



Queen's
UNIVERSITY

Greenhouse Gas Inventory Report 2025

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SUMMARY

Queen's University in Kingston, Ontario, is committed to advancing the United Nations Sustainable Development Goals (SDGs), specifically addressing the University's role in climate change. As an institution for teaching and research, Queen's has an important and unique opportunity to tackle climate change issues by supporting the efforts of innovators and educating a future generation of decision makers.

In 2010, Queen's University signed the University and College Presidents' Climate Change Statement of Action for Canada, thereby committing to reduce greenhouse gas (GHG) emissions. As part of this agreement, Queen's is required to track and report all GHG emissions. This is the fifteenth annual published Greenhouse Gas Inventory Report, which summarizes Queen's Scope 1 & 2 emissions. These emissions are calculated in accordance with the World Resources Institute (WRI) GHG Protocol for Corporate Accounting standard.

In total, Queen's emitted 40,297 tCO₂e from January 1 to December 31, 2025 — an increase from 2024.

The Queen's Climate Action Plan (CAP) was developed to reduce the GHG emissions emitted by the University, with a goal of being carbon neutral by 2040. Additional milestones for 2020 and 2030 have been set to structure an achievable timeline for carbon neutrality. The CAP's target of 35% GHG reductions by 2020 was successfully met, and Queen's is now working towards the second milestone of a 70% reduction by 2030. This report provides a breakdown of the university's emissions in 2025, as well as an overview of Queen's plan for further emission reduction.



BACKGROUND INFORMATION

Scope of Emissions

The Greenhouse Gas Inventory Report reviews the overall emissions associated with the operations of Queen's University, including the direct (Scope 1) and indirect (Scope 2) emissions of all Queen's facilities and operations within the province of Ontario. This encompasses leased and owned buildings both on and off campus. Additionally, it excludes any satellite offices outside of Ontario and Bader College at Herstmonceux, England.

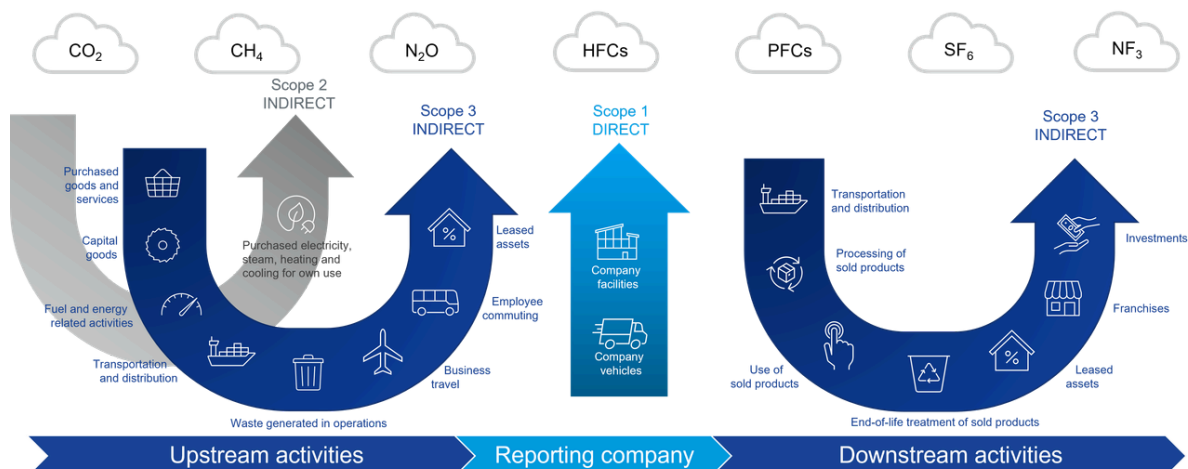
Scope 1 emissions include all emissions directly produced by the University, most of which are caused by local energy production to heat the campus. The main contributors to Scope 1 emissions include:

- Stationary combustion from the boilers, cogeneration plant, generators, furnaces, and kitchen equipment.
- Mobile combustion from various fleet vehicles and grounds maintenance equipment.
- Fugitive emissions from electrical switches, fire suppression equipment, lab chemicals, and refrigerants.

Scope 2 emissions include all indirect emissions associated with energy that the University purchases, including:

- Electricity consumption at main and west campuses as well as the Queen's Biological Station (QUBS).
- The electricity, heating, and cooling in all leased spaces.

Scope 3 emissions include all other indirect emissions and are comprised of 15 unique categories, such as commuting. Scope 3 emissions are not included in the scope of this report.



Source: https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporting-Standard_041613_2.pdf.

Method of Calculation

The quantification methods used to calculate GHG emissions for Queen's University were developed according to the WRI GHG Protocol for Corporate Accounting standard.

All fuel combustion and electricity consumption has been determined from invoice records and utility metering. These sources account for approximately 96% of Queen's GHG footprint. The remaining 4% is calculated based on estimations of non-metered sources such as fugitive releases from laboratory chemicals, refrigerant leakage, wood combustion and small fuel-consuming equipment.

Using emission factors, which are unique to each emission source, the raw data has been converted to metric tonnes of CO₂ equivalent emissions (tCO₂e). This allows for normalized comparison between different types of emissions sources.

The emission factors used in the calculations are based on national industry standards that tend to remain static for most fuels, with the exception of electricity. The grid emission factor used for electricity calculations fluctuates year to year depending on the Ontario electricity grid supply mix, and is published annually in Environment Canada's National Inventory Report. The Atmospheric Fund also provides estimates of the current year's grid emission factor, which is expected to change significantly in the coming years as more natural gas generation is added to Ontario's grid.

The data provided in this report was prepared by Queen's Facilities Energy & Sustainability Team. Any questions regarding the methods used to collect and calculate these values can be directed to sustain@queensu.ca.



2025 EMISSIONS OVERVIEW

Emissions Summary

Queen's University produced 31,789 tCO₂e Scope 1 and 8,508 tCO₂e Scope 2 emissions throughout 2025, summing to a total carbon footprint of 40,297 tCO₂e. To determine Queen's net carbon footprint, the portion of emissions associated with energy exported off-site to Kingston General Hospital (KGH) was excluded.

Over three quarters of Scope 1 emissions on campus come from the Central Heating Plant (CHP), which is owned and operated by Queen's. Natural gas boilers produce steam to heat buildings, and cogeneration turbines also produce electricity and steam during peak demand periods. In addition to serving Queen's Campus, the CHP also generates electricity and steam for KGH.

The total emissions produced by Queen's including exports to KGH in 2025 was 48,147 tCO₂e. KGH demand from the plant was responsible for approximately 20% of that total, therefore that portion was removed from Queen's Scope 1 emissions. A summary of Queen's emissions is shown below in Table 1, including emissions normalized by population and area.

tCO₂e is a metric tonne of carbon dioxide equivalents. This is a universal unit of measure that indicates the global warming potential (GWP) of each of the six greenhouse gases (CO₂, CH₄, N₂O, HFCs, PFCs, and SF₆) expressed in terms of the GWP of one unit of carbon dioxide. This enables the normalized summation of emissions from all GHGs.

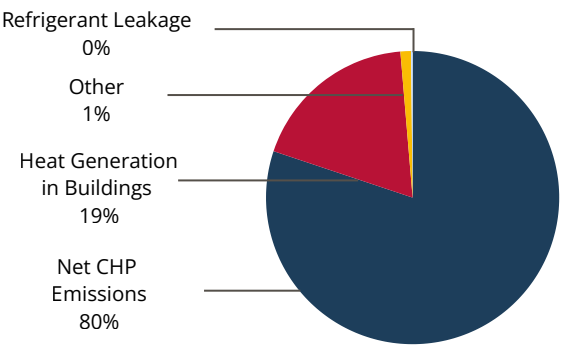
	Queen's Emissions (tCO ₂ e)
Scope 1	31,789
Scope 2	8,508
Total	40,297
Per Capita	1.11
Per 100 m ² Floor Space	5.22

Table 1: Summary of Queen's University's 2024 Scope 1 & 2 carbon emissions.

Emissions Breakdown by Scope

Scope 1 Emissions

Scope 1 emissions are those emitted on site due primarily to energy generation and unintentional chemical release. A source by source breakdown of Queen's Scope 1 emissions is shown in Table 2. The greatest contributors to these emissions are the Central Heating Plant (CHP), which uses natural gas boilers to heat the campus in the winter, and stand alone heat generation in buildings that are not connected to the CHP. The remaining emissions are created by fuel combustion from the campus vehicle fleet, laboratory chemicals, and wood combustion.



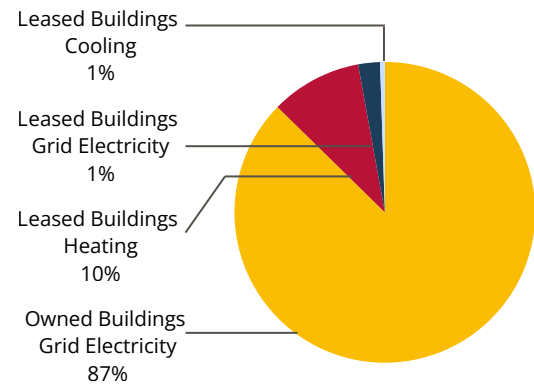
Scope 1 GHG Sources	Total Emissions (tCO ₂ e)
Net CHP Emissions	24,931
Natural Gas Use in Buildings	6,298
Refrigerant Leakage	235
Fuel Combustion in Equipment	258
Laboratory Chemicals	23
SF6 Leakage	17
Wood Combustion	28
Scope 1 Total	31,789

Table 2: Queen's Scope 1 emission source breakdown.

Scope 2 Emissions

Scope 2 emissions are indirectly produced by the University through electricity usage in Queen's owned and leased buildings. A source by source breakdown of Queen's Scope 2 emissions is shown in Table 3.

The quantity of emissions produced by a kWh of electricity from the grid is calculated as an annual grid emissions factor, representing an average based on all forms of electricity production contributing to the provincial grid.



Scope 2 GHG Sources	Total Emissions (tCO ₂ e)
Owned Buildings Grid Electricity	7,528
Leased Buildings Heating	197
Leased Buildings Grid Electricity	43
Leased Buildings Cooling	740
Scope 2 Total	8,508

Table 3: Queen's Scope 2 emission source breakdown.

Emissions Over Time

From 2008 to 2025, Queen's has reduced its total GHG emissions from 57,716 tCO₂e to 40,297 tCO₂e. Figure 1 shows a year over year breakdown of Queen's total Scope 1 & 2 emissions. In 2020, the University was successful in reaching its goal of 35% emissions reduction from the 2008 baseline. Following this achievement, the university has experienced slightly increased carbon emissions attributed to COVID-19 ventilation measures and the addition of new campus buildings. Emissions are being steadily reduced over time from the implementation of new electrification and decarbonization initiatives.

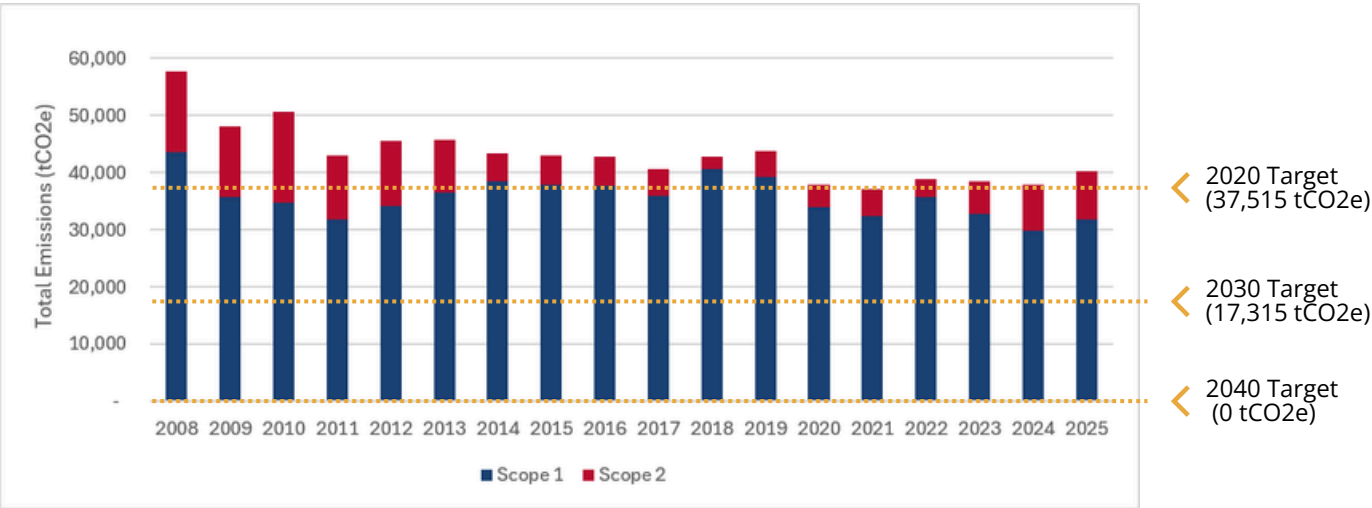


Figure 1: Queen's year over year Scope 1 & 2 GHG emissions and emission targets set in 2010.

Queen's observed higher total emissions in 2025 compared to 2024. Additionally, as shown in Figure 2, there was an increase from 4.85 tCO₂e/100 m² to 5.22 tCO₂e/100 m² from 2024 to 2025. This increase in emissions was driven by a more carbon-intensive electricity grid and colder winter conditions, which increased campus heating demand and associated emissions. Even with significant campus and student growth, overall emissions have still been trending downwards since 2008, resulting in a 44% reduction in emissions per building area.

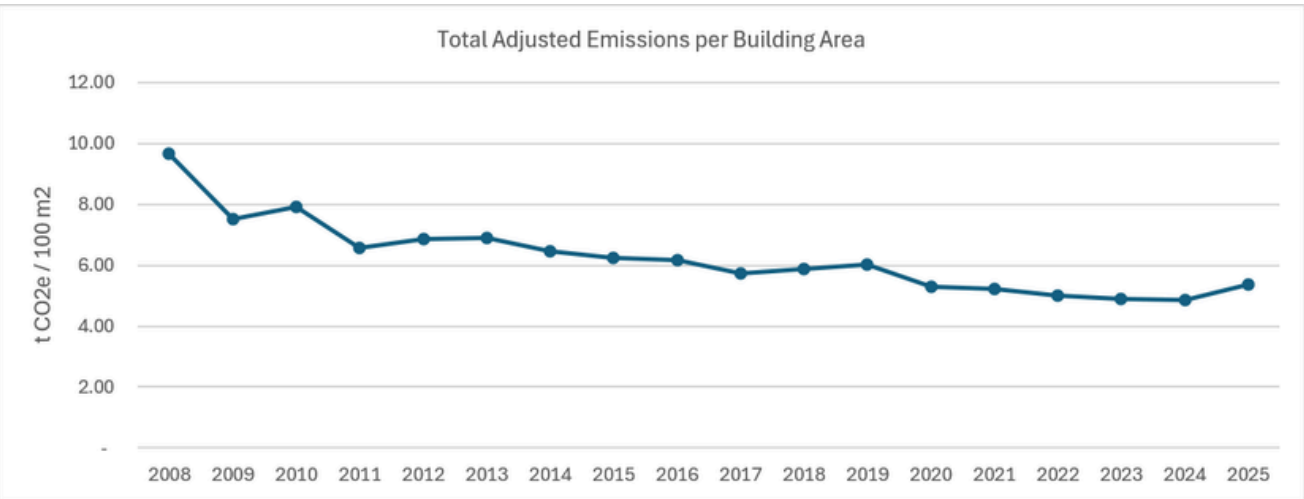


Figure 2: Queen's year over year total GHG Emissions per 100 m² of campus building floor space.

Emissions Over Time

Despite the increase in total emissions, Kingston, ON, experienced a colder winter in 2025, resulting in a total of 4023 heating degree days (HDD). Figure 3 below shows Scope 1 emissions associated with heating buildings across campus normalized by HDD. As shown, Scope 1 emissions per HDD decreased in 2025, indicating that campus heating emissions decreased relative to heating demand. This suggests that the increase in total emissions was largely driven by the colder weather and higher heating demand.

Heating degree days are a measure of heating demand based on the difference between the daily average outdoor temperature and an 18°C base temperature. Higher HDD values indicate colder conditions and greater heating requirements.

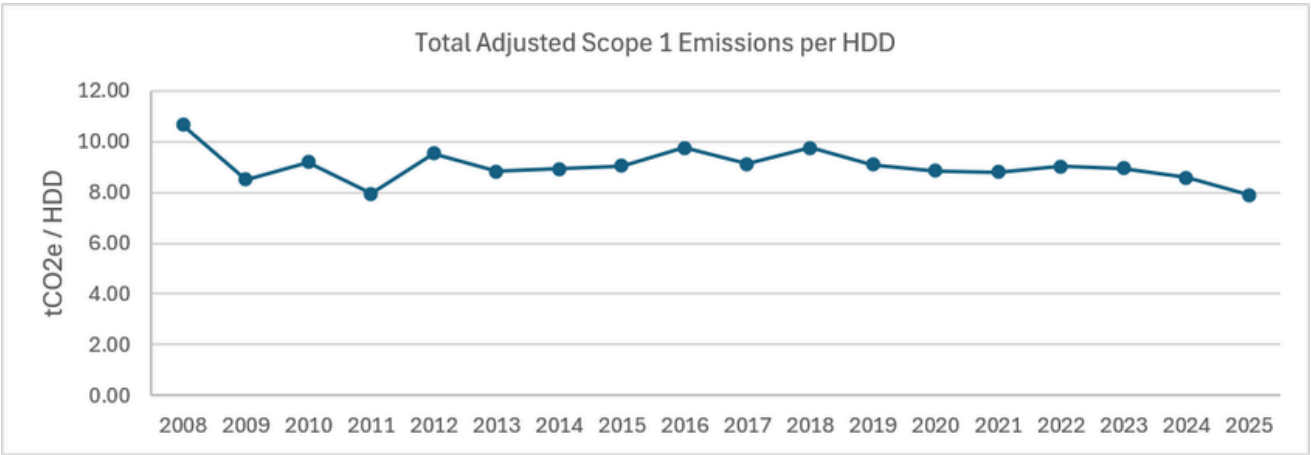


Figure 3: Queen's year over year total Scope 1 GHG Emissions per HDD.



QUEEN'S CLIMATE ACTION PLAN

Summary

Queen's Climate Action Plan was established in 2016 to align with the goals set out by the University and College Presidents' Climate Change Statement of Action for Canada, signed in 2010. The three areas of focus for the original plan included the reduction of point-of-use consumption, improving efficiency and fuels at the CHP, and actualizing the use of renewable energy generation. Queen's reached the goal of achieving a 35% reduction in emissions by 2020. Table 4 outlines the targets set in the Climate Action Plan.

Year	Target Emission Reduction	Actual Emission Reduction
2020	35%	35%
2030	70%	TBD
2040	100%	TBD

Table 4: Emission reduction target milestones.

Some projects have already significantly reduced Queen's emissions, including the West Campus energy project which eliminated heat losses by severing the 2.5 km steam line to West Campus. Installing a new hot water distribution system on West Campus allowed Queen's to save 1,500 tCO₂e annually from the decommissioning of that steam line. Since then, Queen's first large geothermal heating system at 355 King St. West has demonstrated the feasibility of efficient electrification of heating systems.

To continue improving the energy efficiency of Queen's buildings, there are multiple projects and policies that have been implemented. Updates to the Queen's Building Standard provide guidelines to ensure sustainability is considered for new projects and builds, eliminating fossil fuels from new designs, requiring efficient building envelopes, and heat recovery in ventilation systems.

Additionally, all new buildings aim to be Leadership in Energy and Environmental Design (LEED) Gold.

As noted in the Climate Action Plan, updating the district steam system will be a focus to reduce emissions, as heating on campus from the CHP and other natural gas boilers currently makes up 77.5% of all emissions.

Given the age and history of many buildings at Queen's, retrofitting and improving building envelopes and mechanical systems will be important for reducing carbon emissions. Minimizing load will help enable electrification, as well as lower the cost of conversion to geothermal heating by reducing the required size of the system. Upgrading building controls, including scheduling and occupancy-based HVAC, will be a primary focus moving forward to reduce energy consumption and cost — the most economical energy is the energy you do not use.

Emission Reduction Strategies

Queen's has eliminated over a third of its emissions since 2008 through a variety of clean energy projects and building upgrades. With parts of the main campus dating back as far as the mid-1800's, many of the buildings have benefited from envelope renovations such as improved insulation and windows, as well as occupancy-based controls for lighting and ventilation. Some of Queen's recent and upcoming carbon-reducing projects are listed below.



Existing Building Recommissioning - 2025

A building recommissioning pilot project is currently underway to enhance energy efficiency and occupant comfort in existing buildings. The project involves conducting building functional testing to identify opportunities for improved energy performance. Findings from the investigation are being used to inform modifications such as adjusting control programs, adding sensors, and optimizing equipment scheduling. These improvements aim to reduce energy consumption and support the reduction of Queen's Scope 1 and Scope 2 greenhouse gas emissions.

Replacement of 8,000 Fluorescent Fixtures with LED - 2022 to 2025

Over the last few years, a major project to upgrade 8,000 fluorescent fixtures to energy efficient LED's has been completed in 20 buildings across campus. The resulting electricity savings will reduce Queen's Scope 2 emissions, with the exact reduction amount varying depending on the annual Ontario grid emissions factor. As Ontario's grid emissions factor is projected to rise in the near future, the quantity of emissions avoided each year is actually increasing.

Installation of Electric Vehicle Chargers - 2025

Queen's is increasing its electric vehicle charger capacity to support sustainable transportation and help reduce Queen's Scope 3 emissions. In 2025, Queen's began a project to add 16 chargers at West Campus that will be accessible to students, staff, and visitors.

FINAL REMARKS

Queen's University ranked 6th in the world and 1st in Canada for the 2025 Times Higher Education Impact Rankings on the SDGs, remaining in the top 10 for the fifth consecutive year.

The results of the carbon reductions over the last 15 years, combined with our SDG results, showcase the university's commitment to an ongoing strategic approach to sustainability across a diverse range of the SDGs. For more information on the university's strategic plans, please visit the Principal's Office website.

www.queensu.ca/principal/

