-region disposal facilities. The report also includes discussion of ongoing initiatives related to energy efficiency, corporate emissions reductions, provision of clean energy to the region and other climate action projects.

In addition to GHG emissions originating from corporate energy use Metro Vancouver has other sources of quantified GHG emissions, including emissions from combustion of solid waste at the Waste-to-Energy Facility, and unquantified such as including fugitive methane and nitrous oxide (N<sub>2</sub>O) from wastewater collection systems and wastewater treatment plants. Work is underway to more accurately quantify these emissions, and to report operational emissions to better align with established international standards.



