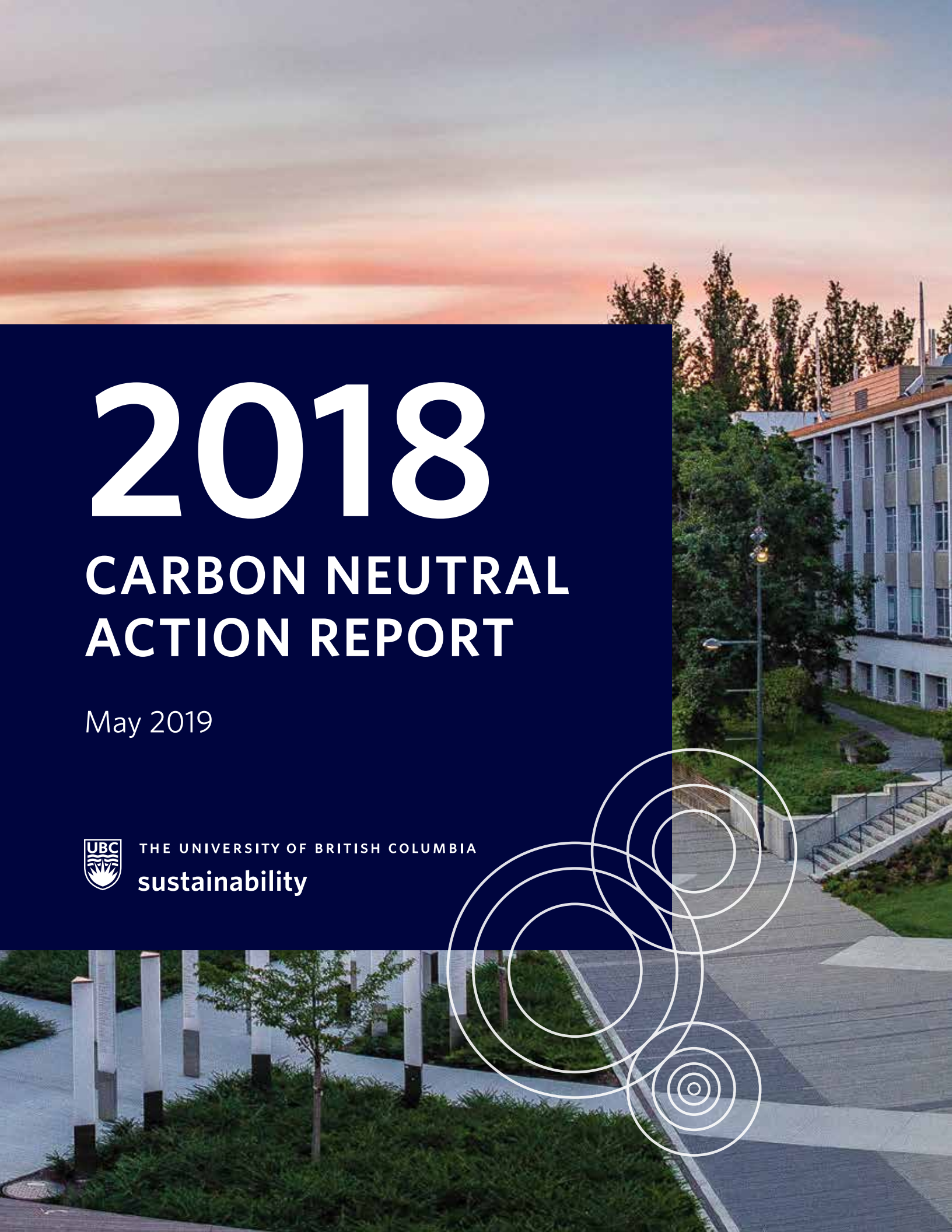


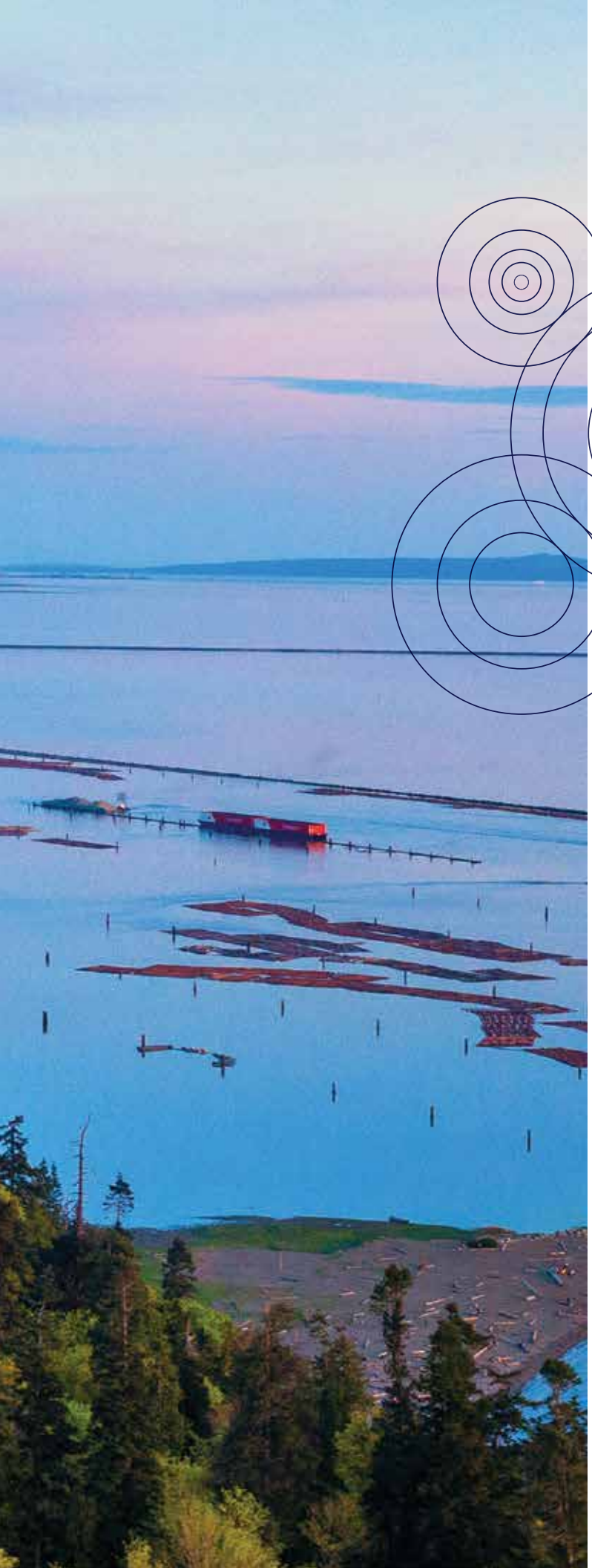
2018

CARBON NEUTRAL ACTION REPORT

May 2019

THE UNIVERSITY OF BRITISH COLUMBIA

sustainability



INTRODUCTION

ABOUT UBC

The University of British Columbia (UBC) is a global centre for teaching, learning and research, consistently ranked among the top 20 public universities in the world and recently recognized as North America's most international university. Since 1915, our motto, Tuum Est (It is Yours), has been a declaration of our commitment to attracting and supporting those who have the drive to shape a better world. As a result, UBC students, faculty and staff continue to embrace innovation and challenge the status quo, placing us at the forefront of discovery, learning and engagement. UBC encourages bold thinking, curiosity and initiative, so you can realize your greatest potential. Our two main campuses, in Vancouver and in the Okanagan, attract and educate over 66,000 students from Canada and more than 160 countries around the world and employ over 16,000 staff and faculty. UBC's Vancouver campus is home to a vibrant, sustainable residential community with some 80,000 staff, faculty, students and residents and visitors on the campus each day. UBC's Okanagan campus has grown by over 100 per cent in student population and building footprint since 2007. It has a population of over 8,700 students, 1,700 of which live on campus.

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:

sustain.ubc.ca/about/plans-policies-and-reports

UBC's Okanagan campus Carbon Neutral Action Reports and Sustainability Reports are available at:

sustain.ok.ubc.ca/reports.html

DECLARATION STATEMENT

This Carbon Neutral Action Report for the period January 1st, 2018 to December 31st, 2018 summarizes our emissions profile, the total offsets to reach net-zero emissions, the actions we have taken in 2018 to reduce our greenhouse gas emissions and our plans to continue reducing emissions in 2019 and beyond.

By June 30, 2019 a copy of University of British Columbia's final Carbon Neutral Action Report will be posted on our website at:

sustain.ubc.ca/about/plans-policies-and-reports

EXECUTIVE SUMMARY

UBC has been a global leader in sustainability for two decades, including opening Canada's first sustainability office in 1997 and meeting its Kyoto target for emissions reductions in 2007. UBC was recently ranked number one in the world for taking urgent action to combat climate change and its impacts and number one in Canada for making cities inclusive, safe, resilient and sustainable, according to *Times Higher Education (THE)*. Our actions to date have saved the university over $5M in avoided carbon costs since 2007, including both carbon offset and carbon tax costs.

In 2018, UBC continued to deliver on our bold climate action commitments, reducing combined greenhouse gas (GHG) emissions at our Vancouver and Okanagan campuses by 37% against a 2007 baseline, despite a 26% combined increase in floor space and a 40% combined increase in student enrolment. Relative to combined student enrolment, we have reduced GHG emissions per full-time equivalent (FTE) student by 55% compared to 2007 levels.

UBC's Vancouver campus achieved a 38% reduction in absolute carbon emissions from the 2007 baseline despite a 21% increase in building floor space and a 32% increase in students (FTE). We have taken vigorous measures to reduce our GHG emissions in recent years; with the planned expansion of the Bioenergy Research and Demonstration Facility (BRDF) we intend to increase the portion of alternative, low-carbon energy sources to our energy mix. Through energy conservation, community engagement, and incremental improvements for new buildings, renovations and retrofits as outlined by our Green Building Action Plan, we hope to achieve significant progress in reducing UBC's GHG emissions.

UBC's Okanagan campus continued to focus its climate action efforts on the development and performance of new and existing buildings and infrastructure in 2018. The campus achieved a 29% reduction in absolute carbon emissions from 2017, supported by the implementation of sustainability policies, behaviour change initiatives, energy efficiency projects and connection to low carbon district energy systems. In the coming year, the campus will continue to implement the Whole Systems Infrastructure Plan to achieve performance co-benefits between energy, carbon, water, landscape, ecology, biodiversity and engagement. The campus will also develop an integrated Climate Action Plan and a Net Zero Carbon District Energy Strategy that will identify measures to address climate mitigation, adaptation, and resilience opportunities. Completion of these initiatives will support environmentally responsible development and advance the campus towards its goal to "achieve a net-positive performance in operational energy and carbon" by 2050.

The recent Intergovernmental Panel on Climate Change (IPCC) Special Report[1] on limiting the impacts of global warming to 1.5°C provides renewed urgency in accelerating our efforts to avoid catastrophic climate impacts. In this report we are pleased to share key highlights of our climate action initiatives implemented in 2018.

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University of British Columbia
Vancouver Campus

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University of British Columbia
Okanagan Campus

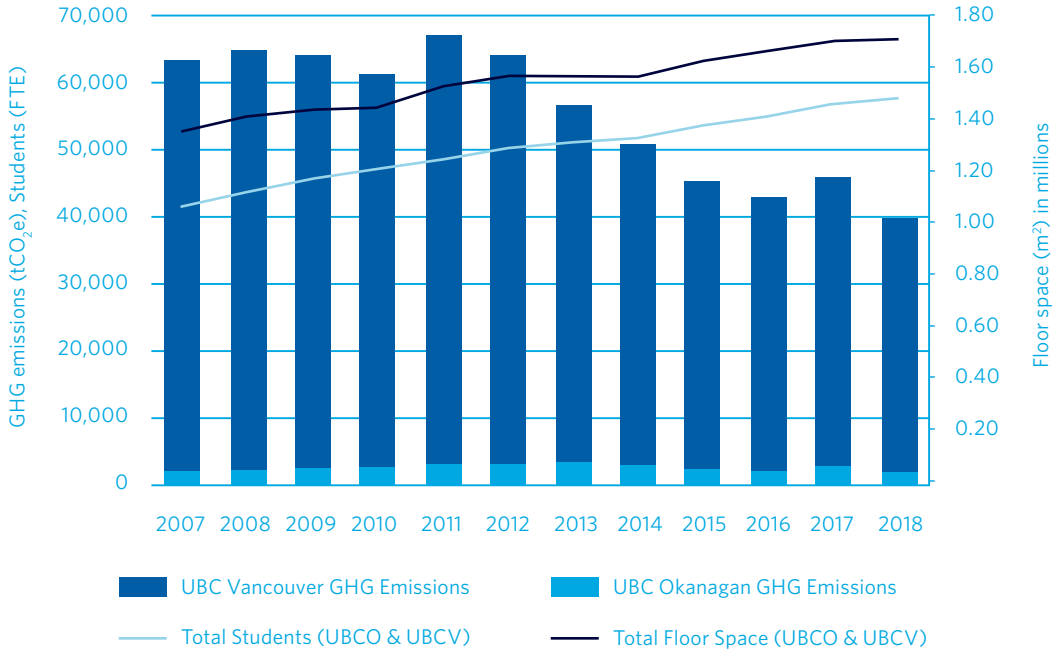
1 IPCC Special Report: Global Warming of 1.5°C, https://www.ipcc.ch/sr15/

EMISSIONS OVERVIEW

EMISSIONS AND OFFSETS SUMMARY

UBC tracks and reports the absolute and relative emissions for each campus against a baseline[2] to measure performance against our Climate Action Plan targets. Despite significant Vancouver and Okanagan campus growth in floor space and student enrollment, UBC has achieved a substantial decrease in both emissions and emissions per capita, as shown in Figure 1.

FIGURE 1: UBC Emissions for Carbon Offsets and Growth, Vancouver and Okanagan Campus, 2007 to 2018



2018 EMISSIONS AND CARBON OFFSETS

Under the *Climate Change Accountability Act* (formerly titled 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 and off-campus units are provided in Table 1 and Figure 2. Emissions for offsets for all properties and sites amounted to 46,553 tCO_2e in 2018; 95% of which was attributed to emissions from the operations of the UBC Vancouver campus, off-campus properties and UBC Properties Trust.

UBC's total emissions for 2018 including biogenic emissions amounted to 66,258 tCO_2e, including 19,705 tCO_2e of biogenic emissions. The biogenic emissions[3] ($BioCO_2$) from biomass combustion are reported separately, but are not counted in emission totals for offset in accordance with Provincial reporting guidelines as the $BioCO_2$ released is part of the biogenic carbon cycle and would be released naturally during decomposition.

2 This summary outlines GHG emissions of both Vancouver and Okanagan campuses since 2007.

3 Biogenic emissions arise from biomass combustion, including wood waste, renewable natural gas and biofuels. The UBC Bioenergy Research and Demonstration Facility (BRDF) only uses clean wood waste from regional wood product manufacturing and municipal plant trimmings as opposed to less sustainable biomass grown specifically for the production of biomass fuel as is the case in some other parts of the world.

EMISSIONS OVERVIEW

TABLE 1: 2018 UBC Total GHG Emissions by Location

GHG Emissions Created in 2018	Emissions for offset	Emissions not required to be offset	Total Emissions
UBC Vancouver	37,941	19,702	57,643
UBC Okanagan	2,153	3	2,156
Off-campus Properties	3,617	-	3,617
UBC Properties Trust	2,842	-	2,842
UBC Total	**46,553**	**19,705**	**66,258**

FIGURE 2: 2018 UBC Offsettable GHG Emissions Distribution

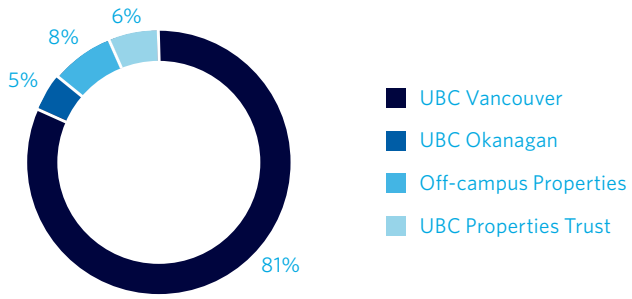


Table 2 shows 2018 emissions for offsets from UBC's two main campuses along with key performance indicators.

TABLE 2: 2018 Offsettable Emissions and Key Performance Indicators (UBC Vancouver and Okanagan Campus)

Key Performance Indicator	Vancouver Campus	Okanagan Campus	UBC Total
GHG Emissions (tonnes CO_2e)	37,941	2,153	40,094
Floor Space (m^2)	1,559,380	148,492	1,707,872
GHG Emissions per Square Metre (tonnes CO_2e/m^2)	0.024	0.014	0.023
Student Enrolment (FTE)[4]	49,624	8,732	58,356
Staff and Faculty Employees (FTE)	13,210	1,178	14,388
GHG Emissions per Student (tonnes CO_2e/FTE)	0.76	0.25	0.69

4 Numbers are calculated on a full time equivalent basis, as opposed to headcount.

UBC VANCOUVER CAMPUS

The University of British Columbia was recently ranked number one in the world for taking urgent action to combat climate change and its impacts according to Times Higher Education (THE). These rankings not only reflect how UBC has worked to dramatically reduce its own climate impact for more than 20 years, but also the importance of engaging in partnerships and collaborations with NGOs and provincial and federal government to develop broader sustainability approaches and solutions.

The recent IPCC Special Report on limiting the impacts of global warming to 1.5°C provides renewed urgency in accelerating our efforts to avoid catastrophic climate impacts.

We're very fortunate at UBC to have a committed campus community and access to innovative sustainability research and infrastructure, the combination of which is allowing the university to take big strides in reducing its footprint.

THE UNIVERSITY OF BRITISH COLUMBIA

vancouver campus

VANCOUVER CAMPUS SUMMARY

An impressive emissions reduction of 38% from the 2007 baseline was achieved in 2018 despite a 21% increase in building floor space and a 32% increase in students (FTE). Per capita, that translates to a GHG emission reduction of 53% per student since 2007.

The significant progress this past year towards the Climate Action Plan 2020 targets also means UBC is achieving operational savings, improving efficiency of buildings, increasing our resiliency and building a strong reputation as an international sustainability leader.

Key achievements in 2018:

- In October 2018 the Association of Energy Engineers Awarded UBC with their International Institutional Energy Management Award[5] for outstanding accomplishments in developing, organizing, managing and implementing our UBC energy management program.
- The Board of Governors approved the Green Building Action Plan (GBAP) which provides a holistic pathway for academic and residential buildings to advance towards making net positive contributions to human and natural systems by 2035. The GBAP outlines actions towards reduced energy use and GHG emissions from buildings which will contribute significantly to achieving the 2050 GHG reduction target of 100%. As part of UBC's commitment to advance green buildings on campus, three buildings in 2018 were LEED Gold certified.
- The addition of a new 12 megawatt boiler at the Bioenergy Research & Demonstration Facility (BRDF) was given preliminary (Board 1) approval by the UBC Board of Governors. The expanded BRDF is expected to be fully operational in 2021, allowing our campus district energy system to meet the projected heating demand needs of new buildings and also enable 70% of the campus heating requirements to be met by a low carbon renewable resource.
- Overall UBC Energy and Water Services continued with its annual program of achieving energy savings to offset the growth associated with new buildings and increased intensity in existing buildings. This is the fifth consecutive year that Energy and Water has achieved these targets.
- UBC Energy & Water Services continued to implement its Building Tune Up program to conserve energy and reduce energy in all buildings across campus. Two major energy efficiency projects were completed - the Michael Smith Labs Demand Control Ventilation Project and the Museum of Anthropology (MOA) Heat Recovery Chiller.
- Major renovations were completed to three major building in UBC Vancouver's core campus - the old Student Union Building, Hebb Building, and Undergraduate Life Sciences Teaching Labs.
- A new BC Hydro sponsored energy management position was added within UBC Ancillaries to help address emissions from Student Housing and Hospitality Services (SHHS) and Athletics.
- In addition to large-scale infrastructure changes, we continue to engage our campus community to reduce emissions. In 2018, UBC's Green Labs Program successfully piloted the 'Chill Up' campaign for Ultra-Low Temperature Freezers to reduce laboratory energy consumption.

Although there is more work to be done in order to achieve our 2020 GHG emissions target, 2018 has been a highly productive year, and we are happy to share the results of our efforts with you.

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JOHN MADDEN
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University of British Columbia

5 https://www.aeecenter.org/resources/aee-energy-efficiency-videos/2018-institutional-energy-management-award-university-british

EMISSIONS AND OFFSET SUMMARY

TABLE 3: Emissions and Offset Summary Table

UBC Vancouver GHG Emissions and Offset for 2018 (tCO_2e)	
GHG Emissions created in Calendar Year 2018	
Total Emissions (tCO_2e)	64,102
Total $BioCO_2$	19,702
Total Offsets (tCO_2e)	44,400
Adjustments to GHG Emissions Reported in Prior Years	
Total Emissions (tCO_2e)	0
Total Offsets (tCO_2e)	0
Grand Total Offsets for the 2018 Reporting Year	
Grand Total Offsets Required (tCO_2e)	44,400
Total Offset Investment ($25/$tCO_2e$ + GST)	$ 1,165,500

RETIREMENT OF OFFSETS

In accordance with the requirements of the Greenhouse Gas Reduction Targets Act and Carbon Neutral Government Regulation, UBC (the Organization) is responsible for arranging for the retirement of the offsets obligation reported above for the 2018 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.

CLIMATE ACTION AT UBC VANCOUVER

OVERVIEW

In 2010, UBC announced our Vancouver Campus Climate Action Plan, committing to aggressive reduction targets for GHG emissions of 33% by 2015, 67% by 2020, and a 100% reduction by 2050, compared to 2007 levels. The greenhouse gas emissions in Table 4 has been quantified using the BC Provincial Government's SMARTTool Reporting Framework. The Vancouver campus now emits 38% less offsettable GHG emissions compared to the 2007 baseline as seen in Table 4.

TABLE 4: Offsettable Emissions Comparison by Source, 2007, 2017 & 2018

Source	2007 Emissions (tCO_2e)	2017 Emissions (tCO_2e)	2018 Emissions (tCO_2e)	Change from 2007 to 2018
Buildings	58,105	41,436	36,606	-37%
Fleet	1,973	926	943	-52%
Paper	1,003	423	392	-61%
Total Vancouver Campus Emissions	**61,082**	**42,786**	**37,941**	**-38%**

2018 GHG 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 2007. It was estimated that fugitive emissions of refrigerant gases comprise less than one percent of the UBC Vancouver campus' total emissions and in accordance with the BC Best Practices Methodology for Quantifying Greenhouse Gas Emissions these fugitive emissions are therefore deemed out of scope in UBC Vancouver campus' GHG emissions profile.

In 2018, Vancouver campus emissions for offsets amounted to 37,941 tCO_2e. A detailed breakdown of the campus emission sources is provided in Table 5. Core academic buildings include teaching and learning spaces, lecture theatres and laboratories, while ancillary buildings include athletics, student housing residences and the bookstore.

CLIMATE ACTION AT UBC VANCOUVER

TABLE 5: 2018 Offsettable Emissions for the UBC Vancouver Campus

Source	2007 Emissions (tCO_2e)	2018 Emissions (tCO_2e)	Percent of 2018 Total
UBC Vancouver Campus – Core Buildings[6]	**46,478**	**25,961**	**68%**
DES (natural gas and light fuel oil)[7]	40,106	17,532	46%
Natural gas (direct burn)	3,515	6,626	17%
Electricity	2,856	1,458	4%
Biomass facility[8]	N/A	323	0.9%
Renewable Natural Gas[9]	N/A	22	0.1%
UBC Vancouver Campus Ancillary Buildings[10]	**11,405**	**10,544**	**28%**
DES (natural gas and light fuel oil)	7,311	5,695	15%
Natural gas (direct burn)	3,108	4,049	11%
Electricity	986	739	1.9%
Biomass facility	N/A	61	0.2%
TRIUMF[11]	**222**	**101**	**0.3%**
Fleet	**1,973**	**943**	**2.5%**
Paper	**1,003**	**392**	**1.0%**
Total Vancouver Campus Offsettable Emissions	**61,082**	**37,941**	**100%**

6 Core buildings comprise academic and administrative buildings.

7 District Energy System (DES).

8 UBC is required to offset the CH_4 and N_2O portions of biomass combustion from the BRDF. In addition, the BRDF burns a small amount of natural gas.

9 UBC is required to offset the CH_4 and N_2O portions of renewable natural gas.

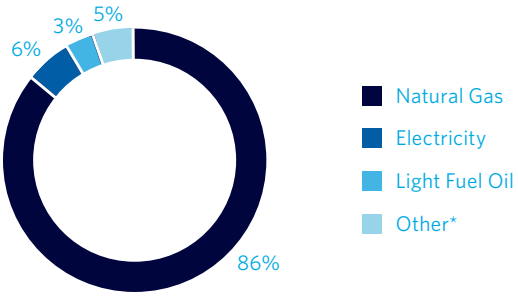
10 Ancillary buildings include student housing, conference, athletics and parking facilities.

11 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 1/13th of the TRIUMF emissions.

CLIMATE ACTION AT UBC VANCOUVER

Figure 3 shows the distribution of major offsettable emissions from UBC's Vancouver campus. Natural gas comprises 86% of the total emissions, confirming that UBC's efforts to reduce fossil fuel reliance provide the greatest opportunity in reducing our carbon emissions.

FIGURE 3: 2018 Offsettable Emissions Distribution for the UBC Vancouver Campus



*Other includes, Fleet, Paper, Biomass, and Renewable Natural Gas

COMPARISON TO BASELINE YEAR

UBC Vancouver tracks and reports our relative emissions against a 2007 baseline to measure and demonstrate performance against our Climate Action Plan targets. In 2018, UBC's Vancouver campus reduced offsettable GHG emissions by 38% against the 2007 baseline.

The emissions from campus buildings, along with fleet and paper amounted to 0.76 tCO_2e per student (FTE) in 2018, a 53% decrease in emissions per student (FTE) since 2007. Between 2007 and 2018, the Vancouver campus building floor space increased by roughly 275,000 m^2 (21%), with several older buildings demolished to make way for the construction of new buildings, while student enrolment increased by over 12,000 FTE students (32%) between 2007 and 2018. Table 6 outlines key performance indicators for the UBC Vancouver campus.

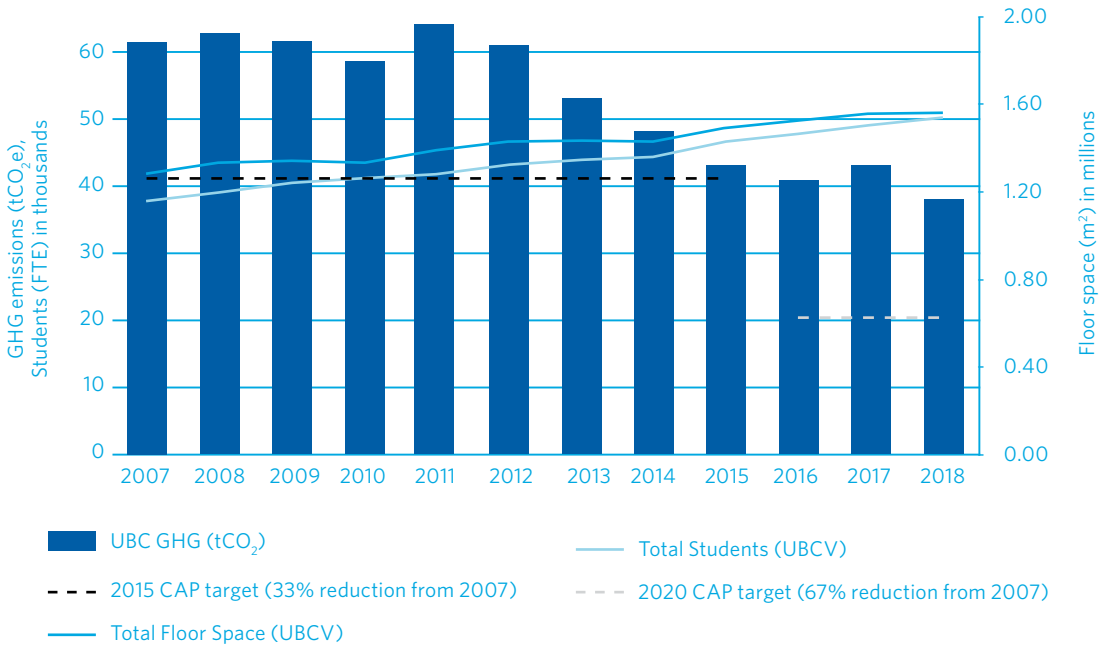
CLIMATE ACTION AT UBC VANCOUVER

TABLE 6: 2018 UBC Vancouver Campus Key Performance Indicators

Key Performance Indicator	2007	2018	% Change
GHG Emissions (tonnes CO_2e)	61,082	37,941	-38%
GHG Emissions per Student (tCO_2e/FTE)	1.62	0.76	-53%
GHG Emissions per square meter (tCO_2e/m^2)	0.048	0.024	-49%
Floor Space (m^2)	1,284,482	1,559,380	+21%
Student Enrolment (FTE)	37,589	49,624	+32%
Staff and Faculty Employees (FTE)	10,509	13,210	+26%

Figure 4 illustrates the change in campus emissions since the 2007 baseline year, along with some key indicators of Vancouver campus growth and our 2015/2020 Climate Action Plan targets.

FIGURE 4: UBC Vancouver Campus Growth and Offsettable Emissions Reduction



CLIMATE ACTION AT UBC VANCOUVER

SCOPE 3 EMISSIONS

Non-offsettable Scope 3 emissions in UBC's inventory include those resulting from:

- Transportation (commuting) to and from campus;
- Business air travel for UBC staff and faculty;
- Building life cycle (embodied energy); and
- Solid waste management (e.g., landfilling of UBC's waste).

Although UBC is not required to report or offset on Scope 3 emissions (except paper) under the Provincial Regulations, the Vancouver campus GHG inventory goes beyond provincial requirements by quantifying the optional Scope 3 emissions, which are outlined in Table 7. We believe it is important to understand where emissions are being generated and to identify measures to reduce them, where possible.

TABLE 7: UBC Vancouver Campus Scope 3 Emissions, 2018

Source	2007 Emissions (tCO_2e)	2018 Emissions (tCO_2e)	% Change
Commuting	36,059	40,821	+13%
Business Flights	13,600	15,710	+16%
Building Lifecycle	10,190	12,865	+26%
Solid Waste	1,930	985	-49%

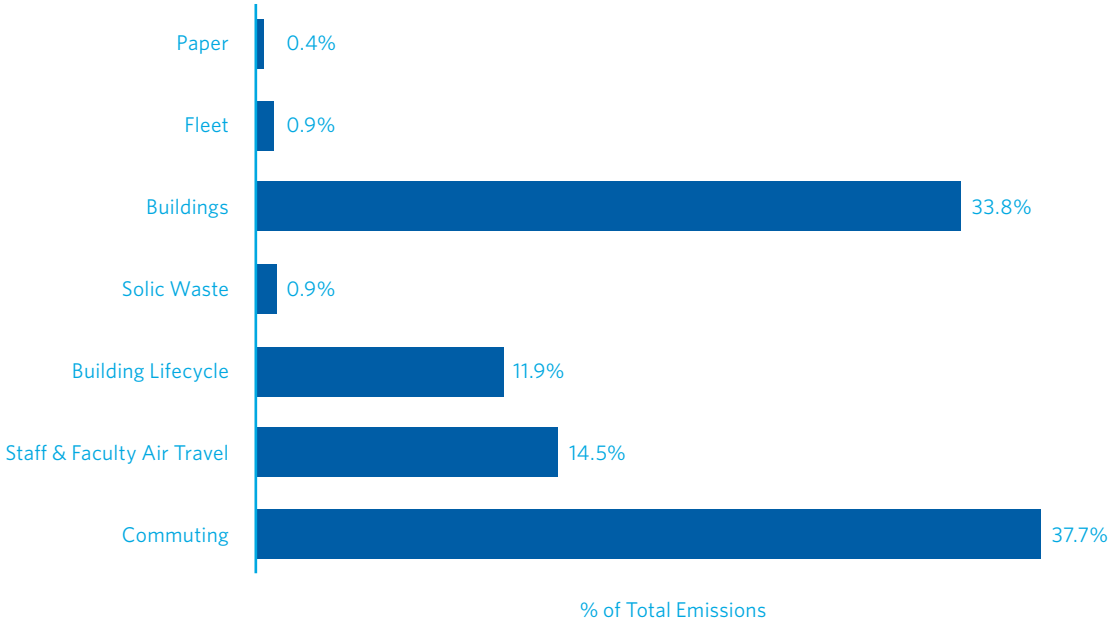
Compared to 2007, in 2018 we saw a 16% increase in emissions from business flights, and 67% of students, staff and faculty used public transit and active transportation modes over single occupant vehicles to commute to and from campus. Also in 2018, UBC Vancouver achieved a 52% transit mode split, supporting the case for rapid transit to be extended to UBC. The increase in emissions from commuting is a reflection of our growing campus population, however these emissions have increased at a slower rate than the associated floor space (21% increase) and student numbers (32% increase), which is in part due to the expansion of housing on and around campus leading to a shorter commute.

Solid waste emissions have decreased 49% from 2007 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 the overall campus floor space.

Although these particular Scope 3 emissions fall outside the scope of the provincial requirements for carbon neutrality, Figure 5 shows the comparative proportions of emissions for the Vancouver campus.

CLIMATE ACTION AT UBC VANCOUVER

FIGURE 5: UBC's Vancouver Campus Total Emissions for Scope 1, 2 and 3, 2018



ACTIONS TAKEN TO REDUCE EMISSIONS

The Climate Action Plan (CAP) developed a number of proposed actions to achieve our GHG targets by focusing on demand-side management and energy supply. The CAP outlined a roadmap for UBC to continue this progress toward the 2020 GHG reduction target of 67%, including the formulation of the UBC Green Building Action Plan outlining policies and actions for existing buildings, new buildings, a Sustainability Engagement Strategy including initiatives to support behavior change, as well as renewal of UBC-owned fleet, and displacing fossil fuels with low carbon energy supply.

Advancing low carbon and renewable energy sources

- UBC Vancouver targets 4 GWh of electrical energy and 20,000 GJ of natural gas savings each year in order to offset campus growth. Looking ahead, UBC will be tripling the capacity of its Bioenergy Research Demonstration Facility (BRDF) biomass plant and energizing two-thirds of the Academic District Energy System (ADES) to further reduce our GHG emissions.

Investing in efficient energy generation and distribution

- The Campus Energy Centre (CEC) is UBC's high efficiency water heating plant and distribution loop for the UBC Vancouver campus that replaced the 90 year-old steam Power House. The centre is an integral part of UBC's GHG emission reduction program. The CEC's high-efficiency energy production and our new district energy system and specialized underground piping have had a significant impact on overall GHG emissions.

Energy demand management and reductions

- UBC Energy & Water Services continued to implement its Building Tune Up program to conserve energy and reduce energy in all buildings across campus. In 2018, three major building renovations were completed to UBC's core campus: the old Student Union Building, Hebb Building, and Undergraduate Life Sciences Teaching Labs.

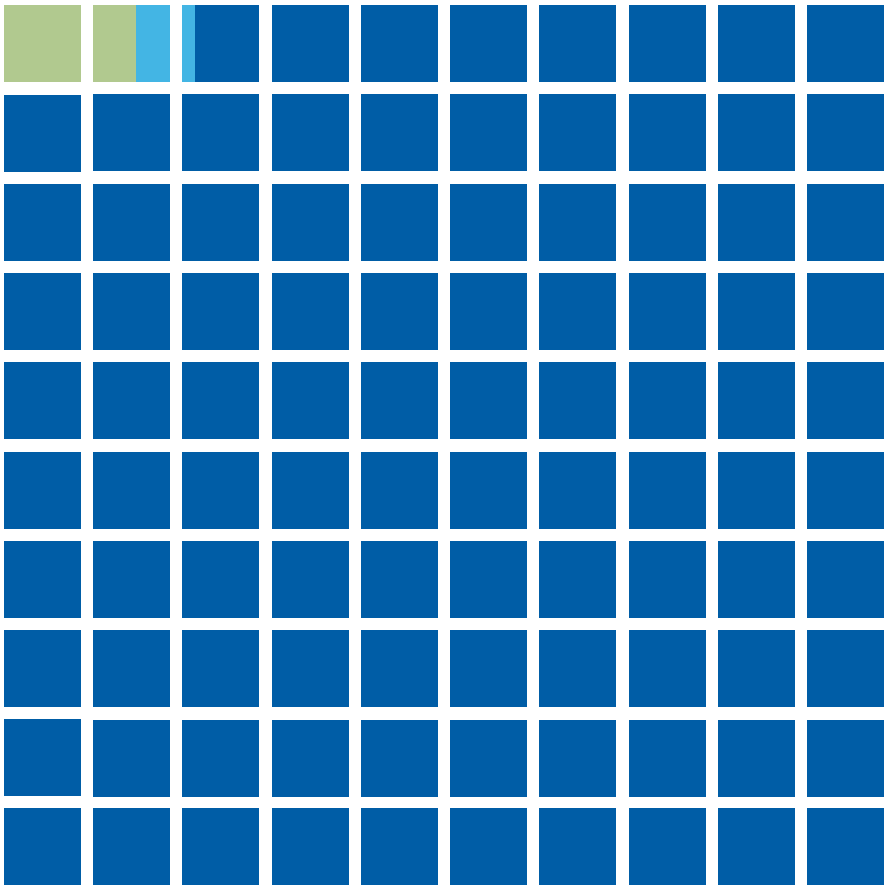
CLIMATE ACTION AT UBC VANCOUVER

- In addition to these large building renews, a number of energy efficiency upgrades were completed in existing buildings on campus, these include adding a demand control ventilation system to Michael Smith Labs, a heat recovery chiller project in the Museum of Anthropology (MOA), as well as fumehood recommissioning and continuous opitmization on a number of other buildings on campus. The MOA chiller recovers energy that is normally rejected to atmosphere and uses this to supplement the building's conventional heating systems. To date, the heat recovery chiller has recovered 1800 GJ of heat and is expected to lower the heating Energy Use Intensity (EUI[12]) of MOA by 183 kWh/m^2/yr.

12 EUI is the energy use per square meter.

GHG EMISSIONS BY SOURCE

FIGURE 6: UBC Vancouver Total Emissions by Source (Vancouver Campus, Off-campus Properties, and UBCPT) for the 2018 Calendar Year (tCO_2e*)



Stationary Fuel Combustion [Building Heating and Generators] and electricity
62,718 (97.84%)

Mobile Fuel Combustion [Fleet and other mobile equipment]
991 (1.55%)

Supplies [Paper]
392 (0.61%)

TOTAL EMISSIONS: 64,102

Offsets Applied to Become Carbon Neutral in 2018 (Generated May 16, 2019)
Total offsets required: 44,400
Total offset investment (inc. GST): $1,165,500
Emissions which so not require offset: 19,702 **

* Tonnes of carbon dioxide equivalent (tCO_2e) 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

CARBON NEUTRAL ACTION REPORT (CNAR) – PART 1 / UBC VANCOUVER CAMPUS

A. STATIONARY SOURCES (E.G. BUILDINGS, POWER GENERATORS): FUEL COMBUSTION, ELECTRICITY USE, FUGITIVE EMISSIONS.

1. Actions taken by your organization in 2018 to support emissions reductions from buildings.

a) Do you have a strategy to reduce emissions from stationary sources? **Yes**

If yes above, what are the main goals?

The UBC Vancouver Campus Climate Action Plan, committing to aggressive reduction targets for GHG emissions of 67 per cent by 2020, and 100 per cent by 2050, compared to 2007 levels.

b) Whether you have a strategy or not (1.a), briefly describe your organization's plans to continue reducing emissions from stationary sources:

I. Over the medium-term term (1-5 years)

- *The Bioenergy Research Demonstration Facility (BRDF) expansion program aims to install an additional boiler to take on a higher proportion of campus baseload energy use, resulting in a significant reduction in GHG emissions.*
- *Intensive demand-side management (DSM) activities are planned.*
- *The Green Building Action Plan (GBAP) has the vision to create a pathway for development of net-positive buildings, both academic and residential, which promote human and ecological wellbeing.*

II. Over the long term (6-10 years)

The GBAP outlines a holistic pathway for academic and residential buildings to advance towards making net positive contributions to human and natural systems by 2035. The plan outlines actions towards reduced energy use and GHG emissions from buildings. Ongoing continuous building optimization will also be performed to enhance the efficiency of our existing buildings.

c) Please describe your strategy's goals (if any) related to energy audits.

UBC utilizes a mix of in-house engineering expertise and outside consulting firms to complete energy audits on a number of our buildings each year. The energy conservation group has four in house energy engineers that audit buildings and pursue optimizations and retrofits.

I. What % on average of your building portfolio has an energy audit completed each year (if any)? 2%

d) Please describe your strategy's goals (if any) related to building retrofits.

Many buildings have undergone energy efficiency upgrades over the years. In 2018, three major building renovations were completed on UBC's core campus: the old Student Union Building, Hebb Building, and Undergraduate Life Sciences Teaching Labs. In addition to these large building renews, a number of energy efficiency upgrades were completed in existing buildings on campus, these include adding a demand control ventilation system to Michael Smith Labs, a heat recovery chiller project in the Museum of Anthropology, as well as fumehood recommissioning and continuous optimization on a number of other buildings on campus.

I. What % on average of your building portfolio is retrofitted each year in the following categories (if any)	
Minor retrofits (e.g., low cost, easy to implement measures including caulking, lighting, adding roof insulation, etc.) (%)	1%
Major retrofits (e.g., replacing windows and doors, equipment replacement such as boilers, etc.) (%)	1%
Deep retrofits (e.g., replacing roof, replacing the heating, ventilation and air-conditioning system with a renewable technology like a ground-source heat pump, etc.) (%)	1%

e) Please describe your strategy's re/retro-commissioning goals (if any)?

UBC's targets 4 GWh of electrical energy and 20,000 GJ of natural gas savings each year in order to offset campus growth. As described above, the University uses a combination of in-house engineering expertise and outside consulting services to plan and implement projects to meet these targets.

I. What % on average of your building portfolio do you recommission each year?	2%

f) Do you keep records of Refrigerant gases category and refilling volumes? **Yes**

Yes, UBC operational departments are required to keep complete up-to date inventories of refrigeration equipment and to report all Ozone Depleting Substances (ODS) releases, including annual top-up volume to Risk Management Services.

I. If yes, have you included the associated emissions in your reporting?	Yes

II. What, if any, mitigation approaches have been considered? Please describe.

Risk Management Services has developed specific pollution prevention policies, procedures and forms which aim to ensure compliance with the Environmental Management Act, Ozone Depleting Substances and Other Halocarbons Regulation, and Environmental Code of Practice for the Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems and has improved communication with UBC operational departments/teams who manage refrigeration/air conditioning equipment on campus. Our operational departments directly implement mitigation measures such as preventative maintenance of equipment by approved service contractors and following the current guidelines of the Environmental Code of Practice for the Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems (2015).

g) How many newly constructed buildings received at least LEED Gold ` certification in 2018?	**3**
I. How many newly constructed buildings did not receive LEED Gold certification?	4

II. Please explain why LEED Gold certification was not obtained.

The Indian Residential School Centre for History and Dialogue was too small at 620 m^2. UBC does not require LEED certification for buildings under 1,000m^2 as the cost is burdensome for a small project. The project was still required to go through the UBC Sustainability Process.

The UBC Life Building renovation was conducted in over 7 construction phases including base building and fit out, which did not require LEED certification at the start of construction.

h) Other actions? Please describe briefly.

The GBAP outlines a holistic pathway for academic and residential buildings to advance towards making net positive contributions to human and natural systems by 2035. The plan outlines actions towards reduced energy use and GHG emissions from buildings, this will contribute significantly to achieving our UBC Vancouver campus 2050 GHG reduction target of 100%.

B. MOBILE SOURCES (VEHICLES, OFF-ROAD/PORTABLE EQUIPMENT): FUEL COMBUSTION

3. Actions taken by your organization in 2018 to support emissions reductions from mobile sources.

a) Do you have a strategy to reduce emissions from mobile sources? **Yes**

If yes, what are its goals?

The UBC Climate Action Plan sets overall GHG reduction targets against 2007 baseline.

b) Whether you have a strategy or not (3.a), briefly describe your organization's plans to continue reducing emissions from mobile sources

I. Over the medium-term term (1-5 years)

Improvements to UBC'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.

II. Over the long term (6-10 years)

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 5 vehicles with a more fuel efficient models.

c) How many fleet vehicles did you purchase from the following categories

Electric Vehicle – EV (e.g. Nissan Leaf, Chevy Bolt)	6
"Plug In" Electric Vehicle – PHEV (e.g. plug-in Prius, Chevy Volt)	0
Hybrid vehicle – HEV – no "Plug In" (e.g. Toyota Highlander Hybrid)	0
Hydrogen fuel cell vehicle	0
Natural gas/propane	0
Gas/diesel vehicle	5

I. If you purchased new gas/diesel vehicles, can you briefly explain why vehicles from the other categories were not chosen?

Unfortunately the mid size trucks/vans are not available in electric at this time in our market. Currently we have fueling limitations at our CNG facility and therefore cannot expand its usage without significant investment.

d) How many existing EV charging stations does your organization have in each category:

level 2	70
level 3	0
How many level 2 stations (if any) are specifically for your fleet vehicles	7
How many level 3 stations (if any) are specifically for your fleet vehicles	0

e) How many EV charging station(s) did you install in 2018 in each category:

level 2	40
level 3	0
How many level 2 stations (if any) are specifically for your fleet vehicles	0
How many level 3 stations (if any) are specifically for your fleet vehicles	0

f) Other actions, please describe briefly (e.g. charging station feasibility studies, electrical panel upgrades, etc.)

We will continue to identify other opportunities that may exist for more efficient vehicles as well as considering more electric options.

4. Please indicate the number of the vehicles in the following vehicle classes that are in your current fleet (including any purchased in 2018):

a) Light duty vehicles (LDVs)

Electric Vehicle – EV (e.g. Nissan Leaf, Chevy Bolt)	17
"Plug In" Electric Vehicle – PHEV (e.g. plug-in Prius, Chevy Volt)	0
Hybrid vehicle – HEV (e.g. – non "Plug In" – older Toyota Prius, Toyota Camry hybrid)	2
Hydrogen fuel cell vehicle	0
Natural gas/propane	0
Gas/diesel vehicle	35

b) Light duty trucks (LDTs)

Electric Vehicle – EV	5
"Plug In" Electric Vehicle – PHEV	0
Hybrid vehicle – HEV (e.g. – non "Plug In" – older Ford Escape Hybrid, older Chevrolet Silverado pickup hybrid etc.)	0
Hydrogen fuel cell vehicle	0
Natural gas/propane	0
Gas/diesel	305

c) Heavy duty vehicles (HDV)

Electric Vehicle – EV	0
"Plug In" Electric Vehicle – PHEV	0
Hybrid vehicle – HEV (e.g. – non "Plug In")	3
Hydrogen fuel cell vehicle	0
Natural gas/propane	2
Gas/diesel	84

5. Please indicate the number of vehicles you plan to replace in your fleet.

How much do you budget per LDV? *To be reviewed and reported in the future.*
How many LDVs do you plan to procure annually over the next 5 years? *To be reviewed and reported in the future.*
How much do you budget per LDT? *To be reviewed and reported in the future.*
How many LDTs do you plan to replace annually over the next 5 years? *To be reviewed and reported in the future.*
How much do you plan to spend per HDV? *To be reviewed and reported in the future.*
How many HDVs do you plan to replace annually over the next 5 years? *To be reviewed and reported in the future.*

C. OFFICE PAPER: INDICATE WHICH ACTIONS YOUR PSO TOOK IN 2018

6. Actions taken by your organization in 2018 to support emissions reductions from paper supplies.

a) Do you have an Office Paper strategy? **No**

If yes, what are its goals?

N/A

b) Whether you have a strategy or not (6.a.), briefly describe your organization's plans to continue reducing emissions from paper use?

I. Over the medium term (1-5 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.

II. Over the long term (6-10 years)

Going forward, we will encourage UBC customers to purchase paper with high recycled content.

c) Have an awareness campaign focused on reducing office paper use **No**

d) Purchased alternate source paper (bamboo, hemp, wheat, etc.) **Yes**

e) Other actions, please specify

Approximately 10% of paper sourced for UBC in 2018 was sugar sheet paper (equivalent to 100% recycled content). We continued to promote the Sustainable Purchasing Guide, which encourages the procurement of paper made from alternative fibre, paper with 30-100% recycled post-consumer recycled content. 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.

UBC OKANAGAN CAMPUS
ENVISIONING A SUSTAINABLE FUTURE

UBC is a recognized leader in sustainability. Established in 2010, the UBC Okanagan Sustainability Office, Campus Planning and Development, is responsible for the advancement of sustainability on campus to support a vibrant, regenerative community. We aspire to integrate sustainability, build capacity and foster leadership across the campus to broaden the impact of sustainability.

The policies, plans and initiatives we deliver and support help to guide campus decisions and actions to achieve UBC's sustainability goals and the requirements of the B.C. Carbon Neutral Government Program. Our annual reports and external benchmarks provide an opportunity to share success, measure progress, and highlight our ongoing commitments.

THE UNIVERSITY OF BRITISH COLUMBIA

okanagan campus

ABOUT THIS REPORT

The UBC Okanagan Sustainability Office, Campus Planning and Development, is responsible to prepare and submit our campus' annual corporate emissions and Carbon Neutral Action Report (CNAR), documenting actions and future plans to reduce campus GHG emissions. The 2018 CNAR provides an overview of the actions taken by the campus to reduce carbon emissions in 2018 and future planned actions to support the Clean BC Strategy released in December 2018, which sets out new targets for the province to achieve a 40% reduction in GHG emissions by 2030, a 60% reduction by 2040 and an 80% reduction by 2050.

This report is included as part of the UBC system-wide CNAR report submission to the Province of BC.

EXECUTIVE SUMMARY AND DECLARATION

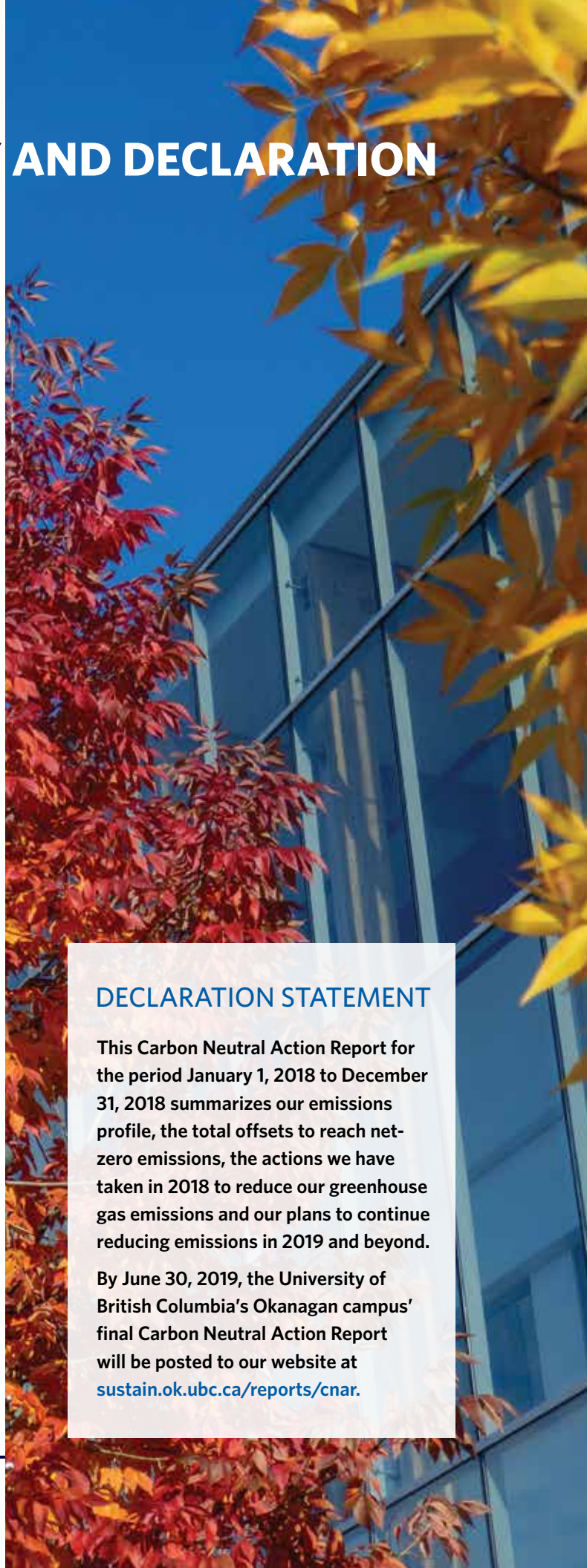
In line with UBC's commitment to climate leadership, UBC Okanagan continues to focus its climate action efforts on improving the performance of new and existing buildings, with an emphasis on energy efficiency and connection to low carbon district energy systems. Overall, absolute campus carbon emissions dropped by 29 per cent from 2017 to 2018. Although impacted by a warmer than usual winter, contributing factors to the reduction include the implementation of policies and actions focused on buildings, the largest source of in-scope emissions. For example, a significant district energy optimization project was completed in multiple buildings resulting in greater compatibility between systems; and building controls recommissioning was completed for a more efficient cold weather operational response.

Additionally, in 2018, the campus completed the Commons library expansion project, developed as a LEED Gold facility that is designed to rely solely on the campus' low carbon district energy system for heating. The campus also completed the design of UBC's first Passivhaus Building, a 220 unit residence, equivalent to Step 4 of the BC Energy Step Code. Plans have also been completed for Nechako, a mixed-use LEED Gold facility, featuring a 500 seat dining hall and 220 residence units. Informed by UBC Okanagan's recently updated Design Guidelines, it is anticipated that these projects will help build local capacity in leading energy efficiency and low carbon design, specialized trades and the application of innovative products and materials.

In the coming year, the campus will continue to implement the Whole Systems Infrastructure Plan to achieve co-benefits between energy, carbon, water, landscape, ecology, biodiversity and engagement projects. Key climate and energy focused initiatives include the development of a Net Zero Carbon District Energy Strategy to guide future low carbon district energy system development and investments. UBC Okanagan is also taking a climate leadership role by developing a Climate Action Plan (CAP). This plan will focus on key mitigation measures and climate adaptation and resilience opportunities, in recognition that climate change is and will continue to occur. It is anticipated that the alignment and completion of these projects will equip the campus with a forward looking, systematic framework for environmentally responsible growth and advance the campus toward its goal to "achieve a net-positive performance in operational energy and carbon" by 2050.

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, 2018 to December 31, 2018 summarizes our emissions profile, the total offsets to reach net-zero emissions, the actions we have taken in 2018 to reduce our greenhouse gas emissions and our plans to continue reducing emissions in 2019 and beyond.

By June 30, 2019, the University of British Columbia's Okanagan campus' final Carbon Neutral Action Report will be posted to our website at sustain.ok.ubc.ca/reports/cnar.

EMISSIONS AND OFFSET SUMMARY

EMISSIONS AND OFFSET SUMMARY

UBC Okanagan campus GHG Emissions and Offset for 2018 (tCO_2e)	
GHG Emissions created in Calendar Year 2018:	
Total Emissions (tCO_2e)	2,156
Total $BioCO_2$	3
Total Offsets (tCO_2e)	2,153
Adjustments to GHG Emissions Reported in Prior Years:	
Total Emissions (tCO_2e)	0
Total Offsets (tCO_2e)	0
Grand Total Offsets for the 2018 Reporting Year:	
Grand Total Offsets (tCO_2e)	2,153
Total Offset Investment	$53,825

RETIREMENT OF OFFSETS

In accordance with the requirements of the Climate Change Accountability Act (CCAA) and Carbon Neutral Government Regulation, UBC Okanagan (the Organization) is responsible for arranging for the retirement of the offsets obligation reported above for the 2018 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.

2018 EMISSIONS OVERVIEW

GREENHOUSE GAS EMISSIONS

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

Table 1: GHG Comparison by Source between 2017-2018

Source	2017 Emissions (tonnes CO_2e)		2018 Emissions (tonnes CO_2e)		Change from 2017 to 2018
Buildings	**2,842**	(93%)	**1,957**	(91%)	**-31%**
Fleet	**49**	(2%)	**65**	(3%)	**31%**
Paper	**64**	(2%)	**56**	(3%)	**-13%**
Fugitive	**99**	(3%)	**78**	(4%)	**-22%**
Total Emissions	**3,055**	(100%)	**2,156**	(100%)	**-29%**
Total Offsettable emissions	**3,053**	(100%)	**2,153**	(100%)	**-29%**

Table 1 provides a breakdown of campus GHG emissions by source. Of note, there was a 29 per cent decrease in total GHG emissions from 2017 to 2018 which will reduce UBC Okanagan's carbon offset liability by $22,500 (excl. tax). This reduction is a result of an 885 tCO_2e reduction in building emissions. Although impacted by a warmer than usual winter, the implementation of policies and actions that focused on buildings supported this achievement. Projects of note include the Low District Energy Systems (LDES) optimization in multiple buildings and recommissioning of building HVAC systems for a more efficient cold weather operation response. Specific measures implemented to reduce emissions over the previous year are detailed in the 'Actions Taken to Reduce Greenhouse Gas Emissions' section of this report.

CARBON NEUTRAL OFFSETS IN 2018

In accordance with the campus SMARTTool[1] reporting and as required by the Climate Change Accountability Act (CCAA), offsets required to achieve carbon neutrality in 2018 total 2,153 tCO_2e. As part of the Okanagan campus' 2018 GHG emissions profile, 3 tCO_2e do not require offsets.

[1] *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 2018

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

A. Stationary Fuel Combustion Electricity (Buildings)

Buildings account for the largest source (91%) of in-scope GHG emissions on campus. Building emissions were reduced by 31 per cent or 885 tCO_2e from 2017. This is largely attributable to the continued implementation of energy reduction measures - including demand-side energy reduction, routine capital investments, the maintenance and expansion of the district energy system, and the recommissioning of building HVAC systems to respond efficiently during cold weather operation. All new capital projects are designed for optimal energy performance and connection to low carbon district energy systems.

ACTIONS:

Academic and Administration Buildings Portfolio

ENERGY CONSERVATION AND NEW BUILDINGS

In 2018, the Campus began implementing a **Five-Year Strategic Energy Management Plan** (SEMP). The SEMP provides a suite of energy conservation measures targeted to reduce energy consumption and GHG emissions.

Final commissioning of the campus' newest development, **the Commons library expansion**, was initiated. Targeted to attain LEED® Gold certification, the facility provides students with additional study, learning and collaborative space while using no natural gas for environmental comfort. Its HVAC system was integrated into the campus' low temperature district energy system (LDES), which is used to heat and cool the building, reducing the campus' reliance on traditional fuel sources.

The campus also completed the designs for two new major capital projects. Targeted to achieve LEED® Gold certification, the **Nechako Building** is a mixed-use facility that will provide 220 residence units, amenities and a 500-seat cafeteria to campus residents. **The Skeena Residence**, UBC's first Passivhaus Building is designed as a 220 unit student residence targeted to achieve Passivhaus Classic Certification, equivalent to Step 4 of the BC Energy Step Code.

EXISTING BUILDING TUNE UPS

District Energy System Optimization Projects

A significant **district energy system** optimization project was completed in the Fipke, University Centre, and Arts and Sciences Centre buildings in 2018. This resulted in a 44 per cent reduction in energy consumption and a 186 tCO_2e reduction in GHG emissions. Additional district energy projects completed in the past year include:

- The **Cooling Plant Expansion** – Final commissioning was completed on the additional cooling tower for the LDES system to increase its air-cooled capacity. This project was initiated to respond to existing cooling capacity deficiencies and to provide additional cooling capacity for future campus growth.
- The **Science Building Third Floor Heating Upgrade** – The Science's 3rd floor heating systems were connected to the campus LDES, removing it from the central heating plant. The project is estimated to save $6,000 per year in energy costs and reduce emissions by a 45 tCO_2e annually.

Building Upgrades

A **ventilation upgrade was completed in the Science Building** in 2018 that 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_2e annually.

Heat Recovery Projects

The following completed **heat recovery projects** are estimated to lower natural gas consumption by 2,980 GJ and emissions by 149 tCO_2e annually:

- Connection of Science Building's Strobic fans to a heat recovery system;
- Completion of the Arts & Sciences Centre exhaust and Sciences' exhaust air heat recovery projects; and,
- Initiation of the Library data centre heat recovery project.

Operational Efficiency Projects

The campus continued to undertake efficiency maintenance projects on multiple buildings. **Enhanced operational efficiencies** have improved building occupant comfort and resulted in more efficient use of HVAC systems and heatpumps. General maintenance to remove particulate buildup from the district energy/science building heat exchanger has improved flow the building heatpumps and increased overall system capacity.

Through the **Electric Demand Management Project**, energy reduction measures continued to be investigated and strategies were reviewed to reduce campus electrical demand to respond to regional electric grid peaks for shorter periods of time.

Operational teams continued to complete **lighting upgrades** to existing interior and exterior campus lighting. Projects completed in 2018 include the replacement of fluorescent tubes with LED lights in the Arts building and in the outdoor street lighting.

DEPARTMENT ACTIONS

Key departments have also implemented a number of projects that support energy reduction at the campus level including:

- The ongoing **replacement of desktop computers** with laptops and more efficient devices as part of IT, Media and Classroom Services Computer Replacement Program;
- **Upgrading devices from spinning to hard drives**, reducing waste production, power consumption and replacement costs to the University; and,
- Using a phase-in approach to conduct ongoing **program upgrades** to remove step down transformers and install power sharing with splice.

Student Housing and Hospitality Services Residences Buildings Portfolio

- A hot water tank replacement project was completed in the student residence, Monashee; and,
- Lighting upgrades were completed in various student residences on a failure-based requirement.

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

In 2018, fleet vehicles accounted for 65 tCO_2e, or 3 per cent of the campus' total emissions, an increase of 15 tCO_2e from 2017. The increase is attributed to the purchase of six new fleet vehicles and the increased use of faculty research vehicles.

ACTIONS:

- Continued 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.
- 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.
- Completed the **campus-wide launch of Skype™ for Business**, an alternative web-conferencing software, supporting the reduction of campus-level emissions produced from travel.

C. Supplies (Paper)

Emissions from paper accounted for 56 tCO_2e, or 3 per cent of total in-scope campus emissions in 2018, a 13 per cent reduction as compared to the previous year. The reduction is largely attributed to the introduction of the PaperCut™ Program's Tap-To-Release feature, which reduces over-printing.

ACTIONS:

- **Reduced printing equipment fleet** and replaced older inventory with new, more efficient machines, for an overall 33 per cent reduction in fleet.
- Initiated the **alternative options to printing** programs through the PaperCut™ print-tracking software. The software provides a platform that delivers reports to clients on printing volumes, including the environmental impacts from printing, such as the total $kgCO_2e$ emitted, trees used, and printing costs (see image in ACTIONS TO SUPPORT CAMPUS SUSTAINABILITY PERFORMANCE section).
- Continued to **promote the purchase of 30 per cent or greater** post-consumer recycled content 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.

D. Fugitive Emissions

HFC emissions accounted for 4 per cent of total campus emissions, or 78 tCO_2e. This is 22 per cent fewer emissions than 2017. Regular maintenance and replacement of older and inefficient refrigerant equipment has kept campus fugitive emissions low in the past three years.

ACTIONS:

- **Replaced inefficient and older equipment** in buildings across campus, including the water source heat pump in Fipke.
- **Conducted preventative maintenance and upgrades** to HVAC system and associated appliances in the Library, University Centre, Arts, and Engineering/Management/Education buildings.

PLANS TO CONTINUE REDUCING GREENHOUSE GAS EMISSIONS IN FUTURE YEARS

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

A. Stationary Fuel Combustion Electricity (Buildings)

Academic and Administration Building Portfolio

CLIMATE LEADERSHIP

The campus will develop a **Net Zero Carbon District Energy Strategy** (NZStrategy) that will support campus growth and the achievement of a net positive performance in operational energy and carbon by 2050. In parallel, the campus will develop a **Climate Action Plan** (CAP), focused on climate change mitigation and adaptation strategies to minimize impacts and ensure resiliency against future climate events.

FUTURE BUILDINGS

All future buildings will be designed in accordance with the UBC Okanagan Design Guidelines that focus on leading green building standards. Examples include:

- The recently completed **Commons library expansion project** is currently undergoing final commissioning. Targeting LEED® Gold Certification, the Commons is estimated to consume less than half the energy compared to a minimally code compliant reference building.
- Construction of two new, sustainable housing developments:
  - **Nechako**, a mixed-use facility targeted to achieve LEED® Gold certification, will feature a 500 seat dining hall and 220 units.
  - **Skeena Residence**, a 220 unit residence, will become UBC's first Passivehaus Building, equivalent to Step 4 of the BC Energy Step Code.
- Continue process to **construct a modular building with an envelope that meets NECB 2011 standards**. This building will not use natural gas, instead electrical heat will be provided by air-source heatpumps. Demand controlled ventilation combined with heat recovery ventilators are planned to reduce electricity consumption.

EXISTING BUILDING TUNING UPS

District Energy System Optimization Projects

In the coming year projects implemented in the Reichwald Health Sciences and Engineering/Management/Education buildings will maximize the amount of heat extracted from the limited groundwater flow rate for use by the district energy system. The campus will also complete the **connection of the district energy system pipeline** between the Central Heating Plant and the Geothermal Building. Projected to save over 500 GJ of natural gas and 25 tCO_2e of emissions annually, the connection will enable the medium temperature district energy system (MDES) to provide heat to the low temperature district energy system (LDES). 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.

Operational Efficiency Projects

Key operational departments will continue to implement building systems' efficiency projects in the coming years, including **HVAC system efficiency maintenance**; investigation of strategies to reduce electrical demand through the **Electric Demand Management project;** and, completion of the **Library data center heat recovery project**, which is expected to reduce natural gas consumption by 480 GJ and emissions by 24 tCO_2e annually.

Building Recommissioning

Ongoing building upgrade projects will include the recommissioning of HVAC Systems with a focus on Carbon Dioxide Sensor Calibration and Cold Weather Operation:

- **Carbon Dioxide Sensor Calibration** – Sensors are used across campus to ensure occupants receive good indoor air quality 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** – Ongoing control sequencing upgrades and additional measures to avoid an increase of natural gas consumption by building management systems during colder than expected weather.

WHOLE SYSTEMS INFRASTRUCTURE PLAN IMPLEMENTATION

Guided by the WSIP (2016), the campus will continue to implement energy and carbon reduction projects in coming years that include:

- Confirm the campus' aspirational **Greenhouse Gas and Energy Reduction targets**; and,
- Continue to implement **re-commissioning efforts** on campus that improve existing building operations.

DEPARTMENT ACTIONS

Key departments will continue to implement projects that support energy reduction at the campus level including:

- Continue to **replace desktop computers** with laptops and more efficient devices as part of IT, Media and Classroom Services Computer Replacement Program;

- **Upgrade devices** from spinning to hard drives, reducing waste production, power consumption and replacement costs to the University; and,
- Conduct ongoing **program upgrades** to remove step down transformers and install power sharing with splice.

Residence Building Portfolio

- **Replace makeup air equipment** in Monashee and Similkameen residences.
- Complete a **full review of automation** in residence buildings.
- Implement the **FortisBC Residential Rental Efficiency Program** to upgrade energy and water fixtures in Purcell.
- Continue to conduct **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)

- Initiate the **awareness messaging prompts and introduce the Find-Me printing option through the PaperCut™** print-tracking software. The software provides a platform that delivers reports to clients on printing volumes, generating awareness, promotes alternatives to printing and will soon allow users to print from any device on campus.
- Continue to **research alternative paper sources** for inclusion on custom order list as an alternative source to tree-derived paper, i.e. Frog Paper from Ricoh.
- Introduce communication to **increase user awareness around reduced paper consumption behaviours** that will align with implementation of printing charge increase.
- Continue to **promote the purchase of 30 per cent or greater post-consumer recycled content 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.

D. Fugitive Emissions

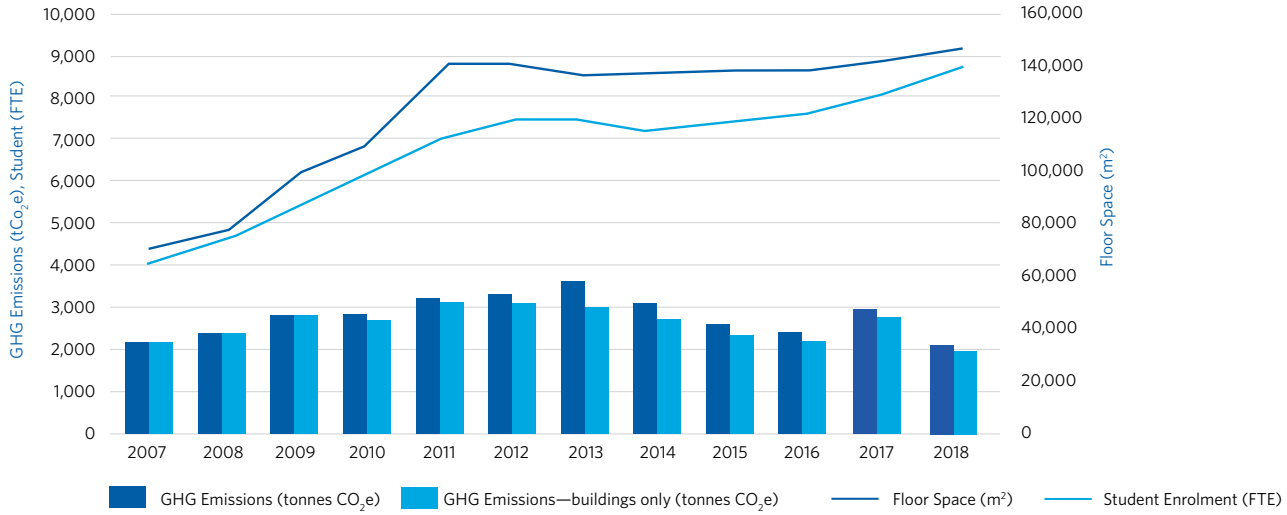
- Continue to **replace inefficient and older equipment**.
- Continue to **conduct preventative maintenance and upgrades to HVAC system and associated appliances**.

CAMPUS EMISSIONS TRENDS

COMPARING EMISSIONS TO GROWTH

Figure 1 shows trends in campus growth and absolute campus and building emissions from 2007 to 2018. Despite the increase of both floor area and student enrollment by over 100 per cent since 2007, absolute GHG emissions have remained fairly stable. Similarly, GHG emissions from buildings alone have dropped by 10 per cent since 2007. Contributing factors include continued implementation of efficiency measures to improve building energy performance including connection to low carbon district energy systems. Following a blip in 2017's campus GHG performance, caused by inefficient operational responses to the colder than normal winter by multiple buildings, the campus has again recorded a reduction in emissions by 29 per cent in 2018. Programs implemented over the previous year, which include HVAC recommissioning projects to improve building operational system responses to cold weather, are outlined in the 'Actions Taken to Reduce Greenhouse Gas Emissions In 2018' section of this report.

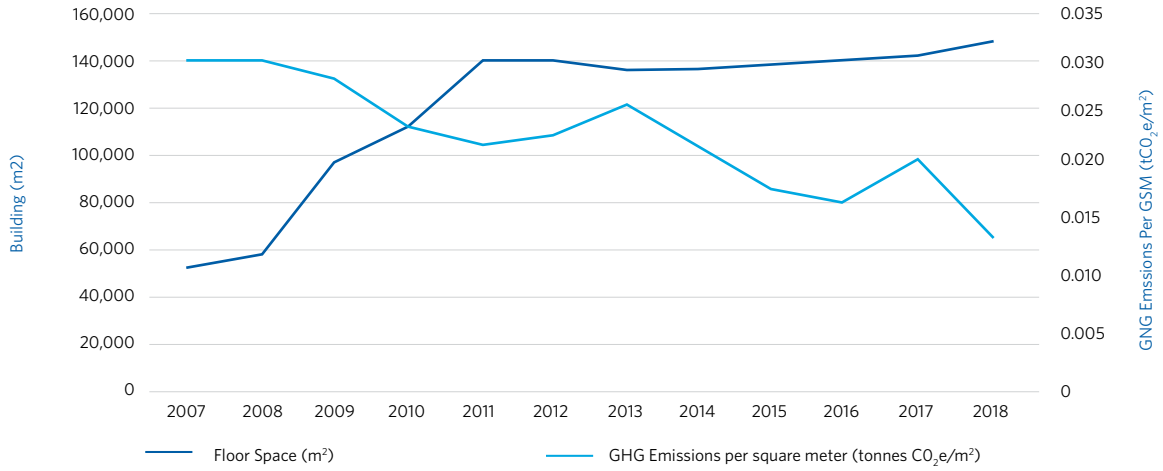
Figure 1 Absolute GHG Emissions Relative to Growth: 2007-2018



**Total GHG Emissions for 2007-2009 reported buildings only emissions; 2010-2018 includes all in-scope emissions.*

Another way to demonstrate campus GHG emissions performance that accounts for changes in growth, is intensity-based. For example, Figure 2 demonstrates the emissions intensity trend relative to campus growth in floor area from 2007 to 2018. Despite the significant floor area growth, GHG emissions per building gross square meter (m2) dropped from 0.030 in 2007 to 0.015 in 2018, a reduction of 52 per cent.

Figure 2 GHG Emissions Intensity Relative to Building GSM: 2007-2018



ABOVE AND BEYOND:

INTEGRATING SUSTAINABILITY IN CAMPUS PLANNING

Whole Systems Approach to Sustainability Planning

UBC Okanagan's Whole Systems Infrastructure Plan (Plan) responds to a call to deepen our approach to sustainability through systems thinking. Implementing the plan addresses interconnected issues related to energy, carbon, water, landscape, ecology, biodiversity and engagement.

Actions implemented in 2018 include:

- Continued implementation of **the Integrated Rainwater Management Plan** (IRMP) to manage rainwater that falls on campus at the source through the application of Low Impact Development techniques with co-benefits to the campus ecology and biodiversity;
- Implementation of the **Strategic Energy Management Plan**, which provides a suite of energy conservation measures targeted to reduce energy consumption and GHG emissions in existing buildings;
- Continued implementation of the **Conservation Awareness and Action Strategy**, targeting energy conservation and carbon reduction behaviours campus-wide;
- Completed the **Commons library expansion**. Developed to achieve LEED® Gold certification, this facility will rely solely on the campus' low carbon district energy system for heating; and,
- Completed the update of **UBCO's Design Guidelines** that integrates sustainability and high performance standards into the design process for all new capital projects. Implementation of the guidelines led the development of the following buildings where it is anticipated that these projects will help build local capacity in leading energy efficiency and low carbon design, specialized trades and the application of innovative products and materials.
  - **Nechako Building that has been designed to achieve LEED® Gold Certification**. This mixed-use facility will provide the student community 220 residence units, a 500-seat cafeteria, and access to quiet study and social amenities space.
  - **Skeena Residence, UBC's first Passivhaus Building**, has been designed as a 220 unit student residence targeted to achieve Passivhaus Classic Certification, equivalent to Step 4 of the BC Energy Step Code.

In the coming year, the campus will continue to focus on its ability to support ongoing energy and emission reduction as well as plan for its future resiliency to climate change through the development of the following:

- The campus' **Net Zero Carbon District Energy Strategy** (NZStrategy) to support campus growth and the achievement of a net positive performance in operational energy and carbon by 2050;
- **UBC Okanagan's energy and carbon reduction targets**; and,
- The UBC Okanagan **Climate Action Plan** (CAP) that will focus on not only key mitigation measures but also, recognizing that climate change is and will continue to occur, climate adaptation and resilience opportunities.

Artist's rendering of the Skeena Residence Building, built to Passivhaus Standard.

WHAT IS PASSIVHAUS?

Passivhaus certification is an internationally recognized high-performance building standard developed in Germany that focuses on the design, construction and operation of energy efficient buildings. Buildings designed and constructed to the Passivhaus standard are characterized by high levels of comfort with low energy consumption – up to 90 percent less space heating and energy consumption than conventional buildings – hence the term "passive" as they need little active heating or cooling to stay comfortable throughout the year. This is achieved by design that minimizes air leakage through the building envelope (e.g. windows, insulation, and heat recovery ventilation), while maintaining indoor air quality and thermal comfort, and achieving the required performance standard of a specific climate zone. For instance, design strategies to minimize east and west-facing glazing as well as high performance glazing reduce summer overheating. The combination of insulation and components have accommodated regions where temperatures often fall below -20 to -30 degrees C.

The Skeena Project has undertaken thermal comfort modeling to inform design strategies to meet with requirements for the Okanagan, including future climates.

ENERGY CONSERVATION

Science's Heat Recovery Project Conserves Energy and Reduces GHG Emissions

The Okanagan campus' Science Building, a legacy facility, has undergone a number of modifications over time that have reduced the efficiency of its ventilation system. In 2018, the campus initiated the Heat Recovery Project which included the implementation of the following measures to address the inefficiencies:

- Rebalancing of laboratory airflows;
- Installation of variable-frequency drives on the building's main exhaust fan motors;
- Several laboratories were connected to a system that monitors laboratory exhaust chemical content in order to allow for ventilation rate optimization; and,
- Key fume hoods were upgraded to variable air volume flow.

To maximize efficiencies from the fume hood upgrade, an occupant awareness initiative will be developed and initiated through the campus' Power of You Program in the coming year.

The completed project is estimated to save $52,000 in energy costs, reduce energy by 2,600 GJ of gas and 415,000 kWh of electricity, and lower emissions by 131 tCO_2e annually.

Campus-Wide Behaviour Change through The Power of You

The Okanagan campus continued to implement the Campus-Wide Conservation Awareness and Action Strategy (Power of You, 2016) in 2018. Designed support 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 Power of You supports building optimization efforts and the advancement of the campus' 2050 Goals through campus-wide engagement.

Engagement programs designed to target a broad range of performance areas through a variety of platforms in 2018 included:

- 3rd Annual Labs: Sort It Out and Power Down event
- 2nd Recycling 101 Event: Recycle Your Empty Coffee Cup event
- Wash In Cold Water, a 10-week residence laundry communication campaign; and,
- The inaugural Holiday Campus Shutdown communication and engagement campaign.

These opportunities resulted in the collection of 168 sustainability-focused Pledge commitments, 5 department-level commitments to support energy conservation during the holiday closure, a 40 per cent reduction in hot water consumed by Nicola housing residents, and 48 per cent increase in the use of re-usable cups and dishware over the previous year.

In addition to the above, campus-wide actions taken by key operational departments in 2018 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 6,500 lights and 30 projectors/screens were turned off or powered down and 70 windows were closed at night, contributing to campus energy conservation.

In 2019, the Okanagan campus will continue to engage all campus constituents, campus-wide with campaigns to support the achievement of the campus' long-term goals. Planning is currently underway to deliver a province-wide awareness campaign called the BC Cool Campus Challenge at UBC Okanagan. Developed in partnership with FortisBC in response to the 2018 pipeline explosion, the Challenge will be undertaken by six BC post-secondary campus' with a focus on reducing energy consumption and emissions during the winter season.

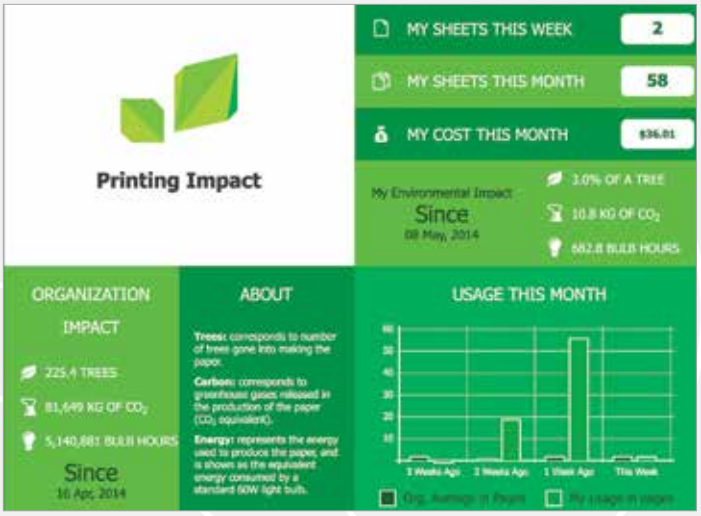
ACTIONS TO SUPPORT CAMPUS SUSTAINABILITY PERFORMANCE

PaperCut™ = Paper Reduction

PaperCut™ is a user-driven, online based printing program designed to improve security, reduce costs, and lower the campus' environmental footprint through paper reduction.

In 2018, the campus population grew by eight per cent, yet paper purchases decreased by 16 per cent. This accounts for the purchase 0.96 packages per individual in 2018 – a reduction of 22 per cent over 2017. A contributing factor to this reduction is attributed to the continued implementation of the Tap-To-Release feature enabled on the PaperCut™ platform that was introduced to the campus in 2016. The use of this feature enabled the campus to save 207,706 sheets (415 packages) of paper from over-printing, effectively reducing campus printing costs by $30,500 in the last year.

Future roll-out of the PaperCut™ software applications will further support the campus emission reductions goals in the coming year. Two new features will be released campus-wide in 2019 that include user awareness prompts, which in addition to the Printing Impact report (see picture 1) will also provide real-time awareness messaging through pop-ups, and a Find-Me print release option, which will allow users to release their print jobs on any printer campus-wide.



Sample of the Printing Impact report provided through PaperCut™.

Treatment of Chemistry Wastes and Reduction of Experimental Inputs

UBC Okanagan's laboratory personnel continue to demonstrate that their research activities do not have to impact the environment. At the request of Risk Management Services and the Engineering department in 2018, a faculty member from the Chemistry department was approached to develop a research project that focused on the treatment and waste reduction of two large hazardous waste streams generated in the undergraduate chemistry programs.

The researchers utilized granulated activated carbon as the absorbing agent in the two experiments. Results from both demonstrated successful absorption of hazardous compounds, effectively reducing waste generation by half, while also reducing experiment costs and the effects waste generation has on the environment. The researchers also developed a guide for laboratory technicians to follow in order to successfully treat the hazardous waste in future years.

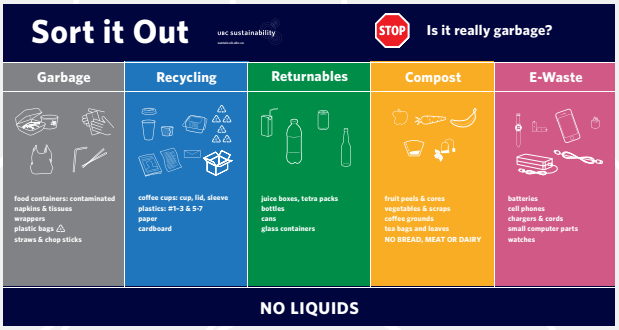
Campus Waste Audit

UBC Okanagan conducted its 5th Bi-Annual Waste Audit in October 2018. Used as an assessment tool to identify the campus' waste behaviours, the audit reviews the waste, recycling and compost streams and offers recommendations to improve sorting behaviours and waste reduction. This year's audit also provided an onsite awareness booth that supplied information on the event, identified the waste streams available to the campus, and responded to participant questions. Staff will use the audit to guide the development of Scope 3 GHG reduction opportunities in the upcoming Climate Action Planning process.

The 2018 audit assessed 9,661 litres of material – 5,211L of garbage, 3,887L of recycling, 523L of returnables, and 40L of organics (compost). The results demonstrated a 13 per cent improvement in recycling stream compliance as compared to 2016.

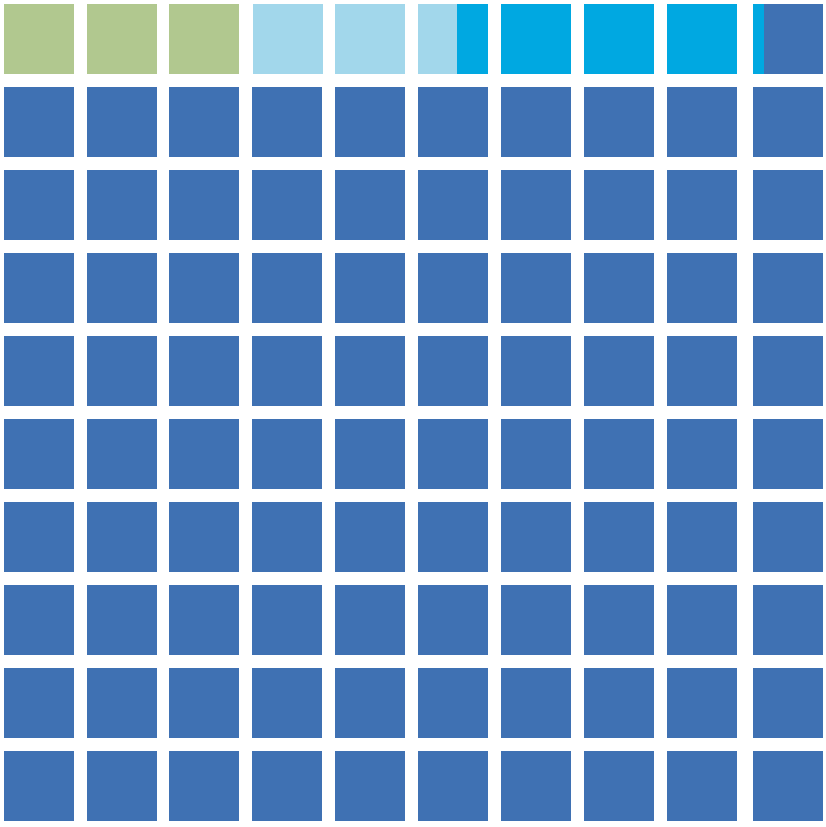
Prior to the audit, the campus undertook a review of the existing recycling signage and stations. As an outcome, the campus initiated upgrades to the recycling facilities, including sign design and content updates, content updates, established message continuity across campus, and constructed two larger recycling station collection centres within the Administration Building and University Centre dining halls, increasing the visibility and accepted material volume for all four waste streams. The campus also held awareness and education events during the year that included Waste 101: Recycle Your Empty Coffee Cup and Labs: Power Down and Sort It Out. The outcomes of these upgrades and events supported the improvement of single-use cup/paper recycling by 10 per cent over the 2016 audit and diversion of over 2,700 liters of clean laboratory material from the landfill.

Recycling programming upgrades and initiatives will continue in 2019 and include the addition of another large recycling station in the Commons and the introduction of recycling station carousels, which have been designed to hold hallway tri-stations in place.



GHG EMISSIONS BY SOURCE

UBC OKANAGAN GREENHOUSE GAS EMISSIONS BY SOURCE FOR THE 2018 CALENDAR YEAR (tCO_2e*)



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

3.0% 65	Mobile Fuel Combustion (Fleet and other mobile equipment)
2.6% 56	Supplies (Paper)
3.6% 78	Fugitive Sources
90.8% 1,957	Stationary Fuel Combustion (Building Heating and Generators) and Electricity

TOTAL EMISSIONS: 2,156

OFFSETS APPLIED TO BECOME CARBON NEUTRAL IN 2018

(Generated April 5, 2019 1:59 p.m.)

Total offsets required: 2,153. Total offset investment: $53,825.
Emissions which do not require offsets: 3. **

*Tonnes of carbon dioxide equivalent (tCO_2e) 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

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

A. STATIONARY SOURCES (E.G. BUILDINGS, POWER GENERATORS): FUEL COMBUSTION, ELECTRICITY USE, FUGITIVE EMISSIONS.

1. Actions taken by your organization in 2018 to support emissions reductions from buildings.

a) Do you have a strategy to reduce emissions from stationary sources? **Yes**

If yes above, what are the main goals?

Whole Systems Infrastructure Plan Sustainability Goals are:

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% diversion of stormwater from municipal systems

5. Strive towards full waste recover/reuse

6. Enhance and/or restore the site's ecology

b) Whether you have a strategy or not (1.a), briefly describe your organization's plans to continue reducing emissions from stationary sources:

I. Over the medium-term term (1-5 years)

Refer to the Plans to continue Reducing Greenhouse Gas Emissions in Future Years section of the 2018 CNAR.

II. Over the long term (6-10 years)

Refer to the Plans to continue Reducing Greenhouse Gas Emissions in Future Years section of the 2018 CNAR.

c) Please describe your strategy's goals (if any) related to energy audits.

No energy audits/studies occurred in 2018; however, an energy audit is scheduled to take place in the Creative & Critical Studies Building in 2019.

I. What % on average of your building portfolio has an energy audit completed each year (if any)? 5%

d) Please describe your strategy's goals (if any) related to building retrofits.

Goals of the Strategic Energy Management Plan (SEMP) include increase heat transfer capability to decrease water temperature; decreased heating water temp to make use of low grade source – better utilize low grade temp; and decarbonizing existing systems.

I.	What % on average of your building portfolio is retrofitted each year in the following categories (if any)	
	Minor retrofits (e.g., low cost, easy to implement measures including caulking, lighting, adding roof insulation, etc.) (%)	5%
	Major retrofits (e.g., replacing windows and doors, equipment replacement such as boilers, etc.) (%)	5%
	Deep retrofits (e.g., replacing roof, replacing the heating, ventilation and air-conditioning system with a renewable technology like a ground-source heat pump, etc.) (%)	5%

e) Please describe your strategy's re/retro-commissioning goals (if any)?

Proposed projects aim to reduce electricity consumption by 500,000 kWh and natural gas consumption by 3,000 GJ per year to 2020, then by 2,000 GJ per year from 2021 and beyond as well as increase the compatibility of buildings with low carbon sources.

I.	What % on average of your building portfolio do you recommission each year?	5%

f)	**Do you keep records of Refrigerant gases category and refilling volumes?**	**Yes**
I.	If yes, have you included the associated emissions in your reporting?	Yes

II. What, if any, mitigation approaches have been considered? Please describe.

a. Continue to replace inefficient and older equipment.

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

g)	**How many newly constructed buildings received at least LEED Gold ` certification in 2018?**	**0**
I.	How many newly constructed buildings did not receive LEED Gold certification?	1

II. Please explain why LEED Gold certification was not obtained.

Construction of Commons building not completed until late 2018, occupancy in December 2018.

B. MOBILE SOURCES (VEHICLES, OFF-ROAD/PORTABLE EQUIPMENT): FUEL COMBUSTION

3. Actions taken by your organization in 2018 to support emissions reductions from mobile sources.

a) Do you have a strategy to reduce emissions from mobile sources? **No**

If yes, what are its goals?

No strategy at this time.

b) Whether you have a strategy or not (3.a), briefly describe your organization's plans to continue reducing emissions from mobile sources

I. Over the medium-term term (1-5 years)

Refer to the Plans to continue Reducing Greenhouse Gas Emissions in Future Years section of the 2018 CNAR.

II. Over the long term (6-10 years)

Refer to the Plans to continue Reducing Greenhouse Gas Emissions in Future Years section of the 2018 CNAR.

c) How many fleet vehicles did you purchase from the following categories

Electric Vehicle – EV (e.g. Nissan Leaf, Chevy Bolt)	0
"Plug In" Electric Vehicle – PHEV (e.g. plug-in Prius, Chevy Volt)	1
Hybrid vehicle – HEV – no "Plug In" (e.g. Toyota Highlander Hybrid)	0
Hydrogen fuel cell vehicle	0
Natural gas/propane	0
Gas/diesel vehicle	5

I. If you purchased new gas/diesel vehicles, can you briefly explain why vehicles from the other categories were not chosen?

Purchases of gas/diesel vehicles were made by Faculty researchers and staff based on their research and departmental requirements. Decisions and purchases are made on a case-by-case basis and the vehicles purchased were outside UBCO's core operational department.

d) How many existing EV charging stations does your organization have in each category:

level 2	0
level 3	0
How many level 2 stations (if any) are specifically for your fleet vehicles	0
How many level 3 stations (if any) are specifically for your fleet vehicles	0

e) How many EV charging station(s) did you install in 2018 in each category:

level 2	6
level 3	0
How many level 2 stations (if any) are specifically for your fleet vehicles	0
How many level 3 stations (if any) are specifically for your fleet vehicles	0

f) Other actions, please describe briefly (e.g. charging station feasibility studies, electrical panel upgrades, etc.)

Future considerations to upgrade 6 level 1 stations located in parking lot E to level 2 stations in 2019/2020.

4. Please indicate the number of the vehicles in the following vehicle classes that are in your current fleet (including any purchased in 2018):

a) Light duty vehicles (LDVs

Electric Vehicle – EV (e.g. Nissan Leaf, Chevy Bolt)	0
"Plug In" Electric Vehicle – PHEV (e.g. plug-in Prius, Chevy Volt)	2
Hybrid vehicle – HEV (e.g. – non "Plug In" – older Toyota Prius, Toyota Camry hybrid)	0
Hydrogen fuel cell vehicle	0
Natural gas/propane	0
Gas/diesel vehicle	1

b) Light duty trucks (LDTs)

Electric Vehicle – EV	0
"Plug In" Electric Vehicle – PHEV	0
Hybrid vehicle – HEV (e.g. – non "Plug In" – older Ford Escape Hybrid, older Chevrolet Silverado pickup hybrid etc.)	0
Hydrogen fuel cell vehicle	0
Natural gas/propane	0
Gas/diesel	16

c) Heavy duty vehicles (HDV)

Electric Vehicle – EV	0
"Plug In" Electric Vehicle – PHEV	0
Hybrid vehicle – HEV (e.g. – non "Plug In")	0
Hydrogen fuel cell vehicle	0
Natural gas/propane	0
Gas/diesel	5

5. Please indicate the number of vehicles you plan to replace in your fleet.

How much do you budget per LDV? ***case-by-case for operational and research requirements***

How many LDVs do you plan to procure annually over the next 5 years? *Unknown, operational budget new asks are new each fiscal budgeting season and new research faculty who require vehicles come onto campus each year and potential purchases are budgeted within grant applications.*

How much do you budget per LDT? *case-by-case for operational and research requirements*

How many LDTs do you plan to replace annually over the next 5 years? *Unknown, operational budget new asks are new each fiscal budgeting season and new research faculty who require vehicles come onto campus each year and potential purchases are budgeted within grant applications.*

How much do you plan to spend per HDV? *case-by-case for operational and research requirements*

How many HDVs do you plan to replace annually over the next 5 years? *Unknown, operational budget new asks are new each fiscal budgeting season and new research faculty who require vehicles come onto campus each year and potential purchases are budgeted within grant applications.*

C. OFFICE PAPER: INDICATE WHICH ACTIONS YOUR PSO TOOK IN 2018

6. Actions taken by your organization in 2018 to support emissions reductions from paper supplies.

a) Do you have an Office Paper strategy? **No**

If yes, what are its goals?

No paper strategy exists at this time; however, paper reduction was a major consideration during the fleet transition that occurred in 2018. The PaperCut® program was introduced as a support and accounting program to track paper consumption and costs.

b) Whether you have a strategy or not (6.a.), briefly describe your organization's plans to continue reducing emissions from paper use?

I. Over the medium term (1-5 years)

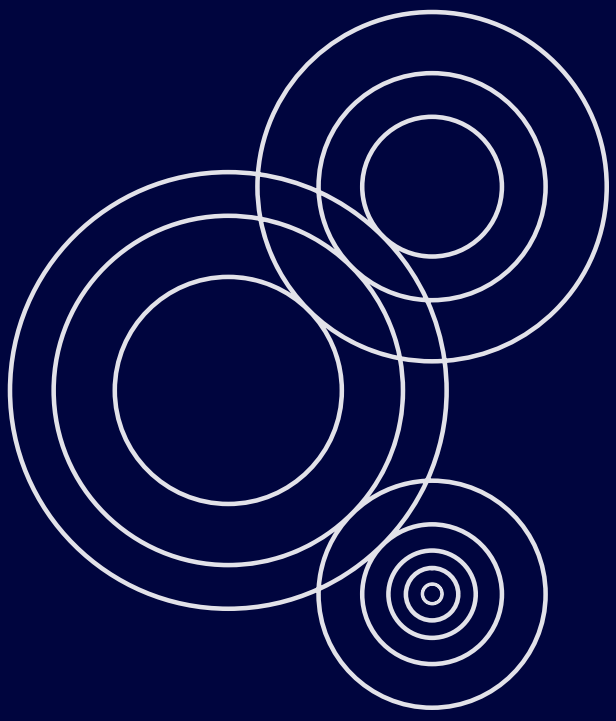
Refer to the Plans to continue Reducing Greenhouse Gas Emissions in Future Years section of the 2018 CNAR.

II. Over the long term (6-10 years)

Refer to the Plans to continue Reducing Greenhouse Gas Emissions in Future Years section of the 2018 CNAR.

c) Have an awareness campaign focused on reducing office paper use **Yes**

d) Purchased alternate source paper (bamboo, hemp, wheat, etc.) **Yes**



THE UNIVERSITY OF BRITISH COLUMBIA

sustainability