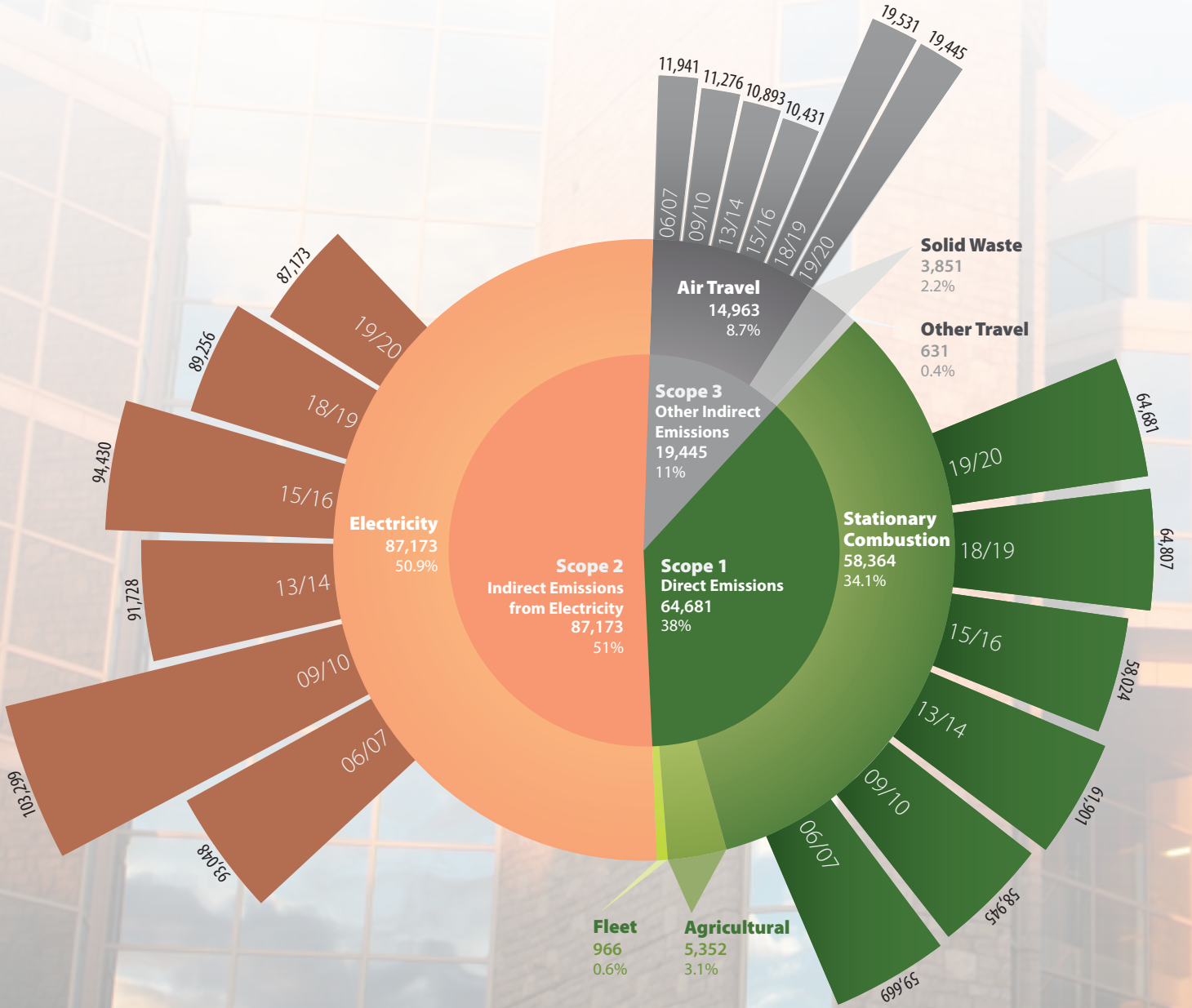
UNIVERSITY OF SASKATCHEWAN | sustainability.usask.ca

Greenhouse Gas (GHG) Emissions

AT A GLANCE



GHG EMISSION SCOPES

SCOPE 1

Direct GHG emissions from sources owned or controlled by the university.

SCOPE 2

Indirect GHG emissions from purchased electricity consumed by the university.

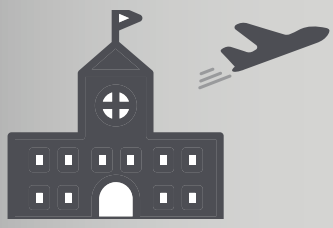
SCOPE 3

Other indirect GHG emissions from sources not owned or controlled by the university.

2020: LOOKING AT THE ABC'S

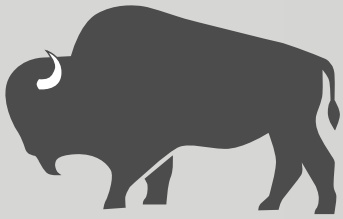
Air Travel

2019/2020 was another record year for faculty and staff air travel, with almost 6,000 trips covering 44.8 million km and emitting nearly 15,000 tonnes CO_2e.



Bison

This was the first year USask had to count bison in its inventory with the new herd supporting world class research here on the USask main campus..



COVID-19

The global COVID-19 pandemic resulted in a shutdown of campus from March 19 onward, which made for a 1,000 tonne CO_2e decline in electricity consumption.

Consumed electricity is still the largest source of emissions, accounting for **51%** of all emissions

~85% of GHG emissions are directly related to energy consumption in buildings.

$1.5 million in funding has been committed through the Sustainability Revolving Fund.

Since 2006, greener buildings have allowed to USask to decrease its overall emissions intensity by **14%**

Table of Contents

Introduction

The University of Saskatchewan (USask) has completed six greenhouse gas (GHG) emissions inventories going back to a selected baseline academic/fiscal year in 2006/2007. The inventories 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_2e). 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.

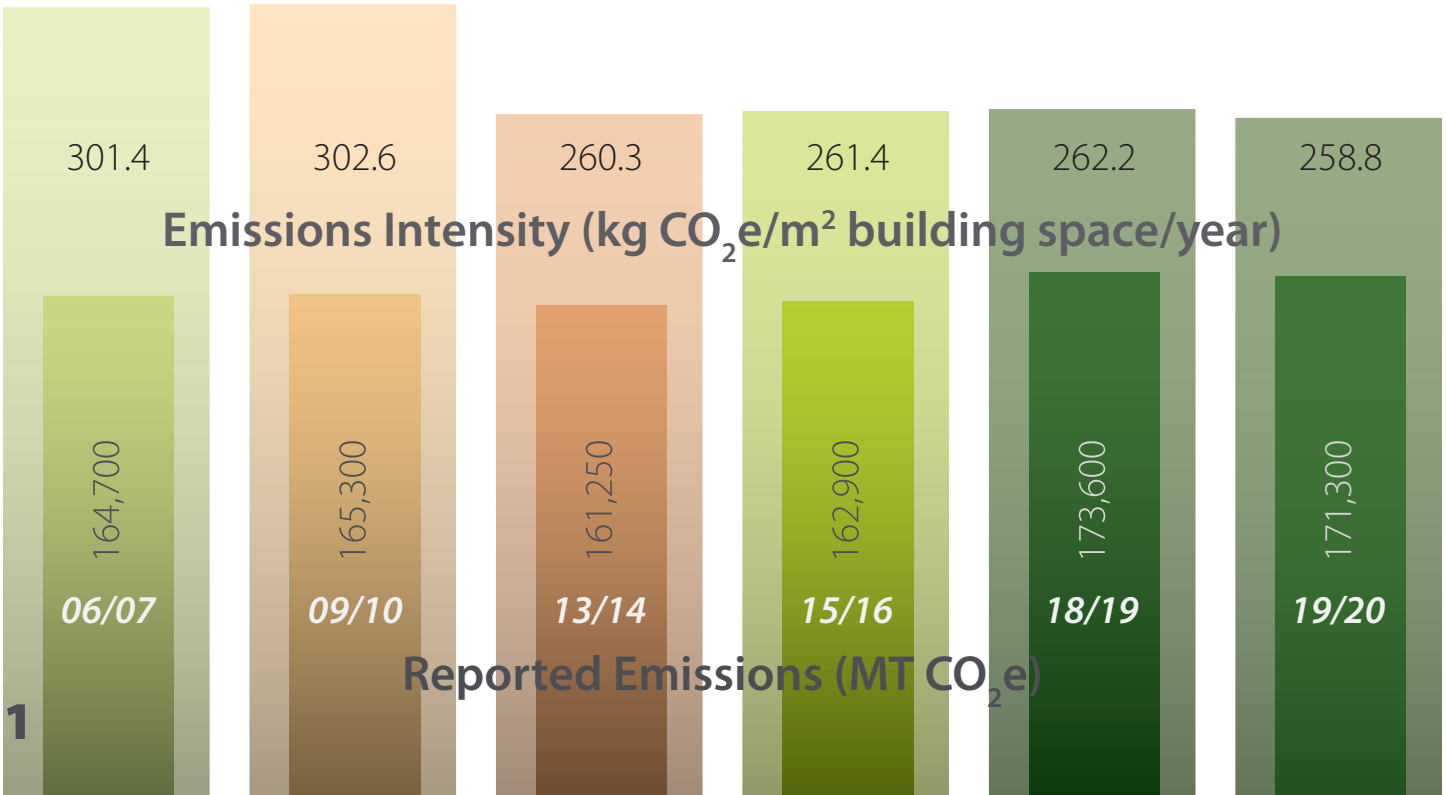
The GHG emissions inventory tracks the amount and sources of emissions produced by the university as accurately as possible, with regular reports published to measure performance against our reduction target.

Annual GHG emissions reporting is required by Environment and Climate Change Canada for any facility that emits more than 50,000 MT CO_2e 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.

Greener Buildings Pull Their Weight

From 2006 - 2019, the university's reported emissions increased by 4%; however, its emissions intensity—a measure of emissions per m^2 of building space—decreased 14%. Greener buildings make for less overall intensity, but more buildings will always mean more emissions.

Figure 1: Annual Summary of USask Greenhouse Gas Emissions

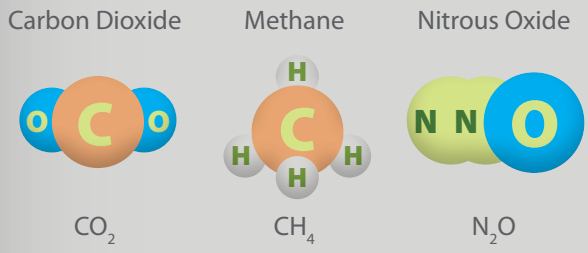


Methodology

Frequently Asked Questions

What is CO_2e and why do we use it?

Carbon-dioxide equivalent (CO_2e) 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_4) and nitrous-oxide (N_2O) 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_2e is used to describe the concentration of CO_2 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_2e). This same methodology was used for all reporting years shown in Figure 1. 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_2e was set assuming 2006/2007 baseline emissions of 161,000 MT CO_2e, which was later adjusted to 164,700 MT CO_2e.

Despite this correction to the reported 2006/2007 GHG emissions level, the UCPCC target GHG emissions level remains unchanged at 128,800 MT CO_2e.
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 to external customers (about one-third). 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 2019/2020 was 171,300 MT CO_2e, an increase of 4% from the baseline fiscal year 2006/2007. Figure 2 shows the overall Scope 1, 2 and 3 emissions, complete with a breakdown by emissions source.

Figure 3 shows the growth of the university across several metrics since the baseline fiscal year 2006/2007, including student enrollment and building area. The majority of GHG emissions (85% in 2019/2020) 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 majority of Scope 1 emissions (Figure 4) 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 5 shows the number of HDD in each reporting year, and the natural gas use intensity (for building heating) measured as kilowatt-hours per square metre

Figure 2: Greenhouse Gas Emissions by Scope

(MT CO_2e)

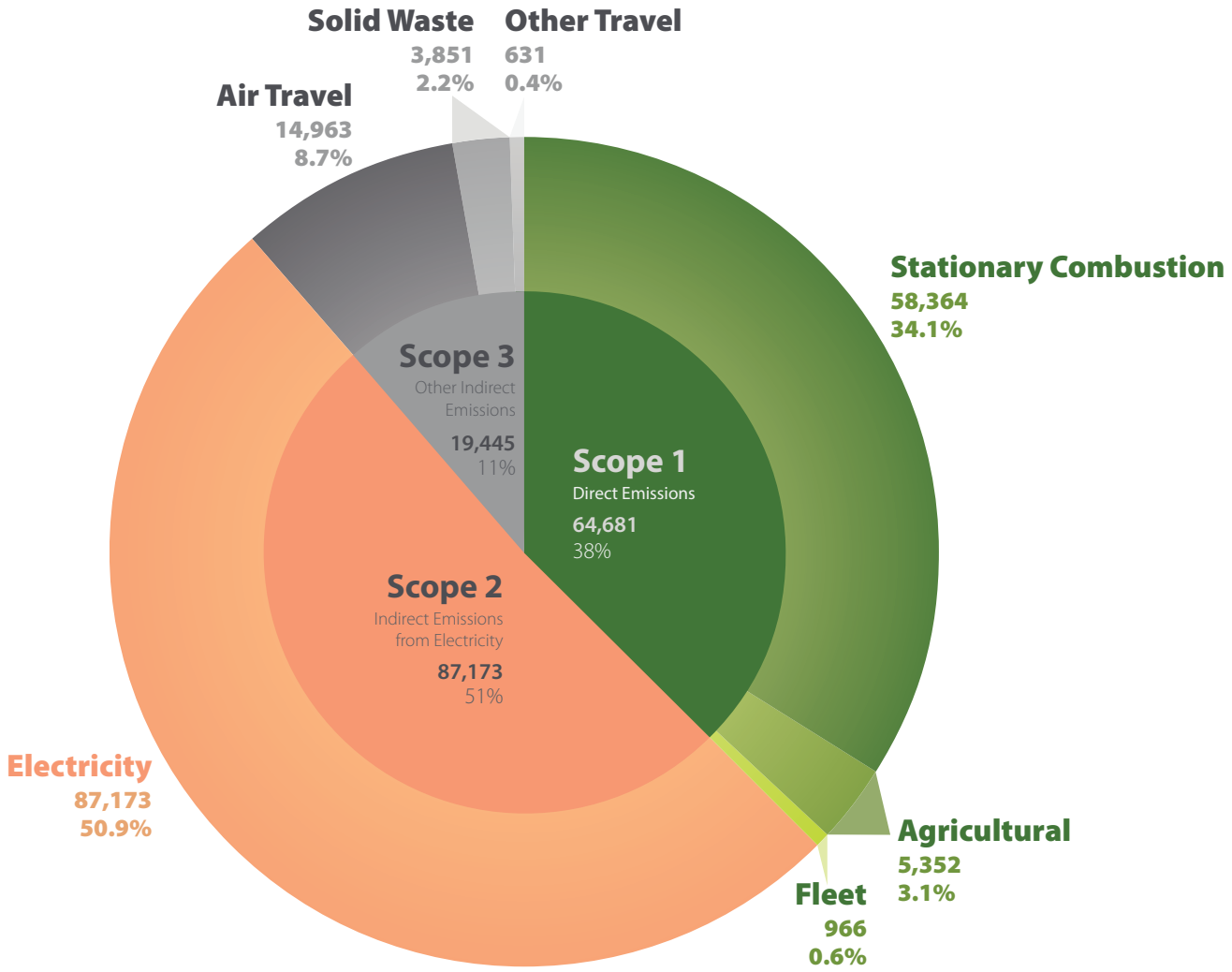
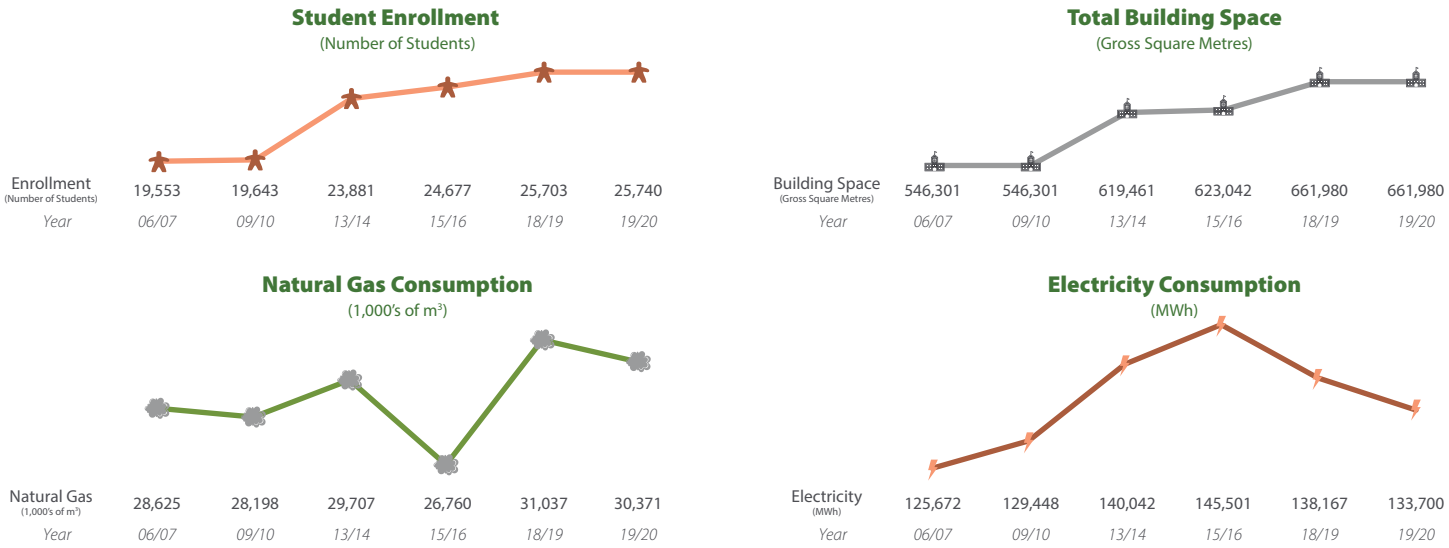


Figure 3: USask Growth Metrics



per year. For the university, the average annual number of HDD over the past 5 years was 5,321. The projected natural gas use intensity is also shown in Figure 5 normalized for 5,321 HDD, as what might have occurred if each year experienced the same number of HDD at 5,321.

The data shows a general decline from the baseline year for natural gas use intensity with the best building energy performance occurring in 2019/2020.

Figure 4: Scope 1 Emissions & Natural Gas Consumption

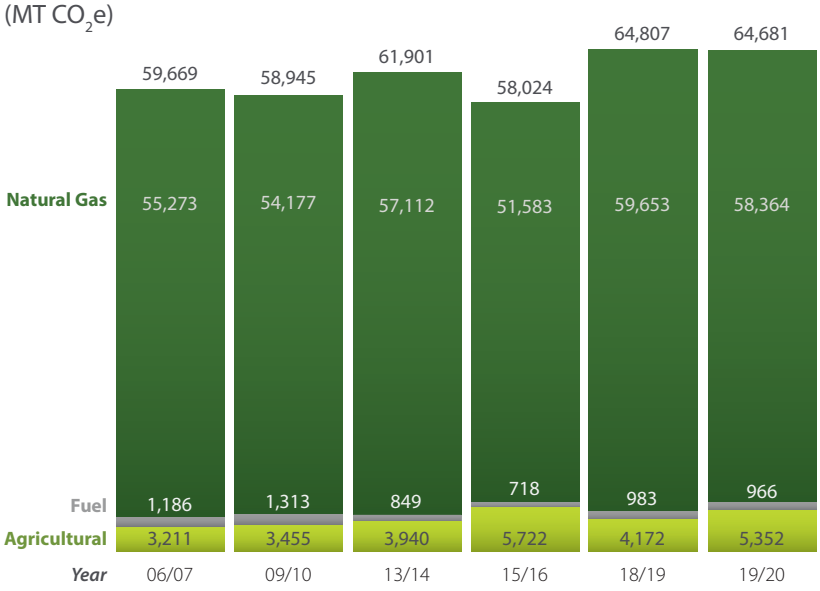
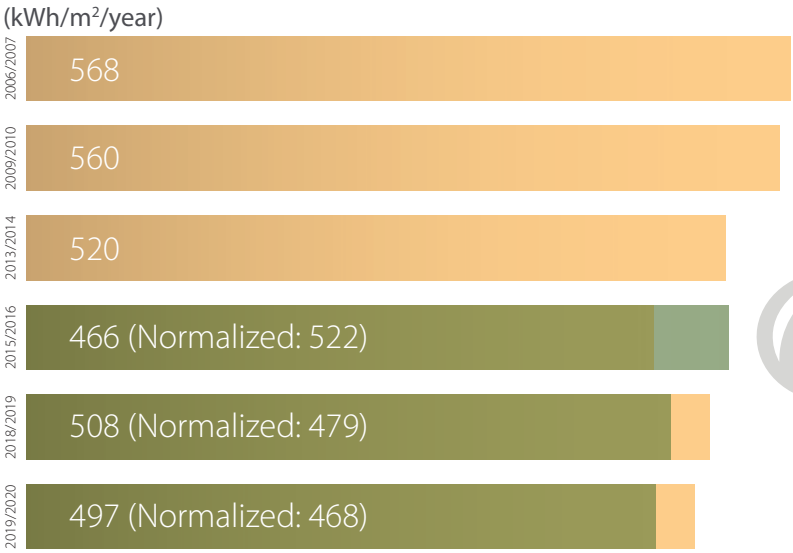


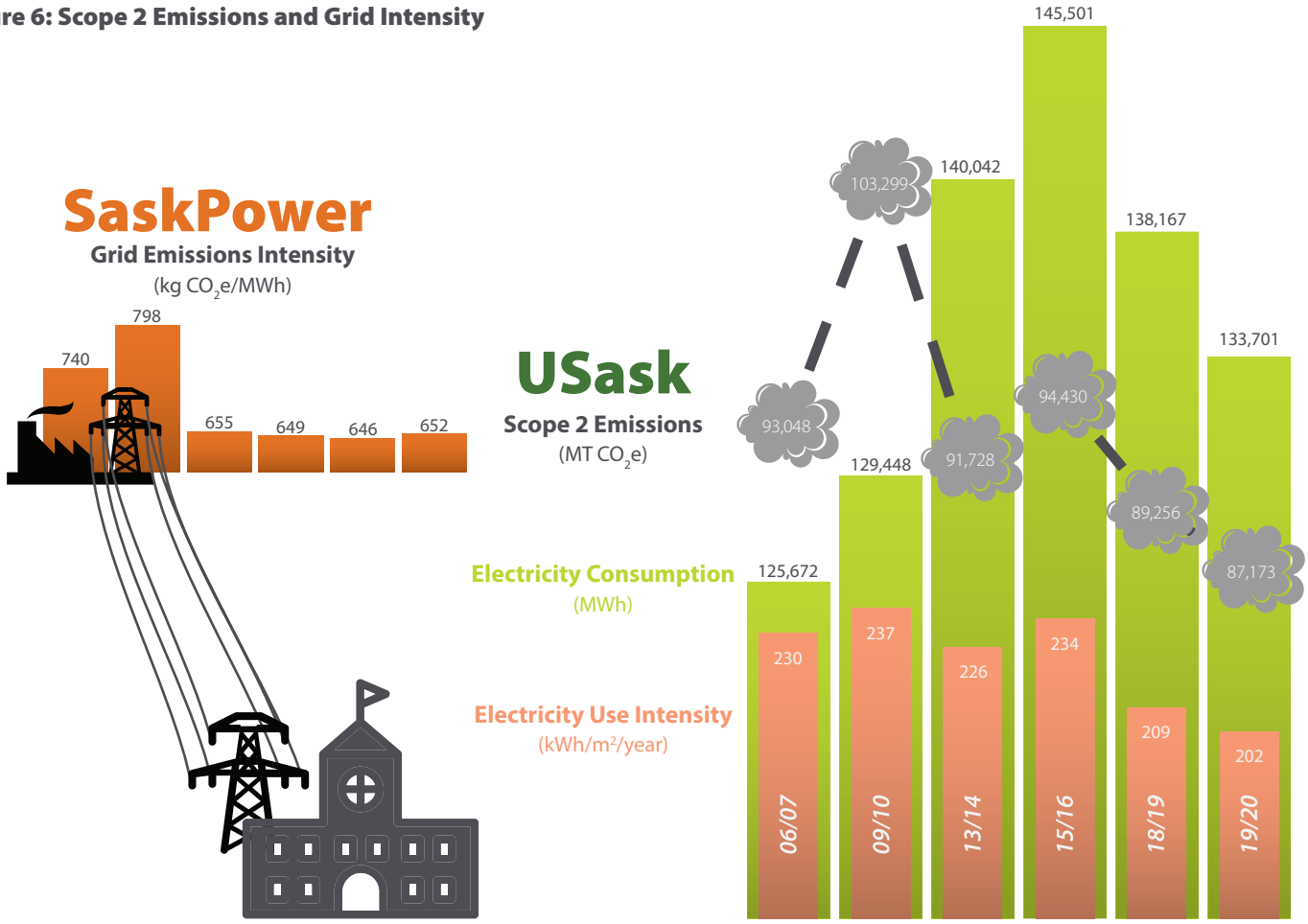
Figure 5: Natural Gas Use Intensity



Normalization?

Having an abnormally hot or cold year makes it hard to compare things on a level scale. Normalizing heating degree days to that of an "average year" helps us see if our natural gas use is actually declining regardless of yearly temperature variation.

Figure 6: Scope 2 Emissions and Grid Intensity



Scope 2 Emissions

Figure 6 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 are at their lowest reported level. The electricity use intensity is also at the lowest reported level.

Scope 3 Emissions

Table 1 shows Scope 3 emissions, the majority of which are from air travel for faculty and staff. During the fiscal year 2019/2020 nearly 6,000 return trips were taken to various destinations totaling approximately 44.8 million kilometres of air travel. Air travel results in significant greenhouse gas emissions of approximately 1 MT CO_2e per passenger for every 3,000 kilometres travelled (such as one return trip from Saskatoon to Vancouver). 50% of these trips were to attend conferences or training.

Emissions from other modes of travel, including by bus, train, and personal or rental vehicles contributed another 631 MT CO_2e.

Table 1: Scope 3 and Air Travel Emissions

	06/07	09/10	13/14	15/16	18/19	19/20
Scope 3 Emissions (MT CO_2e)	11,941	11,276	10,893	10,431	19,531	19,445
Air Travel (millions of kilometres)	21.5	22.6	27.4	17.4	43.7	44.8
Air Travel Emissions (MT CO_2e)	8,614	7,537	6,376	5,805	14,603	14,963

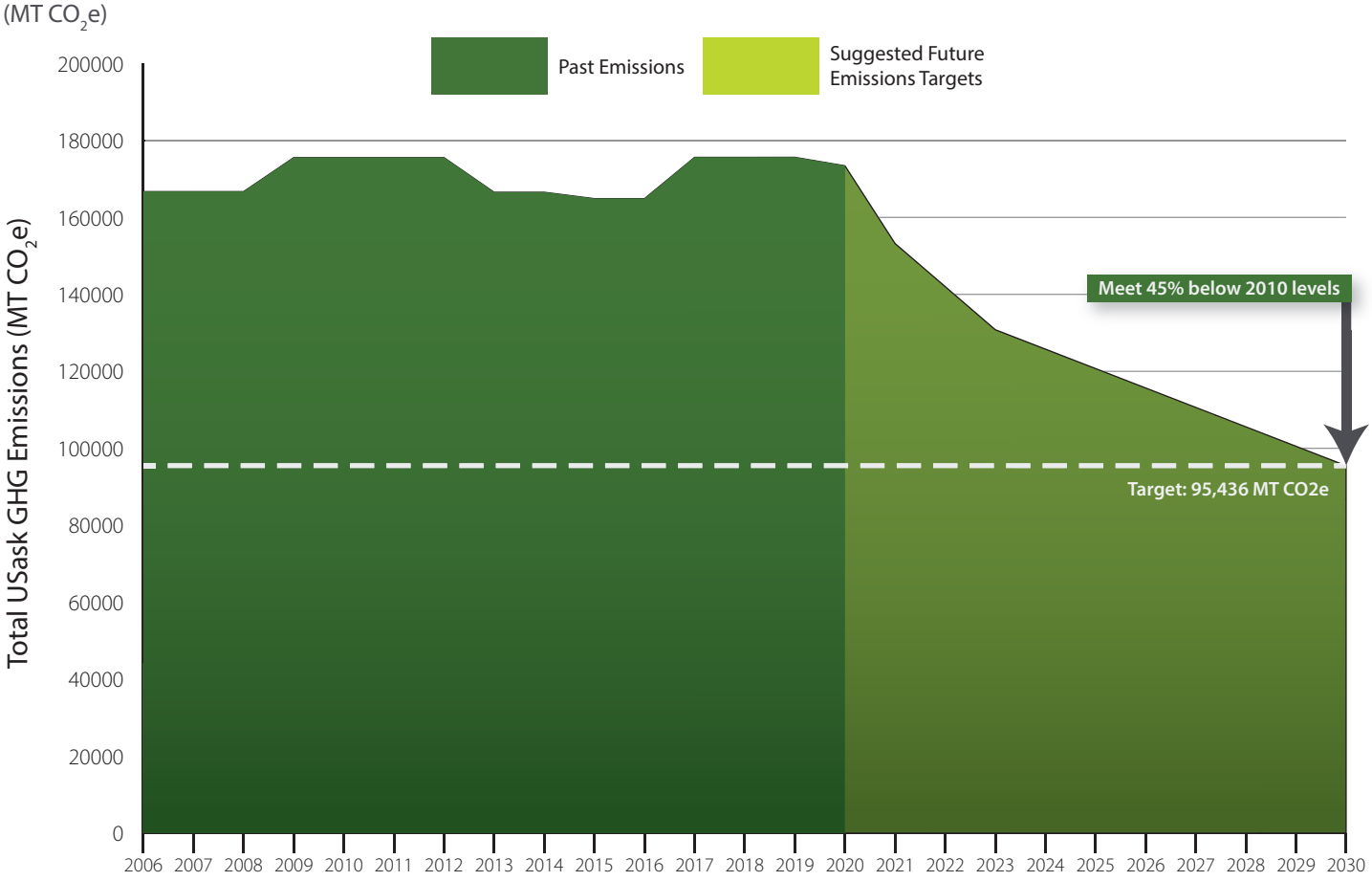
Climate Action Planning

In early 2020, the President's Advisory Circle on Sustainability was re-established with a priority mandate for climate action planning. The Advisory Circle is comprised of sustainability leaders and champions with the primary purpose to advise and counsel the President on the creation of a strategic and integrated sustainability plan for the University of Saskatchewan.

The plan will encompass the discovery, teaching, and engagement missions of the institution as well as include the campus' own operations and facilities. Most exciting is its presentation of a new goal for USask emissions reductions: **45% below 2010 levels**. This aligns with the current UN Intergovernmental Panel on Climate Change's (IPCC) target and is currently more ambitious than any existing municipal, provincial, or federal target

An important commitment to be included in the plan will be the leveraging of USask's unique place in the community to develop solutions to climate problems. We believe we achieve more by working together, and in working with our community and Indigenous leaders we can transform society so that future generations can live together in peace and prosperity. To achieve the goal of becoming an engaged university that works in a coordinated and innovative way with these communities to achieve the UN's Sustainable Development Goals, the plan looks to establish a joint university-community advisory circle, nurture and convene public discourse on sustainability and the SDGS, and create bridges and portals through which external partners can easily and effectively engage with the university community to offer new perspectives and opportunities for action.

Figure 7: USask GHG Emissions 2019-2030



Also of primary importance in the plan will be the university's need to model the way forward in terms of piloting, diffusing, and scaling sustainability solutions. If we are to do our part in limiting global warming to 1.5°C, we will need to implement operational changes. To make sure these changes do not stall, we will need to align institutional priorities, policies, programs, and services to achieve our reduction targets. The plan will specify actions to invest in emissions reduction solutions; ensure that climate actions are bolstered and barriers are removed through the university's policies and practices; map finance and accounting structures, norms, and practices to align with our emissions goals; and ensure accountability and transparency in reporting our progress towards achieving climate action goals.

Green Buildings

A primary factor in our recent emissions reductions has been ensuring that new buildings on campus receive certifications in sustainable and environmentally friendly design. Leadership in Energy and Environmental Design (LEED) is one such system and has provided the following certifications to campus buildings:

LEED Gold

- **Health Science E-Wing** is notable for its prairie stormwater pond and hot water solar collectors. The building is also designed for excellent access to natural lights, which is evident in the main atrium which serves as a popular gathering space.
- **The College of Law Addition** is notable for its living roof, which provides insulation, extends the lifespan of the roof, absorbs and filters rainwater, and reduces the rate of stormwater runoff. It is also home to a passive radiant cooling system in its main atrium where tempered chilled water is used to provide cooling to meet the building and ventilation cooling requirements..

LEED Silver

- **Place Riel Student Centre Expansion** achieved innovation credits for exemplary performance in water use reduction, recycled content of materials used, and sourcing of local/regional materials.
- **Gordon Oakes Red Bear Student Centre** includes many important cultural sustainability such as culturally significant architectural design and advanced ventilation systems to allow for smudge ceremonies.

LEED Certified

- **Health Science D-Wing** incorporated a high degree of daylight filtration and views which is in contrast to other older laboratory buildings on campus.
- **Murray Building University Learning Commons** renovation extensively used existing building features to reduce the need for new inputs, expand opportunities for usable space, and eliminate much of the construction waste.

Outside of LEED certifications, the **Collaborative Sciences Research Building** was the first of the university's buildings to purse a Green Globes certification. Despite its particularly challenging rooftop greenhouse, the building received a laudable 2 out of 4 globes.

Sustainability Revolving Fund

The **Sustainability Revolving Fund** (SRF) was established in 2014 to help finance sustainability initiatives at the University of Saskatchewan. Projects that result in utility savings (either directly or indirectly through behaviour change) are financed; operational savings plus 50% are invested back into the fund to help it grow over time. Projects funded by the SRF currently include:

- Geology Building Plumbing Upgrade
- Agriculture Parkade LED Lighting Retrofit
- Ultra-Low Temperature Freezer Rebate Program

- Standard Fridge-Freezer Rebate Program
- Flow Cytometer Replacement Rebate Program
- Steam Trap Insulation Jackets
- Health Science E-Wing Solar Thermal Upgrades
- John Mitchell Building Solar Panel Installation
- SECC Sustainable Career MeetUps
- Thorvaldson Water-Cooled A/C Replacements
- John Mitchell Building Solar Array
- Chemistry Aspirator Installations
- Urinal retrofits across campus
- Central Copier Replacement and Print Software
- LED Lamp Retrofits
- WCVM Animal Care Lighting Upgrades
- Toxicology Chiller Upgrades
- Geology Trace Element Lab Heat Reclamation

John Mitchell Building Solar Array

The 5.12 kW **John Mitchell Building Solar Array** is theresult of a Living Lab student project which sought to expand renewable energy generation on campus to increase the availability of experiential learning opportunities. The panels are available for a use by a number of classes in the College of Engineering. Their output can be seen live and up-to-date at the Office of Sustainability's webpage.

Chemistry Aspirator Replacements

Wasteful water aspirators are commonly used in research labs to generate vacuum flow for research equipment. While electronic diaphragm vacuum pumps are much more efficient, their much greater upfront cost often drives researchers towards cheaper water aspirators for the same work.
The **Sustainability Revolving Fund** stepped in this past year to provide $90,000 to replace 68 water aspirators in the Thorvaldson Building with 31 new pumps. These pumps will save 7.67 million litres of water and $25,000 in utility costs per year, with a payback period of a mere five years.

Central Copier Replacement and Print Reduction Software

Centralized printer/copiers help to reduce printer impacts and costs, but as equipment ages their efficiency tends to decline. 2019 saw the update of central copiers across campus to new, more efficient

models that use less energy when running and also while in hibernation mode (which is triggered more often). Additional updates include print software for scan-to-email and secure printing capabilities, which reduces overall pages printed and eliminates the need for individual desktop printers. Added software settings control double-sided and black-and-white printing as default settings.

Optimizing Energy Efficiency

The Government of Canada is investing up to $1.5 million to help the University of Saskatchewan reduce greenhouse gas emissions by reducing electricity and natural gas consumption through improved heating, ventilation, and cooling systems in campus buildings.

The project aims to improve energy efficiency in 26 buildings across campus using a proven, systematic process of energy management, retro-commissioning, controls upgrades, and other possible measures such as adding variable speed drives to slow down fans and installing energy recovery equipment. Upon completion of the project, the university is projected to realize an annual emissions reduction of over 4,300 tonnes carbon dioxide equivalent (CO_2e), saving over 70,000 gigajoules of energy each year. This is the equivalent to the annual energy consumption of about 500 homes in Saskatchewan, and reducing annual GHG emissions by an equivalent amount as removing about 1,000 vehicles from our roadways.

This project is funded in part by the Government of Canada.

Canada

For more information, please contact the Office of Sustainability at:

sustainability@usask.ca

To learn more about campus sustainability, please visit:

sustainability.usask.ca