

# 2016 GREENHOUSE GAS INVENTORY REPORT





## EXECUTIVE SUMMARY

This report summarizes the greenhouse gas (GHG) emissions inventory for the University of Saskatchewan (UofS) campus through fiscal years 1991-2016. The report provides year-to-year comparisons in order to measure progress and identify areas for improvement.

In 2010 the University signed University and College Presidents' Climate Change Statement of Action for Canada. The Statement of Action commits signatory institutions to pursue responsible solutions to address climate change. Through the development of the Climate Action Plan in 2011 the UofS has a stated goal to reduce GHG emissions 20% below 2006/2007 levels by 2020.

The greenhouse gas inventory catalogues the six GHG gases that are identified under the Kyoto Protocol which are produced in facilities and operations that are owned or under the direct control of the UofS.

### INVENTORY HIGHLIGHTS

|   | 2006-2007 | 2015-2016 | Change         |
|---|-----------|-----------|----------------|
| Total emissions (MT eCO <sub>2</sub> )                            | 164,700   | 162,900   | 1.1% decrease  |
| Emissions per square metre (kg eCO <sub>2</sub> /m <sup>2</sup> ) | 301.4     | 261.4     | 13.3% decrease |

#### SCOPE 1

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

#### SCOPE 2

Indirect GHG emissions from the generation of electricity consumed by the university.

#### SCOPE 3

All other indirect emissions from sources not owned or controlled by the university. Reporting is optional.

- Consumed electricity is the largest major source of emissions, accounting for 58% of all emissions in 2015/16.
- The recent reduction in emission factors by SaskPower and warmer winter weather is the main source for overall GHG reductions for the university

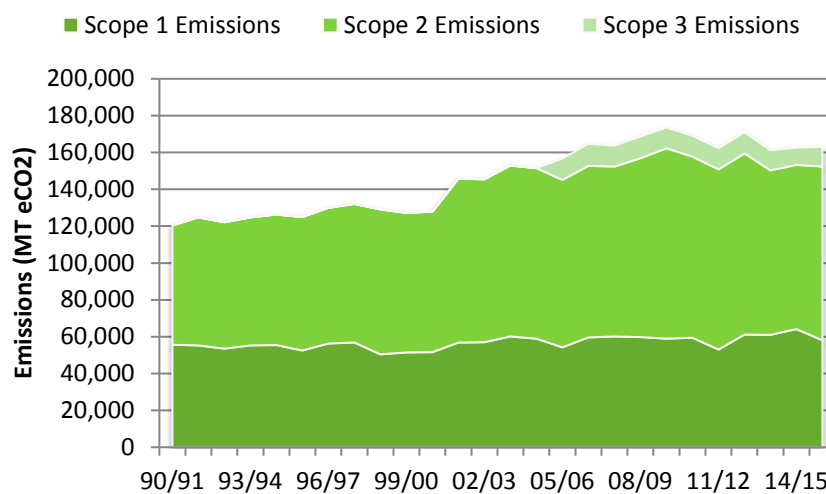


Figure 1 - Total Emissions by Scope (MT eCO<sub>2</sub>)



## TABLE OF CONTENTS

|   |    |
|---|----|
| 1.0 Introduction.....                     | 4  |
| 1.1 Boundaries .....                      | 5  |
| 2.0 Inventory Results & Conclusions ..... | 6  |
| 2.1 Scope 1 Emissions .....               | 7  |
| 2.2 Scope 2 Emissions .....               | 8  |
| 2.3 Scope 3 Emissions .....               | 11 |
| 3.0 Climate Action Planning.....          | 11 |

*The 2016 Greenhouse Gas Emissions Report was prepared by the University of Saskatchewan Office of Sustainability.*

*Special thank you to the campus community that provided information for the 2016 GHG Inventory.*

## FIGURES

|   |    |
|---|----|
| Figure 1 - Total Emissions by Scope (MT eCO <sub>2</sub> ).....                       | 2  |
| Figure 2 - Baseline Year (2006/07) Emissions Breakdown .....                          | 6  |
| Figure 3 – 2015/16 Emissions Breakdown.....   | 6  |
| Figure 4 - Emissions per Square Metre (1991-2016).....                                | 6  |
| Figure 5 – Scope 1 Emissions (2006/07).....   | 7  |
| Figure 6 – Scope 1 Emissions (2015/16).....   | 7  |
| Figure 7 – Scope 1 Emissions per Heating Degree Day (2000-2016).....                  | 8  |
| Figure 8 - Emissions per Square Metre (1991-2016).....                                | 8  |
| Figure 9 – Scope 1 & 2 Emissions compared to Total Building Space (1991-2016).....    | 9  |
| Figure 10 – Scope 2 Emissions compared to Emission Factor (2000-2016).....            | 10 |
| Figure 11 – Scope 1 & 2 Emissions compared to Electrical Consumption (2000-2016)..... | 10 |
| Figure 12 – Scope 3 Emissions (2006/07).....  | 11 |
| Figure 13 – Scope 3 Emissions (2015/16).....  | 11 |





## 1.0 INTRODUCTION

The University of Saskatchewan has completed four GHG inventories within the last 10 years. The inventories catalogue all GHG emissions related to facilities and operations owned or directly controlled by the University.

The UofS Climate Action Plan has a stated goal for 20% reduction below 2006/2007 values by 2020. The target was developed through the university's commitments for the University and College Presidents' Climate Change Statement of Action for Canada<sup>1</sup>.

The purpose of the university's GHG inventory is to assess the amount and sources of emissions produced by the university as accurately as possible. The inventory is required to track our GHG and report against our reduction targets. GHG reporting is also required annually by Environment Canada for any facility that emits more than 50,000 MT eCO<sub>2</sub> Scope 1 emissions. Annual reporting is expected to be required in the future at the provincial level from the Government of Saskatchewan.

## 2.0 METHODOLOGY

The inventory was developed by using the Clean Air-Cool Planet Campus Carbon Calculator v6.85 and emissions are reported in equivalent metric tonnes carbon dioxide (MT eCO<sub>2</sub>). The focus of this report includes the years 2007-2016 using the 2006/07 fiscal year as the baseline.

To determine how to best complete the GHG inventory, the university used the American College and University Presidents' Climate Change Commitment's (ACUPCC) implementation guide<sup>2</sup>. The Greenhouse Gas Protocol (GHG Protocol)<sup>3</sup> was also referenced since it is an internationally recognized accounting tool for quantifying and managing GHG emissions. The GHG Protocol categorizes direct and indirect emissions into three broad scopes: Scope 1 emissions are direct GHG emissions that occur from sources owned or controlled by the university. Scope 2 emissions are indirect emissions from the generation of purchased electricity consumed by the university. Scope 3 emissions are a result of the activities of the university, but they occur from sources that are not owned or controlled by the university. The reporting of the Scope 3 emissions category is optional.

Based on standard GHG Protocol standards, the university is required to track and report emissions from the six GHGs covered by the Kyoto Protocol, namely: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF<sub>6</sub>).

The university's first GHG inventory was completed in 2007, 2010 and 2014. Current standards for reporting GHG emissions are constantly improving, so all calculations have been updated and any inaccuracies corrected in the 2016 update.

---

<sup>1</sup> <http://www.climatechangeaction.ca/>

<sup>2</sup> <http://www.presidentsclimatecommitment.org/>

<sup>3</sup> <http://www.ghgprotocol.org/>





## 2.1 BOUNDARIES

As previously stated, the inventory includes emissions from facilities that are within the university's operational control.

The university produces and sells energy in the form of steam to external customers. Emissions from steam generated on-site are considered Scope 1, so are included in the inventory, whether used by the campus or sold. The university also purchases generated electricity from SaskPower not only for consumption, but also for resale to external customers. Indirect emissions from the generation of purchased electricity consumed by the university are considered Scope 2. Accordingly, the emissions from the sold electricity do not form part of our inventory. These must be reported by the final consumer of the electricity.

### SCOPE 1

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

### SCOPE 2

Indirect GHG emissions from the generation of electricity consumed by the university.

### SCOPE 3

All other indirect emissions from sources not owned or controlled by the university. Reporting is optional.





## 2.0 INVENTORY RESULTS & CONCLUSIONS

Scope 1, 2 and optional Scope 3 emissions are summarized below. Figure 2 shows the emissions breakdown for the 2006 baseline, year and Figure 3 has the 2014 breakdown. Only slight changes in the emissions mix are noted.

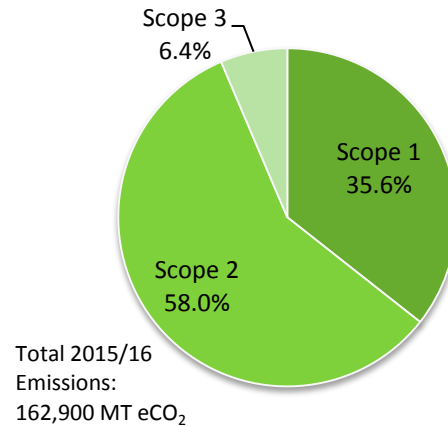
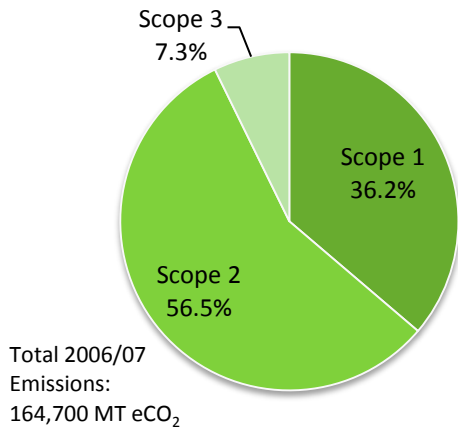


Figure 2 - Baseline Year (2006/07) Emissions Breakdown

Figure 3 - 2015/16 Emissions Breakdown

Since the baseline year, 2006/07, the university GHG emissions have plateaued averaging 166,000 MT eCO<sub>2</sub>. Over the nine years from 2006/07 to 2015/16, emissions have decreased from 164,700 to 162,900 MT eCO<sub>2</sub>. Figure 4 shows that since 2008/09 the university has started to lower its GHG intensity, measured as emissions per square metre of building space. However for the last three years the intensity has remained level. Further discussion on GHG intensity is discussed in Section 2.2 Scope 2 Emissions.

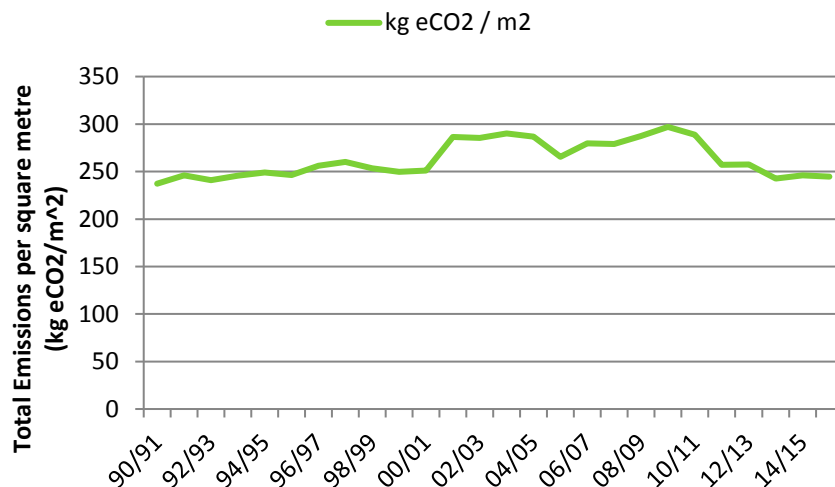


Figure 4 - Emissions per Square Metre (1991-2016)

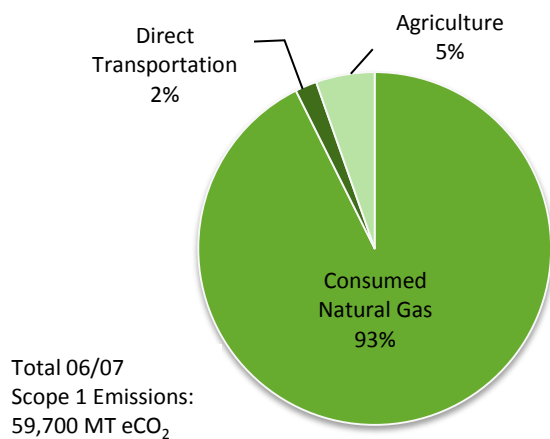




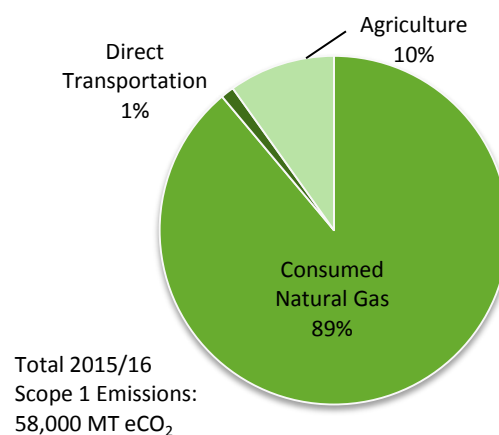
## 2.1 SCOPE 1 EMISSIONS

As mentioned previously, Scope 1 emissions are direct GHG emissions that occur from sources owned or controlled by the university. The Scope 1 emissions included in this inventory are: on-campus stationary sources (natural gas and distillate oil), agriculture (fertilizers and animal husbandry), university fleet and maintenance equipment.

Figure 6 shows the Scope 1 emissions breakdown for the 2006/07 baseline, year and Figure 7 has the 2013/14 breakdown.



**Figure 5 – Scope 1 Emissions (2006/07)**



**Figure 6 – Scope 1 Emissions (2015/16)**

The breakdown of Scope 1 emissions has remained relatively constant over the last seven years. Natural gas used to generate steam for space heating and domestic hot water accounts for between 89%-93% of our Scope 1 emissions. The majority of Scope 1 emissions are related to space heating and are therefore linked to weather conditions.

Figure 7 shows the relationship between Scope 1 emissions and Heating Degree Days (HDD). There is a general trend that in warmer years (less HDD) we produce less steam and therefore consume less natural gas.

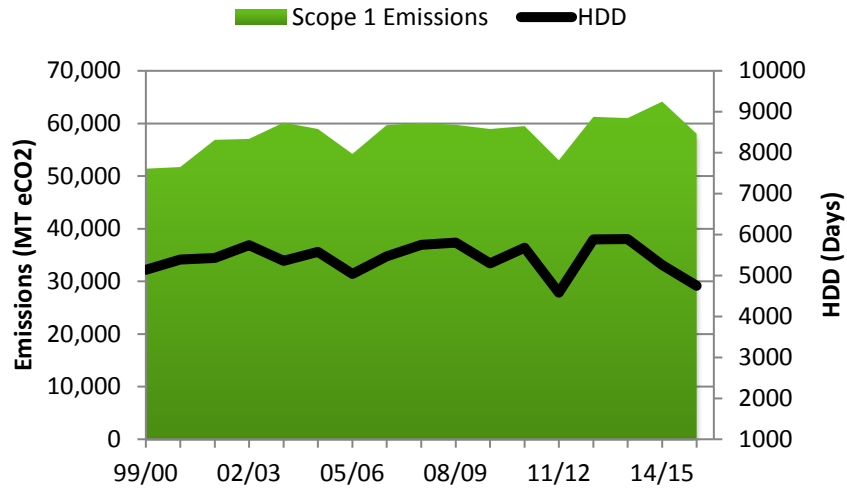


Figure 7 – Scope 1 Emissions per Heating Degree Day (2000-2016)

The intensity of the Scope 1 emissions compared to building space has been declining last 10 years and is shown below on the same graph as Scope 2 emissions intensity (Figure 8).

## 2.2 SCOPE 2 EMISSIONS

Scope 2 emissions are indirect emissions from the generation of purchased electricity consumed by the university. The university does not produce any of its own electricity; it is purchased from SaskPower and Saskatoon Light and Power.

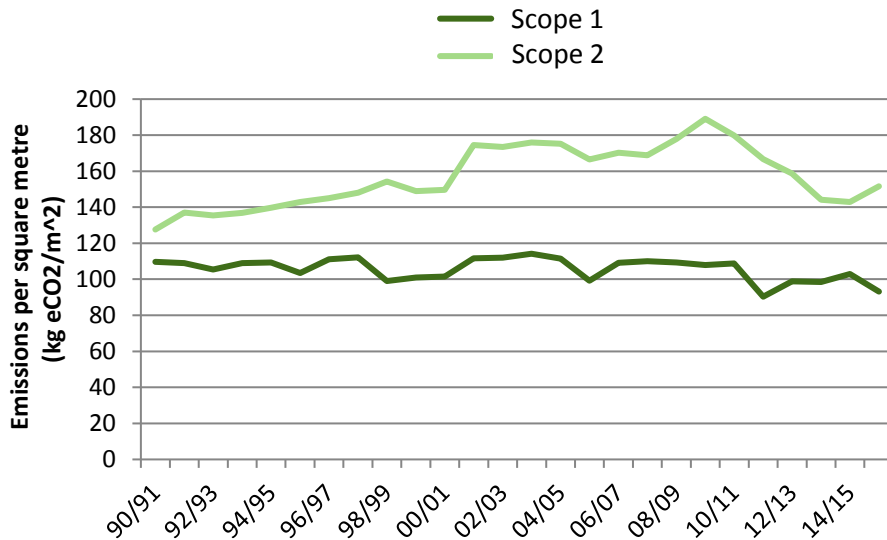


Figure 8 - Emissions per Square Metre (1991-2016)







Figure 8 shows that overall GHG intensity of Scope 1 and 2 emissions per square metre of building space is continuing to decrease. However Scope 2 GHG intensity in 2015/2016 has started to rise. Recent building construction on campus has increased our building space and energy use has not increased to the same proportion, so intensity is decreased. Figure 9 shows the relationship between Scope 1 & 2 emissions and the increase in building space.

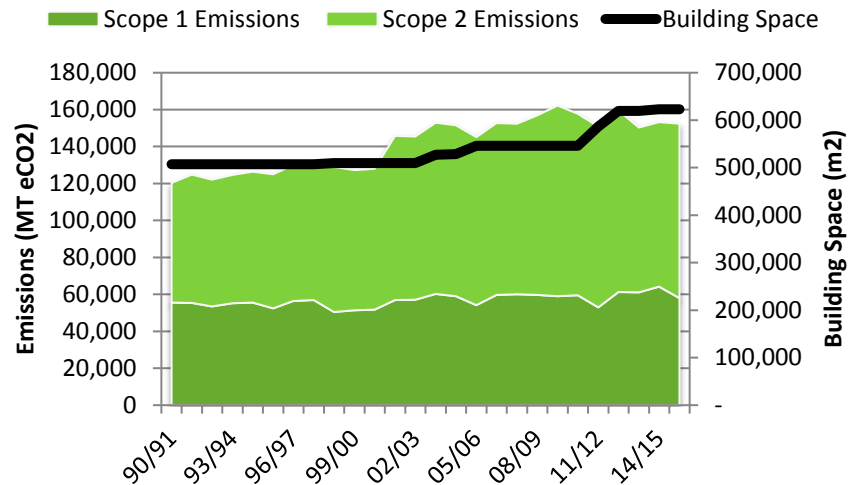


Figure 9 – Scope 1 & 2 Emissions compared to Total Building Space (1991-2016)

Since the university purchases the majority of electricity from SaskPower, the annual Scope 2 emissions are also a function of their electrical utility emission factor. Emission factors are used to calculate greenhouse gas emissions based on the amount and combination of fuel combusted:

$$[\text{Emission Factor (kg/kWh)} * \text{Consumed Electricity (kWh)} = \text{Scope 2 Emissions (kg)}].$$

When SaskPower generation includes cleaner sources than previous years their emission rate decreases, which has a direct effect on the university’s Scope 2 emissions. Figure 10 shows the variance in SaskPower’s emission factor since 2000 and Figure 11 shows the relationship between electrical consumption and Scope 2 emissions. The recent reduction in emission factors by SaskPower is the main source for overall GHG reductions for the university.

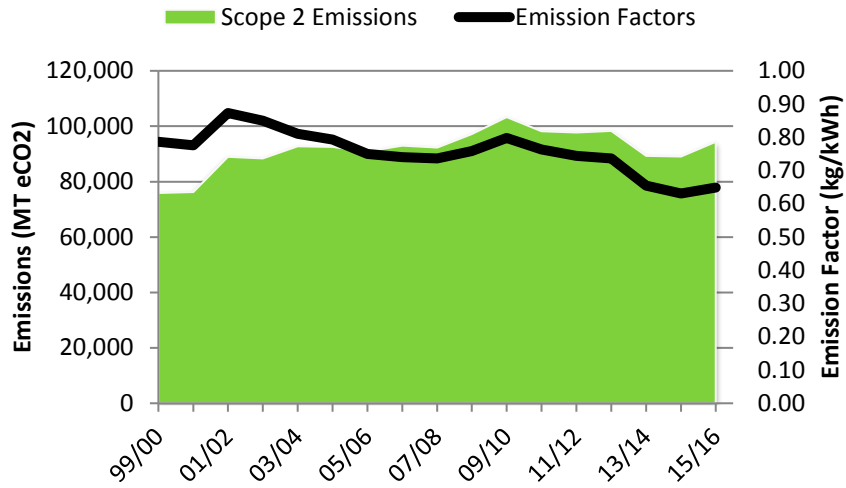


Figure 10 – Scope 2 Emissions compared to Emission Factor (2000-2016)

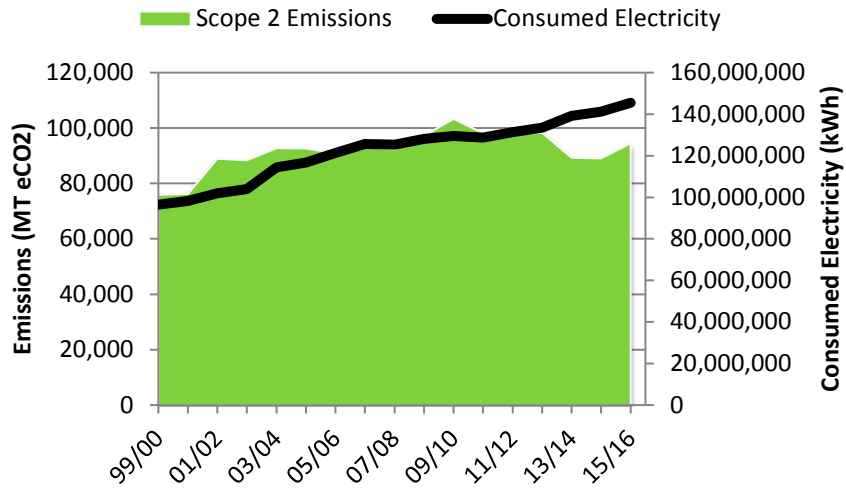


Figure 11 – Scope 2 Emissions compared to Electrical Consumption (2000-2016)



## 2.3 SCOPE 3 EMISSIONS

The Scope 3 emissions category is an optional reporting category that is concerned with the treatment of all other indirect emissions. Scope 3 emissions are a result of the activities of the university, but they occur from sources that are not owned or directly controlled by the university.

Scope 3 emissions for directly financed travel and solid waste are included in the 2015/16 GHG inventory. The following is a list of Scope 3 emissions that were excluded from the GHG inventory: sold electricity, student and employee commuting, study-abroad travel, transportation and distribution losses from purchased energy, and upstream emissions from directly financed purchases. The university will continue to develop tracking procedures so that additional Scope 3 categories can be included in the future.

Figure 12 shows the Scope 3 emissions breakdown for the 2006/07 baseline year and Figure 13 has the 2015/16 breakdown.

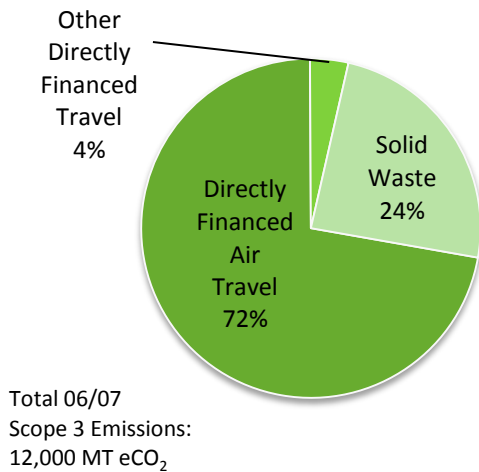


Figure 12 – Scope 3 Emissions (2006/07)

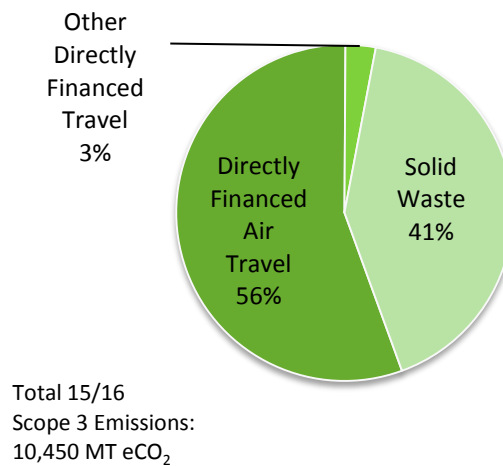


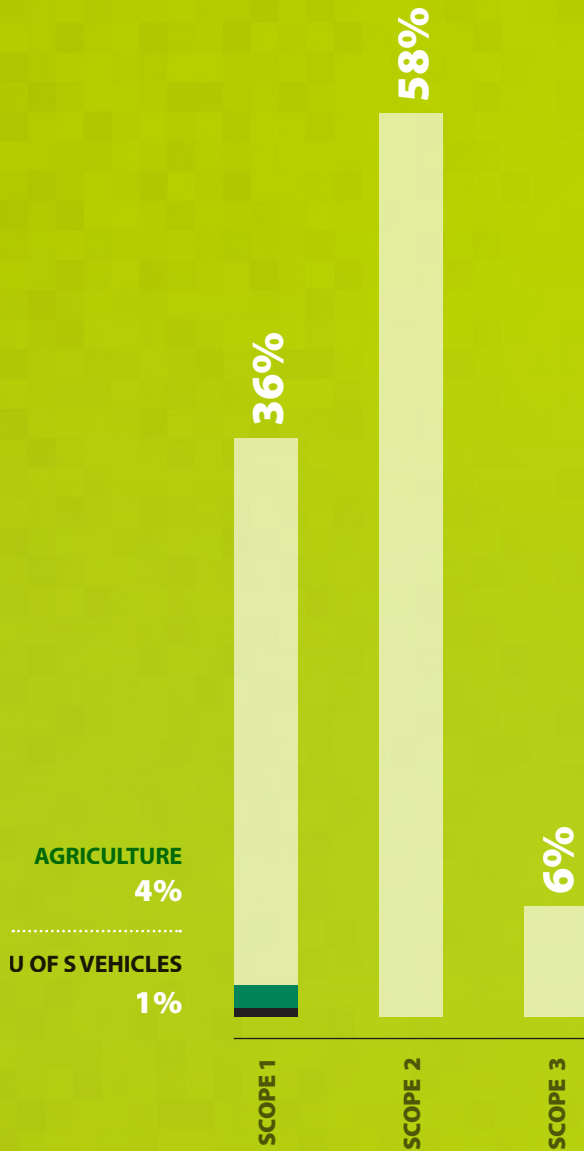
Figure 13 – Scope 3 Emissions (2015/16)

The total amount of Scope 3 emissions is relatively small compared to the other scopes; however this is one of the key areas where individuals' day-to-day decisions can have a great impact.

## 3.0 CLIMATE ACTION PLANNING

The Climate Action Plan was completed in 2012 and has set a target to reduce emissions by 20% from 2006/07 levels by 2020.

The Climate Action Plan will be the catalyst for engaging the campus community in GHG emission reductions. The plan includes strategies for the reduction of university emissions.



**SCOPE 1**

**Consumed**

Natural Gas, Agriculture ■, and Fuel ■

Direct GHG emissions from sources owned or controlled by the university. Examples include emissions from boilers, university vehicles and agriculture.

**SCOPE 2**

**Consumed**

Electricity

Indirect GHG emissions from the generation of electricity consumed by the university.

**SCOPE 3**

**Travel & Waste**

All other indirect emissions from sources not owned or controlled by the university. Examples include business travel, solid waste and employee and student commuting. Reporting is optional. (Current inventory does not include commuter travel.)

**University of Saskatchewan**

is implementing the climate action plan to meet our GHG reduction targets.

See Climate Action Plan at:  
[usask.ca/climateaction](http://usask.ca/climateaction)

**162,900** metric tonnes  
 2015/2016 greenhouse gas emissions (CO<sub>2</sub> equivalent)

