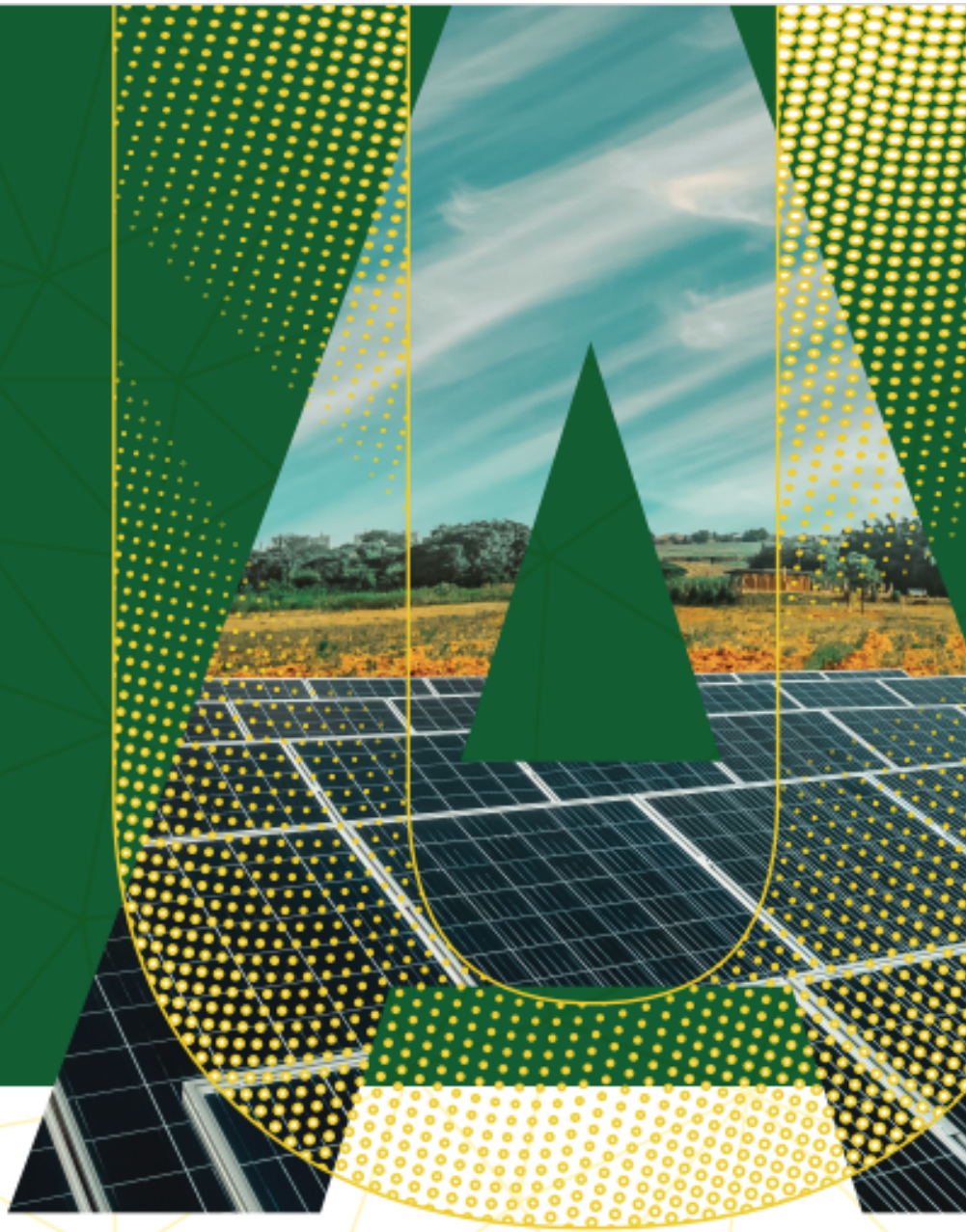
UNIVERSITY OF ALBERTA



Greenhouse Gas Emissions Inventory

2005-06 Baseline and 2020-21 Report

The University of Alberta has been a leader in operational sustainability for over five decades, with a goal to create and maintain dynamic learning spaces that enrich the experience of the students, staff and faculty on our campuses. With mature initiatives in energy efficiency, district energy, building recommissioning, green cleaning, recycling and waste reduction, Facilities and Operations is proud to release its second Greenhouse Gas Emissions Inventory and Greenhouse Gas Emissions Reduction Plan.

The new University of Alberta GHG Inventory and GHG Reduction Plan represent important progress being made towards the university's sustainability journey. The inventory allows F&O to better manage its sustainability data, enabling greater accuracy, transparency and accountability for sustainability reporting. The analysis of the university's GHG emissions also illustrates some remarkable past reductions in GHG emissions. Our longstanding programs in energy management and district energy in particular stand out for their impressive achievements to date.

The GHG Reduction Plan is realistic about the substantial challenge we will face to achieve GHG emissions reduction while providing the necessary teaching and research space for a thriving university. With this in mind, we recognize the necessity for GHG emissions reductions at the University of Alberta. GHG emissions reductions act as one of the most important indicators of progress towards climate change mitigation and ultimately a more sustainable future, and GHG emissions are a key metric with respect to an institution's facilities and operations. By formalizing the inventory and reduction plan, F&O has demonstrated its commitment to mitigating climate change and pledging to do its part to meet national and international GHG emission reduction goals.

We are proud to announce that we have achieved the goal of a 17 per cent reduction below 2005/06 levels by 2020/21. A new goal can be found in the accompanying GHG Reduction Plan. Once again we look forward to celebrating successes along the way, and we reaffirm our strong and continued commitment to sustainability.

Executive Summary

Rationale for a GHG Inventory

The International Panel on Climate Change continues to reinforce that climate change is occurring and that human interference with the climate system is a leading cause. Countries around the world (including Canada) have recognized this call to action, and have made commitments to limit their impact on climate change by reducing greenhouse gas emissions.

In 2021 President Bill Flanagan signed the Joint Statement of Global University Leaders on the 2030 Agenda for Sustainable Development. In 2022 the U of A ranked 11th out of 1,400 universities globally in the Times Higher Education Impact Rankings, showing its leadership and commitment to achieving the United Nations' Sustainable Development Goals for 2030.

The University of Alberta is a globally recognized leader in post-secondary education and research, and a leader in sustainability. Therefore, the U of A is participating in this voluntary GHG inventory and reporting process to measure, assess, report on, and establish strategies for the reduction of GHG emissions. This report compares the baseline data from 2005/06 to the most recent data available, the 2020/21 reporting year, and is the second iteration of the university's Greenhouse Gas Emissions Inventory.

Global Standard for GHG Reporting

The U of A's Greenhouse Gas Emissions Inventory report is guided by the World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD) *Greenhouse Gas Protocol, Corporate Accounting and Reporting Standard* (World Resources Institute and the World Business Council for Sustainable Development, 2015). Use of the *GHG Protocol* ensures the university's report aligns with and follows a global standard.

Organizational Boundary - Operational Approach

The UAlberta GHG Inventory followed the Operational Control approach to define its organizational boundary. The organizational boundaries of this report include the following university-operated campuses and research stations:

Campuses	**Research Stations**
North Campus	Kinsella Research Station
South Campus	Devon Research Station
Augustana Campus	
Campus Saint-Jean	

Other miscellaneous emissions sources are also included. Bamfield Marine Sciences Centre and Enterprise Square are excluded from this report due to operational boundaries.

Additional Context: the University of Alberta District Energy System

The University of Alberta District Energy System (DES) acts as the utility provider for the University of Alberta's North Campus, and also to many facilities in the Greater Campus Area. The organizations in the Greater Campus Area do not fall under operational control of the U of A. These non-U of A customers account for approximately 28 per cent of the total North Campus emissions. However, for the majority of this report and for the GHG Reduction Plan to follow, the non-U of A customers are removed and only emissions associated with U of A operations are discussed.

Emissions Inventory Scopes

Different types of GHG emissions are categorized by "scope" and are detailed below in the U of A context. There are four different scopes of GHG emissions based on the degree of responsibility that a reporting institution has for the source of emissions. Scope 1 includes direct emissions sources, scope 2 includes indirect emissions sources from purchased electricity, and scope 3 includes other indirect emissions sources. Scope 4 is a newer category which takes into account avoided emissions. The university's inventory included all scope 1 and scope 2 emissions, as well as three sources of scope 3 emissions (scope 2 T&D losses, solid waste, and waste water). This inventory does not currently include scope 4, but may in the future.

Scope 1	**Heating Plant Combustion Processes** The university's district energy system on North Campus is fueled primarily by natural gas, which is burned to create steam for electricity and heating. Burning natural gas releases the following greenhouse gasses: CO2, CH4, and N2O.
	Other on-campus stationary combustion Many facilities at South Campus, Campus Saint-Jean, Augustana Campus, and the university's research stations have boilers that combust natural gas. Like at the Heating Plant, this results in the emission of CO2, CH4, and N2O.
	Direct transportation The university's vehicle fleet produces emissions via the combustion of gasoline and diesel, resulting in CO2, CH4, and N2O emissions.
	Refrigerants and Chemicals Various types of equipment use, refrigeration and air conditioning can result in unintentional, or fugitive, greenhouse gas emissions.
	Agriculture Many agricultural processes, including raising livestock and fertilizer application, can result in GHG emissions in the form of CH4 and N2O. The university's South Campus is the primary contributor to this Scope 1 emission source.
Scope 2	**Purchased electricity** For those campuses and research stations that do not have a district energy system, all electricity is purchased from the Alberta electric grid, resulting in CO2, CH4, and N20 emissions from combustion of coal and natural gas.

Scope 3	**Scope 2 T&D Losses** During transmission and distribution of electricity, a portion of the electricity is consumed. The emissions associated with this portion of the electricity are included in this category.
	Solid Waste The decomposition of waste in a landfill results in the emission of CO2 and CH4.
	Waste Water Waste water can be treated aerobically or anaerobically, both of which result in GHG emissions. The university's waste water is treated anaerobically, resulting in CH4 and N2O emissions.
	Air Travel Travel for business and research results in CO2 emissions from the combustion of jet fuel.
	Student and Employee Commuting Motorized travel to and from the university, whether by personal vehicle or public transit, results in emissions via the combustion of fuel and/or the consumption of electricity (e.g. LRT).
	Food The food purchased by university dining operations has upstream greenhouse gas emissions from its production and transportation.
	Paper Usage Paper usage results in emissions from its upstream production and potentially downstream waste management practices.
	Procurement Other procurement categories with upstream emissions could be explored in the future, such as IT equipment.
Scope 4	**Avoided Emissions** Emissions impact of a product (good or service), relative to the situation where that product does not exist. The difference may be positive or negative - positive differences are considered "avoided emissions."

University of Alberta Emissions Highlights

The total University of Alberta emissions in 2020/21 decreased by 23.9 per cent compared to the 2005/06 base year. Emissions in the following table are shown in tonnes of carbon dioxide equivalent (t CO_2e).

		2005-06	2020-21	
	Scope ↓	Total Emission	Total Emission	% Change from 2005
1	Scope 1	116,261.57	89,496.42	↓-23.0%
2	Scope 2	116,811.59	88,972.24	↓-23.8%
3	Scope 3	14,638.31	9,959.12	↓-32.0%
	Total:	**247,711.47**	**188,427.77**	**-23.9%**

Emissions by Location

The majority (98.9 per cent) of U of A emissions stem from campus operations, while less than 2 per cent are from off-campus research stations and other miscellaneous emissions sources. Of the campuses, North Campus accounts for 85.7 per cent of emissions, which translates to 84.9 per cent of the entire U of A emissions profile. The breakdowns are from 2020/21 emissions.

Emissions by Scope

In the base year of 2005/06, the U of A's emissions comprised 47.2 per cent scope 1, 46.9 per cent scope 2, and 95.9 per cent scope 3. In the reporting year of 2020/21, this profile changed slightly, with 62.7 per cent scope 1, 33.6 per cent scope 2, and 3.8 per cent scope 3 emissions. The largest pieces of the University of Alberta emissions profile result from the cogeneration of steam and electricity at the DES (scope 1), the purchase of electricity from the Alberta grid (scope 2), and the related transmission and distribution (T&D) losses (scope 3).

Emissions Trends Over Time

The U of A emitted a total of 247,711.47 tonnes of carbon dioxide equivalent emissions (t CO_2e) in the 2005/06 base year, and 265,680.31 t CO_2e (not including offsets) in the reporting year of 2020/21. With the purchase of offsets worth 77,252.54 t CO_2e the net emissions for 2020/21 are 188,427.77 t CO_2e. This change in 2020/21 represents an overall decrease of 23.9 per cent compared to the base year. This has met and surpassed the previous goal of reducing emissions by 17 per cent below 2005/06 levels (see Figure 2-9).

Without offsets, the change in 2020/21 represents an increase in emissions by 7.3 per cent compared to the base year. However, in that same time the university saw about a 31 per cent increase in building area and a 20 per cent increase in population. Many of the buildings added

to the university during that time were science and lab buildings, which use a much higher amount of energy than office and classroom buildings. The emissions intensity per person also decreased from 6.14 t CO_2e/person in 2005/06 to 3.88 t CO_2e/person in 2020/21.

Concluding Remarks

The University of Alberta is committed to reducing its impact on the environment and completed this GHG inventory to enable better measurement and management of the GHG emissions associated with university operations. The university's second GHG Reduction Plan was developed alongside this inventory and outlines reduction targets and strategies to the year 2030. This inventory will be maintained on an ongoing basis with results shared annually highlighting overall emissions as well as any progress being made towards the university's GHG emissions reduction target as a result of actions taken by the U of A.

Table of Contents

1. Introduction …….. 1

2. Greenhouse Gas Inventory…… 2
2.1. GHG Inventory Reporting Protocol and Principles…… 2
2.2. Scope of Inventory…….. 3
2.2.1. Organizational Boundaries
2.2.2. Operational Boundaries
2.2.3. Reporting Year and Base Year
2.3. Methodology……8
2.4 Emissions Inventory Results…….. 9
2.4.1. Summary of Total University of Alberta Emissions
2.4.2. Emissions by Location
2.4.3. Emissions by Scope and Activity
2.4.4. Emissions by Type of Greenhouse Gas
2.4.5. Emissions by Fuel Source
2.4.6. Emission Trends Over Time
2.4.7. Offsets and GHG Sink

3. Concluding Remarks……..18

4. Acknowledgements……..19

5. Contact Information……..19

6. References…..……..20

7. Appendices…..……..21

Important Abbreviations

CH_4	Methane
CO_2	Carbon dioxide

DES	District Energy System
ESG	Environmental, Social, and Governance
GHG	Greenhouse gas
HFCs	Hydrofluorocarbons
HCFC-22	Chlorodifluoromethane
N_2O	Nitrous oxide
PFCs	Perfluorocarbons
SF_6	Sulfur hexafluoride
TIER	Technology Innovation and Emissions Reduction
T&D	Transmission and Distribution
U of A	University of Alberta
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

1. Introduction

The International Panel on Climate Change continues to reinforce that climate change is occurring and that human interference with the climate system is a leading cause. Countries around the world (including Canada) have recognized this call to action, and have made commitments to limit their impact on climate change by reducing greenhouse gas emissions. In Canada, the federal government has an emissions reduction target of 40 percent below 2005 levels by 2030 and net-zero emissions by 2050 (Government of Canada, 2022).

In 2021 President Bill Flanagan signed the Joint Statement of Global University Leaders on the 2030 Agenda for Sustainable Development. In 2022 the U of A ranked 11th out of 1,400 universities globally in the Times Higher Education Impact Rankings, showing its leadership and commitment to achieving the United Nations' Sustainable Development Goals for 2030.

The University of Alberta is a globally recognized leader in post-secondary education and research, and a leader in sustainability. Therefore, the U of A is participating in this voluntary GHG inventory and reporting process to measure, assess, report on, and establish strategies for reducing the GHG emissions of the university. This report compares the baseline data from 2005/06 to the most recent data available, the 2020/21 reporting year, and is the second iteration of the university's Greenhouse Gas Emissions Inventory. In addition, the university's emissions are tracked and reported annually using an interactive Greenhouse Gas Emissions Dashboard. The dashboard can be found at uab.ca/emso.

2. Greenhouse Gas Inventory

2.1 GHG Inventory Reporting Protocol and Principles

The U of A GHG Inventory report is guided by the World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD) *Greenhouse Gas Protocol, Corporate Accounting and Reporting Standard* (World Resources Institute and the World Business Council for Sustainable Development, 2015). Use of the *GHG Protocol* ensures the university's report aligns with and follows a global standard. GHG reporting also has many advantages. As highlighted in the GHG Protocol, generally speaking a GHG inventory allows the U of A to:

- Manage GHG risks and identify reduction opportunities;
- Participate in (current or future) public reporting and voluntary GHG programs;
- Participate in (current or future) mandatory reporting programs;
- Participate in GHG markets;
- Be recognized for early voluntary action.

This and future U of A GHG inventories will adhere to the five *GHG Protocol* reporting principles:

- *"Relevance*

    - *Ensure the GHG inventory appropriately reflects the GHG emissions of the [university] and serves the decision-making needs of users - both internal and external to the [university].*
- *Completeness*
    - *Account for and report on all GHG emission sources and activities within the chosen inventory boundary. Disclose and justify any specific exclusions.*
- *Consistency*
    - *Use consistent methodologies to allow for meaningful comparisons of emissions over time. Transparently document any changes to the data, inventory boundary, methods, or any other relevant factors in the time series.*
- *Transparency*
    - *Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used.*
- *Accuracy*
    - *Ensure that the qualification of GHG emissions is systematically neither over nor under actual emissions, as far as can be judged, and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to enable users to make decisions with reasonable assurance as to the integrity of the reported information."*

2.2. Scope of Inventory

2.2.1. Organizational Boundaries

The U of A GHG Inventory follows the Operational Control approach to define its organizational boundary, rather than a Financial Control or Equity Share approach. Both the Financial Control and Equity Share approaches are more suited to private business and industry, where differing levels of financial contributions, voting rights and ability to profit from an operation are considered. Thus, the Operational Control approach was chosen as a better fit for a public institution like U of A. Operational Control is defined as having full authority to introduce and implement the university's operating policies.

Additional Context: the University of Alberta District Energy System

As illustrated in Figure 2-1 the University of Alberta District Energy System (DES) is unique from many other university power plants. It not only acts as the utility provider for the U of A's North Campus, but also to many facilities in the Greater Campus Area, including the University of Alberta Hospital, Stollery Children's Hospital, Canadian Blood Services, the Northern Alberta Jubilee Auditorium, the Cross Cancer Institute, and other small customers. None of these organizations fall within the organizational boundary of the U of A, but to be transparent and accept accountability for emissions from DES, the total DES emissions were tracked and reported for this inventory.

It is also important to note that the DES is required to submit annual reports both federally, to Environment Canada, as a facility that emits at least 10,000 tonnes of CO_2 equivalent emissions each year,[1] and provincially, as a TIER regulated facility that emits 100,000 tonnes of CO_2 equivalent emissions each year.[2] In order to accurately account for and characterize U of A GHG emissions, and in light of the fact that this is a voluntary reporting process, the DES emissions are included in this report as scope 1 emissions, but should not be mistaken for additional or double-reported emissions.

The organizational boundaries of this report include the following university-operated campuses and research stations, which are also illustrated in Figure 2-1.

Campuses	**Research Stations**
North Campus	Kinsella Research Station
South Campus	Devon Research Station
Augustana Campus	
Campus Saint-Jean	

Note: The Ellerslie and Meanook Research Stations were decommissioned in 2019 and 2020 respectively.

Other miscellaneous emissions sources are also included.

The following areas are excluded from this report:

- Bamfield Marine Sciences Centre. Bamfield is owned and operated by the Western Canadian Universities Marine Sciences Society (University of Alberta, University of Calgary, Simon Fraser University, University of British Columbia and University of Victoria).
- Enterprise Square. Enterprise Square is owned by the university but is managed and controlled by a property management company.

Emissions at a Glance

[1] Government of Canada, About the Greenhouse Gas Reporting Program. https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/facility-reporting/about.html. Accessed January 19, 2023.
[2] Government of Alberta, Technology Innovation and Emissions Reduction Regulation. https://www.alberta.ca/technology-innovation-and-emissions-reduction-regulation.aspx. Accessed January 05, 2023.

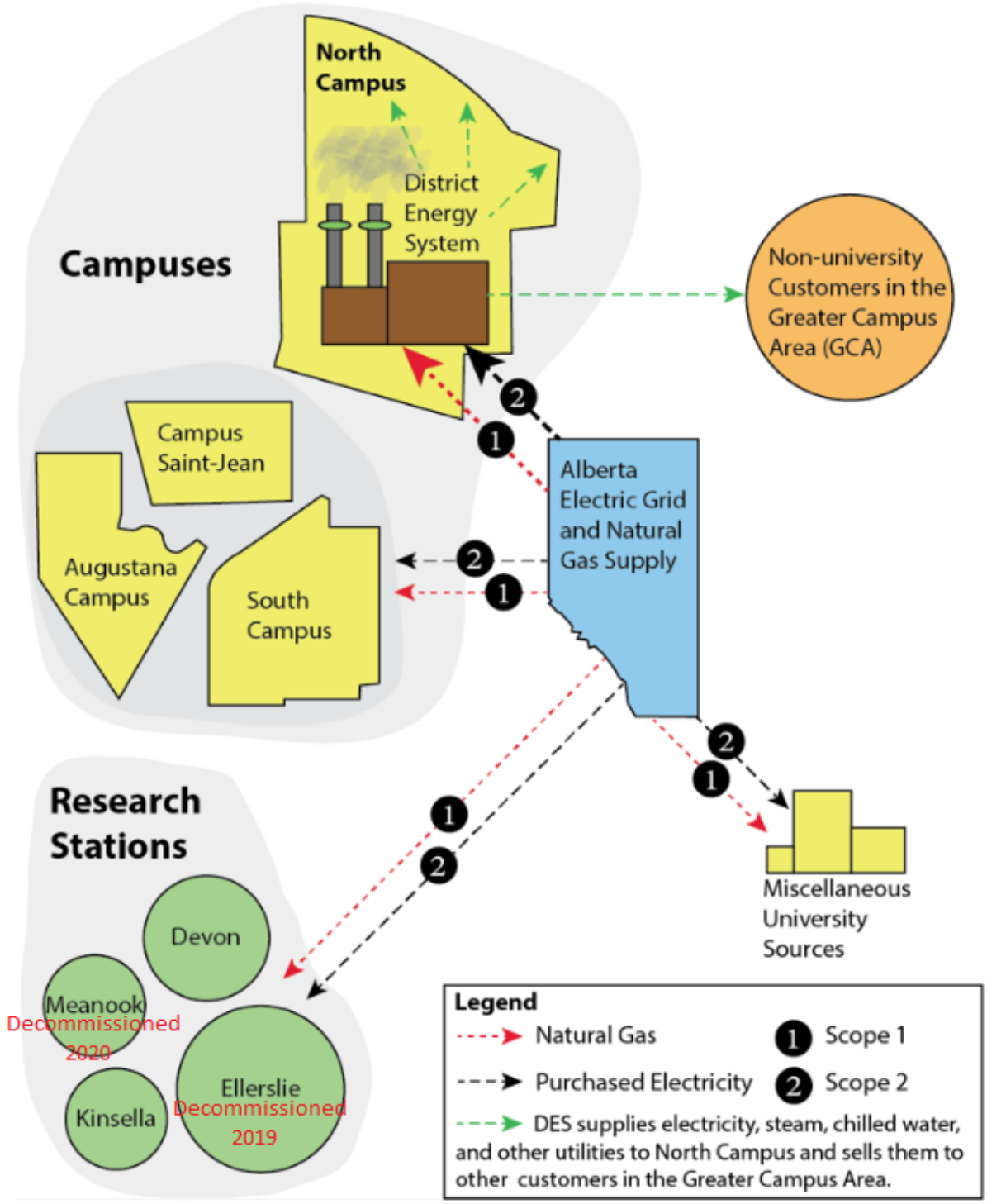


Figure 2-1. Illustration of the breakdown of major scope 1 and 2 emissions from U of A campuses and research stations. The DES supplies utilities to North Campus as well as customers in the greater campus area. North Campus is the source of 84.9 per cent of the university's total emissions.

2.2.2. Operational Boundaries

Description of Operational Boundaries

There are three different scopes of GHG emissions used to define the operational boundaries of an institution. These scopes are based on the degree of responsibility that a reporting institution has for the source of emissions. The definition of each scope, as well as the relationship to the university and this report are included in Table 2-1 and visually represented in Figure 2-1. All scope 1 and scope 2 emissions are included, as well as three sources of scope 3 emissions: scope 2 transportation and distribution (T&D) losses, solid waste, and waste water. Scope 3 emissions from student and staff transportation, air travel and paper will be considered for future inventories, but data was unavailable at the time of this inventory. Scope 4 is a newer category which takes into account avoided emissions. This inventory does not currently include scope 4, but may in the future.

Table 2-1. Operational Boundaries of the University of Alberta GHG Inventory (Scopes)

Scope	**Description**	**Required or Optional to Report**[a]	**University of Alberta Sources Included in this Inventory Report**
Scope 1	Direct emission sources in each of these four general categories: 1. Stationary combustion 2. Mobile combustion 3. Process emissions 4. Fugitive emissions	Required	Heating plant combustion processes[b]: - Cogeneration electricity - Cogeneration steam Other on-campus stationary combustion Direct transportation[c] Refrigerants and chemicals[d] Agriculture
Scope 2	Indirect emission sources from the consumption of purchased electricity, heat, or steam	Required	Purchased electricity[e]
Scope 3	Indirect emission sources from upstream or downstream activities and/or emissions associated with outsourced or contracted manufacturing, leases, or franchises not included in scope 1 or 2	Optional	Scope 2 T&D losses Solid waste Waste Water

[a]According to GHG Protocol

[b]Fuels include natural gas and fuel oil

[c]Emissions from university owned fleet vehicles

[d]Fugitive emissions only

[e]Purchased from the Alberta electrical grid

Description of Emissions Sources

SCOPE 1

Heating Plant combustion processes

The DES on North Campus is fueled primarily by natural gas, as well as some diesel, which are burned to create steam for electricity and heating. Burning natural gas releases the following greenhouse gases: CO_2, CH_4, N_2O.

Other on-campus stationary combustion

Many facilities at South Campus, Campus Saint-Jean, Augustana Campus, and the university's research stations have boilers that combust natural gas, like at the Heating Plant. This results in the emission of CO_2, CH_4, N_2O.

Direct transportation

The university's vehicle fleet produces emissions via the combustion of gasoline and diesel, resulting in CO_2, CH_4 and N_2O emissions.

Refrigerants and chemicals

Various types of equipment use, refrigeration and air conditioning can result in unintentional, or fugitive, greenhouse gas emissions. In the case of the U of A, this is a source of chlorodifluoromethane (HCFC-22) emissions.

Agriculture

Many agricultural processes, including raising livestock and fertilizer application, can result in GHG emissions in the form of CH_4 and N_2O. The university's South Campus is the primary contributor to this Scope 1 emission source.

SCOPE 2

Purchased electricity

For those campuses and research stations that do not have a district energy system, all electricity is purchased from the Alberta electric grid, resulting in CO_2, CH_4 and N_2O emissions from combustion of coal and natural gas.

SCOPE 3

Scope 2 T&D losses

During transmission and distribution of electricity, a portion of the electricity is consumed. The emissions associated with this portion of the electricity are included in this category.

Solid waste

The decomposition of waste in a landfill results in the emission of CO_2 and CH_4.

Waste water

Waste water can be treated aerobically or anaerobically, both of which result in GHG emissions. The university's waste water is treated anaerobically, resulting in CH_4 and N_2O emissions.

2.2.3. Reporting Year and Base Year

The base year for this inventory is the 2005/06 fiscal year and was chosen to align with federal government goals.[3] The reporting year for this inventory is the 2020/21 fiscal year, the most recent year for which all necessary data was available. All calculations are based on the fiscal year (April 1 through March 31).

Policy for Making Base Year Emissions Recalculations

Base year emissions recalculations will be made if the university acquires land or buildings that existed prior to acquisition. For example, if the university purchased a research station that was built prior to the base year of 2005/06, the base year emissions would have to be recalculated to include that research station's emissions; however if the university built a new building after the 2005/06 base year, no base year emissions would be made.

2.3. Methodology

The inventory was compiled using FigBytes, an ESG reporting platform.[4] The inventory was split up into three different categories for data collection purposes: campuses, research stations, and miscellaneous emission sources. The university's Energy & Climate Action group within Facilities and Operations collected and compiled all the data for this inventory. All masses of GHG were tracked using the metric system and are presented in metric tonnes (t) throughout the report unless stated otherwise.

Greenhouse gases
The following six greenhouse gases are identified by the Kyoto Protocol:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulfur hexafluoride (SF_6)

No sources of HFCs, PFCs or SF_6 were identified at the U of A and so these three gases are not included in this inventory report. However, some fugitive emissions were identified in the form of chlorodifluoromethane (HCFC-22), and so are included in the report.

[3] Government of Canada, 2030 Emissions Reduction Plan: Clean Air, Strong Economy. https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/climate-plan-overview/emissions-reduction-2030.html. Accessed December 13, 2022.
[4] Figbytes. https://figbytes.com/.

2.4. Emissions Inventory Results

2.4.1 Summary of Total University of Alberta Emissions

The U of A emitted a total of 247,711.47 tonnes of carbon dioxide equivalent emissions (t CO_2e) in the 2005/06 base year, and 265,680.31 t CO_2e (not including offsets) in the reporting year of 2020/21. With the purchase of offsets worth 77,252.54 t CO_2e the net emissions for 2020/21 are 188,427.77 t CO_2e. This change in 2020/21 represents a decrease of 23.9 per cent compared to the base year.

Table 2-2. Total CO_2 equivalent U of A emissions for the 2005/06 base year and 2020/21 reporting year (t CO_2e).

		2005-06	2020-21	
	Scope ↓	Total Emission	Total Emission	% Change from 2005
1	Scope 1	116,261.57	89,496.42	↓-23.0%
2	Scope 2	116,811.59	88,972.24	↓-23.8%
3	Scope 3	14,638.31	9,959.12	↓-32.0%
	Total:	**247,711.47**	**188,427.77**	**-23.9%**

Table 2-3. Total CO_2 equivalent U of A emissions for the 2005/06 base year and 2017 onwards showing both net emissions and emissions excluding offsets until the 2020/21 reporting year (t CO_2e).

	Year	Emissions Excluding Offsets (mt CO2e)	Offsets	Net Emissions (mt CO2e)	% Change from 2005 Baseline
1	2005-06	247,711.47	0.00	247,711.47	
2	2017-18	301,757.45	58,598.68	243,158.77	-1.8%
3	2018-19	274,744.50	56,728.86	218,015.64	-12.0%
4	2019-20	288,478.33	101,579.75	186,898.58	-24.5%
5	2020-21	265,680.31	77,252.54	188,427.77	-23.9%

North Campus and Greater Campus Area Customers

As discussed above, the University of Alberta Heating Plant on North Campus serves as a utility provider for customers in the Greater Campus Area, in addition to servicing North Campus. Figure 2-2 outlines how the emissions from the University of Alberta North Campus and its Heating Plant are divided between U of A operations and the Greater Campus Area (GCA) customers in both 2005/06 and 2020/21. For this report the emissions associated with U of A operations are shown with the GCA customers' emissions removed since these customers' operations are not under the operational control of the university. Only U of A operations will form the basis for GHG emissions reduction planning.

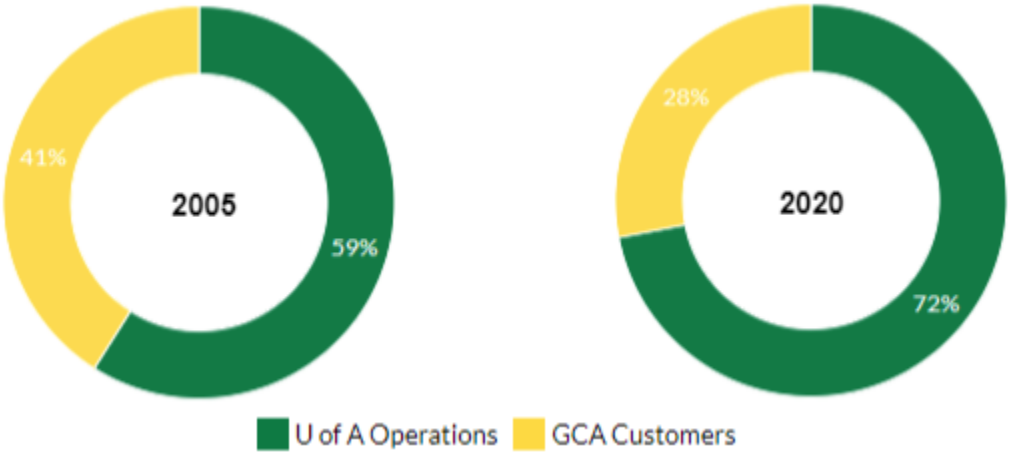


Figure 2-2. Emissions division between U of A operations and North Campus GHG emissions in 2005/06 and 2020/21 including GCA customers.

2.4.2. Emissions by Location

Shown in Figure 2-3 and 2-4 are the emissions breakdowns by location in the 2005/06 base year and 2020/21 reporting year respectively. For the reporting year the majority (98.6 per cent) of U of A emissions stem from campus operations, while less than 2 per cent are from off-campus research stations and other miscellaneous emissions sources. Of the campuses, North Campus accounts for 93.4 per cent of emissions, which translates to 91.2 per cent of the entire U of A emissions profile.

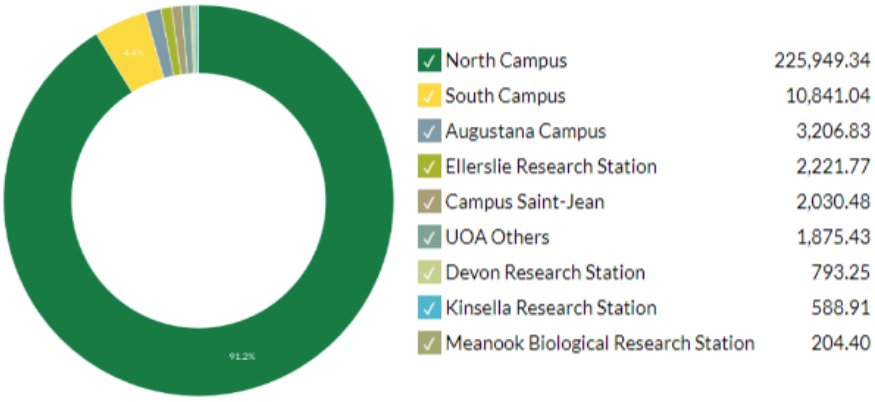


Figure 2-3a. Total emissions by location 2005/06

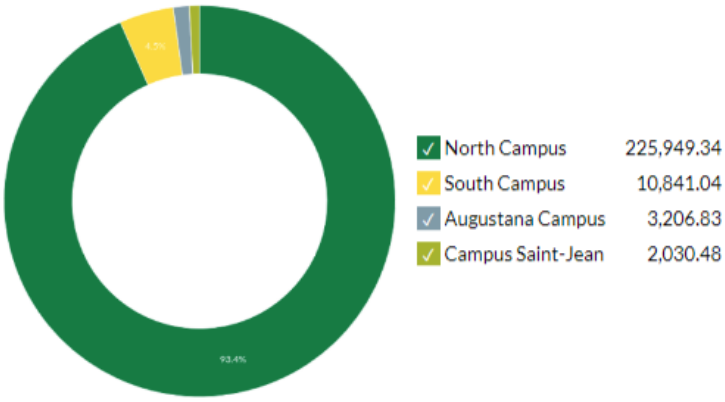


Figure 2-3b. Total emissions by Campus 2005/06

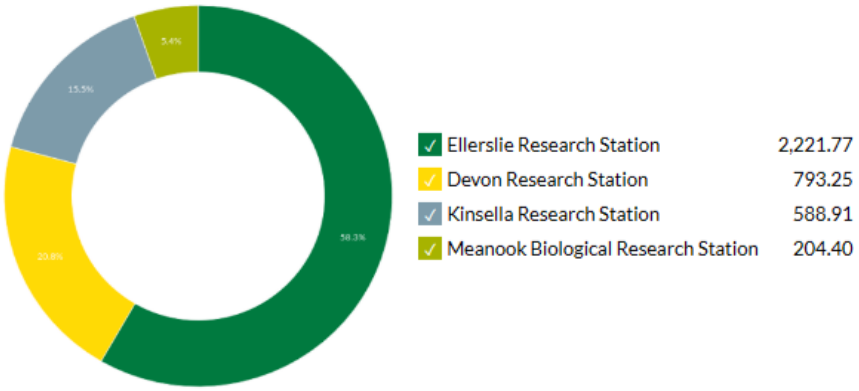


Figure 2-3c. Total emissions by Research Station 2005/06

Figure 2-3. Summary of U of A emissions by location for the 2005/06 base year broken down by (a.) all U of A sources; (b.) campuses; and (c.) research stations. Miscellaneous emissions sources (labeled UOA Others) are not broken out because there are multiple sources, each with a small contribution that is difficult to measure (see Table A-1). The total mass of miscellaneous emissions in 2005 was 1,875.4 t CO_2e.

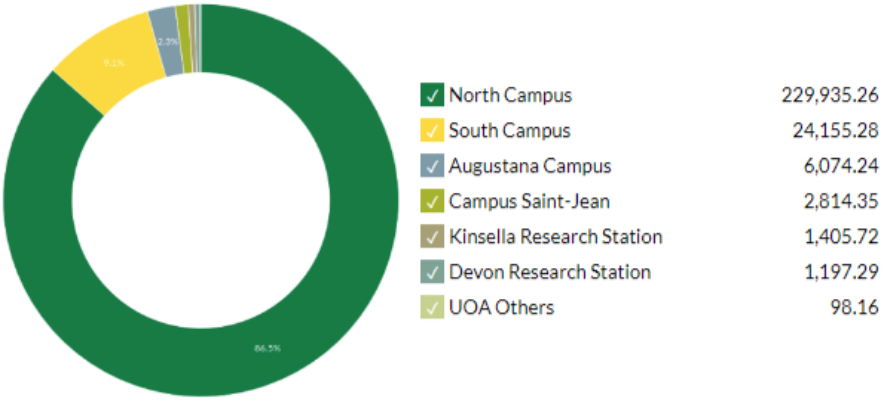


Figure 2-4a. Total emissions by location 2020/21

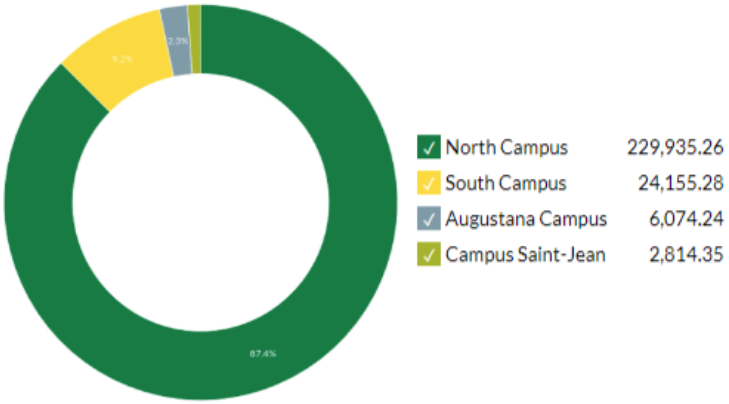


Figure 2-4b. Total emissions by Campus 2020/21

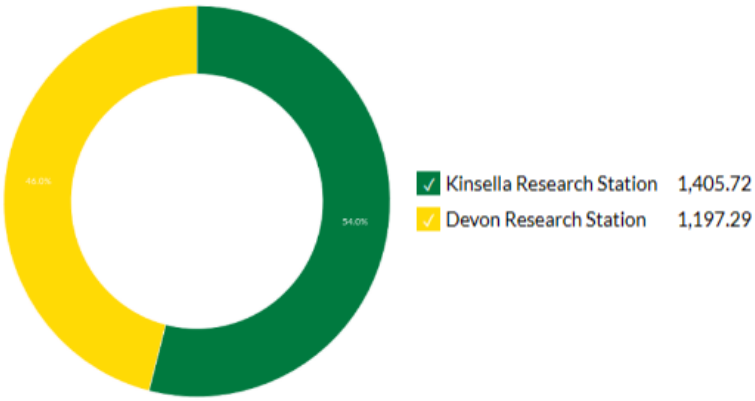


Figure 2-4c. Total emissions by Research Station 2020/21

Figure 2-4. Summary of U of A emissions by location for the 2020/21 reporting year broken down by (a.) all U of A sources; (b.) campuses; and (c.) research stations. Miscellaneous emissions sources (labeled UOA Others) are not broken out because there are multiple sources, each with a small contribution that is difficult to measure (see Table A-1). The total mass of miscellaneous emissions in 2020 was 98.2 t CO_2e.

2.4.3. Emissions by Scope and Activity

In the base year of 2005/06, the University of Alberta's emissions comprised 47.2 per cent scope 1, 46.9 per cent scope 2, and 5.9 per cent scope 3 (Figure 2-5). In the reporting year of 2020/21, this profile changed slightly, with 62.8 per cent scope 1, 33.5 per cent scope 2, and 3.7 per cent scope 3 (Figure 2-6).

The largest pieces of the University of Alberta emissions profile result from the cogeneration of steam and electricity at the DES (scope 1), the purchase of electricity from the Alberta grid (scope 2), and the related transmission and distribution (T&D) losses (scope 3) (Figure 2-6).

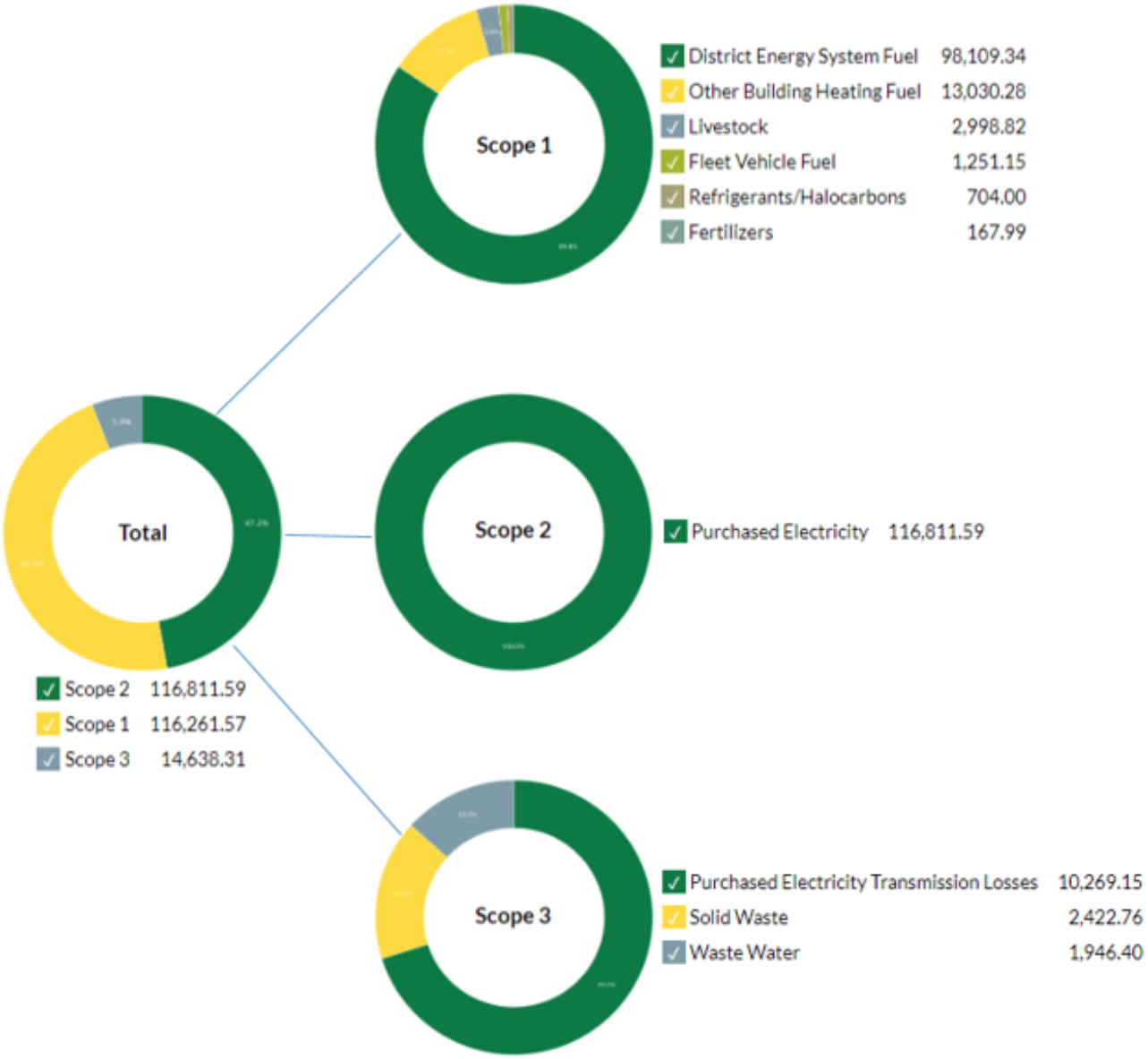


Figure 2-5. Breakdown of total U of A emissions in the 2005/06 base year by scope and by activity within each scope.

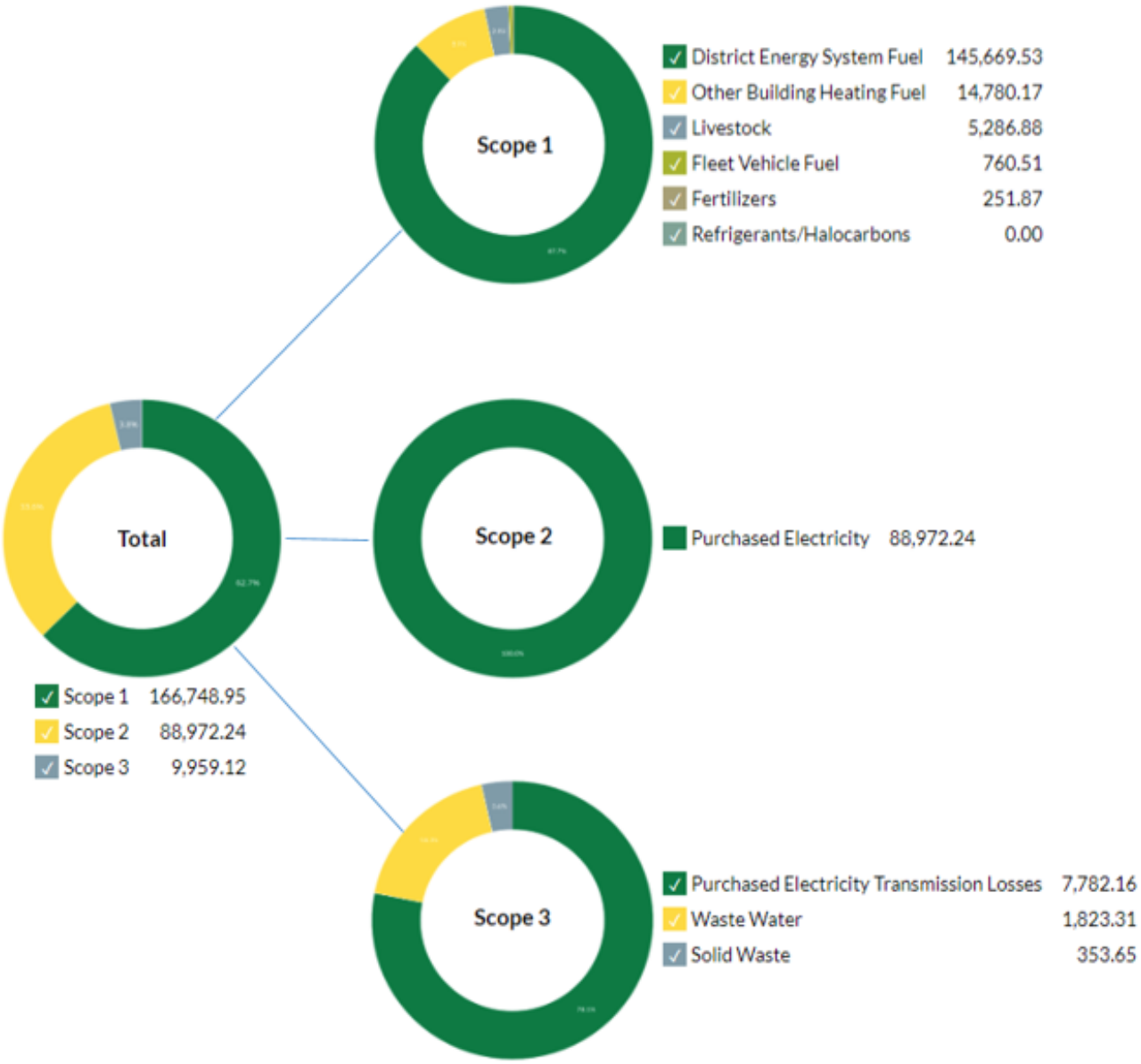


Figure 2-6. Breakdown of total U of A emissions in the 2020/21 reporting year by scope and by activity within each scope.

2.4.4. Emissions by Type of Greenhouse Gas

The emission of CO_2, CH_4 and N_2O were tracked and are reported here. The majority (96.6 per cent) of the university's greenhouse gas emissions in 2020/21 are CO_2. This is consistent with 2005/06 base year emissions (Figure 2-7).

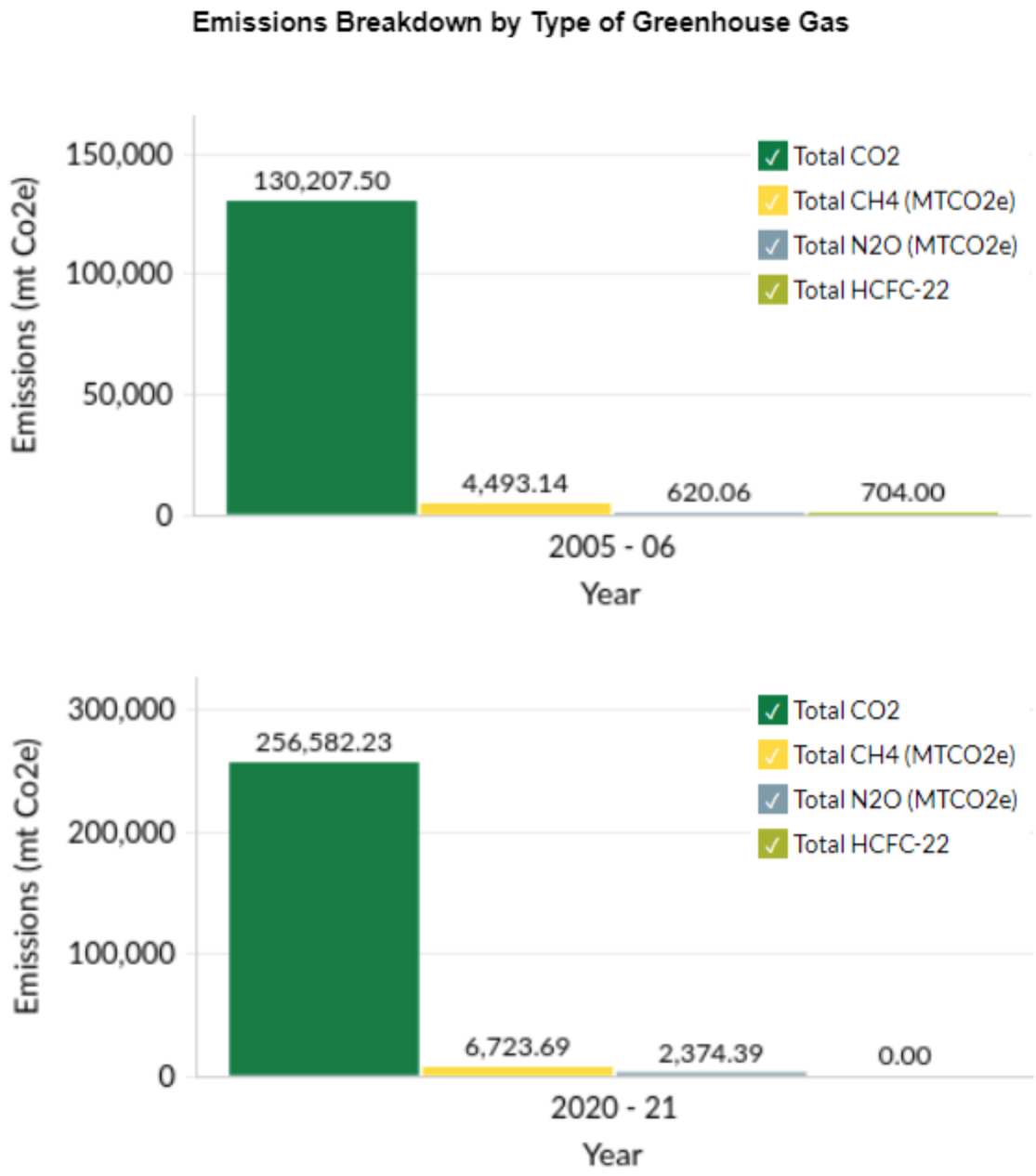


Figure 2-7. Total U of A GHG emissions broken down by type of greenhouse gas in the 2005/06 base year and 2020/21 reporting year.

2.4.5. Emissions by Fuel Sources

Fuel sources used by the U of A are natural gas, purchase electricity, diesel, and gasoline. Natural gas is used for cogeneration (North Campus only) and other stationary generation, and diesel and gasoline are used by university fleet vehicles. Most of the U of A's fuel emissions (59 per cent in 2020/21) stem from natural gas, with gasoline and diesel accounting for about 1 per

cent, regardless of the year. Natural gas and diesel use increased between 2005/06 and 2020/21, while electricity and gasoline use decreased.

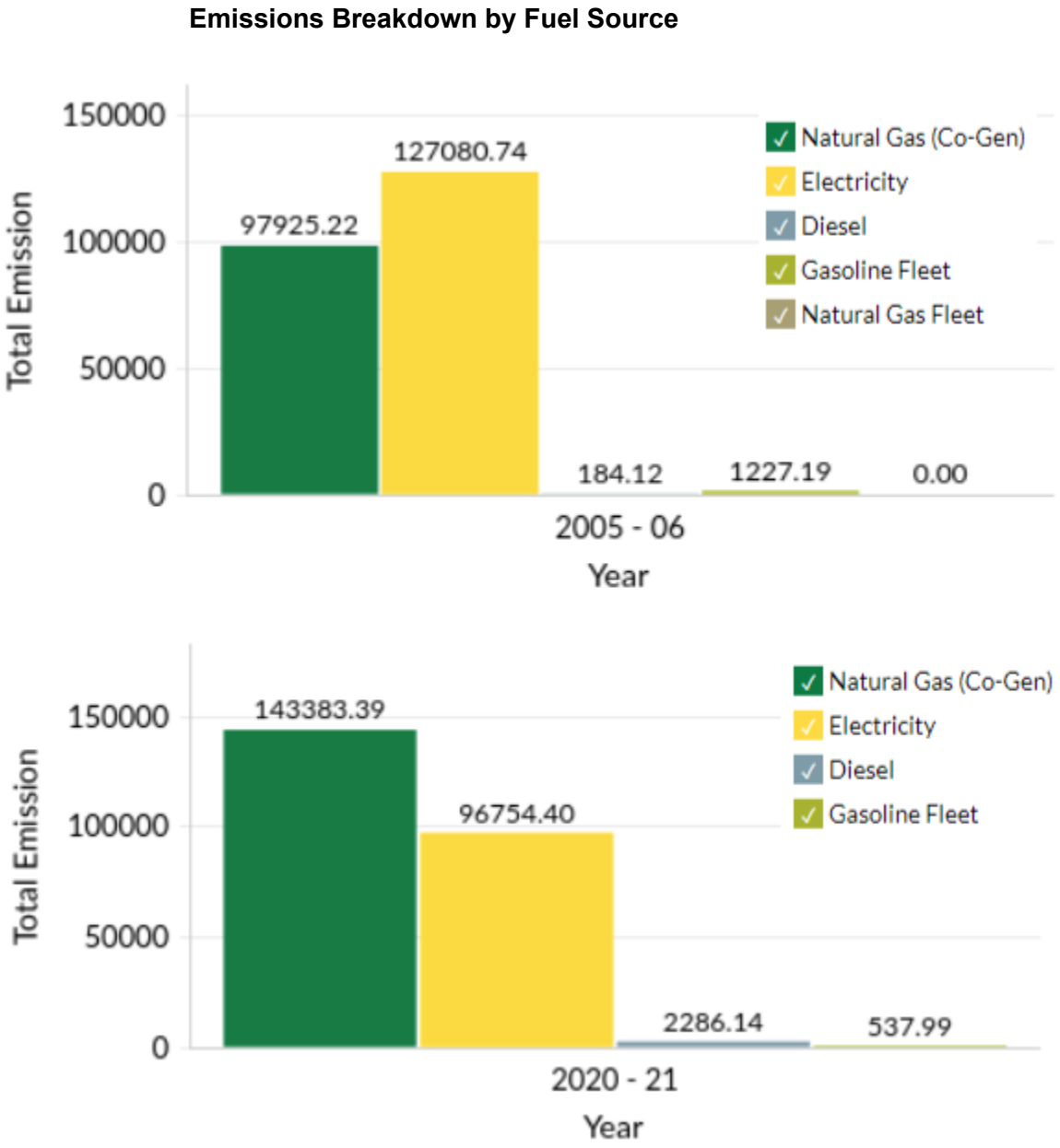


Figure 2-8. Summary of U of A emissions in the base year of 2005/06 and reporting year of 2020/21, broken down by fuel source.

2.4.6. Emission Trends Over Time

The U of A emitted a total of 247,711.47 tonnes of carbon dioxide equivalent emissions (t CO_2e) in the 2005/06 base year, and 265,680.31 t CO_2e (not including offsets) in the reporting year of 2020/21. With the purchase of offsets worth 77,252.54 t CO_2e the net emissions for 2020/21 are

188,427.77 t CO_2e. This change in 2020/21 represents an overall decrease of 23.9 per cent compared to the base year. This has met and surpassed the previous goal of reducing emissions by 17 per cent below 2005/06 levels (see Figure 2-9).

Without offsets, the change in 2020/21 represents an increase in emissions by 7.3 per cent compared to the base year. However, in that same time the university saw about a 31 per cent increase in building area and a 20 per cent increase in population. Many of the buildings added to the university during that time were science and lab buildings, which use a much higher amount of energy than office and classroom buildings. In the base year of 2005/06 the emissions intensity per person was 6.14 t CO_2e/person. In 2020/21 the emissions intensity per person decreased to 5.48 t CO_2e/person when considering emissions excluding offsets. When considering net emissions (including offsets) the emissions intensity per person is even lower at 3.88 t CO_2e/person.

2.4.7. Offsets and GHG Sink

Technology Innovation and Emissions Reduction

Technology Innovation and Emissions Reduction (TIER) Regulation is the main source of Alberta's emissions management approach. TIER focuses on reducing industrial facility emissions. Facilities that have emitted 100,000 t CO_2e per year since 2016 are regulated by TIER.[5] The U of A falls into this category and has participated in TIER since 2017 (see Figure 2-9). The university meets its compliance obligations by reducing on-site emissions and purchasing fund credits by paying into the TIER fund.

Forest Reserve

The University of Alberta has reserved approximately eight hectares of land on the south bank of the North Saskatchewan River alongside North Campus. This land is set aside and will not be developed. The GHG sink resulting from this forest reserve is approximately 55 tonnes per year. In addition, reserving this land maintains an unbroken length of the river valley, helping to preserve wildlife habitat and biodiversity.

[5] Government of Alberta, Technology Innovation and Emissions Reduction. https://www.alberta.ca/technology-innovation-and-emissions-reduction-regulation.aspx#jumplinks-0. Accessed January 05, 2023.

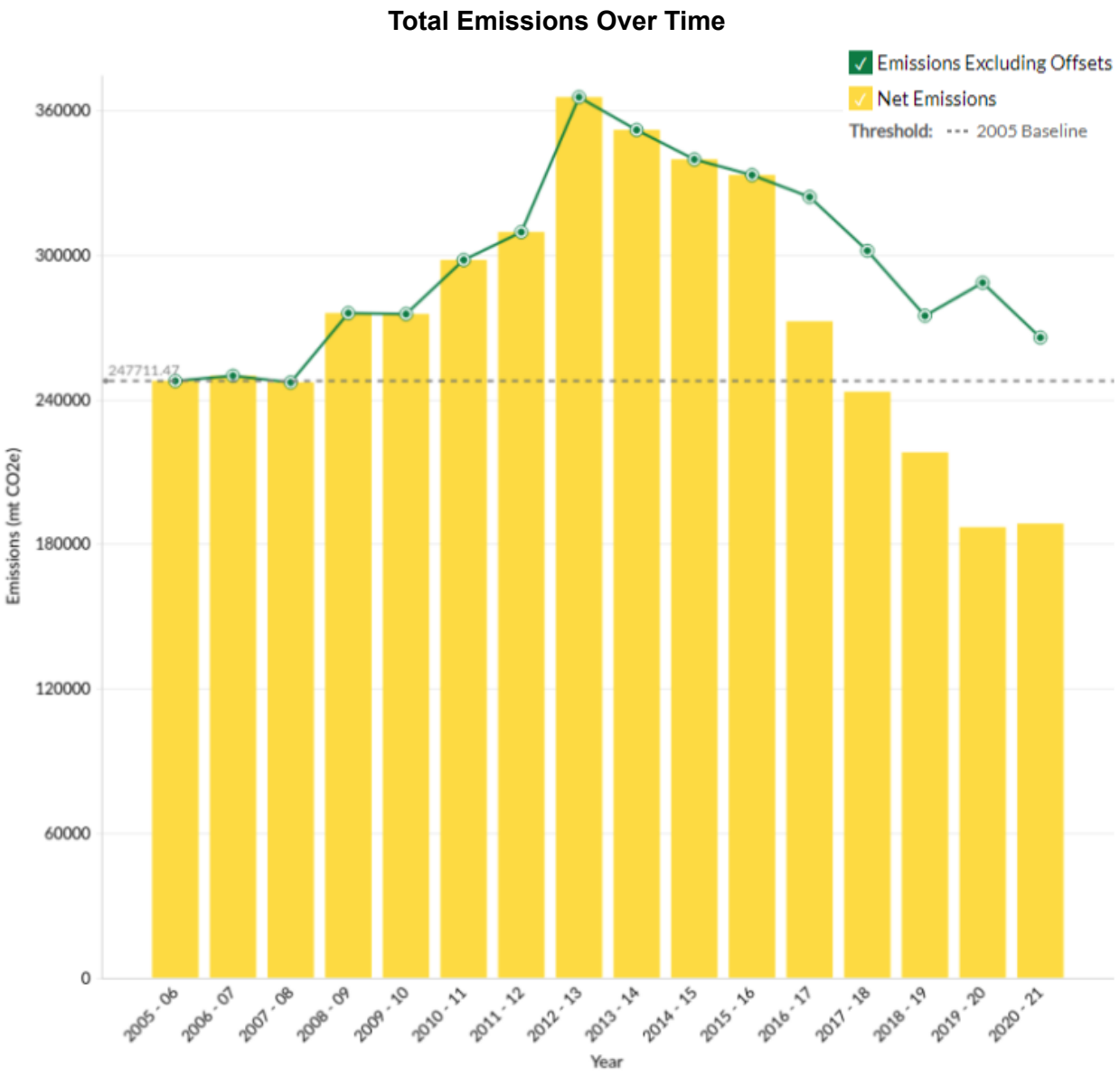


Figure 2-9. Total emissions over time starting with the base year of 2005/06 until the 2020/21 reporting year. Net emissions met and surpassed the goal to reduce emissions by 17 per cent below the 2005/06 threshold.

3. Concluding Remarks

The University of Alberta is committed to reducing its environmental impact and completed this GHG Inventory to enable better measurement and management of the GHG emissions associated with university operations. The inventory will be maintained on an ongoing basis and an annual report will be published highlighting overall emissions as well as any progress being made towards GHG emissions reduction as a result of actions taken by the university.

4. Acknowledgements

The Greenhouse Gas Emissions Inventory and Greenhouse Gas Emissions Reduction Plan were compiled and written by Energy & Climate Action with input from across the university.

Energy & Climate Action
Michael Versteege, *Manager*
Yashashwinee Parmar, *Program Coordinator*

Utilities
Mike Kohlenberg, *Associate Vice-President*
Laurel Roblin,*Utility Services Manager*
Jason Yuzyk, *Utilities Business Manager*

Facilities and Operations
Monica Ding, *Finance Partner*
Urszula Laskowski-Fuller, *Asset Work Management*

Operations and Maintenance
Randy Stumpf, *Manager of F&O for Augustana*

Residence Services
Delphi Kozmeniuk, *Assignment Supervisor*

Vehicle Pool
Jim Laverty, *Manager*

Faculty of Agricultural, Life, & Environmental Sciences
Jay Willis, *Research Stations Manager*

Performance, Analytics and Institutional Research - Strategic Analysis & Data Warehousing
Michael Goodnight, *Technical Trainer*

Buildings, Grounds, and Environmental Services
Tam Connelly, *Director, Grounds & Augustana*
Sobia Samad, *Zero Waste Coordinator*

5. Contact Information

Michael Versteege, P. Eng., EET, LEED AP, Lean Yellow Belt
Manager, Energy & Climate Action
Phone: 780-492-4024
Email: mike.versteege@ualberta.ca

6. References

Government of Alberta. (2023). Technology Innovation and Emissions Reduction Regulation. Retrieved January 05, 2023, from https://www.alberta.ca/technology-innovation-and-emissions-reduction-regulation.aspx

Government of Canada. (2022, July 12). *2030 Emissions Reduction Plan: Clean Air, Strong Economy*. Retrieved December 13, 2022, from https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/climate-plan-overview/emissions-reduction-2030.html

Government of Canada. (2023, January 23). *About the Greenhouse Gas Reporting Program.* Retrieved January 19, 2023 from https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/facility-reporting/about.html

World Resources Institute and the World Business Council for Sustainable Development. (2015). *The Greenhouse Gas Protocol. A Corporate Accounting and Reporting Standard. Revised Edition.*

7. Appendices

Appendix A. Miscellaneous Facilities

Table A-1. List of miscellaneous U of A sources of GHG emissions included in this report.

Name of Location or Facility
Lac St. Anne
Lac St. Anne Residence
Whitemud Drive (McTaggart)
Fish Lab
Misc off campus jobs
Bunkhouse
Hazardous Waste Storage Facility Meridian Street
Lac St. Anne Residence
Breton
George Lake
Leduc Seismographic Station
Ministick Research
Timms Estate
Woodbend/Devon Observatory
Acoustical Research Lab
Foote Field
Michener Tennis Centre - Change Room