



# 2017 CARBON NEUTRAL ACTION REPORT

MAY 2018



THE UNIVERSITY OF BRITISH COLUMBIA  
**sustainability**





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Photo credit: Hover Collective

## ABOUT UBC

The University of British Columbia is a global centre for research and teaching, consistently ranking among the 40 best globally, and among the top 20 public universities in the world. Since 1915, UBC's West Coast spirit has embraced innovation and challenged the status quo. Its entrepreneurial perspective encourages students, staff and faculty to challenge convention, lead discovery and explore new ways of learning. At UBC, bold thinking is given a place to develop into ideas that can change the world. Our two main campuses, in Vancouver and in the Okanagan, attract and educate over 65,000 students from 162 countries and employ over 15,000 staff and faculty. UBC's Vancouver campus is home to a vibrant, sustainable residential community where some 26,000 students, faculty, staff and other residents live, work and learn together. UBC's Okanagan campus, which has nearly doubled in size since 2007, is home to 1,700 students.

## SUSTAINABILITY PLANS AND PUBLICATIONS

UBC's Vancouver campus sustainability plans and reports, including annual GHG Inventories, Carbon Neutral Action Reports, and Annual Sustainability Reports are available at <https://sustain.ubc.ca/our-commitment/strategic-plans-policies-and-reports>. UBC's Okanagan campus Carbon Neutral Action Reports and SHIFT Sustainability Reports are available at <http://sustain.ok.ubc.ca/reports.html>.

## DECLARATION STATEMENT

The University of British Columbia's 2017 Carbon Neutral Action Report for the period January 1, 2017 to December 31, 2017 summarizes our emissions profile, the total offsets to reach net-zero emissions, and the actions we have taken in 2017 to reduce our greenhouse gas emissions and our plans to continue reducing emissions in 2018 and beyond.

By June 30, 2018 a copy of this report will be posted on our website at:

<https://sustain.ubc.ca/our-commitment/strategic-plans-policies-and-reports>.

# EXECUTIVE SUMMARY

As a rapidly growing, research-intensive institution, the University of British Columbia (UBC) is working on finding innovative ways to decouple growth from carbon emissions. UBC's carbon reduction strategy is driven by the need to manage operational costs and the urgency of mitigating climate change. The strategy focuses on increasing renewable energy supply and demand-size energy conservation. Our actions to date have saved the university roughly \$4M in avoided carbon costs since 2007.

In 2017, UBC continued to deliver on our bold climate action commitments, reducing greenhouse gas (GHG) emissions at our Vancouver and Okanagan campuses by 28 percent against a 2007 baseline, despite a 25 percent increase in floor space and a 36 percent increase in student enrolment. Relative to student enrolment, we have reduced GHG emissions per full-time equivalent (FTE) student by 47 percent compared to 2007 levels.

As the majority of UBC's GHG emissions arise from the operation of buildings, our achievement has resulted largely through integrating renewables into the district energy fuel supply, increasing the operational energy efficiency of district energy systems, re-commissioning existing buildings, designing and constructing new green buildings and delivering behavior-change programs focused on energy conservation.

UBC's Vancouver campus achieved a 30 percent reduction in absolute carbon emissions from the 2007 baseline. This year's achievements in managing our carbon emissions were attained by the increase in capacity of the highly efficient Campus Energy Centre, the decommissioning of UBC's old steam Powerhouse, the fifth full year of operation for the Bioenergy Research and Demonstration Facility (BRDF), and the Building Tune-up program to re-commission all major buildings on campus resulting in continued energy conservation. As part of UBC's commitment to advance green buildings on campus, six buildings became Leadership in Energy and Environmental Design (LEED) certified, five Gold and one LEED Platinum building – the AMS Student Nest. Three buildings became Residential Energy Assessment Program (REAP) certified. Brock Commons Tallwood House, the world's tallest mass timber building at 18 storeys, completed construction in 2017.

UBC Okanagan continued to make strides toward reducing carbon emissions through the implementation of key sustainability policies and actions within the context of campus planning and development. Ongoing building optimization, district energy system expansion and behaviour change initiatives have contributed to a 16 percent GHG emission reduction compared to a 2013 baseline. Looking ahead, UBC Okanagan will continue to take action on multiple, long-term efficiency measures to reduce energy and emissions as guided by the Whole System Infrastructure Plan. Among many planned projects, a 20-year Campus Scale District Energy (DE) Expansion Strategy will be developed to support campus growth and the achievement of a net positive performance in operational energy and carbon by 2050.

We are pleased to share key highlights of our climate action initiatives implemented in 2017.



MICHAEL WHITE  
Associate Vice-President  
Campus and Community Planning



ROB EINARSON  
Associate Vice-President  
Finance and Operations – Okanagan Campus



# EMISSIONS OVERVIEW

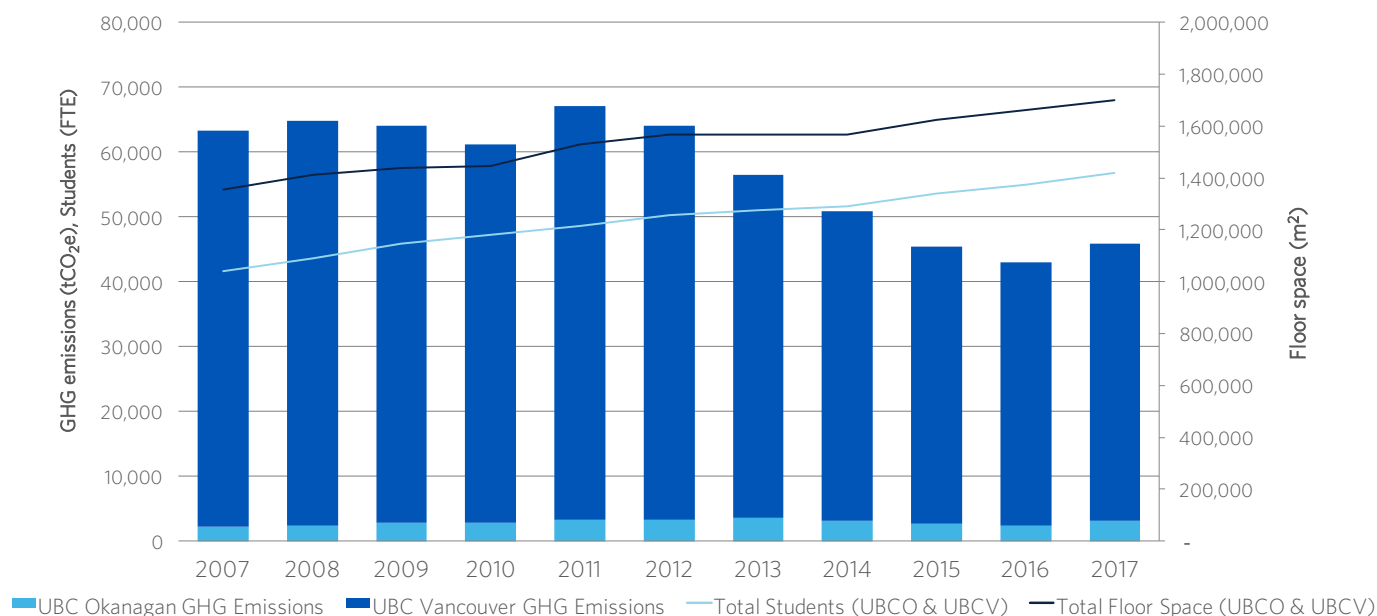


Photo credit: Paul Joseph / UBC Communications & Marketing

## EMISSIONS AND OFFSETS SUMMARY

UBC tracks and reports the absolute and relative emissions for each campus against a 2007<sup>1</sup> baseline to measure and demonstrate performance against our Climate Action Plan targets. Despite significant campus growth in floor space and student enrollment, UBC has achieved a substantial decrease in emissions per capita, as shown in Figure 1.

Figure 1: UBC Emissions for Offsets and Growth, Vancouver and Okanagan Campus, 2007 to 2017



<sup>1</sup> This summary outlines GHG emissions of both Vancouver and Okanagan campuses against a 2007 baseline. However, climate action targets and baselines are set by each of the campuses – Vancouver measures against a 2007 baseline, while Okanagan measures against a 2013 baseline. These different baselines consider the stability of growth of each of the campuses, which vary in both size and rate of growth.

## 2017 EMISSIONS AND OFFSETS

Under the [Greenhouse Gas Reductions Target Act](#), UBC has been required to report and offset its emissions since 2010, including emissions from all properties owned and leased by UBC and its subsidiaries.

A summary of emissions attributed to UBC's two campuses available in the figures below. Emissions for offsets for all properties and sites amounted to 51,938 tCO<sub>2</sub>e in 2017. Biogenic emissions, which are carbon dioxide emissions from biomass, renewable natural gas and biofuels, amount to 18,099 tCO<sub>2</sub>e, are not required to be offset, only reported. Including biogenic emissions, UBC's total emissions for 2017 amounted to 70,037 tCO<sub>2</sub>e.

Figure 2: 2017 UBC Total GHG Emissions by Location

GHG Emissions Created in 2017 Calendar Year	Emissions for offset	Emissions not required to be offset	Total Emissions
UBC Vancouver	42,786	18,097	60,883
UBC Okanagan	3,053	2	3,055
Off-campus Properties	3,885	-	3,885
UBC Properties Trust	2,214	-	2,214
<b>UBC Total</b>	<b>51,938</b>	<b>18,099</b>	<b>70,037</b>

Figure 3: 2017 UBC Total GHG Emissions by Location

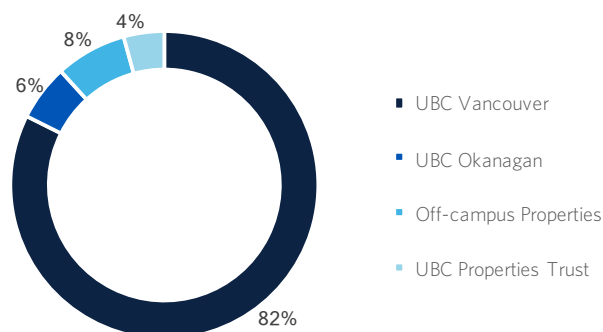


Figure 4 shows the 2017 emissions for offsets from UBC's two main campuses along with key performance indicators.

Figure 4: 2017 Emissions for Offsets for UBC's Vancouver and Okanagan Campus

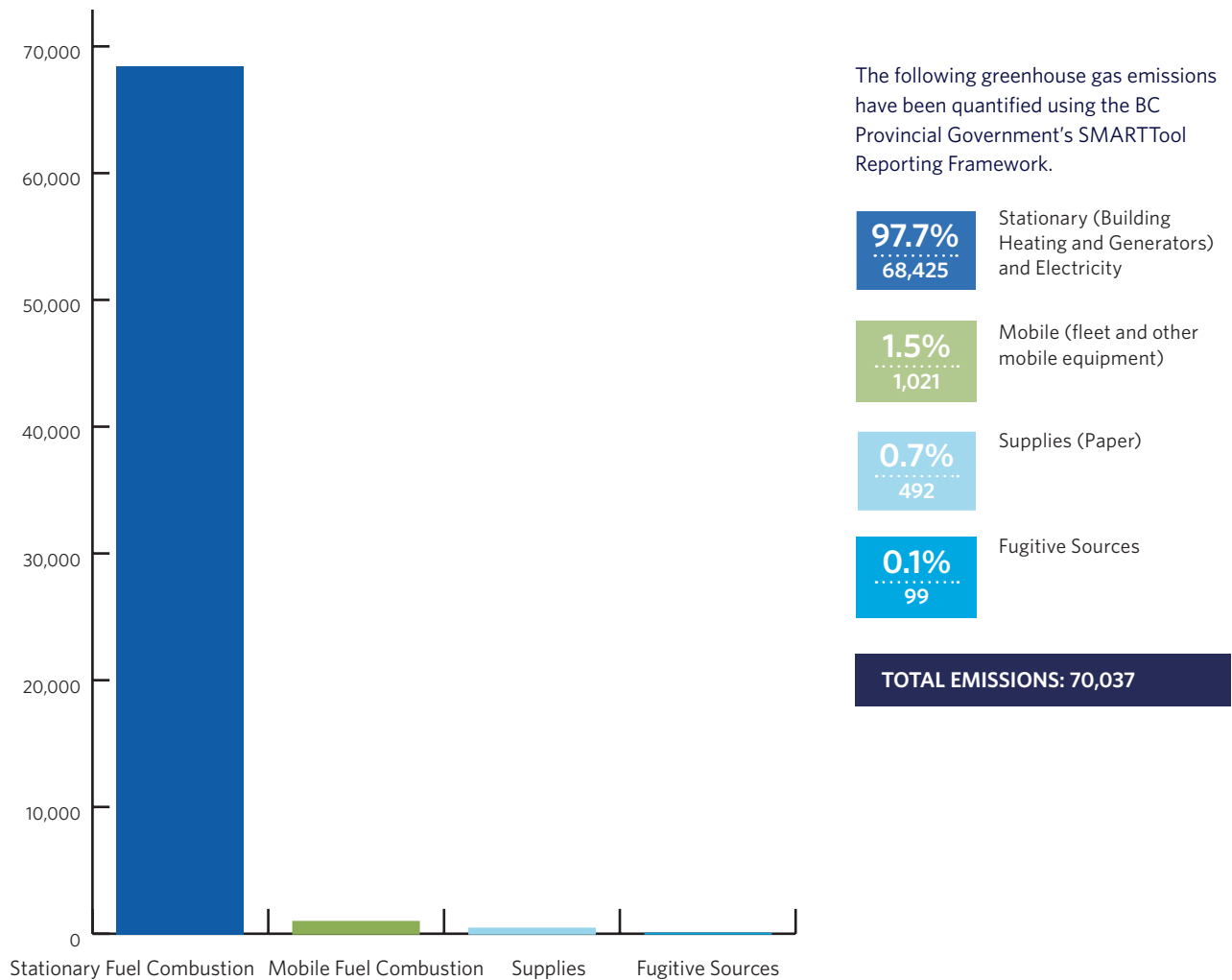
Key Performance Indicator	Vancouver Campus	Okanagan Campus	UBC Total
GHG Emissions (tCO <sub>2</sub> e)	42,786	3,053	45,839
Floor Space (m <sup>2</sup> )	1,558,209	141,896	1,700,105
GHG Emissions per Square Metre (tCO <sub>2</sub> e/m <sup>2</sup> )	0.027	0.022	0.027
Student Enrolment (FTE) <sup>2</sup>	48,782	8,010	56,972
Staff and Faculty Employees (FTE)	12,542	1,125	13,667
GHG Emissions per Student (tCO <sub>2</sub> e/FTE)	0.88	0.38	0.81

<sup>2</sup> Numbers are calculated on a full-time equivalent basis, as opposed to a headcount.



# GHG EMISSIONS BY SOURCE

UNIVERSITY OF BRITISH COLUMBIA GREENHOUSE GAS EMISSIONS BY SOURCE FOR THE 2017 CALENDAR YEAR (tCO<sub>2</sub>e\*)



## OFFSETS APPLIED TO BECOME CARBON NEUTRAL IN 2017

(Generated May 16, 2018 10:21 a.m.)

Total offsets required: 51,938. Total offset investment: \$1,298,450.

Emissions which do not require offsets: 18,099. \*\*

\*Tonnes of carbon dioxide equivalent (tCO<sub>2</sub>e) is a standard unit of measure in which all types of greenhouse gases are expressed based on their global warming potential relative to carbon dioxide.

\*\* Under the Carbon Neutral Government Regulation of the Greenhouse Gas Reduction Targets Act, all emissions from the sources listed above must be reported. As outlined in the regulation, some emissions do not require offsets.



# **UBC VANCOUVER CAMPUS**

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Emission Details

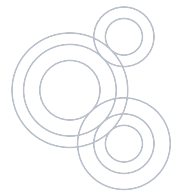




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# VANCOUVER CAMPUS SUMMARY

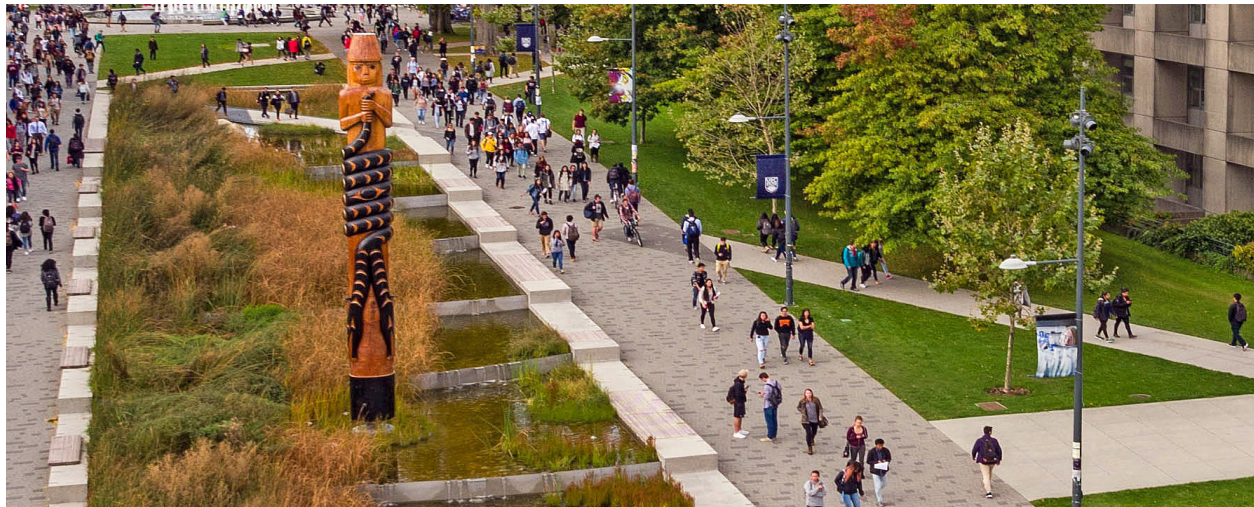


Photo credit: Hover Collective

UBC Vancouver's Climate Action Plan set some of the most aggressive GHG reduction targets among universities worldwide. An emissions reduction of 30 percent from the 2007 baseline was achieved in 2017.

UBC Vancouver's Climate Action Plan set some of the most aggressive GHG reduction targets among universities worldwide. An emissions reduction of 30 percent from the 2007 baseline was achieved in 2017. Despite the growth in campus population and size, UBC Vancouver achieved an emissions reduction per unit area of 42 percent compared to the 2007 baseline. Compared the 2016 emissions, there was a slight increase in GHG emissions in 2017, a fluctuation that can be expected with a growing campus and the colder temperatures experienced throughout the year. UBC will continue to pursue the Climate Action Plan target of 67 percent reductions in 2020. Meeting this target also means UBC is achieving operational savings, improving the efficiency of buildings, increasing resilience, and building a strong reputation in championing sustainability within and beyond the region.

UBC's 2017 success is due to its action over the last six years:

- UBC's award winning [Bioenergy Research and Demonstration Facility](#), a pioneering campus as a living lab project which began operation in 2012, generates renewable thermal energy from clean wood waste and electricity from renewable natural gas, significantly reducing fossil fuel-based energy use on campus.
- As part of the multi-year Academic District Energy System steam-to-hot water conversion project, the [Campus Energy Centre](#) has completed its second year of operation as the primary thermal energy source for UBC's new hot water district energy system. The project replaces the campus' 90-year-old steam system and aging steam plant, improving energy efficiency by over 24 percent.
- UBC continues the implementation of the [Building Tune Up](#) program to conserve energy and reduce waste in all buildings across campus. Alongside energy conservation projects, the program has reduced energy in over 50 buildings, saving \$2 million a year in operational costs and eliminating over 9 percent of campus GHG emissions compared to 2007 levels.





The first phase of UBC Vancouver's 2020 Climate Action Plan identified 24 actions to advance toward the 2020 target of 67% reduction below the 2007 baseline. Phase 2 of the Climate Action Plan was completed in 2017, with approval to expand of the Bioenergy Research and Demonstration Facility, which will increase the use of renewable wood waste and further reduce UBC's reliance on fossil fuels. The BRDF expansion is expected to be complete in 2020.

As part of UBC's commitment to advance green buildings on campus, six new buildings became LEED certified – one Platinum and five Gold, while three buildings became REAP certified. Brock Commons Tallwood House, the world's tallest wood building, completed construction in 2017. A new Green Building Plan is currently under development to create a pathway for achieving buildings that contribute to a net-positive campus which promotes human and ecological wellbeing as expressed in UBC's 20-year Sustainability Strategy.

In addition to large-scale infrastructure changes, we continue to engage our campus community to reduce emissions. In 2017, key engagement activities included the fifth annual Shut the Sash energy conservation competition engaging researchers to save energy in labs. UBC also expanded the Green Labs Program and the Sustainability Coordinator program to further reduce the environmental impact of our research laboratories.

Although there is much more work to be done in order to achieve our 2020 GHG reductions target, 2017 has been a highly productive year, and we are happy to share the results of our efforts with you.



MICHAEL WHITE  
Associate Vice-President  
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The University of British Columbia



# CLIMATE ACTION AT UBC VANCOUVER

## OVERVIEW

In 2010, UBC announced our Vancouver Campus Climate Action Plan, committing to aggressive reduction targets for GHG emissions – 33 percent reduction by 2015, 67 percent by 2020, and 100 percent reduction by 2050, compared to 2007 levels. The Vancouver campus now emits 30 percent less GHG emissions and a 42 percent reduction in emissions reduction per unit area compared to the 2007 baseline. Compared the 2016 emissions, there was an increase of 2,250 tCO<sub>2</sub>e in 2017, a fluctuation that can be expected with a growing campus and the colder temperatures experienced throughout the year.

Figure 5: GHG Emission Comparison by Source 2007, 2016 & 2017

Source	2007 Emissions (tCO <sub>2</sub> e)	2016 Emissions (tCO <sub>2</sub> e)	2017 Emissions (tCO <sub>2</sub> e)	Change from 2007 to 2017
Buildings	58,105	39,066	41,436	-29%
Fleet	1,973	1,017	926	-53%
Paper	1,003	453	423	-58%
<b>Total Vancouver Campus Emissions</b>	<b>61,082</b>	<b>40,536</b>	<b>42,786</b>	<b>-30%</b>

The building operations of the UBC Vancouver Campus, off-campus properties and UBC Properties Trust continue to be the largest source of emissions, making up 97 percent of the Vancouver Campus total in 2017. The Vancouver campus emitted a total of 18,097 tCO<sub>2</sub>e of biogenic (BioCO<sub>2</sub>) emissions from biomass, RNG and biofuels, which are not required to be offset.

UBC Vancouver has also completed an update to the Climate Action Plan, and identified an additional 24 measures to achieve the 67 percent reduction target by 2020. In 2017, the UBC Board of Governors gave initial approval for the addition of a new 12 megawatt boiler at the Bioenergy Research & Demonstration Facility (BRDF). Design work has started with the intention of obtaining approval to proceed with construction in December of 2018. This expansion to the BRDF, expected to come online in 2020, will allow our campus district energy system to meet projected heating demand needs of new buildings and also enable over 50% of the campus heating requirements to be met by a renewable resource.





## ACTIONS TAKEN TO REDUCE EMISSIONS

The Vancouver campus now emits 30 percent less GHG emissions than it did in 2007 despite a 21 percent growth in floor space. This was made possible by reducing energy consumption, investing in efficient energy generation and distribution, and integrating renewable energy sources.

### INVESTING IN EFFICIENT ENERGY GENERATION AND DISTRIBUTION

UBC's new 45 megawatt [Campus Energy Centre](#) completed its second full year of operation as the primary thermal energy source for UBC's new hot water district energy system. The new hot water district energy system replaces the campus' 90-year-old steam system and improves energy efficiency by over 24 percent through high efficiency boilers, heat recovery, and well-insulated piping. When combined with the new hot water district energy system, the Campus Energy Centre reduces the Vancouver campus' GHG emissions by approximately 20 percent and reduces operational costs by \$5.5 million a year.

### TUNING UP EXISTING BUILDINGS AND ENERGY CONSERVATION RETROFITS

UBC Energy & Water Services continued to implement its [Building Tune Up](#) program to conserve energy and reduce energy in all buildings across campus. In 2017, projects such as Life Sciences' supply air optimization, static pressure reset, and heat recovery system recommissioning, as well as the completion of Brimacombe/QMI energy retrofit have reduced over 100,000 GJ of natural gas. A campus-wide LED retrofit program was also completed in 2017, converting 36,000 lamps to LED, reducing campus electrical consumption by over 1 GWh. Overall, the program has reduced energy and operational costs by \$2.0 million a year in over 50 buildings, eliminating over 9 percent of campus GHG emissions compared to 2007 levels.

### ADVANCING LOW-CARBON AND RENEWABLE ENERGY SOURCES

UBC's [Bioenergy Research and Demonstration Facility](#) completed its fifth year of operation, generating heat from renewable biomass and electricity from renewable natural gas (RNG). In 2017, the current facility converted 8,800 tonnes of clean wood waste to produce over 25 percent of total campus steam and hot water production. This has significantly reduced natural gas use on campus and eliminated approximately 10 percent of campus GHG emissions compared to 2007 levels.

### PLANS TO CONTINUE REDUCING EMISSIONS

The [Climate Action Plan 2020](#) outlines a number of proposed actions to achieve our GHG targets by focusing on demand-side management and energy supply. The update to UBC's Climate Action Plan for the Vancouver Point Grey Campus outlined a roadmap for UBC to continue this progress toward meeting the approved 2020 GHG reduction target of 67%. To achieve this target, the Plan outlined several policies and actions that include areas such as existing buildings, new buildings, behavior change, UBC-owned fleet, and energy supply.

The update is a two-phased approach. Phase One, which was completed in 2016, commenced the implementation of energy demand actions focusing on emissions reductions through behaviour change, UBC-owned vehicles, and buildings. Phase Two, which was completed in 2017, addressed outstanding technical analysis related to the proposed energy supply options, which resulted in approval of the BRDF expansion by the Board of Governors in 2017.



## 2017 GREENHOUSE GAS EMISSIONS IN DETAIL

The Vancouver campus GHG Inventory, which is comprised of the emissions from core and ancillary buildings, TRIUMF, fleet and paper, has been compiled each year since 2006. In 2017, Vancouver campus emissions for offsets amounted to 42,786 tCO<sub>2</sub>e. A detailed breakdown of the campus emission sources is provided in Figure 6.

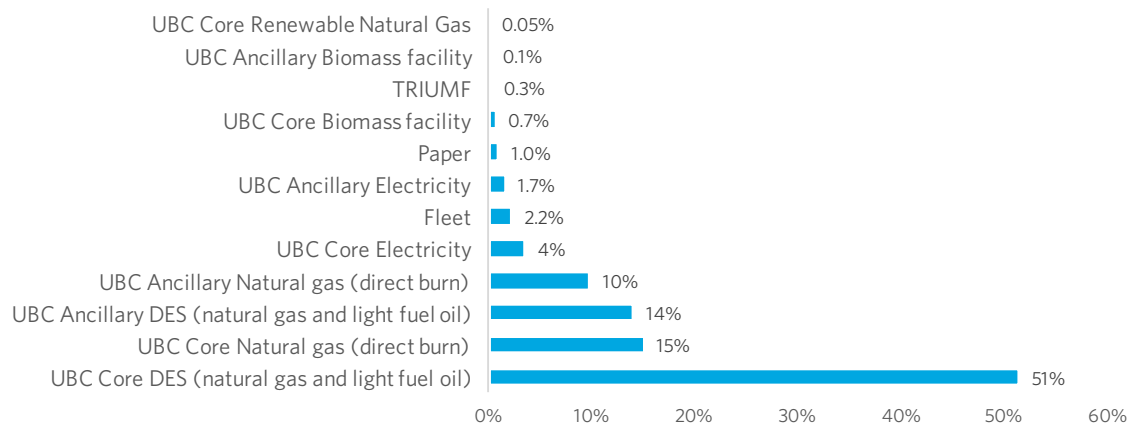
Figure 6: UBC's Vancouver Campus Emissions for Offsets, 2017

Source	2007 emissions (tCO <sub>2</sub> e)	2017 emissions (tCO <sub>2</sub> e) <sup>3</sup>
<b>UBC Vancouver Campus – Core buildings<sup>4</sup></b>	<b>46,478</b>	<b>30,308</b>
DES (natural gas and light fuel oil) <sup>5</sup>	40,106	22,021
Natural gas (direct burn)	3,515	6,463
Electricity	2,856	1,508
Biomass facility <sup>6</sup>	N/A	295
Renewable Natural Gas <sup>7</sup>	N/A	20
<b>UBC Vancouver Campus – Ancillary buildings<sup>8</sup></b>	<b>11,405</b>	<b>11,010</b>
DES (natural gas and light fuel oil) <sup>4</sup>	7,311	6,020
Natural gas (direct burn)	3,108	4,214
Electricity	986	713
Biomass facility	N/A	64
<b>TRIUMF<sup>9</sup></b>	<b>222</b>	<b>118</b>
<b>Fleet</b>	<b>1,973</b>	<b>926</b>
<b>Paper</b>	<b>1,003</b>	<b>423</b>
<b>Total Vancouver Campus Offsettable Emissions</b>	<b>61,082</b>	<b>42,786</b>

In accordance with the 2016/17 BC Best Practices Methodology for Quantifying Greenhouse Gas emissions, fugitive emissions from refrigerant gases comprise less than one percent of the Vancouver campus' total emissions, and are therefore deemed out of scope in the Vancouver campus' GHG emissions profile.

Core academic buildings include teaching and learning spaces, lecture theatres and laboratories, while ancillary buildings include athletics, student housing residences and the bookstore. Figure 7 shows the distribution of the source emissions from UBC's Vancouver campus. Natural gas makes up 90 percent of the total emissions, confirming that UBC's efforts to reduce fossil fuel reliance provide the greatest opportunity in reducing our carbon

Figure 7: UBC's Vancouver Campus' Historical Emissions and Growth



<sup>3</sup> May not sum to total due to rounding.

<sup>4</sup> Core buildings comprise academic and administrative buildings.

<sup>5</sup> District Energy System (DES)

<sup>6</sup> UBC is required to offset the CH<sub>4</sub> and N<sub>2</sub>O portions of biomass combustion. In addition, the Bioenergy Research and Demonstration Facility (BRDF) burns a small amount of natural gas. The BRDF began operating in 2012.

<sup>7</sup> UBC is required to offset the CH<sub>4</sub> and N<sub>2</sub>O portions of renewable natural gas.

<sup>8</sup> Ancillary buildings include student housing, conference, athletics and parking facilities.

<sup>9</sup> TRIUMF is a joint venture with other universities for physics research, it has historically been included in the UBC Vancouver Campus inventory since it is located on campus. UBC accounts for 1/12th of emissions from TRIUMF.



## COMPARISON TO BASELINE YEAR

UBC tracks and reports our absolute and relative emissions for each campus against a 2007 baseline to measure and demonstrate performance against our Climate Action Plan targets. In 2017, UBC's Vancouver campus reduced offsettable GHG emissions by 30 percent against a 2007 baseline.

The emissions from campus buildings, along with fleet and paper amounted to 0.88 tCO<sub>2</sub>e per student (FTE) in 2017, a 46% decrease in emissions per student (FTE) since 2007. Between 2007 and 2017, the Vancouver campus' building floor space increased by roughly 270,000 m<sup>2</sup> (21%), with several older buildings demolished to make way for the construction of new buildings, while student enrolment increased by 11,209 FTE students (30%) between 2007 and 2017. Figure 8 and 9 outline the change in campus emissions since the 2007 baseline year, along with indicators of Vancouver campus growth.

Figure 8: UBC's Vancouver Campus' Historical Emissions and Growth

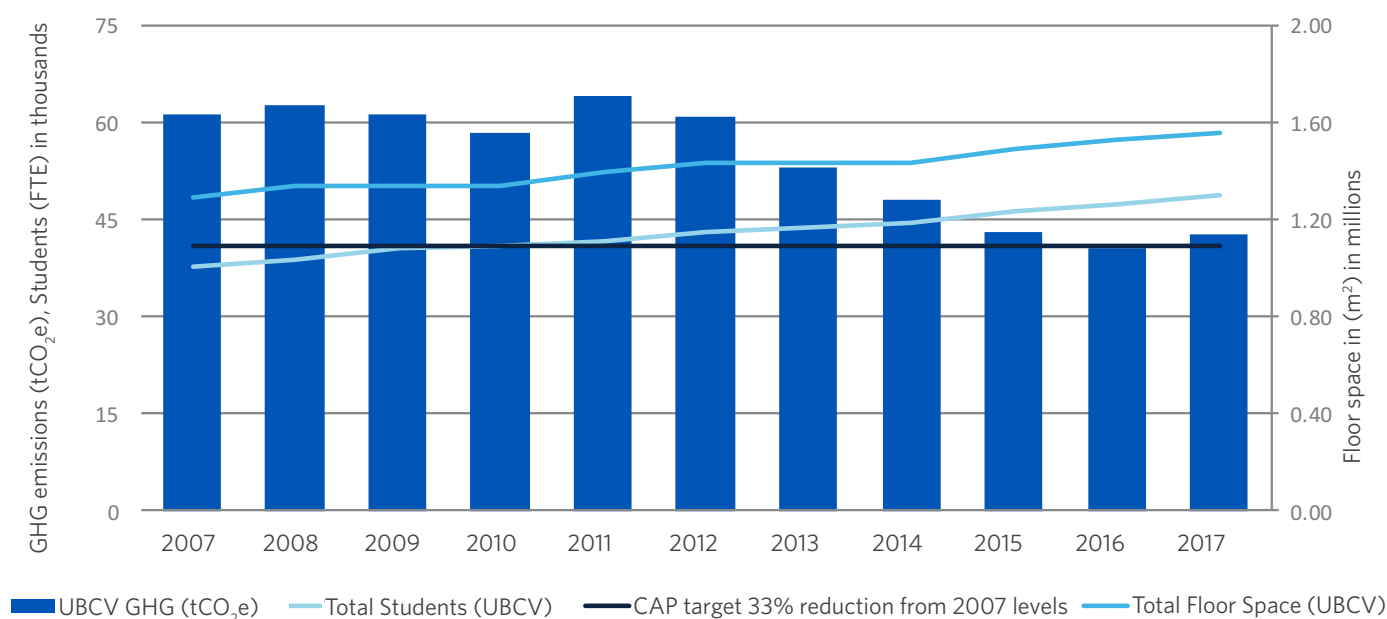


Figure 9: UBC Vancouver Campus' Scope 3 Emissions, 2017

Key Performance Indicator	2007	2017	% Change
GHG Emissions (tCO <sub>2</sub> e)	61,082	42,786	-30%
GHG Emissions per Student (tCO <sub>2</sub> e/FTE)	1.62	0.88	-46%
GHG Emissions per square meter (tCO <sub>2</sub> e/m <sup>2</sup> )	0.048	0.027	-42%
Floor Space (m <sup>2</sup> )	1,284,482	1,558,209	+21%
Student Enrolment (FTE)	37,589	48,798	+30%
Staff and Faculty Employees (FTE)	10,509	12,542	+19%



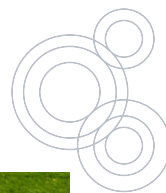


Photo credit: Hover Collective

## SCOPE 3 EMISSIONS

UBC's Climate Action Plan includes strategies for reducing emissions related to commuting, business travel, procurement and food. These emissions are not required to be offset. However, the Vancouver campus GHG inventory goes beyond provincial requirements by quantifying several categories of optional or Scope 3 emissions, which are outlined in Figure 10.

Figure 10: UBC Vancouver Campus' Scope 3 Emissions, 2017

Source	2007 emissions (tCO <sub>2</sub> e)	2017 emissions (tCO <sub>2</sub> e)	Percent change from baseline year
Commuting	36,059	41,738	+16%
Business Flights	13,600	16,693	+23%
Building Lifecycle	10,190	12,855	+26%
Solid Waste	1,930	964	-50%

The increase in emissions from commuting and business flights are a reflection of our growing campus population. Compared to 2007, a greater percentage of students, staff and faculty use public transit and active transportation modes over single occupant vehicles to commute to and from campus.

Solid waste emissions have decreased significantly from 2007 to 2017 despite the increase in campus population during that time. This is a result of the change in Metro Vancouver's emission factor and the implementation of the Zero Waste Action Plan, with a subsequent decrease in the total amount of operational waste disposed to the landfill or incinerated during that time. Building lifecycle emissions are approximately proportional to campus floor space.

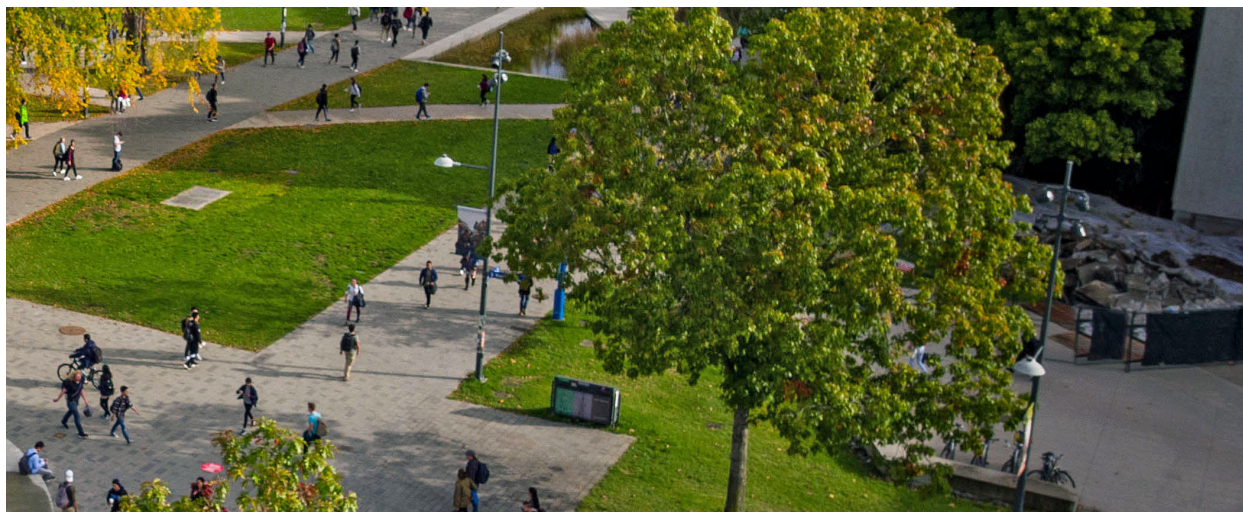
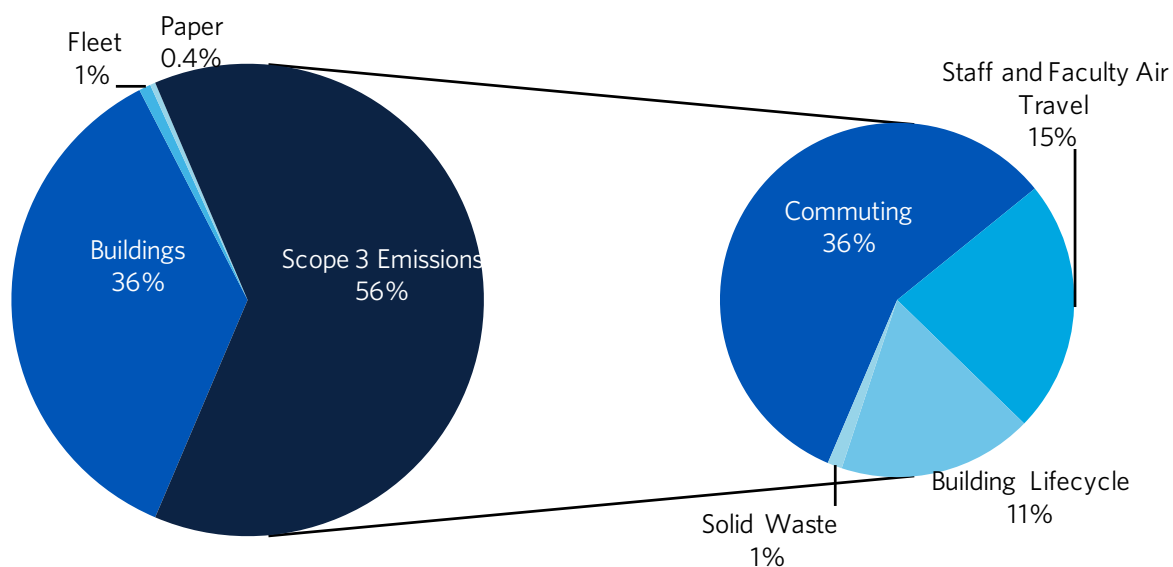


Photo credit: Hover Collective

## COMPARISON TO SCOPE 1 & 2 EMISSIONS

The combined Scope 3 emissions from commuting, business travel, building lifecycle and solid waste were greater than the Vancouver campus emissions for offset. Figure 11 shows the comparative proportions of the various emission categories for the Vancouver campus. Although Scope 3 emissions fall out of scope of the provincial requirements for carbon neutrality, Figure 11 characterizes their relative significance.

Figure 11: UBC's Vancouver Campus Total Emissions by Scope (Scope 1, 2 & 3), 2017







# **UBC VANCOUVER ACTIONS SURVEY**

2017 CARBON NEUTRAL  
ACTION REPORT (CNAR)



# UBC ACTIONS SURVEY

## 2017 CARBON NEUTRAL ACTION REPORT (CNAR) - PART 1 UBC VANCOUVER CAMPUS

### 1. Stationary Sources (Buildings, Power Generators): Fuel Combustion, Electricity use, Fugitive Emissions

Survey Question	Response
During 2017, did your organization take any of the following actions to support emissions reductions from buildings? Select all that apply	
<ul style="list-style-type: none"> <li>Conducted an energy audit/study of building(s) in the organization's portfolio</li> </ul>	Yes
<ul style="list-style-type: none"> <li>Performed energy retrofits of the organization's buildings</li> </ul>	Yes
<ul style="list-style-type: none"> <li>If yes, how many buildings?</li> </ul>	29
<ul style="list-style-type: none"> <li>Built, or are building new LEED Gold or other "Green" buildings</li> </ul>	Yes
<ul style="list-style-type: none"> <li>If yes, how many buildings?</li> </ul>	6
<b>Other actions? Please describe briefly.</b>	
<p>In the 2017 calendar year:</p> <ul style="list-style-type: none"> <li>6 buildings became LEED certified. 5 are LEED gold and one is LEED platinum (the Nest through student-led push for a sustainable building).</li> <li>3 buildings were REAP certified. 2 are REAP gold and one (Central) is REAP gold plus.</li> <li>Brock Commons Tallwood House finished construction in 2017, the world's tallest wood building.</li> </ul>	
<b>Did your Organization perform any retrofits during 2017? Please describe briefly.</b>	
<p>Retrofits performed:</p> <ul style="list-style-type: none"> <li>Brimacombe/QMI building – energy recovery, process cooling and air change rate retrofit.</li> <li>Fumehood recommissioning – right sizing air changes in 5 lab buildings.</li> <li>Continuous optimisation – VSD, sensor, and programming upgrades.</li> <li>Recommissioning and optimisation of the Nest building.</li> <li>LSC building – Air changes and static pressure reset optimisation.</li> </ul>	
<b>Please briefly describe your organization's plans to continue reducing emissions from its stationary sources over the next 1-5 years.</b>	
<p>Intensive demand-side management (DSM) activities are planned, in addition to installing an expansion of the Bioenergy Research Demonstration Facility (BRDF), and creation of a Green Building Plan.</p> <p>The BRDF expansion program aims to install an additional boiler to take on a higher proportion of campus baseload energy use.</p> <p>The Green Building Plan has the vision to create a pathway for development of net-positive buildings, both academic and residential, which promote human and ecological wellbeing.</p>	

**Over the next 6-10 years**

We have an overall target to reduce emission to zero by 2050. The Green Building Plan has a time frame to 2035.

## 2. Mobile Sources (Fleet, Off-road/Portable Equipment) Fuel Combustion

Survey Question	Response
During 2017, did your organization take any of the following actions to support emission reductions from its mobile sources?	
▪ Replaced existing vehicles with more fuel efficient vehicles (gas/diesel)	Yes
▪ If yes, how many vehicles?	23
▪ Replaced existing vehicles with hybrid or electric vehicles	Yes
▪ If yes, how many vehicles?	1
<b>Other actions? Please describe briefly.</b>	
In 2017 we replaced a total of 23 vehicles to a more fuel efficient model models, and 1 heavy duty vehicle has been replaced by a hybrid model to help reduce our GHG emissions. We will continue to identify other opportunities that may exist with a greater exposure to CNG, as well as consider the electric options that are potentially coming our way in the 2019 model year for our commercial fleet.	
<b>Briefly describe your organization's plans to continue reducing emissions from its mobile sources over the next 1-5 years:</b>	
Improvements to UBC Building Operation's fleet are strongly tied to the vehicle industry and options that are readily available to our market. We will continue to expand our vehicles to electric options where possible, and look to other cleaner sources of fuel like CNG. In the past year, we have added two more electric vehicle charging stations and 3 more electric Smart Fortwo electric vehicles in order to expand our shared vehicle program.	
<b>Over the following 6-10 years:</b>	
Our plan is to continue to properly size our fleet with sustainable options and ensure that we keep ourselves updated with electric service vehicle options that become available on the market, which is where we anticipate the largest potential reduction in GHG emissions for our fleet. Our replacement plan for the upcoming fiscal year will look at replacing an additional 15 vehicles with more fuel efficient models.	



### 3. Supplies: (Paper)

Survey Question	Response
During 2017, did your organization take any of the following actions to support emissions reductions from paper supplies?	
▪ Awareness campaign focused on reducing office paper use	No
▪ Policy requiring the purchase of recycled content paper	No
▪ If yes, state % of recycled content (e.g. 30%, 100%)	N/A
▪ Policy requiring the purchase of alternate source paper (bamboo, hemp, wheat, etc.)	No
▪ If yes, state source type (e.g. bamboo, wheat)	
<b>Other actions? Please describe briefly.</b>	
Updated Sustainable Purchasing Guide was published in 2016 and encourages the procurement of paper made from alternative fibre, paper with 50-100% recycled post-consumer recycled content, paper with FSC certification and chlorine-free paper. It also discourages the purchasing of paper with less than 30% post-consumer recycled content, excessive packaging, paper without eco-certification and paper that is produced in distant regions.	
<b>Please briefly describe your organization's plans to continue reducing emissions associated with its office paper use in future years.</b>	
In future years, we plan to continue to promote the Sustainable Purchasing Guide to the campus community, especially for the departmental and unit administrators, and the network of Sustainability Coordinators across campus.	
Also, we will be working with a new supplier of Office Supplies (including paper) which will provide a refocus on the types of paper offered and promotion of sustainable options. We will encourage UBC customers to purchase paper with high recycled content.	

### 4. Other Sustainability Actions: Business Travel

Survey Question	Response
During 2017, did your organization take any of the following actions to support emissions reductions from business travel?	
▪ Created a low-carbon travel policy or travel reduction goal (low-carbon = lowest emission of greenhouse gas per kilometer per passenger)	No
▪ Encouraged alternative travel for business (e.g. bicycles, public transit, walking)	Yes
▪ Encouraged or allowed teleworking or working from home	Yes

**Other actions? Please describe briefly.**

UBC has made a strong effort to provide video conferencing technology in multiple meeting rooms across campus, making it easier for staff and faculty to reduce travel. One of the most common trips is from UBC Vancouver to UBC Okanagan, and vice versa – this strategy is helping to reduce these trips.

A UBC SEEDS project was conducted in collaboration with Sustainability and Engineering and Financial Operations, and found that:

- 50% of UBC air-travel GHG emissions are produced by 8-11% of faculty and staff. It was determined that the most common reason for campus business travel is in-person conference attendance. In addition, nearly half of faculty members report willingness to reduce number of flights if they have access to right tools for video conferencing.
- Recommendations included a centralized accounting system, eliminating higher class of travel, integrating central information and communications technology into climate action, and adopting an offsets program (with caution).
- This has led to Sustainability and Engineering proposing a follow-up SEEDS project looking at how a UBC offsets program could be structured to advance climate action at UBC.

One of the major goals of the UBC's Transportation Plan is to reduce Single Occupancy Vehicle (SOV) travel; one way this goal is being targeted is by working with application developers and other technologies, to make it easier for people to carpool rather than take their own vehicles to work/school.

Another major effort to reduce car travel to UBC, is through the development of a rapid transit line from the city of Vancouver. Several staff members are communicating with Translink and other stakeholders to discuss potential options for travel to UBC.

## Education and Awareness

Survey Question	Response
During 2017, did your organization have any of the following programs or initiatives to support sustainability education and awareness?	
▪ Green, Sustainability or Climate Action Team	Yes
▪ Support for professional development on sustainability (e.g. workshops, conferences, training)	Yes
▪ Supported or provided education to staff about the science of climate change, conservation of water, energy and/or raw materials	Yes
<b>Other actions? Please describe briefly.</b>	
For additional details on UBC's sustainability initiatives please refer to UBC's Annual Sustainability Reports ( <a href="https://sustain.ubc.ca/our-commitment/strategic-plans-policies-reports/annual-reports">https://sustain.ubc.ca/our-commitment/strategic-plans-policies-reports/annual-reports</a> ) and STARS Reports ( <a href="https://stars.aashe.org/institutions/university-of-british-columbia-bc/report/2015-08-04/">https://stars.aashe.org/institutions/university-of-british-columbia-bc/report/2015-08-04/</a> ).	









# UBC OKANAGAN CAMPUS

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## Emission Details



THE UNIVERSITY OF BRITISH COLUMBIA

Okanagan Campus




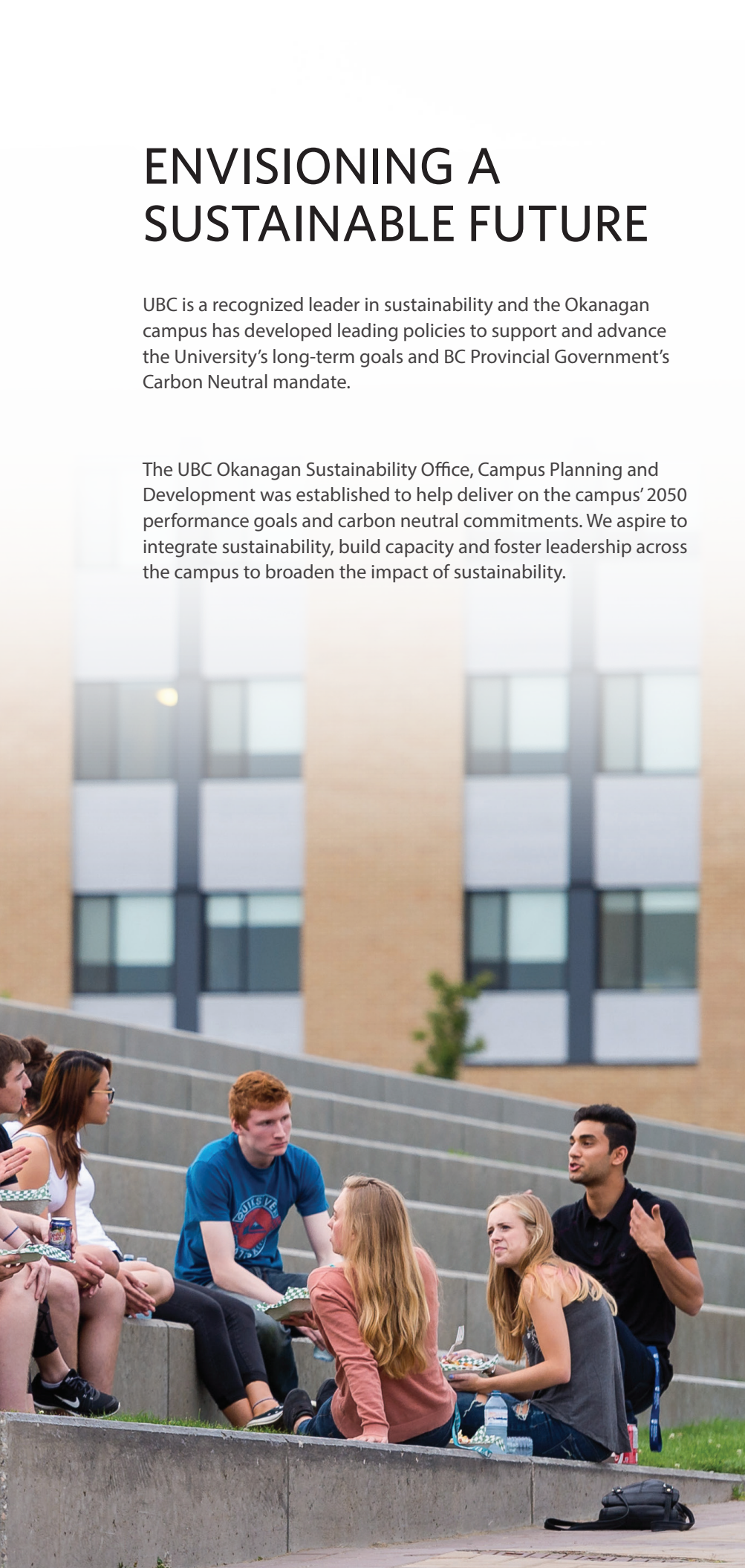




# ENVISIONING A SUSTAINABLE FUTURE

UBC is a recognized leader in sustainability and the Okanagan campus has developed leading policies to support and advance the University's long-term goals and BC Provincial Government's Carbon Neutral mandate.

The UBC Okanagan Sustainability Office, Campus Planning and Development was established to help deliver on the campus' 2050 performance goals and carbon neutral commitments. We aspire to integrate sustainability, build capacity and foster leadership across the campus to broaden the impact of sustainability.



Provincially mandated greenhouse gas (GHG) and sustainability reporting for the Okanagan campus is the responsibility of the Sustainability Office, Campus Planning and Development. The 2017 Carbon Neutral Action Overview Report contributes to the UBC reporting submitted to the Climate Action Secretariat. This report provides an overview of the actions taken by the campus to reduce carbon emissions in 2017 and future planned actions to support British Columbia's commitment to reduce the provincial GHG emissions by 80 per cent below 2007 levels by 2050.





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# EXECUTIVE SUMMARY AND DECLARATION

UBC Okanagan continues to make strides toward the advancement of the BC Provincial Government carbon neutral mandate through the implementation of key sustainability policies and actions within the context of campus planning and development. Ongoing building optimization, district energy system expansion and behaviour change initiatives have contributed to a 16 per cent GHG emission reduction as compared to a 2013 baseline. Unfortunately, in 2017, UBC Okanagan's GHG emissions increased by 25 per cent (619 tCO<sub>2</sub>e), compared to 2016. This increase is largely attributable to colder than normal weather, which led to an increase in consumption of natural gas and building operational issues that have since been rectified.

Design and early construction of the Commons (Teaching & Learning Building) in 2017 marked the beginning of a new phase of campus growth and development. Designed to achieve LEED® Gold certification and connected to the campus district energy systems, this facility will address the critical need for additional study, collaborative learning and large group lecture space on campus. Joint Federal, Provincial and University investments have enabled the design and construction of the Commons, and have provided critical funding to support a number of sustainability and infrastructure projects, including expansion of the district

energy system (DES), a multi-building LDES optimization project, and the upgrade of legacy building equipment.

Looking ahead, UBC Okanagan will continue to take action on multiple, long-term efficiency measures to reduce energy and emission reductions as guided by the Whole System Infrastructure Plan. Among many planned projects, we will be developing a 20-year Campus Scale District Energy (DE) Expansion Strategy to support campus growth and the achievement of a net positive performance in operational energy and carbon by 2050. We are also undertaking the design of two new student housing facilities, which include a mixed-use facility targeted to achieve LEED® Gold Certification and a student dormitory targeted to achieve Passivhaus Classic Certification. Designing these projects for greater energy performance as well as future climate trends will enable us to respond to campus growth needs while ensuring GHG mitigation and campus resiliency over time.



**Rob Einarson**

Associate Vice-President,  
Finance and Operations  
University of British  
Columbia, Okanagan campus

## DECLARATION STATEMENT

This carbon Neutral Action Report for the period January 1, 2017 to December 31, 2017 summarizes our emissions profile, the total offsets to reach net-zero emissions, the actions we have taken

in 2017 to reduce our greenhouse gas emissions and our plans to continue reducing emissions in 2018 and beyond.

By June 30, 2018 UBC Okanagan campus' final *Carbon Neutral Action Report* will be posted to our website: [sustain.ok.ubc.ca](http://sustain.ok.ubc.ca)

# EMISSIONS AND OFFSET SUMMARY

## EMISSIONS AND OFFSET SUMMARY

### UBC Okanagan campus GHG Emissions and Offset for 2017 (tCO<sub>2</sub>e)

#### GHG Emissions created in Calendar Year 2017:

Total Emissions (tCO <sub>2</sub> e)	3,055
Total Offsets (tCO <sub>2</sub> e)	3,053

#### Adjustments to GHG Emissions Reported in Prior Years:

Total Emissions (tCO <sub>2</sub> e)	0
Total Offsets (tCO <sub>2</sub> e)	0

#### Grand Total Offsets for the 2017 Reporting Year:

Grand Total Offsets (tCO <sub>2</sub> e)	3,053
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## RETIREMENT OF OFFSETS

In accordance with the requirements of the Greenhouse Gas Reduction Targets Act and Carbon Neutral Government Regulation, UBC's Okanagan campus (the Organization) is responsible for arranging for the retirement of the offsets obligation reported above for the 2017 calendar year, together with any adjustments reported for past calendar years. The Organization hereby agrees that, in exchange for the Ministry of Environment and Climate Change Strategy ensuring that these offsets are retired on the Organization's behalf, the Organization will pay, within 30 days, the associated invoice to be issued by the Ministry in an amount equal to \$25 per tonne of offsets retired on its behalf plus GST.



# 2017 EMISSIONS OVERVIEW

## GREENHOUSE GAS EMISSIONS

The following greenhouse gas (GHG) emissions have been quantified using the BC Provincial Government's SMARTTool Reporting Framework.

**Table 1: GHG Comparison by Source between 2016 - 2017**

Source	2016 Emissions (tonnes CO <sub>2</sub> e)	2017 Emissions (tonnes CO <sub>2</sub> e)	Change from 2016 to 2017
Buildings	2,227	2,842	28%
Fleet	47	49	4%
Paper	64	64	1%
Fugitive	98	99	1%
<b>Total Emissions</b>	<b>2,436</b>	<b>3,055</b>	<b>25%</b>
<b>Total Offsettable emissions</b>	<b>2,434</b>	<b>3,053</b>	<b>25%</b>

*\*Individual amounts may not sum exactly due to rounding.*

Table 1 demonstrates an absolute campus GHG emission increase of 25 per cent over the 2016 reporting year, which will result in an additional \$15,475 in carbon offset costs to the university. As the largest source of in-scope emissions within the UBC Okanagan portfolio, the impacts of this year's emissions increase was largely influenced by the 28 per cent increase in emissions reported by buildings. A combination of environmental and operational factors contribute to this increase, which include building operational systems responding inefficiently to the inclement winter experienced in early-2017. Despite the year-over-year increase, the campus did maintain a reduction trend in comparison to its 2013 baseline. Detailed information on measures implemented to impact emissions over the previous year can be found in the 'Actions to Reduce Emissions' section of this report.

### Carbon Neutral Offsets in 2017

In accordance with the campus SMARTTool reporting and as required by the Greenhouse Gas Reduction Targets Act (GGRTA), offsets required to achieve carbon neutrality in 2017 total 3,053 tCO<sub>2</sub>e. As part of the Okanagan campus' 2017 GHG emissions profile, 2 tCO<sub>2</sub>e do not require offsets.

<sup>1</sup> *Protocols established in 2016/2017 BC Best Practices Methodology for Quantifying Greenhouse Gas Emissions.*





# EMISSIONS REDUCTION ACTIVITIES

## ACTIONS TAKEN TO REDUCE GREENHOUSE GAS EMISSIONS IN 2017

The following provides an overview of actions and plans reported in the CNAR Actions Form, Section 1.

### A. Stationary Fuel Combustion, Electricity (Buildings)

The largest source of in-scope GHG emissions on campus is derived from buildings, which comprised 93 per cent, or generated 2,842 tCO<sub>2</sub>e, of in-scope emissions in 2017. The combination of building operational systems working inefficiently during the inclement winter in early-2017 resulted in a higher than normal consumption of natural gas, increasing GHGs by 28 per cent over the previous reporting year. Notwithstanding, UBC Okanagan continued to target emission reduction through the implementation of energy reduction measures including a focus on demand-side energy reduction through ongoing building optimization, routine capital investments, building re-commissioning, and the maintenance and expansion of the district energy system.

#### ACTIONS:

##### Academic and Administration Buildings

- In response to the significant increase of natural gas consumption resulting from cold weather affecting building controls in early-2017, staff **completed control sequence upgrades** and began to investigate other actions to avoid this issue in the future. It's anticipated that additional control sequencing upgrades will be completed.
- **Initiated construction of the new Commons building**, which is expected to achieve LEED® Gold certification upon completion.
- **Commenced with the design of two new, sustainable housing developments** which include a mixed-use facility targeted to achieve LEED® Gold certification and a student dormitory targeted to achieve Passivhaus Classic Certification.
- **Installed new Administration Building MUA** - The new kitchen makeup air unit is targeted to reduce natural gas consumption at the expense of increasing electricity by 33,333 kWh; a requirement to support additional cooling due to heat pump use.
- **Upgraded WIFI Occupancy Controls** - This upgrade is expected to save the campus \$22,500 per year in heating and cooling costs through the reduction in energy consumption by 850 GJ of natural gas and 170,000 kWh of electricity, resulting in an emission reduction of 43 tCO<sub>2</sub>e annually.
- **Completed Supply Air Temperature Reset** - BMS control software was upgraded to set supply-air temperatures based on average heating/cooling valve positions rather than outdoor air temperatures or a fixed setpoint. This upgrade is expected to save \$5,800 per year in heating and cooling costs through the reduction of consumed energy by 390 GJ of natural gas and 24,300 kWh of electricity, effectively reducing emissions by 20 tCO<sub>2</sub>e annually.
- **Completed Supply Air Pressure Reset** - BMS control software was upgraded to adjust supply-air pressure set points based

on the heating/cooling demand in a building. This will allow reduced fan speeds and correspondingly reduced electrical consumption. Savings are expected equal \$4,400 in energy through the reduction of electricity consumption by 53,000 kWh per year.

- **Increased Heat Pump Utilization** - Optimization of building supply water temperatures allows existing heat pumps to operate for a larger fraction of the year. Implementation of this strategy is estimated to result in a reduction of natural gas consumption and an increase in electricity use for an annual net energy cost savings of approximately \$1,200 and a reduction of 85 tCO<sub>2</sub>e in GHG emissions.
- **Completed Lighting Upgrades in Administration and Creative & Critical Studies buildings** - The utilization of combined government funding and FortisBC incentives totaling \$247,000 supported the completion of lighting upgrades in the ADM and CCS buildings.
  - **ADM Building** - This lighting upgrade is expected to reduce electricity consumption by 78,000 kWh per year.
  - **CCS Building** - The upgrade completed in the office/classroom wing of the CCS building is expected to reduce this building's energy consumption by 52,000 kWh annually.
- **Continued Campus-wide Fluorescent Tube Lighting Replacement Program** - With approximately 7,000 tube replacements completed to date, the reduction in energy is expected to be over 300,000 kWh of electricity per year, saving the campus an estimated \$26,000 in associated costs annually.
- **Completed EME DHW Separation from Main Building Boilers**
  - To support a more efficient method of heating domestic hot water, a separate dedicated electric water heater was installed in EME. To further increase efficiency, the domestic hot water system was connected to the building's heat pumps to capture waste heat to preheat the domestic water. This system is expected to save \$4,000 in energy costs, 1,200 GJ of natural gas, and 60 tCO<sub>2</sub>e of GHG emissions per year.
- **Completed construction of cooling plant expansion** - The addition of a cooling tower will increase the air-cooled capacity of the LDES system.
- **Completed upgraded of Science building 3rd floor heating system** - This project is estimated to save the campus \$6,000 in energy costs and reduce emissions by 45 tCO<sub>2</sub>e per year.
- Replaced the **Mountain Weather Office's** low-efficient 190kW boiler with two 117kW high-efficiency condensing boilers.
- Implemented Energy Star's Portfolio Manager as a tool for communicating the energy performance of the campus.

- **Completed Building/LDES optimization in Fipke, University Centre, and Arts and Sciences Centre** – The optimization focused on an upgrade of the central plant to a 4-pipe glycol system with hot and cold tanks. A reduction in the winter operating temperatures of the LDES has already been observed as result of the completion of these upgrades.
- **Completed Heating Water Temperature Optimization Project** – The heating supply water setpoints in the Science, Library, Admin and Arts buildings have been programmed to be variable in order to increase the operating efficiency of the buildings' heatpumps.
- **Commenced with Science building ventilation upgrade.**
- **Initiated project to fully connect all Science building's Strobic fans to a heat recovery system.**
- **Commenced with LDES Optimization project in EME.**
- **Initiated evaluation of the ASC Exhaust Heat Recovery system.**
- **Initiated funding application process to upgrade MDES building heat exchangers in Science, Arts and Gym buildings.**
- **Initiated connection of MDES pipeline between the Central Heating Plant and the Geothermal Building.**
- **Recommissioned HVAC Systems in EME and UNC**
  - EME HRV-4 is now scheduled to run during normal building operating hours; estimated annual savings of 260,000 kWh and 212 GJ of Gas, reducing emissions by 11 tCO<sub>2</sub>e.
  - UNC AHU-4 rescheduled to run only during utilized hours; estimated annual savings of 29,700 kWh and 27 GJ of natural gas, reducing emissions by 2 tCO<sub>2</sub>e.
- **Continued implementation of the Whole Systems Infrastructure Plan:**
  - Adapted UBC Technical Guidelines for the Okanagan Campus

#### Residence Buildings

- Completed lighting upgrades in Similkameen
- Completed window upgrades in Kalamalka and Valhalla

#### B. Mobile Fuel Combustion (Standard and Non-Standard Fleet)

In 2017, fleet vehicles accounted for 49 tCO<sub>2</sub>e, or two per cent of the campus' total emissions, an increase of 2 tCO<sub>2</sub>e from 2016. The increase in this year's fleet emissions is attributed to a higher usage of on-site operations vehicles used by key operational departments.

#### ACTIONS:

- **Continued to implement measures to reduce reliance on fleet vehicles** and diverted the number of trips taken by encouraging fleet carpooling, walking or cycling, as well as consolidating off-campus trips.
- **Continued stewardship of sustainable mobile fuel combustion** through adherence to Sustainable Fleet Procedures, replacement of retired fleet vehicles with electric and energy efficient models, and ongoing training and education to support sustainable fleet use.

#### C. Supplies (Paper)

Emissions from paper accounted for 64 tCO<sub>2</sub>e, or two per cent of total in-scope campus emissions in 2017. This demonstrates an increase over the previous year and is attributed to an increased consumption of 30 per cent Post-Consumer Recycled (PCR) paper over 2016 by an additional 291 packages.

#### ACTIONS:

- **Continued program upgrades**, using a phased-in approach, to remove step down transformers and install power sharing with splice. This project is currently 70-80 per cent complete.
- **Completed pilot of Skype™ for Business**, an alternative web-conferencing software.
- **Completed full integration of PaperCut™** print-tracking software to faculty and departments. This program provides a platform that delivers reports to clients on printing volumes, generates user awareness, and promotes alternatives to printing.
- **Completed review of current printing equipment inventory** for improvements. Recommendations include a reduction in inventory size and replacement of old equipment with new, more efficient machines.
- **Continued to promote the purchase of 30 per cent or greater post-consumer recycled content paper.**
- **Continued to ensure wheat sheet paper** is available to order from the custom list as an alternative source to tree-derived paper.
- **Continued to increase the use of digital signs** and related communications platforms within buildings to share news, activities and events to reduce the reliance on paper-based promotional materials.
- **Continued to replace desktop computers with laptops** and more efficient devices as part of IT, Media and Classroom Services Computer Replacement Program. IT also began to focus on upgrading devices from spinning to hard drives, which will reduce waste production, power consumption and replacement costs to the University.

#### D. Fugitive Emissions

In 2017, the campus' in-scope HFC emissions accounted for 3 per cent of total campus emissions, producing 99 tCO<sub>2</sub>e. The inclusion of the residences air conditioning unit data contributed to the small increase in emission by one per cent over the 2016 reporting year.

#### ACTIONS:

- **Continued to replace inefficient and older equipment.**
- **Continued to conduct preventative maintenance and upgrades to HVAC system** and associated appliances.

# PLANS TO CONTINUE REDUCING GREENHOUSE GAS EMISSIONS IN FUTURE YEARS

This section describes planned actions across buildings, fleet and procurement in the coming years.

## A. Stationary Fuel Combustion Electricity (Buildings)

### Academic and Administration Buildings

- Finalize a Five-Year Strategic Energy Management Plan.
- Develop a Campus-Wide District Energy Strategy.
- Finalize development of the new Commons building, which is targeted to achieve LEED® Gold certification.
- Continue process to construct two new, sustainable housing developments on campus, which include a mixed-use facility targeted to achieve LEED® Gold certification and a student dormitory targeted to achieve Passivhaus Classic Certification.
- Complete Science building ventilation upgrade. This project is estimated to reduce energy consumption by 2,600 GJ of natural gas and 415,000 kWh of electricity, saving the campus \$52,000 in energy costs and 131 tCO<sub>2</sub>e annually.
- Complete full connection of all Science building's Strobic fans to a heat recovery system.
- Complete Engineering/Management/Education LDES optimization project.
- Initiate and complete Arts & Sciences Centre exhaust heat recovery project.
- Implement project that upgrades the heat exchangers in the Science, Arts and Gym buildings. Upon completion, the campus is estimated save 400 GJ in energy and 20 tCO<sub>2</sub>e in emissions annually. (subject to funding)
- Complete MDES/LDES Heat Exchanger Connection Project- Complete connection of MDES pipeline between the Central Heating Plant and the Geothermal Building. An opportunity of this pipeline is that the MDES system could be used to provide heat to the LDES system. This mode of operation provides two main benefits:
  - Boiler B-2 in the geothermal plant is a low-efficiency boiler and is in poor condition. A LDES/MDES connection would replace it.
  - Boilers in the CHP can be made to operate more efficiently with a source of colder return water which can be provided using the MDES/LDES heat exchanger.

A completed energy study of this system indicated expected savings of over 500 GJ of natural gas consumption, effectively reducing emissions by 25 tCO<sub>2</sub>e annually. (subject to funding)
- Continue Peak Load Management Project – As electricity costs for the campus are a mixture of charges for energy consumption (kWh) and peak demand (kW), a reduction of electrical demand at peak times can have significant impacts on campus energy costs. This project is reviewing development and implementation of peak load management algorithms and is currently underway with initial control sequences in place. These sequences will be modified as experience indicates is appropriate. (subject to funding)

- Continue to recommission building HVAC Systems with a focus on:
  - Carbon Dioxide Sensor Calibration – Carbon dioxide sensors are used across campus to ensure occupants receive good indoor air quality (IAQ) by increasing ventilation rates on demand and are slated for recalibration or replacement. Recalibration of sensors that have drifted high and are bringing in more outdoor air than necessary will result in substantial energy savings; and,
  - Cold Weather Operation – Continue ongoing control sequencing upgrades and additional measures to avoid the reoccurrence of increased natural gas consumption by building management systems during colder than expected weather.
- Continue to conduct HVAC System Efficiency Maintenance- An Energy Team HVAC efficiency technician will continue to clean heat exchangers and other campus HVAC equipment; improvements to operational efficiencies is expected.
- Continue to implement the Whole Systems Infrastructure Plan recommendations, including:
  - Establishment of the Okanagan campus' Greenhouse Gas and Energy Reduction targets;
  - Continual implementation of re-commissioning efforts on campus that improved existing building operations;
  - Updates to UBCO's Design Guidelines, Technical Guidelines, and Project Design Briefs with guidance for energy performance of new construction and energy efficient systems;
  - Set up and start research for development of strategic Embodied Carbon Framework and include recommendations in UBCO's Design Guidelines;
  - Commission students to conduct background studies: summer/winter occupancy, lab energy reduction opportunities, electrical demand, night/weekend shut-downs; and,
  - Aspire to establish a revolving fund to finance ongoing energy improvements. This fund could be established from savings gained from the implementation of electrical and demand-side savings measures.

### Residence Buildings

- Replace makeup air equipment in Similkameen
- Complete a full review of automation in residence buildings
- Review timing and schedule for Monashee building's hot water tank replacement
- Continue to complete lighting upgrades on a failure-based requirement





#### **B. Mobile Fuel Combustion (Standard and Non-Standard Fleet)**

- Continue to implement measures to **reduce reliance on fleet vehicles** and divert the number of trips taken by encouraging fleet carpooling, walking or cycling, as well as consolidating off-campus trips.
- Continue **stewardship of sustainable mobile-fuel combustion** through adherence to Sustainable Fleet Procedures, replacement of retired fleet vehicles with electric and energy-efficient models, and ongoing training and education to support sustainable fleet use.

#### **C. Supplies (Paper)**

- Commence with project to **reduce the printing equipment inventory** and **replace older inventory** with new, more efficient machines.
- **Complete campus-wide launch of Skype™ for Business**, an alternative web-conferencing software.
- Initiate the awareness and **alternative options to printing programs** through the PaperCut™ print-tracking software. The software provides a platform that delivers reports to clients on printing volumes, generating awareness and promoting alternatives to printing.

- Continue to promote the purchase of 30 per cent or greater post-consumer recycled content paper.
- Continue to ensure wheat sheet paper is available to order from the custom list as an alternative source to tree-derived paper.
- Continue to **increase the use of digital signs** and related communications platforms within buildings to share news, activities and events to reduce the reliance on paper-based promotional materials.
- Continue to **replace desktop computers with laptops** and more efficient devices as part of IT, Media and Classroom Services Computer Replacement Program. In addition to replacement program, IT is also focusing on upgrading devices from spinning to hard drives, reducing waste production, power consumption and replacement costs to the University.
- **Continue program upgrades**, using a phase-in approach, to remove step down transformers and install power sharing with splice.

#### **D. Fugitive Emissions**

- Continue to **conduct preventative maintenance and upgrades to HVAC system** and associated appliances.



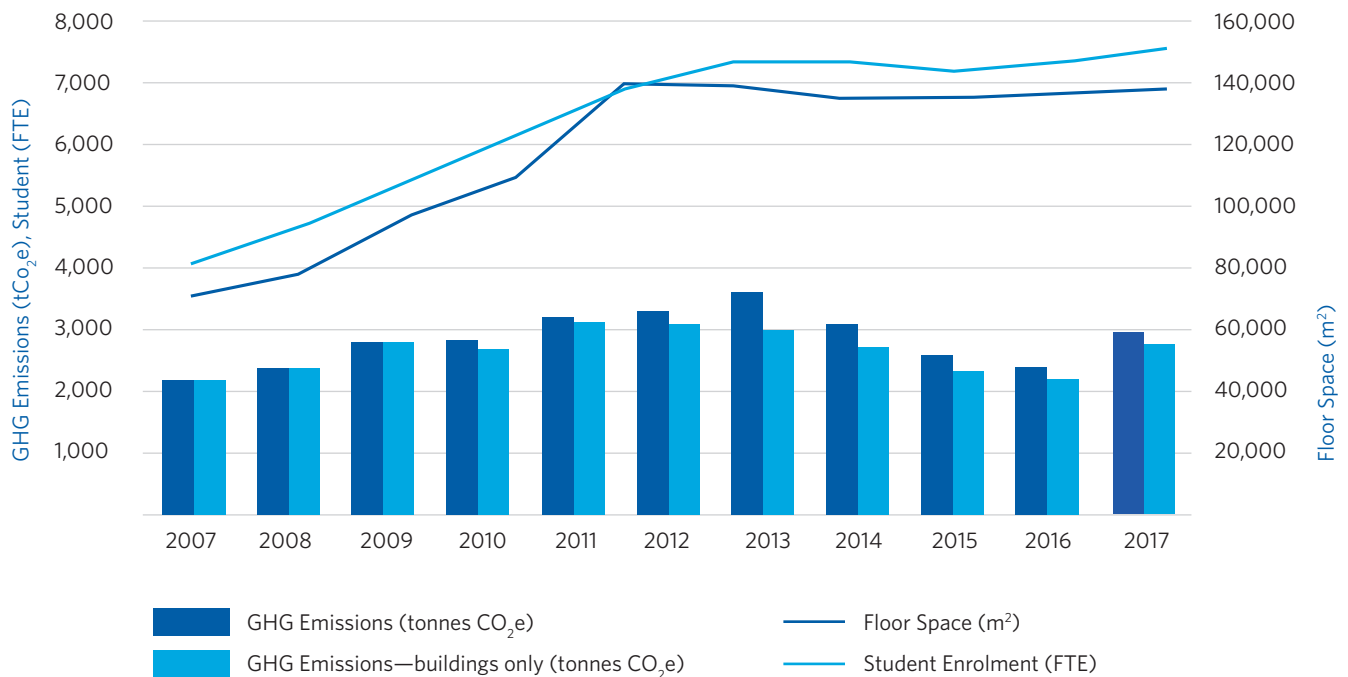
# EMISSIONS IN GREATER DETAIL

## COMPARISON TO BASELINES

Figure 1 provides a comparison of absolute campus and building emissions since 2007 relative to the growth in floor space by 97 percent and student FTEs by 96 per cent in 2017. Despite the continued growth of the campus and increase in this year's absolute carbon emissions, GHGs have been tempered since the campus' 2013 build-out. Factors contributing to the mitigation of carbon emissions include the successful implementation of energy conservation measures initiated following 2013 that includes building optimization and behaviour change programming and continual investment into the district energy system's infrastructure and operation, which significantly reduces the campus' reliance on gas-fired heating equipment. The deviation from the reduction trend demonstrated over the previous three years is attributed to the adverse reaction building management systems had to the inclement weather in early-2017. A cold weather response project was initiated to address this year's increase in natural gas consumption. Ongoing control sequencing upgrades and additional measure implementation will be conducted to avoid a reoccurrence of this building management systems response to colder than expected weather in the future.



Figure 1 Absolute GHG Emissions Relative to Growth: 2007-2017



# ABOVE AND BEYOND:

## Promoting a Culture of Sustainability

### INTEGRATING SUSTAINABILITY IN CAMPUS PLANNING

#### Whole Systems Approach to Sustainability Planning

Completed and endorsed by the UBC Okanagan Executive in 2016, the UBC Okanagan Whole Systems Infrastructure Plan (WSIP) was developed in parallel to and in support of the UBC Okanagan Campus Plan (2015). Departing from the traditional system-by-system infrastructure planning approach, the WSIP employs a whole systems approach that views the entire campus as an integrated set of systems. It establishes a long-term roadmap and implementation framework for future infrastructure needs and environmental stewardship to support sustainable campus growth, community well-being and ecological resilience.

In 2017, the Plan's implementation yielded the following achievements:

- Completed an Integrated Rainwater Management Plan (IRMP);
- Optimized District Energy Servicing Infrastructure;
  - Commenced expansion of the District Energy System (DES) loop from geo-exchange building to the Central Housing Plant at the south end of campus
- Continued implementation of the Conservation Awareness and Action Strategy, targeting energy conservation and carbon reduction;

- Updated sections of UBCO Technical Guidelines; and,
- Developed Project Design Briefs for new capital projects with guidance for energy performance of new construction and energy efficient systems.

#### 2050 WHOLE SYSTEMS SUSTAINABILITY GOALS



1 Achieve a net positive performance in operational energy and carbon



2 Implement a framework that supports low embodied carbon in future development



3 Optimize water quality, supply and security



4 100 per cent diversion of stormwater from municipal systems



5 Strive towards full waste recovery/reuse



6 Enhance and/or restore the site's ecology





## ENERGY CONSERVATION

### Building Optimization and Energy Management

In response to the WSIP's objectives, a *Strategic Energy Management Plan* (SEMP), was developed and implemented in 2016. The SEMP provides a suite of energy conservation measures targeted to reduce energy consumption and GHG's in alignment with established campus plans and strategies.

Successful projects implemented to-date, as detailed in the Actions section of this report, have started to yield positive results in both energy and carbon reduction. A key project demonstrating significant reductions to the campus' natural gas consumption was the Building/Low Temperature District Energy System (LDES) Optimization project completed in the Charles E. Fipke Centre for Innovative Research (Fipke), Arts and Sciences Centre (ASII) and University Centre (UNC) in late-2017. The optimization focused on an upgrade of the central plant to a 4-pipe glycol system with hot and cold tanks. This project has lowered the fuel consumption by 97 per cent in the Fipke building and 22 per cent in the UNC when comparing Q4 of 2016 to 2017. At a glance, the first quarter of 2018 is projected to report additional reductions of 2,163.2 GJ, or 51 per cent less fuel consumed across all three buildings, reducing emissions by approximately 108 tCO<sub>2</sub>e.

An update to the SEMP is currently under development. It will provide recommended measures for implementation to 2023. This update proposes projects that aim to reduce electricity consumption by 500,000 kWh per year and natural gas consumption by 3,000 GJ per year to 2020, then by 2,000 GJ per year from 2021 and beyond.

### Campus-Wide Behaviour Change through The Power of You

Implemented in 2017, the *UBC Okanagan Campus-Wide Three-Year Conservation Awareness and Action Strategy* (Strategy) responded the WSIP's recommendation to "[establish] engagement and awareness programs necessary to facilitate conservation-based behaviour on campus by all (faculty, staff, and students)." *The Strategy* evolved from the successful foundation established by the inaugural phase of **Power of You** program. Broadening the scope of the **Power of You** program to include active initiatives and communication-based campaigns, *the Strategy* was designed to impact all performance areas—energy, carbon, waste, water and ecology—and intends to build capacity and encourage voluntary actions by all campus constituents, campus-wide.

Campaigns targeting a broad range of performance areas in 2017 included the 3rd Annual **Campus Lights Out Challenge**, **Carbon 101: Better in a Sweater**, 2nd Annual **Labs: Sort It Out** and **Power Down**, and **Recycling 101: Recycle Your Empty Coffee Cup**. As a result, these events collected 412 sustainable behaviour implementation pledges from event participants, recorded a 67 per cent reduction in energy consumption by a residential building during Earth Hour, and reported an increase of lab recycling report submissions by 579 per cent and the use of re-usable cups and dishware by 14 per cent over the previous year.

In addition to the above campus-wide initiatives, actions taken by key operational departments in 2017 in response to the **Power of You Lights Out and Power Down** campaigns involved a staff-led audit across academic and administration buildings. As a direct result of the nightly audits, over 5,100 lights and 127 projectors/screens were turned off or powered down and 173 windows were closed at night, contributing to campus energy saving.

In 2018, campaigns will continue to target energy, water and waste performance through a variety of focused communication and engagement activities designed to bring awareness, build capacity and drive action to impact the campus' operational and environmental performance.



## ACTIONS TO SUPPORT CAMPUS SUSTAINABILITY PERFORMANCE

### Rainwater Managed on Campus

Viewing rainwater as a resource that should be managed at the source, the Okanagan campus completed and achieved executive endorsement of an integrated campus-scale rainwater management plan in 2017. The plan will achieve the continued diversion of 100 per cent of the rainwater from the municipal system through capture, re-use, infiltration and storage. Through responsible management, the plan also sustainably accommodates the future growth of the campus in a way that respects natural hydrological processes, protects existing environmental values, and manages risk.

The IRMP provides a technical guide to manage rainwater on campus through:

- site control and retention storage
- peak flows and volumes for development sites
- planning for future climate impacts
- co-benefits to campus ecology and biodiversity

The IRMP is currently being implemented across major capital projects on campus. Examples include low impact development (LID) measures such as the incorporation of bioswales into the Transit Exchange and Mountain Weather Office parking lot projects. These projects are designed to manage runoff, filter pollutants, offer a degree of temporary water storage and increase rainwater infiltration. Additional LID measures that offer other techniques to filter, store, infiltrate and use rainfall were it lands are under consideration for implementation in future campus projects, including dry ponds and infiltration planters.



*Bioswales into the Transit Exchange*



*Bioswales into the Mountain Weather Office parking lot*



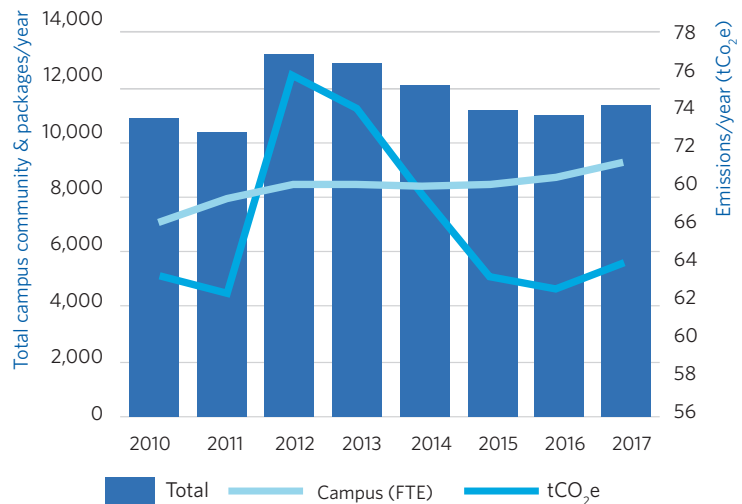
## Paper Reduction... At the users' fingertips

The amount of paper purchased by the campus has continued to vary subtly since 2010 despite the continued growth. Through a continued focus to integrate sustainability into all levels of performance areas, the university is committed to taking stronger actions that support the reduction of Scopes 1, 2 and Scope 3 emissions, which includes waste production. In 2017, a full integration of the PaperCut™ software program continued to provide student users with the ability to monitor and measure printing, while permitting faculty and staff the ability to hold printing jobs securely for up to four hours—secure printing requires users to release jobs with a password or tap-to-release function within a set number of hours or the job is deleted. The implementation of this tap-to-release feature enabled the campus to save over 130,000 sheets (260 packages) of paper from printing, effectively decreasing campus printing costs by \$18,000.

A full rollout of the PaperCut™ software program's user awareness features are currently under review for implementation in 2018. These features offer user's real-time access to their total amount of paper

consumed and the associated costs for all jobs and will provide pop-up printing prompts that can remind users to print double-sided, as well as offer environmental information, such as "Did you know" messaging.

Paper Purchases and GHG Emissions Relative to Growth



## By Foot, By Bike, By Bus - Commuting Options to UBC Okanagan Aboard

A variety of infrastructure projects initiated in 2017 are part of the exciting development of the Okanagan campus. Projects include the completion of the Transit Exchange, initialization of the John Hindle Drive expansion, and, through the City of Kelowna, access to the Bulman Road cycling and pedestrian route, which intersects with the future Okanagan Rail Trail corridor, planned for 2018 completion.

These projects are expected to increase access to public transit and the campus from the west; support the expansion of the

campus' district energy system and implementation of the Integrated Rainwater Management Plan; and, provide additional opportunities to safely and sustainably commute to campus.

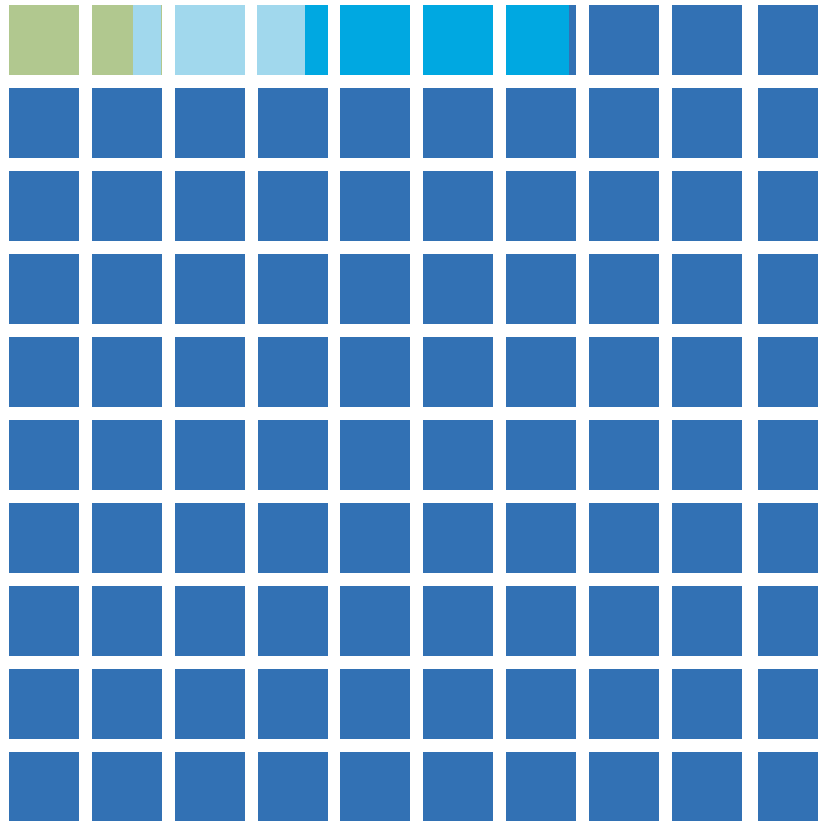
Moving ahead, the campus will be initializing the pedestrianization of University Way. Upon completion, this project will provide UBC Okanagan with a welcoming point of arrival, enhance community life and safety, and offer universal accessibility across campus.





# GHG EMISSIONS BY SOURCE

UBC OKANAGAN GREENHOUSE GAS EMISSIONS BY SOURCE FOR THE 2017 CALENDAR YEAR (tCO<sub>2</sub>e\*)



The following greenhouse gas emissions have been quantified using the BC Provincial Government's SMARTTool Reporting Framework.

1.6%  
49

Mobile (fleet and other mobile equipment)

2.1%  
64

Supplies (Paper)

3.2%  
99

Fugitive Sources

93.1%  
2,842

Stationary (Building Heating and Generators and Electricity)

**TOTAL EMISSIONS: 3,055**

## OFFSETS APPLIED TO BECOME CARBON NEUTRAL IN 2017

(Generated April 17, 2018 12:28 p.m.)

Total offsets required: 3,053. Total offset investment: \$76,325.

Emissions which do not require offsets: 2. \*\*

\*Tonnes of carbon dioxide equivalent (tCO<sub>2</sub>e) is a standard unit of measure in which all types of greenhouse gases are expressed based on their global warming potential relative to carbon dioxide.

\*\* Under the Carbon Neutral Government Regulation of the Greenhouse Gas Reduction Targets Act, all emissions from the sources listed above must be reported. As outlined in the regulation, some emissions do not require offsets.

# UBC ACTIONS SURVEY

## 2017 CARBON NEUTRAL ACTION REPORT (CNAR) – PART 1 UBC OKANAGAN CAMPUS

### 1. Stationary Sources (Buildings, Power Generators): Fuel Combustion, Electricity use, Fugitive Emissions

Survey Question	Response
During 2017, did your organization take any of the following actions to support emissions reductions from buildings? (please select all that apply)	
• Conducted an energy audit/study of building(s) in the organization's portfolio	Yes
• Performed energy retrofits of the organization's building(s)	Yes
• Built, or are building new LEED Gold or other "Green" buildings	Yes
• Other? Please specify:	Yes
• Commenced construction on the Commons (Teaching & Learning Building); registered and targeting LEED® Gold certification	
If you selected "Performed energy retrofits of the organization's building(s)":	3
How many buildings were retrofitted?:	1
Did your Organization perform any retrofits during 2017? Please describe briefly:  Yes, in addition to a boiler upgraded in the Mountain Weather Office, retrofits were performed to optimize the UBC Okanagan's Charles E. Fipke Centre for Innovative Research, Arts & Sciences Centre and University Centre's building & LDES systems in 2017. An audit was completed on the Science building ventilation system and there were functional upgrades completed on the windows in Kalamalka and Valhalla residences.	

### 1a. Stationary Sources (eg. Buildings, Power Generators): Fuel Combustion, Electricity use, Fugitive Emissions.

Survey Question
Please briefly describe your organization's plans to continue reducing emissions from its stationary sources:
a) Over the next 1-5 years Refer to the Plans to continue Reducing Greenhouse Gas Emissions in Future Years section of the 2017 CNAR.
b) Over the following 6-10 years Refer to the Plans to continue Reducing Greenhouse Gas Emissions in Future Years section of the 2017 CNAR.

## 2. Mobile Sources (Vehicles, Off-road/portable Equipment): Fuel Combustion:

Survey Question	Response
During 2017, did your organization take any of the following actions to support emissions reductions from its mobile sources? (please select all that apply)	
Replaced existing vehicles with more fuel efficient vehicles (gas/diesel)	No
Replaced existing vehicles with hybrid or electric vehicles	No
Took steps to drive less than previous years	Yes
None of the above	No

### 2a. Mobile Sources (Vehicles, Off-road/portable Equipment): Fuel Combustion:

Survey Question	Response
<p>Please briefly describe your organization's plans to continue reducing emissions from its stationary sources:</p> <p>a) Over the next 1-5 years</p> <ul style="list-style-type: none"> <li>Continue to implement measures to reduce reliance on fleet vehicles and diverted the number of trips taken by encouraging fleet carpooling, walking or cycling, as well as consolidating off-campus trips.</li> <li>Continue stewardship of sustainable mobile fuel combustion through adherence to Sustainable Fleet Procedures, replacement of retired fleet vehicles with electric and energy efficient models, and ongoing training and education to support sustainable fleet use</li> </ul> <p>b) Over the following 6-10 years</p> <ul style="list-style-type: none"> <li>Continue to implement measures to reduce reliance on fleet vehicles and diverted the number of trips taken by encouraging fleet carpooling, walking or cycling, as well as consolidating off-campus trips.</li> <li>Continue stewardship of sustainable mobile fuel combustion through adherence to Sustainable Fleet Procedures, replacement of retired fleet vehicles with electric and energy efficient models, and ongoing training and education to support sustainable fleet use.</li> </ul> <p>If you selected "Replaced existing vehicles with more fuel efficient vehicles":</p> <ul style="list-style-type: none"> <li>How many vehicles?</li> </ul>	0
<p>If you selected "Replaced existing vehicles with hybrid or electric vehicles":</p> <ul style="list-style-type: none"> <li>How many vehicles?:</li> </ul>	0



### 3. Supplies (Paper): Indicate which actions your PSO took in 2017:

Survey Question	Response
<p>During 2017, did your organization take any of the following actions to support emissions reductions from paper supplies? (please select all that apply)</p> <ul style="list-style-type: none"> <li>• Had an awareness campaign focused on reducing office paper use</li> <li>• Had a policy requiring the purchase of recycled content paper</li> <li>• Had a policy requiring the purchase of alternate source paper (bamboo, hemp, wheat, etc.)</li> <li>• Other? Please describe briefly:</li> </ul> <p>N/A</p>	<p>No</p> <p>Yes</p> <p>No</p> <p>No</p>
<p>If you selected “Had a policy requiring the purchase of recycled content paper”:</p> <p>State the required recycled content here (30%, 50%, 100%):</p>	<p>50%</p>
<p>If you selected “Had a policy requiring the purchase of alternate source paper (bamboo, hemp, wheat, etc.)”, which type of alternate source paper did you use?</p> <p>UBC Okanagan does not have a policy that requires the purchase of alternate source paper; however, wheat sheet is available for purchase through the preferred supplier.</p>	
<p>Please briefly describe your organization's plans to continue reducing emissions associated with its office paper use in future years:</p> <p>Refer to the Plans to continue Reducing Greenhouse Gas Emissions in Future Years section of the 2017 CNAR.</p>	

## 4. Other Sustainability Actions

Survey Question	Response
<p>a) During 2017, did your organization take any of the following actions to support emissions reductions from business travel? (please select all that apply)</p> <ul style="list-style-type: none"> <li>Created a low-carbon travel policy or travel reduction goal (low-carbon = lowest emission of greenhouse gas per kilometre per passenger)</li> <li>Encouraged alternative travel for business (e.g. bicycles, public transit, walking)</li> <li>Encouraged or allowed teleworking or working from home</li> <li>None of the above</li> </ul> <p>Other? Please describe briefly: N/A</p>	<p>No</p> <p>Yes</p> <p>Yes</p> <p>No</p> <p>No</p>
<p>a) Education/Awareness</p> <p>During 2017, did your organization have any of the following programs or initiatives to support sustainability education and awareness? (please select all that apply)</p> <ul style="list-style-type: none"> <li>A Green, Sustainability or Climate Action Team</li> <li>Support for professional development on sustainability (e.g. workshops, conferences, training)</li> <li>Supported or provided education to staff about the science of climate change, conservation of water, energy and/or raw materials</li> <li>None of the above</li> </ul> <p>Other? Please describe briefly: N/A</p>	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>No</p> <p>No</p>
<p>a) Other Sustainability Actions</p> <ul style="list-style-type: none"> <li>During 2017, did your organization have any of the following programs or initiatives to support sustainability? (please select all that apply)</li> <li>A water conservation strategy which may include a plan or policy for replacing water fixtures with efficient models</li> <li>An operations policy or program to facilitate the reduction and diversion of building occupant waste (e.g. composting, collection of plastics, batteries from land fills or incineration facilities)</li> <li>Green procurement standards for goods (e.g. office furniture, etc)</li> <li>Lifecycle costing of new construction or renovations</li> <li>None of the above</li> </ul> <p>Other? please describe N/A</p>	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>No</p> <p>No</p>



