



McGill

GREENHOUSE GAS INVENTORY

2022 REPORTING YEAR

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Executive Summary

Scope

- **Reporting period:** January 1 – December 31, 2022
- **Consolidation approach:** operational control
- **Operational boundary:** Scope 1, Scope 2 and select Scope 3 emissions; select carbon sequestration; carbon offsets
- **Protocol:** WBCSD/WRI [Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard](#) (2004)

Key Results

- **Gross emissions in 2022 were 48,213 tonnes of CO₂-equivalent (tCO₂e).** This is a decrease of 19% (10,996 tCO₂e) from the 2015 base year and an increase of 15% (6,116 tCO₂e) from 2021. Most emissions were Scope 1 (71%), particularly natural gas consumption (63%). An additional 375 tCO₂e was generated from biogenic (biodiesel and renewable natural gas) sources.
- **Net emissions in 2022 were 44,659 tCO₂e.** Net carbon sequestration in the forests at the Gault Nature Reserve and Morgan Arboretum is equal to 2,629 tCO₂e/year (6% total emissions). As of 2022, carbon offsets purchased via the McGill-Bayano Reforestation Project account for 925 tCO₂e sequestered yearly until 2040 (2% total emissions).
- **The COVID-19 pandemic continued to account for significant Scope 3 decreases in 2022 with respect to 2019.** Emissions from university-related air travel and commuting were 4,778 tCO₂e (59%) and 2,523 tCO₂e (35%) lower than 2019 levels (pre-pandemic), respectively, due to pandemic-related travel restrictions and work-from-home orders from January to May 2022 and the interim flexible work arrangement beginning in May 2022.
- **Scope 1 energy emissions increased in 2022.** Natural gas consumption (Scope 1) rose by 1,809 tCO₂e (6%) from 2021 levels, largely due to colder weather. Emissions from increased ventilation rates throughout 2022 to combat the transmission of COVID-19 were counteracted by emission reductions from recently implemented heat recovery projects.
- **Energy-intensity-based key performance indicators for 2021–2022 have improved since 2015.** McGill's emissions from stationary combustion sources were 0.93 tCO₂e/full-time-equivalent student, 0.038 tCO₂e/m² of gross area, and 17.09 tCO₂e/\$M endowed, all of which have decreased since 2015.

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1. Scope of the Inventory

A. Description of the Organization

McGill University, located in Montreal, Quebec, offers over 300 academic programs in 11 faculties and schools. Over 33,000 full-time-equivalent students were enrolled in FY2022, and the University employed more than 13,000 part- and full-time faculty and staff. As of April 30, 2022, the University's endowment was \$1.8 billion¹ and its budget \$1.56 billion.²

McGill owns and operates over 200 buildings on three main campuses: Downtown Campus in Montreal, Macdonald Campus in Sainte-Anne-de-Bellevue, and the Gault Nature Reserve in Mont-Saint-Hilaire. The University also owns and operates the Bellairs Research Institute in Barbados, the McGill Arctic Research Station, and the McGill Sub-Arctic Research Station.

B. Reporting Period

This report details McGill's greenhouse gas inventory for calendar year 2022.

C. Organizational Boundary

This inventory follows the GHG Protocol's operational control consolidation approach.

We include, within Scope 3, emissions from energy consumption in some buildings over which we do not have operational control. We also include data for several small research stations and facilities whose emissions are relatively immaterial compared to those of our main campus. See Detailed Appendix.

D. Operational Boundary

This inventory includes:

All Scope 1 emissions within the organizational boundaries defined above, except process gases generated by chemicals used for, and by-products generated by, research experiments. See Detailed Appendix.

All Scope 2 emissions within the defined organizational boundaries.

Scope 3 emissions believed to have significant greenhouse gas impacts, that are considered most relevant to the University's mission, and for which data are accessible, namely from:

- Electricity and natural gas consumption for select buildings over which we do not have operational control
- Student, faculty, and staff commuting
- Directly financed, University-related air travel
- University sports team travel
- The Macdonald Campus shuttle bus
- Water supply and treatment

¹ https://www.mcgill.ca/investments/files/investments/endowment_report_v10_final_0.pdf, p. 5 (market value)

² https://www.mcgill.ca/vpadmin/files/vpadmin/2021-2022_-_english_audited_financial_statements_final_1.pdf, p. 3

- Power transmission and distribution losses between production sites and McGill facilities.

The following emissions are reported separately as per best practice:

- Emissions from refrigerants not covered by the Kyoto Protocol
- Emissions avoided through waste management and diversion (recycling and composting)
- Emissions from biodiesel in the Macdonald Campus shuttle bus and renewable natural gas purchased to offset a portion of natural gas consumption (biogenic emissions)
- Carbon sequestration from the Gault Nature Reserve and Morgan Arboretum
- Carbon offsets purchased via the McGill-Bayano Reforestation Project.

E. Base Year & Recalculation Policy

Our base year for comparison is 2015. We will recalculate base year emissions should structural changes at the University, changes in calculation methodologies or emissions factors, or significant errors result in a cumulative difference to gross emissions of 10% or more.

F. Method

We invite readers to refer to the Detailed Appendix for methods including data sources, emissions factors, key assumptions, and equations.

2. Results

A. Greenhouse Gas Emissions

Gross emissions in 2022 were 48,213 tCO₂e. An additional 375 tCO₂e was generated from biogenic sources (biodiesel and renewable natural gas). Figure 1 presents the breakdown of emissions by certain key activities.

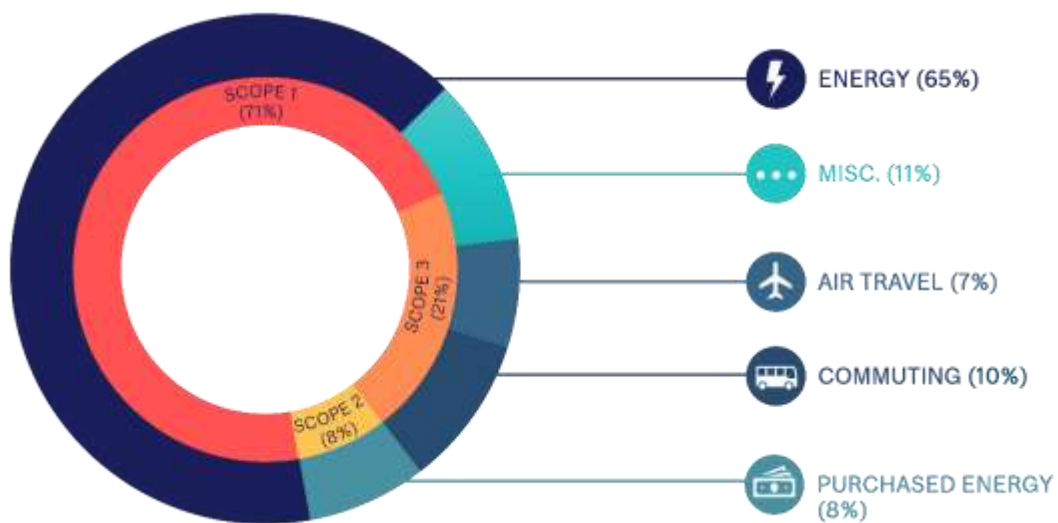


Figure 1. Emissions Breakdown by Key Activity

Table 1 presents 2022 emissions by greenhouse gas. Table 2 details 2022 emissions by scope and activity.

Table 1. Emissions Breakdown by Greenhouse Gas

Greenhouse Gas	Emissions (tGHG)	Emissions (tCO ₂ e)
Carbon dioxide (CO ₂)	45,433	45,433
Methane (CH ₄)	24	679
Nitrous oxide (N ₂ O)	1.4	377
Refrigerant R134a	1.0	1,519
Refrigerant R125	0.04	132
Refrigerant R32	0.03	26
Sulphur hexafluoride (SF ₆)	0.002	47
Total	N/A	48,213

Note: When emission factors were only available in units of CO₂e, emissions were wholly attributed to CO₂ in the tGHG column

Table 2. 2022 Greenhouse Gas Inventory

CATEGORY	ACTIVITY	ACTIVITY LEVEL	UNIT	EMISSIONS (tCO ₂ e)	% TOTAL
Scope 1 (direct emissions)					
Stationary combustion	Natural gas	15,768,025	m ³	30,536	63.3%
	Propane	0	L	0	0.0%
	Heating oil	292,120	L	799	1.7%
	Diesel	59,607	L	165	0.3%
McGill-owned vehicle fleet	Diesel vehicles	78,761	L	219	0.5%
	Gasoline vehicles	58,060	L	138	0.3%
	Propane vehicles	0	L	0	0.0%
Refrigerants & chemicals	Refrigerants	1,062	kg	1,677	3.5%
	Insulating gas	2	kg	47	0.1%
Agriculture	Livestock	5,565	heads	702	1.5%
	Fertilizers	64,430	kg	82	0.2%
Subtotal				34,364	71.3%
Scope 2 (indirect energy emissions)					
Purchased energy	Electricity	178,847,580	kWh	250	0.5%
	Steam	364,805	m ³	706	1.5%
	Hot water	1,380,479	m ³	2,673	5.5%
	Chilled water	239,797	kWh	0	0.0%
Subtotal				3,630	7.5%
Scope 3 (indirect emissions)					
Stationary combustion	Natural gas	755,078	m ³	1,462	3.0%
	Electricity	17,456,476	kWh	23	0.0%

CATEGORY	ACTIVITY	ACTIVITY LEVEL	UNIT	EMISSIONS (tCO ₂ e)	% TOTAL
Commuting	Faculty, staff, students	N/A	pass-km	4,649	9.6%
Third-party fleet	Macdonald shuttle	90,087	L	267	0.6%
Air travel	Directly financed air travel	34,199,955	pass-km	3,317	6.9%
Sports team travel	Air	593,832	pass-km	47	0.1%
	Bus	39,341	vehicle-km	34	0.1%
	Public transit	0	pass-km	0	0.0%
	Taxi + car	3,900	km	1	0.0%
Water	Supply	1,862,713	m ³	137	0.3%
	Treatment	1,129,156	m ³	261	0.5%
Energy losses	Transmission & distribution	15,703,673	kWh	21	0.0%
Subtotal				10,219	21.2%
Total Gross Emissions				48,213	100%

NON-INVENTORY CATEGORY	ACTIVITY	ACTIVITY LEVEL	UNIT	EMISSIONS (tCO ₂ e)
Avoided emissions from waste management	Solid waste - recycling	808	tonnes	-2,674
	Solid waste - composting	282	tonnes	-133
Total				-2,807
Refrigerants governed by Montreal Protocol	Refrigerants (e.g., R22)	189	kg	269
Total				319
Biogenic emissions	Macdonald shuttle, biodiesel	11,368	L	28
	Renewable natural gas	183,456	m ³	346
Total				375

B. Gross vs. Net Emissions

Figure 2 compares gross and net emissions without biogenic emissions.

Net carbon sequestration at the Gault Nature Reserve and Morgan Arboretum is estimated at 2,629 tCO₂e/year.³

As part of the McGill-Bayano Reforestation project in Panama,⁴ 16,500 trees were planted in 2022, and 28,000 trees were planted in 2020 and 2021. The *ex-ante* estimate of carbon sequestered by the first

³ Boushey, I. 2019. "Evaluation of Aboveground Forest Carbon Sequestration for Climate Change Mitigation Targets: A Case Study on McGill University Properties".

⁴ <https://www.mcgill.ca/sustainability/commitments/carbon-neutrality/mcgill-bayano-reforestation>

25,000 trees is 9,953 tCO₂e over 25 years including estimated mortality.⁵ As of 2022, we account for 925 tCO₂e of carbon offsets per year until 2040, our target year for carbon neutrality.

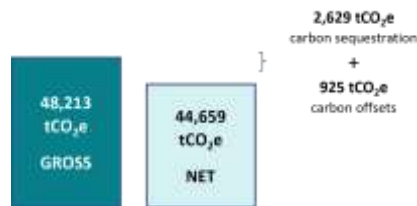


Figure 2. 2022 Gross vs. Net Emissions

C. Description of Changes in Emissions since 2021

2022 emissions continue to be anomalous given COVID-19-pandemic-related restrictions from Jan–May 2022. The main changes in 2022 emissions are the following:

- Scope 3 directly financed (University-related) air travel emissions rose by 765% (2,933 tCO₂e) from 2021 levels and fell by 4,778 tCO₂e (59%) from 2019 levels (pre-pandemic), due to pandemic-related travel restrictions and work-from-home orders from Jan–May 2022. Scope 3 commuting emissions increased by 1,445 tCO₂e (45%) in 2022 compared to 2021 levels and dropped by 2,523 tCO₂e (35%) from 2019 levels, due to work-from-home orders from Jan–May 2022 and the interim flexible work arrangement allowing for part-time remote work as of May 2022.
- Scope 1 natural gas consumption emissions rose by 6% (1,809 tCO₂e) from 2021 levels, as weather was colder on average in 2022 than in 2021, with 7% more heating degree days. Increased ventilation rates throughout 2022 to combat the transmission of COVID-19 resulted in an estimated increase in natural gas consumption of 500 to 1,500 tCO₂e. However, overall effects of increased ventilation were counteracted by recently implemented heat recovery projects.

D. Key Performance Indicators

Table 3 presents three key performance indicators (KPIs) that McGill reports to the Ministry of Education. Note that these include only building-related Scope 1 and 2 energy emissions.

Table 3. 2015 vs. 2022 Emissions KPIs for McGill

	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	% Change (2020–21 to 2021–22)	% Change (2015–16 to 2021–22)
Emissions/student enrolment <i>tCO₂e/FTE student</i>	1.12	1.02	1.00	1.02	1.00	0.90	0.93	3.2%	-17.1%
Emissions/gross area <i>tCO₂e/m²</i>	0.045	0.038	0.040	0.041	0.041	0.038	0.038	1.2%	-14.6%
Emissions/endowment <i>tCO₂e/\$M</i>	24.96	22.18	23.79	20.51	21.78	16.16	17.09	5.8%	-31.5%

⁵ Marchena, B., and Potvin, C. 2021. Bayano-McGill Carbon Offsetting Project Report 1.

E. Base Year vs. Current Emissions

We have achieved near continuous gross emission reductions since 2015, except in 2019. Figure 3 presents the annual gross and net emissions for 1990 and 2015–2022, as well as future targets. See the Detailed Appendix for differences in emissions per activity between 2015 and 2022.

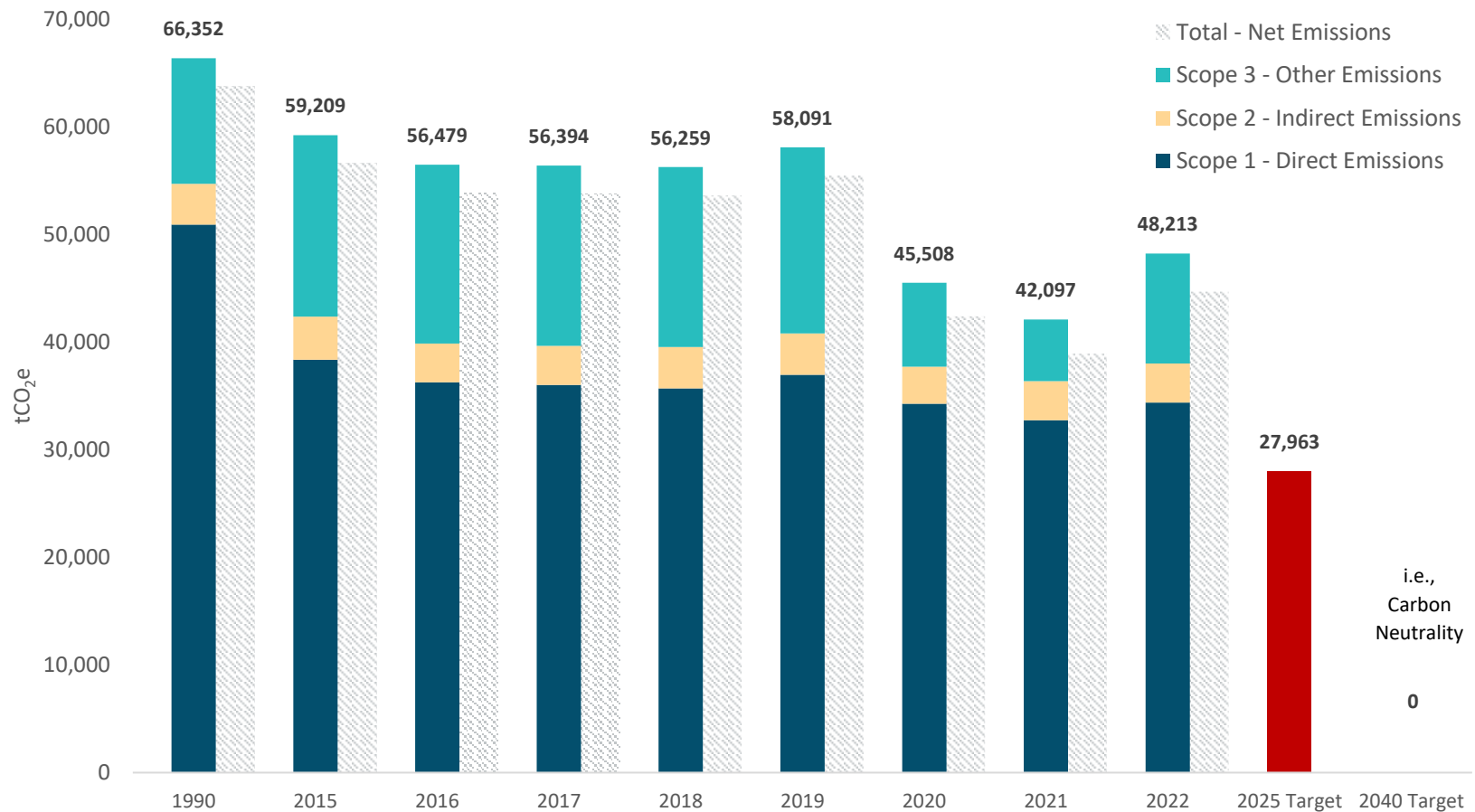


Figure 3. Emissions from 1990 to Present, and Intermediate and Long-Term Reduction Targets

Note: Net emissions account for carbon sequestration on forested McGill properties, including the Gault Nature Reserve and Morgan Arboretum, and carbon offsets purchased via the McGill-Bayano Reforestation Project