

UNIVERSITY OF SASKATCHEWAN

# 2019

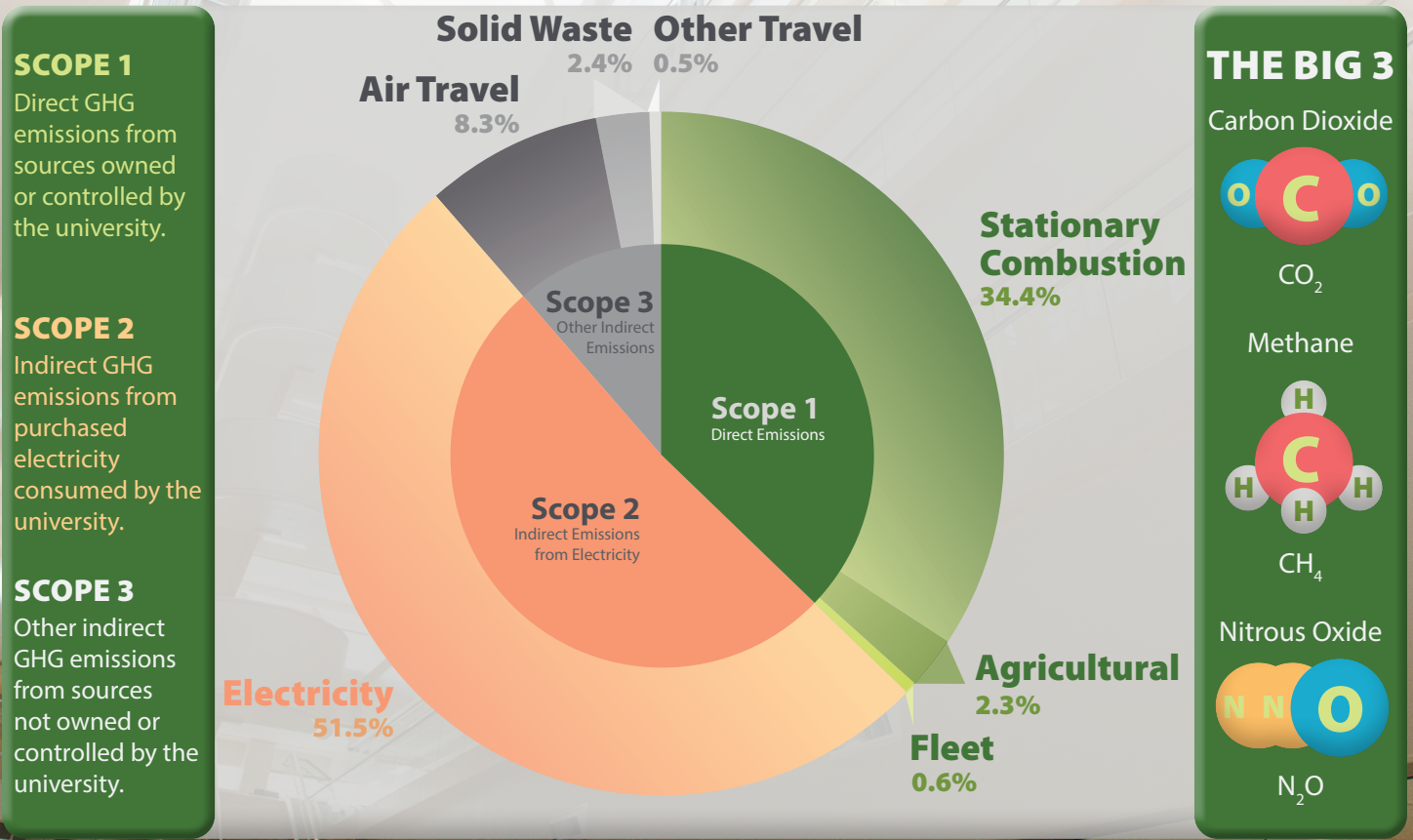
GREENHOUSE GAS EMISSIONS INVENTORY



UNIVERSITY OF  
SASKATCHEWAN

| [sustainability.usask.ca](http://sustainability.usask.ca)

# Greenhouse Gas (GHG) Emissions AT A GLANCE



## THE BETTER BUILDINGS BUFFER

From 2006-2019,  
total university  
GHG emissions

**INCREASED**  
**7.8%**



while emissions  
per square metre  
of building space

**DECREASED**  
**13%**



## TRANSLATION:

More efficient and "greener" buildings have helped to lessen the increase of emissions despite a growing campus and student population

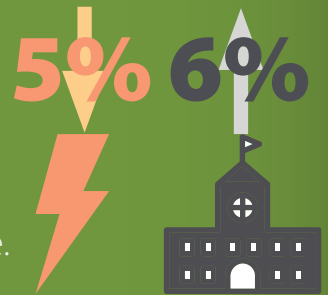
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Consumed electricity is still the largest source of emissions, accounting for

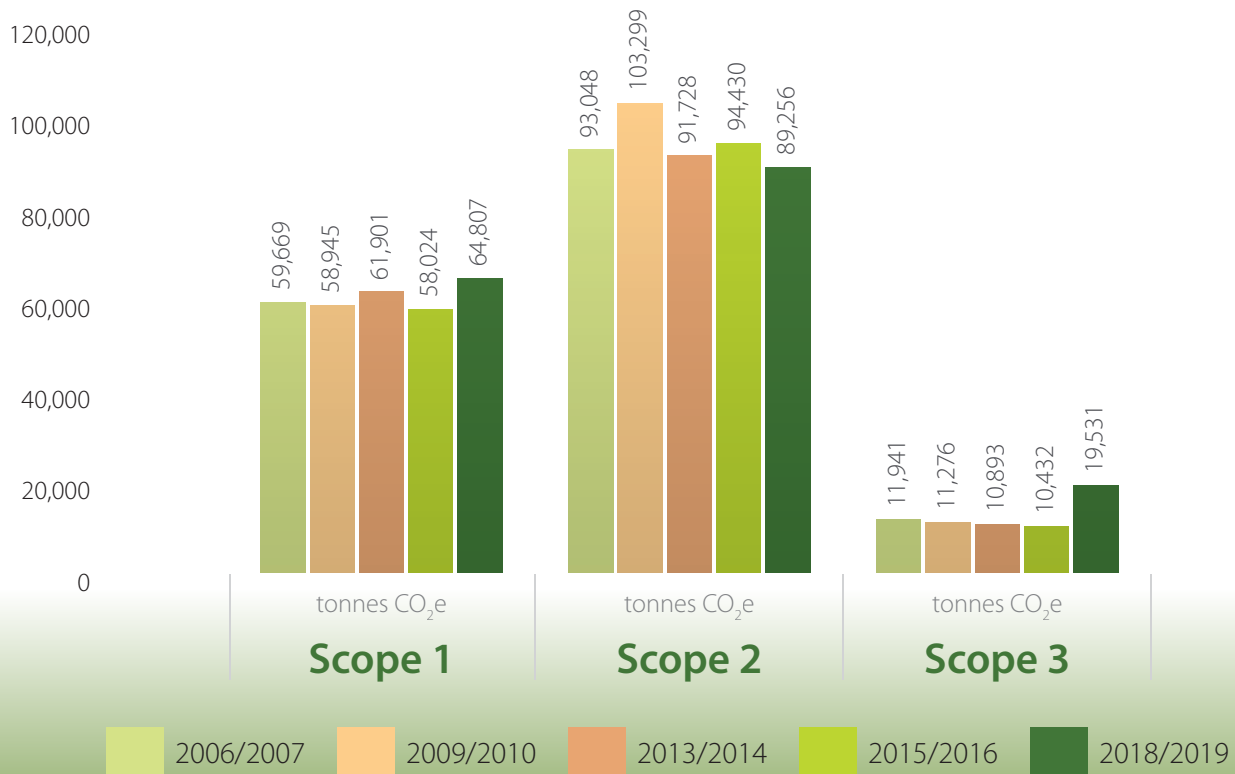
**52%**  
of all emissions

2018/2019 was the first recorded year that saw reductions in electricity consumption while still increasing building space.



## Through the Years

Total Emissions by Scope



# Introduction

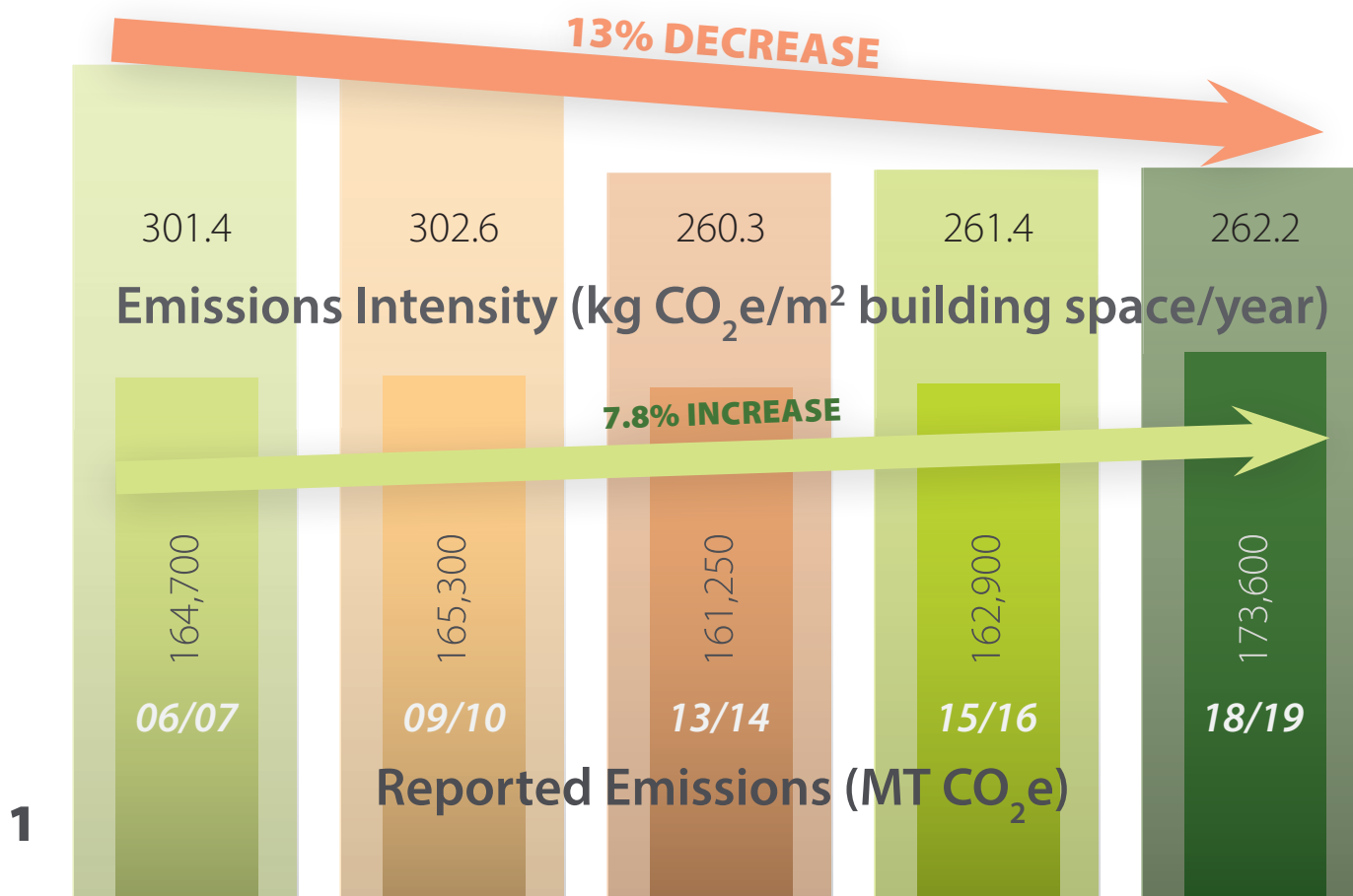
The University of Saskatchewan (USask) has completed five greenhouse gas (GHG) emissions inventories going back to a selected baseline academic/fiscal year in 2006/2007. These catalogue GHG emissions related to facilities and operations owned or directly controlled by the university.

The USask 2012 Climate Action Plan has a stated goal to reduce GHG emissions by 20% below the fiscal year 2006/2007 level by year 2020, which means a target GHG emissions level of 128,800 metric tonnes carbon-dioxide equivalent (MT CO<sub>2</sub>e). The target was set as one of the university's commitments through the University and College Presidents' Climate Change (UCPCC) Statement of Action for Canada. The GHG emissions inventory tracks the amount and sources of emissions produced by the university as accurately as possible, with regular reports published to measure performance against our reduction target. Annual GHG emissions reporting is required by Environment and Climate Change Canada for any

facility that emits more than 50,000 MT CO<sub>2</sub>e of direct emissions (referred to as Scope 1), and is to be submitted by June 1 on a calendar-year basis – this applies only to on-site combustion of natural gas and liquid fuels, and is separate from this report.

## Better Buildings Pull Their Weight

From 2006 - 2019, the university's reported emissions increased by 7.8%; however, its emissions intensity—a measure of emissions per m<sup>2</sup> of building space—decreased 13%. Greener buildings make for less overall intensity, but more buildings will always mean more emissions.

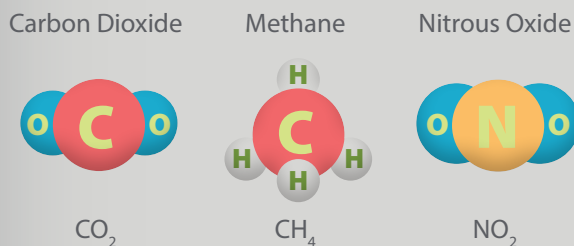


# Methodology

## Frequently Asked Questions

### What is CO<sub>2</sub>e and why do we use it?

Carbon-dioxide equivalent (CO<sub>2</sub>e) is a standard measurement when discussing GHG emissions. While carbon-dioxide is the most common of the greenhouse gases, it is not the only one of concern. Others such as methane (CH<sub>4</sub>) and nitrous-oxide (NO<sub>2</sub>) contribute to the same warming effects in the earth's atmosphere.



Trying to account for all of these other compounds in reporting would be unnecessarily difficult and complicated. Instead, CO<sub>2</sub>e is used to describe the concentration of CO<sub>2</sub> that would cause the same effects as the other compound in question. This allows for uniform and simplified reporting of GHG emissions while still accounting for the diversity of compounds of concern in the atmosphere.

The inventory was determined by using the Clean Air-Cool Planet Campus Carbon Calculator (version 6.85) with emissions reported in metric tonnes carbon-dioxide equivalent (MT CO<sub>2</sub>e). This same methodology was used for all reporting years shown in the summary table above. Some corrections were made to GHG emissions totals previously reported, including for the baseline fiscal year 2006/2007. The target GHG emissions level of 128,800 MT CO<sub>2</sub>e was set assuming 2006/2007 baseline emissions of 161,000 MT CO<sub>2</sub>e, which was later adjusted to 164,700 MT CO<sub>2</sub>e.

Despite this correction to the reported 2006/2007 GHG emissions level, the UCPCC target GHG emissions level remains unchanged at 128,800 MT CO<sub>2</sub>e.

GHG emissions are categorized into three broad scopes: Scope 1 are direct GHG emissions that occur from sources owned or controlled by the university, and includes natural gas and liquid fuel consumption for buildings and fleet operations, and agricultural emissions from animals and fertilizer; Scope 2 are indirect GHG emissions from purchased electricity consumed by the university, and; Scope 3 emissions are a result of the activities of the university but occur from sources that are not owned or controlled by the university, and include business travel for faculty and staff, as well as solid waste disposal from the university in local landfills.

The university produces steam for building heating, and sells a portion (about 30%) to external customers. Emissions from steam generated on-site are Scope 1, and are included in the inventory whether used by the campus or sold. The university also purchases generated electricity from SaskPower not only for internal consumption, but also for resale to external customers. Indirect emissions from the generation of purchased electricity consumed by the university are Scope 2. Accordingly, the emissions from the sold electricity do not form part of our inventory.

# Results & Findings

The total of all GHG emissions for the fiscal year 2018/2019 was 173,600 MT CO<sub>2</sub>e, an increase of 7.8% from the baseline fiscal year 2006/2007. Figure 1 shows the overall Scope 1, 2 and 3 emissions.

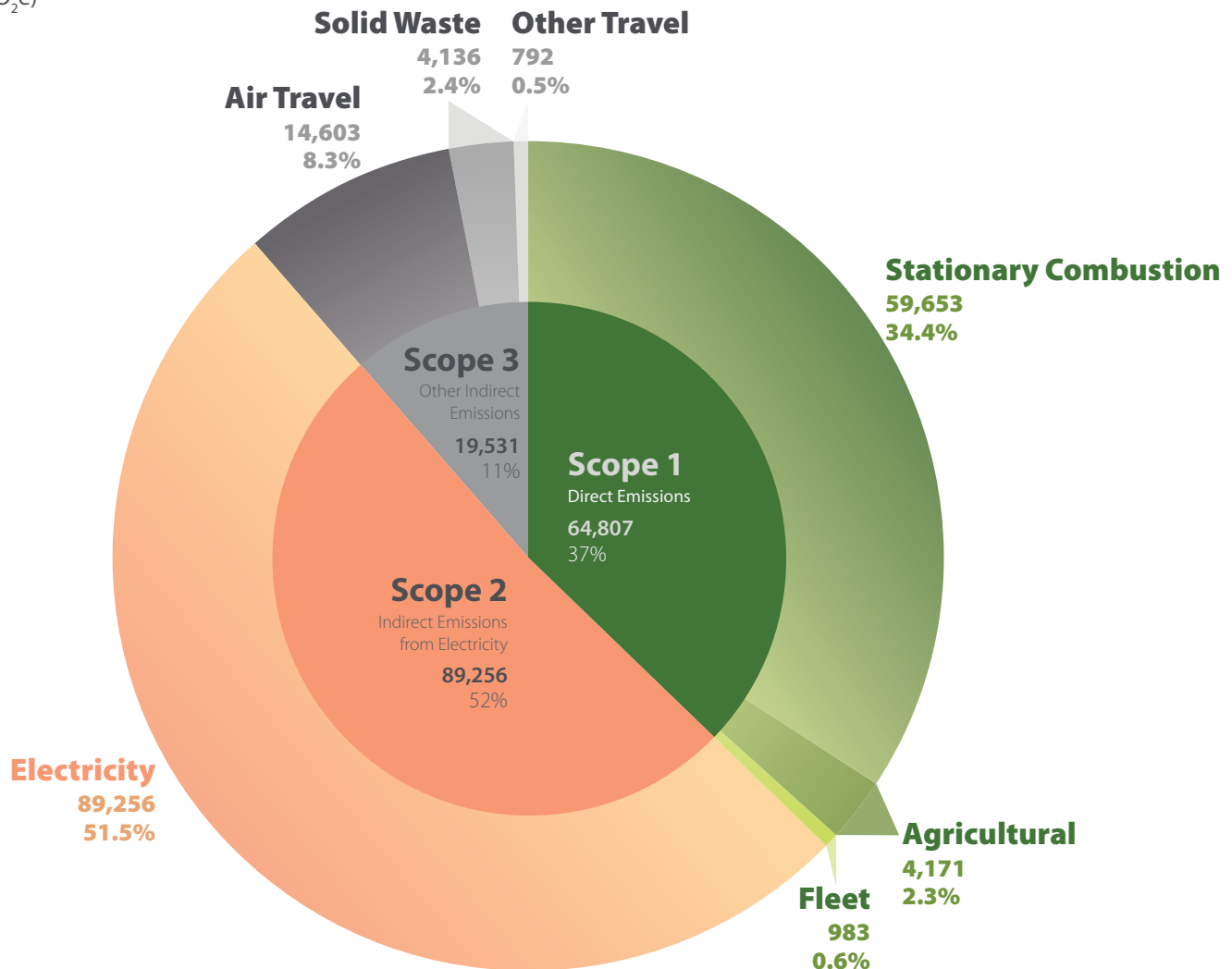
Figure 2 shows the growth of the university across several metrics since the baseline fiscal year 2006/2007, in terms of building area and student enrollment. The majority of GHG emissions (85% to 90%, depending on the year) are directly related to energy consumption in buildings, and therefore as the university grows the effort needed to reduce energy consumption and GHG emissions must be proportionately increased.

## Scope 1 Emissions

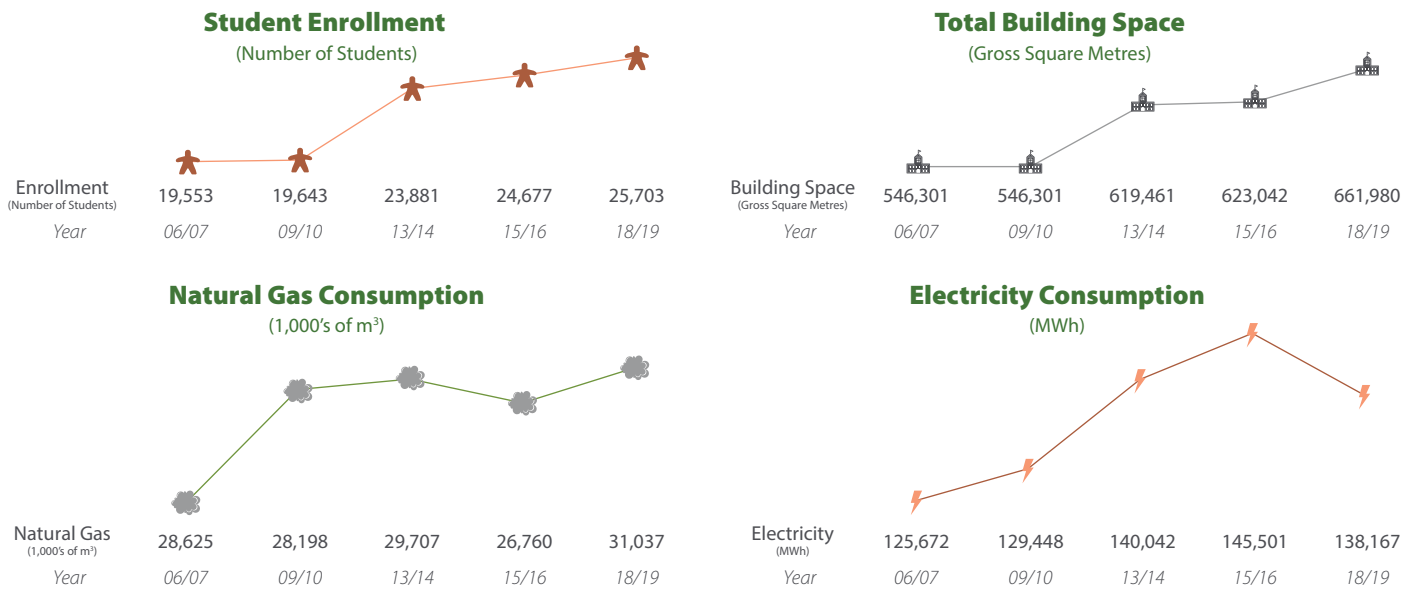
The university's Scope 1 emissions—including natural gas, agriculture, and fuel emissions—and natural gas consumption can be seen in Figure 3. The majority of Scope 1 emissions are from natural gas consumption for building heating. Energy consumption for building heating will change with outside temperature measured as annual heating degree-days. Heating degree-days (HDD) are the number of days that the outside temperature is below a base temperature of 18°C (below which most buildings require heating), multiplied by the average number of degrees away from the base temperature.

**Figure 1: Greenhouse Gas Emissions by Scope**

(MT CO<sub>2</sub>e)

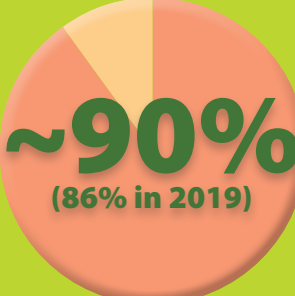


**Figure 2: USask Growth Metrics**



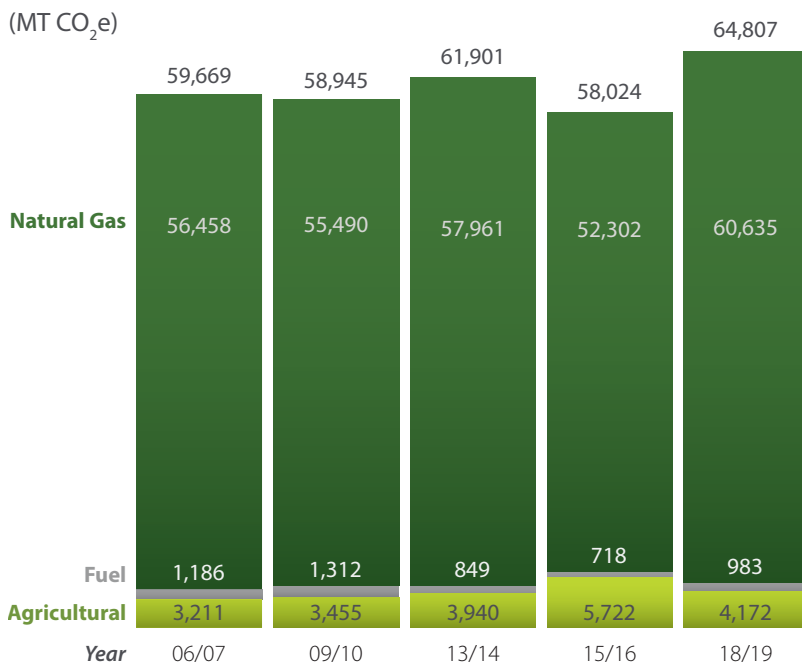
For Saskatoon and area, the number of HDD in a normal year is 5,700, and happens to be the same as for the calendar year 2018. The projected natural gas use intensity is also shown in Figure 4 normalized for 5,700 HDD, as what might have occurred if each year experienced the same number of HDD at 5,700. HDD are recorded on a calendar-year basis and therefore do not align with the university's fiscal year of May 1 to April 30 of the following year. Still, the data shows a general decline from the baseline year for natural gas use intensity (except for 2009/2010), with the best building energy performance occurring in 2018/2019.

## Mo' Space, Mo' Problems

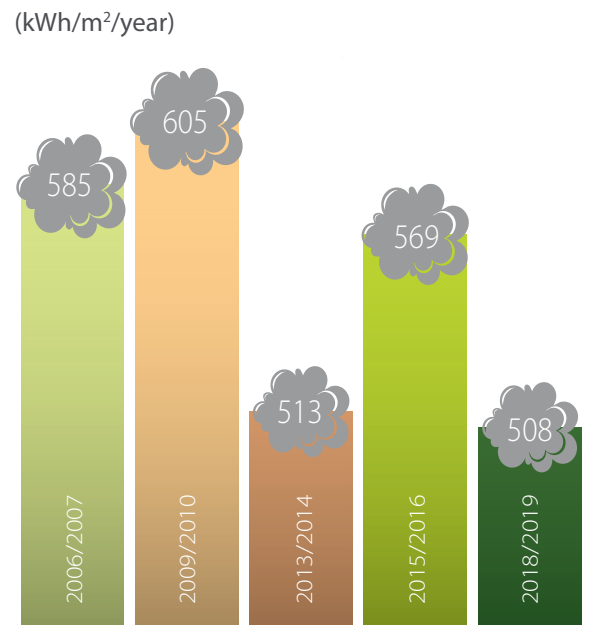


of GHG emissions are directly related to energy consumption in buildings. As the university grows in floor space, it will need to increase its efforts to reduce energy use.

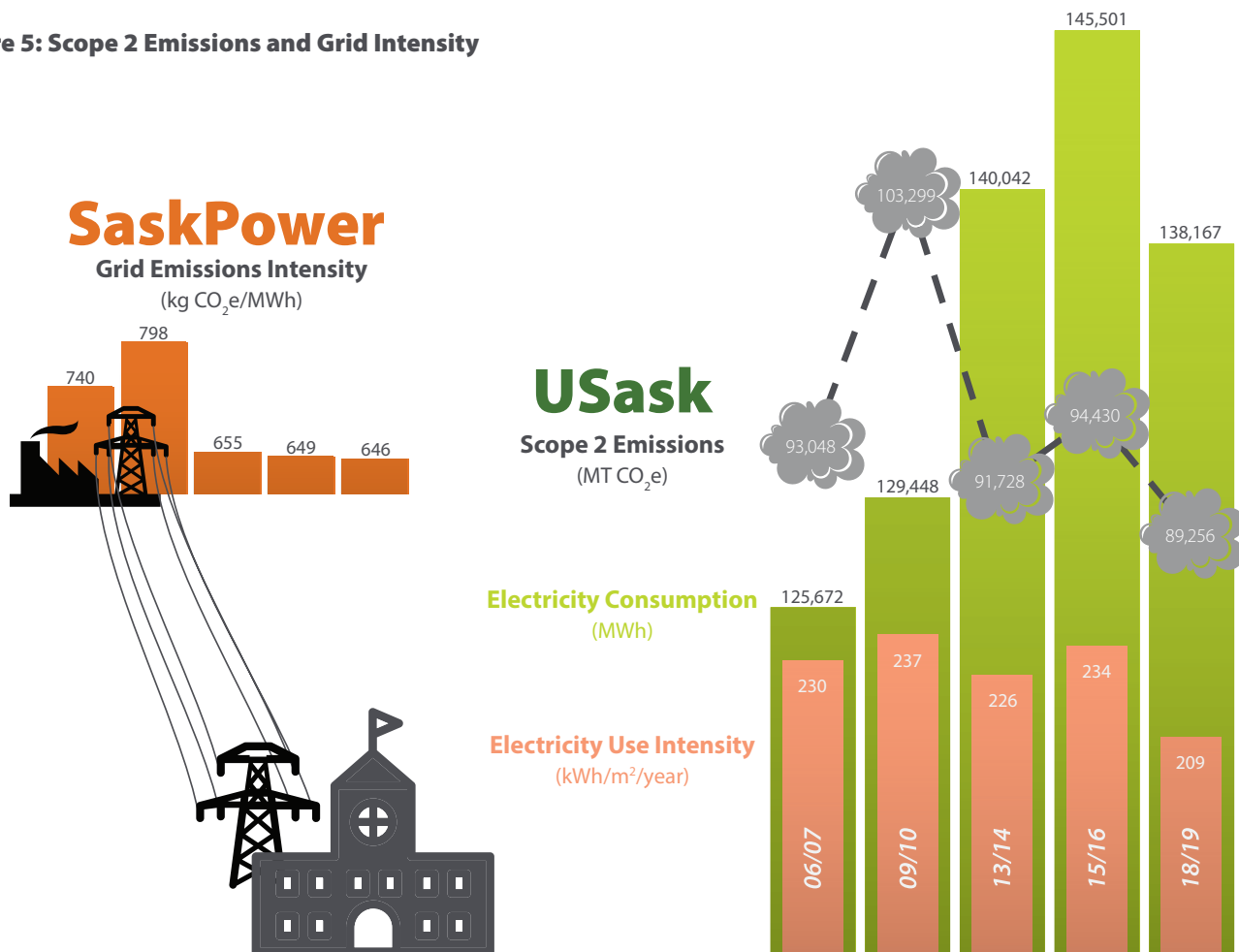
**Figure 3: Scope 1 Emissions & Natural Gas Consumption**



**Figure 4: Normalized Natural Gas Use Intensity**



**Figure 5: Scope 2 Emissions and Grid Intensity**



## Scope 2 Emissions

Figure 5 shows the Scope 2 emissions from electricity consumption, the majority of which occurs in buildings to operate heating, ventilation, and air conditioning systems and other types of mechanical equipment, and the rest is for lighting and plug loads in classrooms and common areas, laboratories, and offices. While a significant portion of the electricity consumption is used to operate building heating and cooling systems, there is not a strong relationship showing dependence on local weather conditions such as heating and cooling degree-days. Scope 2

emissions and electricity use intensity are both at their lowest reported level, even with an increase in overall building space for the university.

## Scope 3 Emissions

Table 6 shows Scope 3 emissions, the majority of which are from air travel for faculty and staff. During the fiscal year 2018/2019 over 6,600 return trips were taken to various destinations totaling approximately 43.7 million kilometres of air travel. Air travel results in significant greenhouse gas emissions of approximately 1 MT CO<sub>2</sub>e per passenger for every 3,000 kilometres travelled (such as one return trip from Saskatoon to Vancouver). Due to a significant increase in the amount of reported air travel, our Scope 3 emissions are at their highest reported level, and have increased 62% from the baseline fiscal year in 2006/2007. This is likely due to a suspected error in previous reporting years, which under-reported previous Scope 3 emissions.

**Table 6: Scope 3 and Air Travel Emissions**

	06/07	09/10	13/14	15/16	18/19
<b>Scope 3 Emissions</b> (MT CO <sub>2</sub> e)	11,941	11,276	10,893	10,431	19,531
<b>Air Travel</b> (millions of kilometres)	21.5	22.6	27.4	17.4	43.7
<b>Air Travel Emissions</b> (MT CO <sub>2</sub> e)	8,614	7,537	6,376	5,805	14,603



# Climate Action Planning

USask developed a Climate Action Plan in 2012 from the recommendations of more than thirty (30) individuals representing stakeholder groups from across campus. Five subcommittees reviewed, evaluated, developed and refined strategies and initiatives to help the university meet its GHG emissions reduction target. At the time the plan was developed, business as usual emissions – that is, without mitigation efforts – were projected to grow to 219,000 MT CO<sub>2</sub>e by 2020 with new building space.

USask’s target GHG emissions level was set at 128,800 MT CO<sub>2</sub>e. With 2018/2019 fiscal year emissions levels at 173,600 MT CO<sub>2</sub>e—a 7.8% increase above the baseline emissions in 2006/2007 of 164,700 MT CO<sub>2</sub>e—USask will not meet its target by 2020. A plan for consideration has been developed to meet

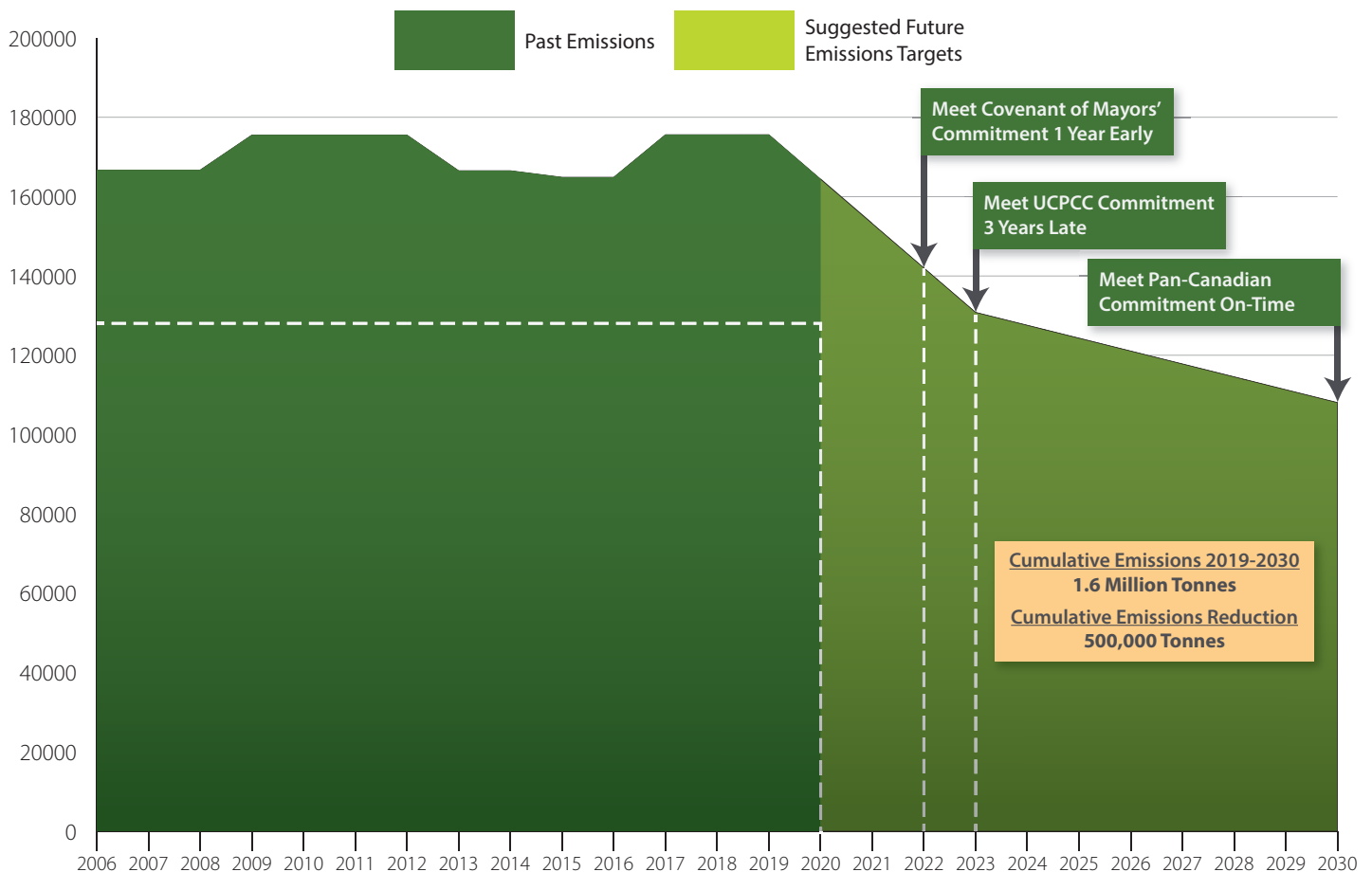
this target by the year 2023, three years later than originally committed to.

Governments at all levels have made commitments to take action on climate change by reducing GHG emissions. The Paris Agreement, ratified by 185 countries, came into force on November 4, 2016 with a central aim to strengthen the global response to climate change by keeping the global temperature rise this century to well below 2 degrees Celsius (°C) above pre-industrial levels and to pursue efforts to limit the temperature increase even lower to 1.5 °C.

The federal government’s response was to establish the Pan-Canadian Framework on Clean Growth and Climate Change. The framework was signed by all provinces and territories except Saskatchewan and

**Figure 7: USask GHG Emissions 2019-2030**

(MT CO<sub>2</sub>e)

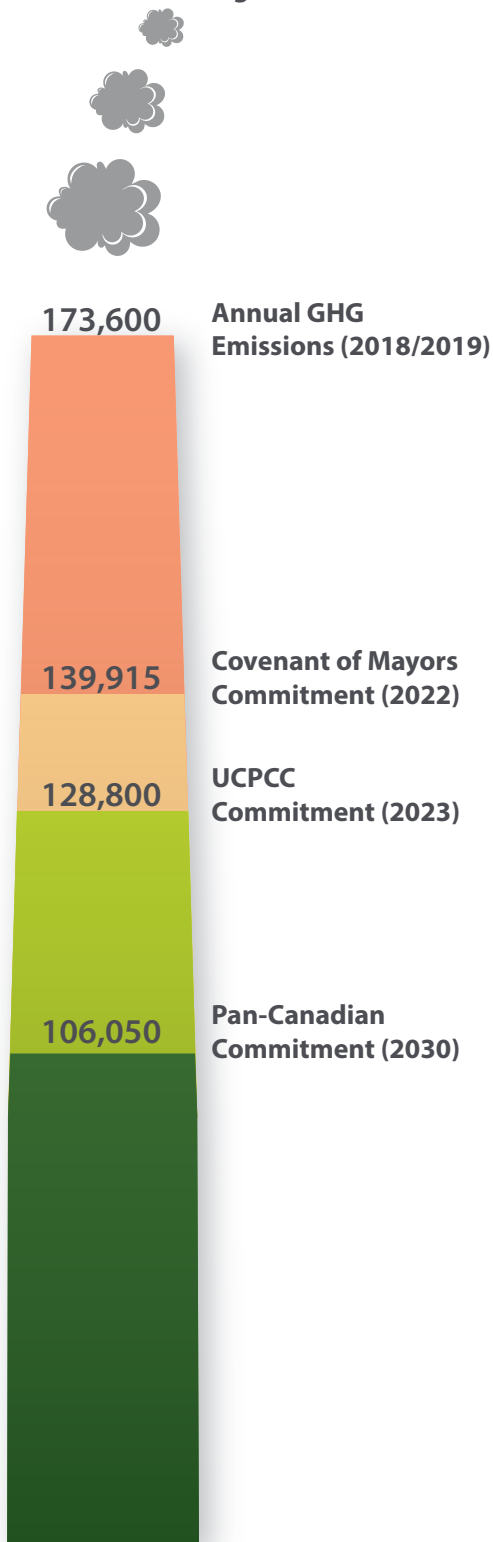


Manitoba, and is a commitment to take ambitious action in support of meeting or exceeding Canada's 2030 target of a 30 percent reduction below 2005 levels of GHG emissions.

The Government of Saskatchewan released its Prairie Resilience climate change strategy in December, 2017, which outlined multiple commitments across five areas designed to make Saskatchewan more resilient to the climatic, economic and policy impacts of climate change. The cumulative measures would reduce

**Figure 8: USask Emissions Targets**

(MT CO<sub>2</sub>e)



emissions by 16% from 2015 levels by 2030, but do not commit municipalities, universities, schools and hospitals (sometimes referred to as the MUSH sector) to reduce their GHG emissions.

The City of Saskatoon is signatory to the Global Covenant of Mayors for Climate and Energy, and is a commitment to join over 9,000 cities from 132 countries to take voluntary action to combat climate change. Through this commitment, Saskatoon's target is to reduce community emissions 15% below 2014 levels by 2023, and 80% by 2050.

Figure 7 (previous page) shows a projection of our GHG emissions should we adopt the emissions reduction efforts recommended by the Office of Sustainability. These projections would meet our 20% reduction commitment by 2023, and also meet the Covenant of Mayors and Pan-Canadian targets on time or earlier. Figure 8 lists the corresponding GHG Emissions reduction targets through 2030.

Comprehensive strategies and initiatives were developed in the 2012 Climate Action Plan across three broad areas (Figure 9), including:

1. Education, Research & Community Engagement;
2. GHG Emissions Mitigation; and
3. a Campus Sustainability Revolving Fund.

Some examples of these strategies/initiatives include:

### Education, Research & Community Engagement

- a. A *Campus Living Lab* program that brings together students, faculty and staff to work collaboratively on applied research projects involving campus operations and activities to address sustainability issues and challenges.
- b. *Energy Awareness Training* for students, faculty, researchers, laboratory staff, and custodians.

### GHG Emissions Mitigation

- a. *Retro-Commissioning* of heating, ventilation, and air conditioning to ensure equipment and systems are operating at peak efficiency.
- b. *Lighting Retrofits* to reduce energy consumption when spaces are unoccupied, and

**Figure 9: Climate Action Plan Strategies and Initiatives**



implement a program to retrofit lighting using more efficient lighting technologies.

- c. *Energy Supply* strategies to implement clean energy solutions for the university.
- d. *Business Travel* to be processed through a central system to track emissions more readily, and implement alternatives such as video conferencing in-lieu of travel.
- e. *University Fleet* to consider more sustainable vehicles for fleet renewal.
- f. *Composting Strategy* for organic waste.

## Sustainability Revolving Fund

Implementation of a consistent and available source of funding for climate action and sustainability-related projects. Seed funding is set aside to finance projects resulting in quantifiable monetary savings with a return on investment. Once the initial funding has been repaid, additional savings are re-invested to fund other projects. Some examples of projects that have received funding are:

- a. Freezer Rebate program
- b. John Mitchell Building Solar Array, and Health Sciences Solar Heating
- c. Student Employment and Career Centre Meet-Ups to create dialogue around the United Nations 17 Sustainable Development Goals

In addition to the strategies and initiatives listed, USask already has five (5) small-scale solar installations on campus that contribute to a cleaner energy supply. Additional opportunities are being considered to add more solar in the future. Current installations include:

- A 24-Kilowatt adjustable tilt array of photovoltaic (electric) panels at the Horticulture Science Field Research Facility along 14th Street East, just north of Greystone Park.
- A student-led demonstration project featuring a 5-Kilowatt adjustable tilt array of photovoltaic panels near the John Mitchell Building.
- Three solar hot-water heating arrays on the roofs of the Aspen Hall and Spruce Hall student residence buildings, and on the roof of the Health Sciences E-Wing Building.

While these strategies and initiatives have helped lower the average emissions per square-metre of building space per year, as USask continues to grow, a much greater effort will be required to actually lower the overall GHG emissions of the university.

USask is investigating other projects and initiatives in the coming years to ensure that future targets are met.



For more information, please contact the  
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To learn more about campus  
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