2015 CARBON NEUTRAL ACTION REPORT

a place of mind
THE UNIVERSITY OF BRITISH COLUMBIA

sustainability

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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. Driven by the need to manage operational costs and the urgent need to mitigate climate change, UBC's efforts focus on renewable energy supply and demand side energy conservation. Our actions to date have reduced UBC's carbon liability by $2.5M from 2007 levels.

In 2015, UBC continued to deliver on our bold climate action commitments, reducing greenhouse gas (GHG) emissions at our Vancouver and Okanagan campuses by 28 per cent against a 2007 baseline, despite a 20 per cent increase in floor space and a 29 per cent increase in student enrollment. Relative to student enrolment, we have reduced GHG emissions per full-time equivalent (FTE) student by 44 per cent 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 behaviour change programs focused on energy conservation.

From 2007 UBC's Vancouver campus achieved a 30 per cent reduction in absolute carbon emissions. This reduction was attained by the completion of the highly efficient Campus Energy Centre, the substantial completion of the steam to hot water conversion of the Academic District Energy System (ADES), the third 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, nine campus buildings targeting Leadership in Energy and Environmental Design (LEED) gold and four neighbourhood buildings targeting Residential Energy Assessment Program (REAP) gold were under construction in 2015.

UBC's Okanagan campus' key achievements include a 17 per cent reduction in absolute carbon emissions, 14 per cent of which is attributable to a reduction in building emissions. A strategic focus on demand-side energy reduction through continuous optimization of campus facilities and district energy systems; the ongoing pursuit of operational improvements and efficiencies through technical and behavioral approaches; and the integration of sustainability in campus planning have made significant contributions to reduce carbon emissions and operational costs. In 2015, the campus undertook a significant building and infrastructure analysis as part of a broader sustainability planning process that helped to advance early actions toward the achievement of the campus' 2050 Whole Systems Goals. Arising from the UBC endorsed Campus Plan (2015), the Whole Systems Infrastructure Plan will provide the roadmap and implementation framework for future infrastructure needs and environmental stewardship to support sustainable campus growth, community wellbeing and ecological resilience.

We are pleased to share key highlights of our climate action initiatives implemented in 2015.

MICHAEL WHITE
Associate Vice-President
Campus and Community Planning

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

EMISSIONS OVERVIEW

Photo Credit: Hover Collective

The University of British Columbia's 2015 Carbon Neutral Action Report for the period January 1st, 2015 to December 31st, 2015 summarizes our emissions profile, the actions we have taken in 2015 to reduce our greenhouse gas emissions, the total offsets to reach net-zero emissions, and our plans to continue reducing emissions in 2016 and beyond.

By June 30, 2016 a copy of this report will be posted on our website at:
https://sustain.ubc.ca/our-commitment/strategic-plans-policies-and-reports

Following the emissions overview section, a detailed implementation report provides additional information on emissions and actions taken to reduce emissions for UBC's Vancouver and Okanagan campuses.

ABOUT UBC

The University of British Columbia (UBC) is a global centre for research and teaching, consistently ranked among the top 40 universities in the world. Our two main campuses — the Vancouver campus and the Okanagan campus — attract and educate nearly 60,000 students from 140 countries and employ over 15,000 staff and faculty. UBC's Vancouver campus is home to a vibrant, sustainable residential community where some 20,000 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.

EMISSIONS AND OFFSETS SUMMARY

2015 Emissions and Offsets

Under the Greenhouse Gas Reductions Target, 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. Table 1 shows UBC's total GHG emissions and offsets purchased in addition to any adjustments made to previously reported figures.

Table 1: 2015 Total UBC Emissions and Offsets Summary

	UBC Vancouver[1]	UBC Okanagan	UBC Total
GHG Emissions Created in Calendar Year 2015 (tCO_2e)			
Total Emissions	66,597	2,601	69,198
Total Emissions for Offsets[2]	47,440	2,599	50,039
Adjustments to GHG Emissions Reported in Previous Years (tCO_2e)			
Adjustments to 2014 Offsets	+551[3]	0	+551
Total Emissions for Offset Purchase in 2015 (tCO_2e)			
Total Emissions for Offsets	47,991	2,599	50,590

1 Including UBC Properties Trust and off-campus properties.

2 Biogenic emissions ($BioCO_2$) from biomass, renewable natural gas and biofuels are not required to be offset due to their renewable source. Methane (CH_4) and Nitrous Oxide (N_2O) emissions from those sources are required to be offset and are included in offset amount.

3 Adjustments made to 2014 offsets corrects for an unreported on-campus property which UBC subleases and an off-campus property in which UBC had reported estimated emissions for which there is now actual data.

A summary of emissions attributed to UBC's campuses and off-campus units is provided in Table 2 and Figure 1. Emissions for offsets for all properties and sites amounted to 50,039 tCO_2e in 2015. Biogenic emissions, which are carbon dioxide emissions from biomass, renewable natural gas and biofuels, amount to 19,159 tCO_2e but are not required to be offset, only reported. Including biogenic emissions, UBC's 2015 total emissions amounted to 69,198 tCO_2e.

Table 2: UBC Total 2015 Emissions by Location

Location	2015 Emissions (tCO_2e)
UBC's Vancouver campus	42,846
UBC's Okanagan campus	2,599
Off-campus properties	2,587
UBC Properties Trust	2,007
Total Emissions for Offset purchases	50,039
Emissions not required to be offset[1]	19,159
UBC Vancouver Biogenic Emissions	*19,157*
UBC Okanagan Biogenic Emissions	*2*
Total Emissions	69,198

[1] Biogenic emissions ($BioCO_2$) from biomass, renewable natural gas and biofuels are not required to be offset due to their renewable source. Methane (CH_4) and Nitrous Oxide (N_2O) emissions from those sources are required to be offset and are included in offset amount.

Figure 1: UBC 2015 Emissions for Offsets by Location

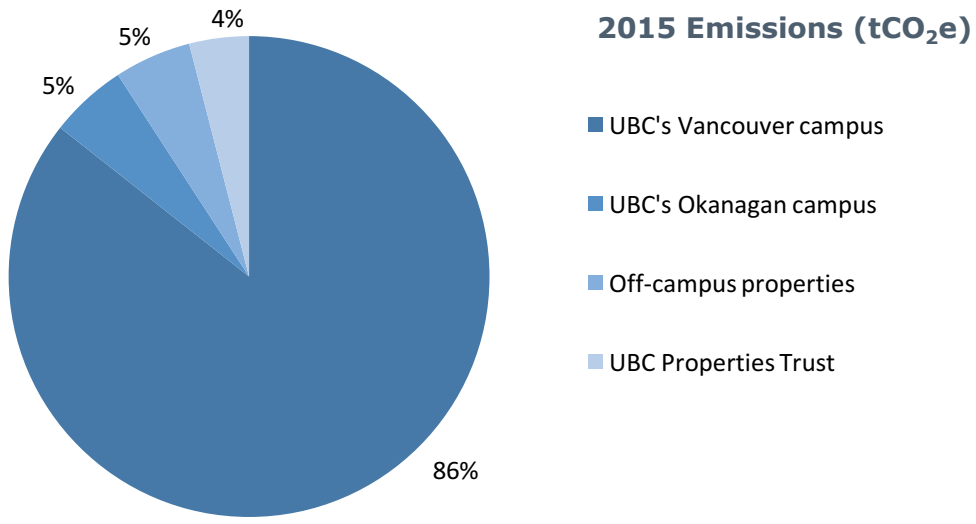


Table 3 shows the 2015 emissions for offsets from UBC's two main campuses along with key performance indicators.

Table 3: 2015 Emissions for Offsets for UBC's Vancouver and Okanagan Campuses

Key Performance Indicator	Vancouver Campus[1]	Okanagan Campus
GHG Emissions (tonnes CO_2e)	42,846	2,599
Floor Space (square meters)	1,487,899	137,604
Staff and Faculty Employees (FTE)	12,183	1,033
Student Enrolment (FTE)	46,183	7,403
GHG Emissions per Student (tonnes CO_2e/FTE)	0.93	0.35
GHG Emissions per Square Metre (tonnes CO_2e/m^2)	0.029	0.019

[1] *Excludes UBC Properties Trust and off-campus properties*

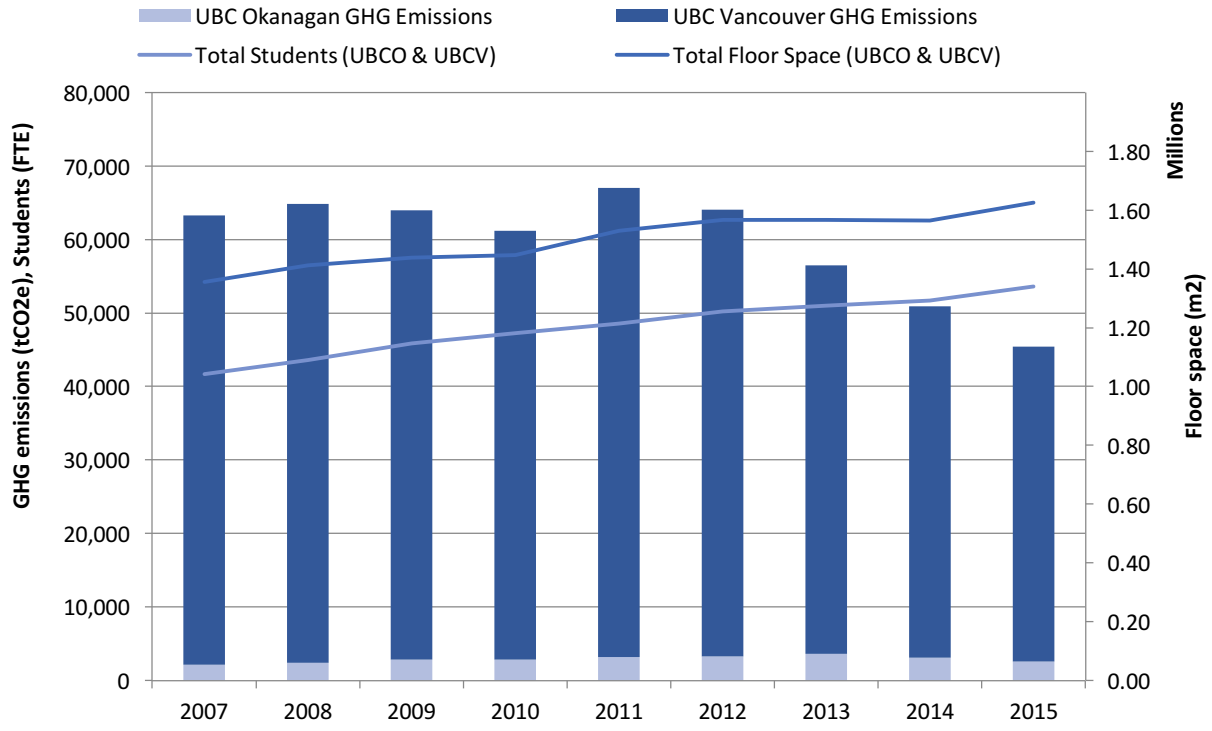
Comparison to 2007 Baseline

UBC tracks and reports the absolute and relative emissions for each campus against a 2007 baseline to measure and demonstrate performance against our Climate Action Plan targets. Despite significant campus growth in floor space and student enrolment, UBC has achieved a decrease in emissions per capita, as shown in Figure 2.

In 2015, UBC's Vancouver and Okanagan campuses reduced GHG emissions by 28 per cent against a 2007 baseline, despite a 20 per cent increase in floor space and 29 per cent increase in student enrollment. Since 2007, we have reduced GHG emissions by 44 per cent per FTE student.

Figure 2 outlines the change in emissions for offsets for the Vancouver and Okanagan campuses since the 2007 baseline year, along with indicators of UBC campus growth. Student enrolment increased by 12,000 FTE students from 2007 to 2015 while floor space increased by 269,000 square metres.

Figure 2: UBC Emissions for Offsets and Growth, Vancouver and Okanagan campus, 2007 to 2015



PART A

UBC Vancouver Campus Emission Details

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VANCOUVER CAMPUS SUMMARY

UBC's Vancouver campus made significant progress this past year towards achieving the Vancouver Climate Action Plan's aggressive GHG reduction targets. In 2015, UBC's Vancouver Campus emissions for offsets decreased 30 per cent from 2007 levels, despite a 16 per cent increase in building floor space and a 23 per cent increase in student enrolment. Per capita, we have reduced emissions 43 per cent per FTE student since 2007. Three core projects of our Climate Action Plan that have helped reduce GHG emissions include:

- UBC's Bioenergy Research and Demonstration Facility, a pioneering campus as a living lab project, completed its third full year of operation, generating clean thermal energy from renewable biomass to produce 23 per cent of total campus steam production, significantly reducing natural gas use on campus and eliminating 14 per cent of campus GHG emissions compared to 2007 levels.

- The five-year Academic District Energy System steam to hot water conversion project is over 90 per cent complete, including the opening of the new Campus Energy Centre, which replaces the campus' aging steam plant. Upon final completion, the $88 million project will connect 130 buildings to the highly efficient hot water district energy system, reducing emissions by 22 per cent and saving $5.5 million a year in operational costs.

- In 2015, the "Building Tune-Up" program continued its retro-commissioning work of over 20 additional institutional buildings. Alongside other energy conservation projects, such as the Life Sciences Heat Recovery Chiller project, the program has reduced energy in over 50 buildings, eliminating over 7 per cent of campus GHG emissions compared to 2007 levels. A further 27 buildings have completed energy audits with implementation to commence in 2017.

UBC's Climate Action Plan projects are forecasted to achieve the targeted 33 per cent emissions reduction compared to 2007 levels in 2016. In 2015, work has commenced on updating UBC Vancouver's Climate Action Plan to identify additional actions and measures that will advance UBC towards the 2020 target of reducing emissions by 67 per cent compared to 2007 levels.

As part of UBC's commitment to advance green buildings on campus, nine campus buildings targeting LEED gold and four neighbourhood buildings targeting REAP gold were under construction in 2015.

In addition to large scale infrastructure changes, we continue to engage our campus community to reduce emissions. In 2015, key engagement activities included the fourth annual Shut the Sash energy conservation competition engaging researchers to save energy in labs, as well as the annual Aim to Sustain energy and water conservation competition in two main student residences. UBC also expanded the Green Labs Program and Sustainability Coordinator program to further reduce the environmental impact of our research laboratories.

We are pleased to share with you some of the highlights of our climate action initiatives that were implemented in 2015.

MICHAEL WHITE
Associate Vice-President
Campus and Community Planning
The University of British Columbia

CLIMATE ACTION AT UBC VANCOUVER

OVERVIEW AND HISTORY

In 2010, UBC announced our Vancouver Campus Climate Action Plan, committing to aggressive reduction targets for GHG emissions – 33 per cent reduction by 2015, 67 per cent by 2020, and 100 per cent reduction by 2050, compared to 2007 levels. In 2015, work commenced on updating UBC Vancouver's Climate Action Plan for 2015-2020 to identify additional actions and measures to advance towards our aggressive targets.

To track progress towards achieving our GHG targets, UBC produces an annual Carbon Neutral Action Report which includes a detailed analysis and discussion of our GHG Inventory. In 2013, UBC and the University Neighborhoods Association (UNA) completed a Community Energy and Emissions Plan that identifies actions to reduce emissions from UBC's residential community. With support from the Community Energy Manager there has been steady progress in implementing initiatives that will reduce energy and emissions within the neighbourhoods.

UBC's Energy Management Plan is designed to maintain energy savings and identify further electricity and natural gas conservation opportunities and efficiencies. This plan reviews the current status of energy use and operating costs, sets targets, assesses opportunities, and identifies priority energy conservation initiatives. UBC has implemented an Energy Policy for Classrooms and Offices that outlines standards for heating, cooling, ventilation, lighting, IT and other equipment. The policy provides guidelines for reducing energy use, while maintaining comfort of building occupants.

For more information about climate action at UBC, read the award-winning AASHE Case Study on Implementing UBC's Climate Action Plan. For additional details on UBC's sustainability plans, initiatives, and other performance reports, please visit the Plans and Reports section of our website and refer to our full UBC Annual Sustainability Report.

2015 GREENHOUSE GAS EMISSIONS

UBC's Vancouver campus educates over 46,000 students, employs over 12,000 staff and faculty, and is home to a campus residential population of some 20,000 students, staff, faculty and other residents. With an institutional footprint of 402 hectares, UBC's Vancouver campus is home to 394 institutional buildings owned by UBC, totalling more than 1.4 million square metres (15.4 million square feet).

In 2015, total GHG emissions for UBC's Vancouver campus amounted to 42,846 tCO_2e. Of the total emissions, 96 per cent come from Vancouver campus core and ancillary buildings, with 70 per cent of the total occurring from the campus' district energy system. Key actions to reduce emissions focus on optimizing the district energy system (through integrating renewables and increasing energy efficiency), re-commissioning existing buildings, designing and constructing new green buildings and delivering behaviour change programs focused on energy conservation.

It was estimated that fugitive emissions of refrigerant gases comprise less than one per cent of UBC's Vancouver campus total emissions and collecting data to estimate these emissions would be disproportionately onerous. For this reason, emissions from this source have been deemed out of scope and have not been included in UBC's Vancouver campus GHG emissions profile.

EMISSIONS IN GREATER DETAIL

The Climate Action Plan GHG reduction targets apply to emissions from core and ancillary buildings, TRIUMF, fleet and paper. The UBC Vancouver Campus GHG Inventory, which comprises these elements, has been compiled each year since 2006. In 2015, the Vancouver Campus emissions for offsets amounted to 42,846 tCO2e, a 30% reduction from 2007 levels. A detailed breakdown of the campus emission sources is provided in Table 1.

Table 1: UBC's Vancouver Campus Emissions for Offsets, 2015

Source	2007 Emissions (tCO_2e)[1]	2015 Emissions (tCO_2e)[1]	Per cent of 2015 campus emissions[1]
UBC Vancouver Campus - Core Buildings[2]	46,478	31,148	73%
Steam (natural gas and light fuel oil)	*40,106*	*23,763*	*55%*
Natural gas (direct burn)	*3,515*	*5,501*	*13%*
Electricity	*2,856*	*1,502*	*4%*
Biomass facility[3]	*N/A*	*363*	*0.8%*
Renewable Natural Gas[4]	*N/A*	*19*	*0.04%*
UBC Vancouver Campus – Ancillary buildings[5]	11,405	10,040	23%
Steam (natural gas and light fuel oil)	*7,311*	*5,816*	*14%*
Natural gas (direct burn)	*3,108*	*3,622*	*8%*
Electricity	*986*	*518*	*1%*
Biomass facility[3]	*N/A*	*84*	*0.2%*
TRIUMF[6]	222	104	0.2%
Total Building Emissions	58,105	41,292	96%
Fleet	1, 973	1,094	3%
Paper	1, 003	460	1%
Total Vancouver Campus Emissions for Offsets	61, 082	42,846	100%

[1] *May not sum to total due to rounding.*

[2] *Core buildings comprise academic and administrative buildings.*

[3] *UBC is required to offset the CH_4 and N_2O 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.*

[4] *UBC is required to offset the CH_4 and N_2O portions of renewable natural gas.*

[5] *Ancillary buildings include student housing, conference, athletics and parking facilities.*

[6] *Although TRIUMF is a joint venture with other universities, 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.*

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 the emissions attributed to different subsidiary and off-campus units of UBC is provided in *Table 2*.

Table 2: UBC Properties Trust (UBCPT) and Off-Campus Properties' Emissions for Offsets, 2015

Source	2015 Emissions (tCO_2e)[1]
UBC Properties Trust - Owned Buildings & Paper[2]	2,007
UBC Robson Square Campus	173
Other Off-Campus Properties[3]	2,335
Joint Ventures with other universities[4]	79
Great Northern Way Campus	*63*
Bamfield Marine Sciences Centre	*16*
Total UBCPT and Off-Campus Property Emissions for Offsets	4,594

[1] *May not sum to total due to rounding.*
[2] *UBC Properties Trust, a company wholly owned by UBC, owns several residential buildings that are rented to staff, faculty and students, as well as space leased to retail and commercial tenants on campus.*
[3] *Other off-campus properties include 20 UBC owned or leased spaces throughout the province.*
[4] *Although TRIUMF is a joint venture with other universities, it has historically been included in the UBC Vancouver Campus inventory and is thus not included in this table.*

UBC's Vancouver Campus, UBC Properties Trust and off-campus properties emissions for offsets totaled 47,440 tCO2e in 2015 (see Table 3). In addition, 19,157 tCO2e of biogenic (BioCO2) emissions, which are carbon dioxide emissions from biomass, renewable natural gas (RNG) and biofuels, were emitted but are not required to be offset due to their renewable sources. The main source of BioCO2 at UBC's Vancouver campus is from the BRDF which consumes biomass in its thermal process and RNG in its cogeneration process. In addition, a portion of the vehicle fuels consumed by UBC contain renewable content, as mandated by BC's Renewable and Low Carbon Fuel Requirements Regulation. The total UBC Vancouver emissions amounted to 66,597 tCO2e in 2015.

Table 3: UBC Vancouver Total 2015 Emissions by Location

Location	2015 Emissions (tCO_2e)
UBC's Vancouver campus	42,846
Off-campus properties	2,587
UBC Properties Trust	2,007
Total 2015 Emissions for Offset purchases	47,440
Biogenic Emissions not required to be offset[1]	19,157
Total 2015 Emissions	66,597

[1] *Biogenic emissions ($BioCO_2$) from biomass, renewable natural gas and biofuels are not required to be offset due to their renewable source. Methane (CH_4) and Nitrous Oxide (N_2O) emissions from those sources are required to be offset and are included in offset amount.*

COMPARISON OF UBC VANCOUVER CAMPUS' EMISSIONS TO BASELINE YEAR

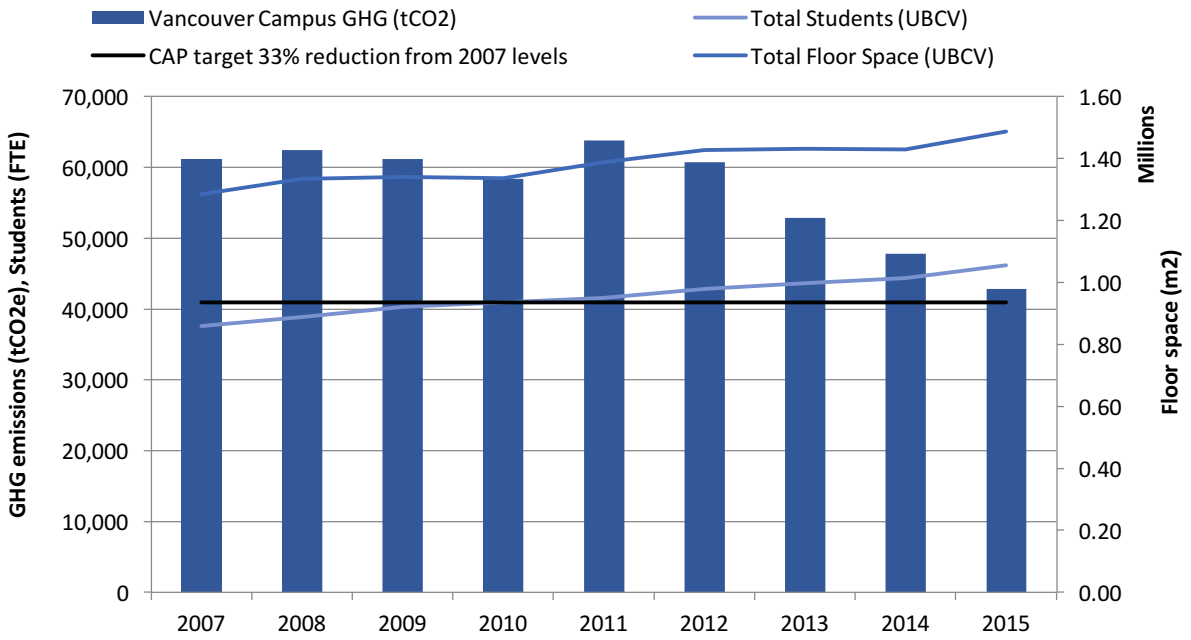
From 2007 to 2015, UBC Vancouver Campus' emissions for offsets decreased 30 per cent, despite a 16 per cent increase in building floor space and a 23 per cent increase in student enrolment. The emissions from campus buildings along with fleet and paper amounted to 0.93 tCO_2e per student (FTE) in 2015, a 43 per cent decrease in emissions per student (FTE) since 2007. UBC's Vancouver Campus building floor space increased by over 200,000 square metres between 2007 and 2015, with several older buildings demolished to make way for construction of new buildings.

Table 4 and *Figure 1* outline the change in campus emissions since the 2007 baseline year, along with indicators of UBC Vancouver campus growth. Student enrolment increased by over 8,500 students (FTE) from 2007 to 2015 while faculty and staff remained the same.

Table 4: UBC's Vancouver Campus Emissions for Offsets Compared to 2007 Baseline

Key Performance Indicator	2007	2015	Change from 2007 to 2015
GHG Emissions (tonnes CO_2e)	61,082	42,846	-30%
Staff and Faculty Employees (FTE)	12,461	12,183	-2%
Student Enrolment (FTE)	37,589	46,183	+23%
GHG Emissions per Student (tonnes CO_2e/FTE)	1.62	0.93	-43%
Floor Space (square meters)	1,284,462	1,487,899	+16%
GHG Emissions per square meter (tonnes CO_2e/m^2)	0.048	0.029	-39%

Figure 1: UBC's Vancouver Campus Emissions for Offsets and Growth, 2007 to 2015



OFFSETS APPLIED TO BECOME CARBON NEUTRAL IN 2015

As required by provincial regulation, UBC purchased a total of 47,991 tonnes of offsets for UBC Vancouver Campus, UBC Properties Trust and off-campus properties to become carbon neutral for 2015, including adjustments to previous years (see *Tables 5*).

Table 5: Total Offsets Purchased for UBC Vancouver

Location	2015 Emissions (tCO_2e)
UBC's Vancouver campus	42,846
Off-campus properties	2,587
UBC Properties Trust	2,007
2015 emissions for offsets	47,440
Adjustments to 2014 Inventory	551
Total emissions for offsets purchased in 2015	47,991

SCOPE 3 EMISSIONS

Going beyond the provincial requirements, the annual UBC Vancouver Campus GHG Inventory also quantifies several categories of optional or Scope 3 emissions (*Table 6*). These emissions are not required to be offset. UBC's Climate Action Plan includes strategies for reducing Scope 3 emissions related to commuting, business travel, procurement and food.

Table 6: UBC Vancouver Campus' Scope 3 Emissions, 2015

Source	2007 Emissions (tCO_2e)	2015 Emissions (tCO_2e)
Commuting	36,059[1]	34,522
Staff and Faculty Air Travel	13,600[2]	13,315[3]
Building Lifecycle	10,190	12,275
Solid Waste[4]	1,930	964[5]
Scope 3 Emissions	61,779	61,204

[1] *Baseline adjusted in 2015 to correct errors and reflect updated methodology*
[2] *Not calculated in 2007; the value from 2006 is provided.*
[3] *Emission factors for air travel changed in 2013 resulting in reduced emissions.*
[4] *Solid waste includes operational waste sent to landfill or incinerated.*
[5] *2014 emission factor used as 2015 was not available at time of publishing.*

UBC's Vancouver Campus Scope 3 emissions (*Table 6*) can also be evaluated in the context of indicators of growth in population and floor space (*Table 4* and *Figure 1*). While student, staff and faculty population increased by 23% the total commuting, air travel and solid waste emissions decreased from 2007 to 2015. The decrease in commuting emissions is primarily due to a shift in mode share; trips by single-occupancy vehicles and carpools decreased while trips by transit and bicycle increased from 2007 to 2015. The air travel emission factor changed in 2013 which resulted in decrease emissions.

Solid waste emissions decreased significantly from 2007 to 2015 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.

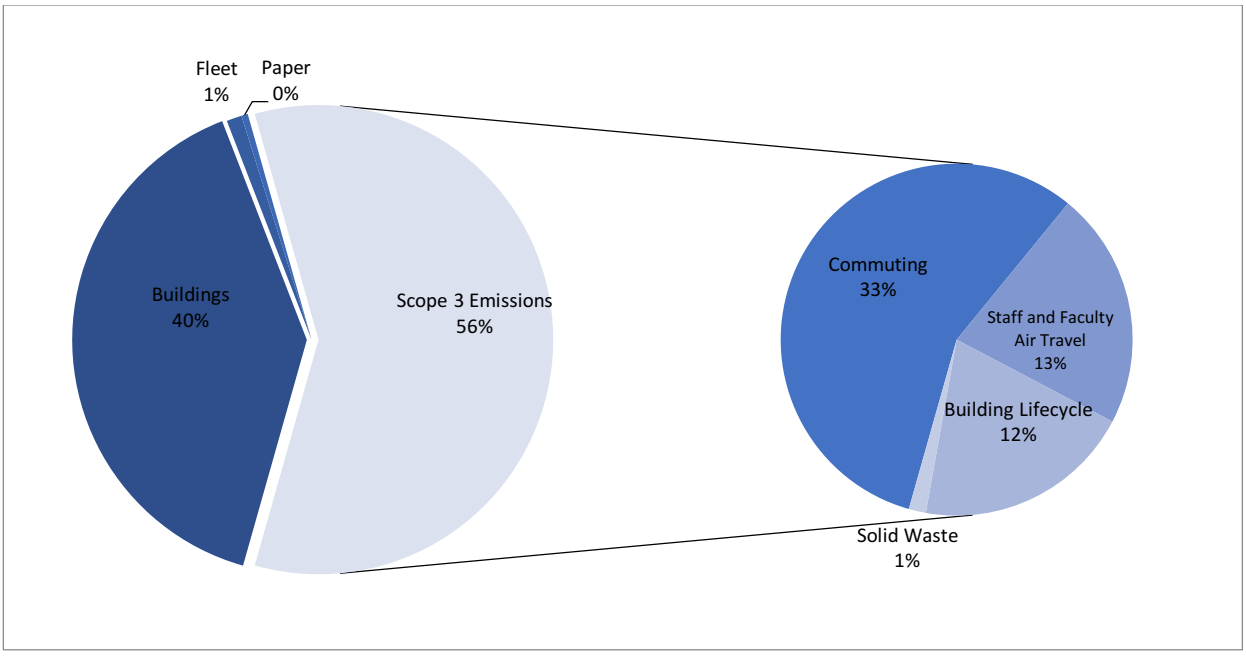
Building lifecycle emissions are proportional to campus floor space, which increased by 16% from 2007 to 2015.

UBC's Climate Action Plan includes strategies for reducing Scope 3 emissions related to commuting, business travel, procurement and food. For additional details on targets, performance and actions please refer to the full UBC Annual Sustainability Report.

Comparison to Scope 1 & 2 Emissions

In comparison to Scope 1 & 2 emissions, the combined Scope 3 emissions from commuting, business travel, building lifecycle and solid waste (*Table 6*) were more than the Vancouver Campus emissions for offsets (*Table 1*). Figure 1 shows the comparative proportions of the various emission categories for the UBC Vancouver campus. Even though Scope 3 emissions fall out of scope of the provincial requirements for carbon neutrality, Figure 1 characterizes their relative significance.

Figure 1: UBC's Vancouver Campus Total Emissions by Scope (Scope 1, 2 & 3), 2015



ACTIONS TO REDUCE EMISSIONS

In 2015, UBC made significant progress on implementing the three core projects of our Vancouver Campus Climate Action Plan, which together achieved an aggressive 30% GHG reduction compared to 2007 levels and is on track for a 33% reduction in 2016.

- INVESTING IN LOW CARBON, RENEWABLE AND ALTERNATIVE ENERGY SOURCES

  UBC's Bioenergy Research and Demonstration Facility (BRDF) completed its third full year of operation, generating heat from renewable biomass and electricity from Renewable Natural Gas (RNG). In 2015, the facility converted 9,500 tonnes of renewable biomass (wood waste) to produce over 23 per cent of total campus steam and hot water production, significantly reducing natural gas use on campus and eliminating 14 per cent of campus GHG emissions compared to 2007 levels. 2015 was the first full year of operation for the BRDF's cogeneration engine which provided eight per cent of UBC's core and ancillary electricity consumption and reduced electrical demand by two megawatts. The facility has also provided faculty, staff, students and private sector partners the opportunity to study, test, teach and apply lessons learned at the facility.

- INVESTING IN INNOVATIVE AND EFFICIENT ENERGY GENERATION AND DISTRIBUTION PROJECTS

  The five-year Academic District Energy System steam to hot water conversion project is 90 per cent complete, including the completion of the new high efficiency 60 megawatt thermal Campus Energy Centre which became operational in October 2015 to replace the campus' aging steam boiler plant. As of the end of 2015, 99 buildings (622,000 square metres) have been converted from steam to the district hot water system and 11 additional buildings had been converted from steam to either gas or electric heating. When complete, the $88 million project will replace 14 km of aging steam system piping infrastructure and convert a total of 130 buildings (800,000 square metres of building floor space) to the highly efficient hot water district energy system, reducing emissions by 22 per cent and saving $5.5 million a year in operational costs.

- TUNING UP OUR EXISTING BUILDINGS AND CONSERVING ENERGY

  UBC continued to implement its "Building Tune Up" program to conserve energy and increase efficiency in over 70 major buildings across campus. Implementation has been completed on 17 energy-intensive laboratory buildings with another 24 buildings currently being retro-commissioned. Alongside other in-house energy conservation projects, such as the Life Sciences Heat Recovery Chiller project, the program has reduced energy and operational costs in nearly 50 buildings, eliminating over 7 per cent of campus GHG emissions compared to 2007 levels. A further 27 buildings have completed energy audits with tune-ups to commence in 2017. Overall, the program is targeted to reduce emissions in core buildings by 10 per cent in combination with behavior change programs and in-house reduction measures.

For a full report on UBC's sustainability and climate action plans, initiatives and performance, please refer to our comprehensive Annual Sustainability Reports, available online.

UBC VANCOUVER ACTIONS SURVEY

Part 1 - Actions Taken to Reduce Emissions

1) Stationary Sources (Buildings, Power Generators, Ext. Lighting) Fuel Combustion, Electricity use, Fugitive Emissions: Please indicate which actions your PSO took in 2015:

Survey Question	Response
Have developed an overall strategy/plan to reduce energy use in your organization's buildings inventory:	Yes
As a single owner of both utility and building infrastructure UBC Vancouver's strategy to reduce energy consumption involves both supply and demand side measures which are geared towards meeting the University's 2015 climate action plan commitments at the lowest life cycle cost. The plan's core projects include the optimization of major campus buildings, the district steam to hot water conversion project and the use of biomass for heating at the Bioenergy Research and Demonstration Facility. In 2015, work has commenced on updating the Climate Action Plan to identify additional actions and measures to advance towards its aggressive target to reach a 67% emission reduction target by 2020. As part of the updated plan, UBC Energy & Water Services is targeting to reduce electricity consumption by 4 GWh/yr and Natural Gas consumption by 20,000 GJ/yr in order to achieve the GHG reduction target.	
Undertook evaluations of building energy use:	Yes
Performed energy retrofits on existing buildings	Yes
Built or are building new LEED Gold or other "Green" buildings	Yes
UBC Energy & Water Services has reduced electricity consumption by 4 GWh/yr and natural gas consumption by 20,000 GJ/yr through the following demand-side initiatives: • Re-commissioning of all major buildings on campus • Re-commissioning of all energy intensive laboratory space on campus • Identifying and implementing heat recovery projects • Energy efficient retrofits for aging equipment • Lighting retrofits • Preventative maintenance Highlights in 2015 on the building energy demand side include installation of a heat recovery chiller, continued optimization of over 20 buildings, and completion of a variable volume laboratory exhaust project. In addition to energy conservation of existing buildings, all new construction and major renovations for institutional buildings at UBC must achieve a minimum of LEED Gold certification. Furthermore, all new residential buildings at UBC must achieve a minimum of REAP** Gold certification. Continuing to advance green buildings on campus, under construction in 2015 were nine campus buildings targeting LEED gold and four neighbourhood buildings targeting REAP gold. **UBC's Residential Environmental Assessment Program (REAP) is a comprehensive, UBC-specific green building rating system for mandatory application to all residential construction on campus.	

2) Mobile Sources (Fleet, Off-road/Portable Equipment) Fuel Combustion: Indicate which actions your PSO took in 2015:

Survey Question	Response
Have put in place an operations policy/program to support systematic reductions in fleet related emissions:	Yes
Sustainable fleet management strategic goals, objectives, and performance metrics were incorporated into department-level Sustainability Frameworks developed in 2013 for key operational departments on campus, including Building Operations and Student Housing and Hospitality Services. UBC's Building Operations department, which operates the central campus fleet of 240 vehicles, has received Canada's first E3 (Energy, Environment, Excellence) Platinum Certification for sustainable fleet management. Several programs and policies have been taken to better the performance of the fleet: • Adopted a green fleet plan • Implemented better tracking and analysis of fleet data, including data on fuel use • Replaced vehicles when due for replacement, to minimize repair costs and fuel use • "Right-sized" the fleet in all vehicle classes (light, medium and heavy duty), by choosing smaller, more efficient vehicles suited to the task • Trained staff on fuel management and fuel-efficient driving practices • Purchased electric bikes with detachable trailers, used by trades staff on campus • Integrated alternative fuel infrastructure including B5 biofuel, E10 gasoline, electric vehicle charging stations, and a CNG fueling station.	
Replaced existing vehicles with more fuel efficient vehicles (gas/diesel):	Yes
Replaced existing vehicles with hybrid or electric vehicles	Yes
Reduced the overall number of fleet vehicles	Yes
Took steps to drive less than previous years	Yes
Please list any other actions, programs or initiatives that your organization has introduced that support emissions reductions from fleet combustion: In 2015 our compressed natural gas (CNG) fueling station came online and we added one heavy duty refuse CNG truck to our fleet and ordered another bringing UBC's total to three CNG units. These were our largest diesel fuel consuming vehicles, which now emit over 20% less carbon emissions with CNG. In addition, in late 2014 we introduced an electric car sharing segment with existing vehicles to serve as people movers. The utilization of these vehicles and the pool of staff with access increased, shifting that function to a more sustainable vehicle. We have since expanded this pool of electric vehicles. UBC has 18 electric vehicle charging stations on campus, enabled through the Provincial Community Charging Infrastructure Fund, including 10 stations at the University Services Building to power the campus fleet and 8 stations at Thunderbird Parkade available for faculty, staff, and the general public to use free of charge.	

3) Supplies (Paper): Indicate which actions your PSO took in 2015:

Survey Question	Response
Have put in place an operations policy/program to facilitate a systematic reduction in paper-related emissions: (e.g., policy to purchase 100% Recycled Content; default to double-sided printing)	Yes
If yes, please describe: Since 2013, we have optimized 2-day paper delivery schedule on campus with our preferred paper supplier to alleviate transportation-related emissions. The double-sided printing is advocated with the information posters near the MDF stations and MDFs provider turns it ON by default with the agreement of the user department.	
Have put in place an operations policy/program to facilitate behavioural changes from paper use: (e.g. awareness campaign to reduce paper use)	No
Used only 100% recycled paper	No
Used some recycled paper	Yes
Used alternate source paper (e.g., bamboo, hemp, wheat etc.)	Yes
The UBC Sustainability Office, and Financial Operations in collaboration with other UBC stakeholders and vendor community provide the sustainable purchasing guide for paper, advocating for a minimum 30% recycled content paper, use of double-sided printing, avoiding unnecessary printing of emails or draft documents. Recycling of the paper is done using the separate blue bin stream.	

4). Other Sustainability Actions:

Business Travel	Response
Created a low-carbon travel policy or travel reduction goal: (low-carbon = lowest emission of greenhouse gas per kilometer per passenger)	No
Encourage alternative travel to meetings (e.g., bicycles, public transit, walking)	Yes
Encouraged or allow telework/working from home:	Yes
For additional details on UBC's sustainability initiatives that support sustainable transportation, please refer to UBC's 2015 STARS Submission online at: https://stars.aashe.org/institutions/university-of-british-columbia-bc/report/2015-08-04/OP/transportation/OP-21/	

Education and Awareness	Response
Have a Green/Sustainability/Climate Action Team:	Yes
Supported green professional development: (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
For additional details on UBC's sustainability initiatives please refer to UBC's Annual Sustainability Reports https://sustain.ubc.ca/our-commitment/strategic-plans-policies-reports/annual-reports and STARS Reports https://stars.aashe.org/institutions/university-of-british-columbia-bc/report/2015-08-04/	

Adaptation Planning for Climate Change	Response
Have assessed whether increased frequency of extreme weather events and/or long term changes in climate will affect your organization's infrastructure, its employees and/or its clients:	Yes
Have incorporated these anticipated changes in climate into your organization's planning and decision making:	Yes
UBC is in the process of developing an Integrated Stormwater Management Plan. We are also studying the erosion of the cliffs around the Point Grey Campus including taking climate change/sea level rise into account. Additionally, we are adapting through the implementation of LEED and other high performance building specifications.	

Other Sustainability Actions	Response
Established a water conservation strategy which includes a plan or policy for replacing water fixtures with efficient models:	Yes
Have put in place an operations policy/program to facilitate the reduction and diversion of building occupant waste stream from landfills or incineration facilities: (e.g., composting, collection of plastics, batteries)	Yes
Established green standards for goods that are replaced infrequently and/or may require capital funds to purchase: (e.g., office furniture, carpeting, etc.)	Yes
Incorporated lifecycle costing into new construction or renovations:	Yes
Initiated an update to UBC's Climate Action Plan, to be completed in 2016, which maps out how UBC could meet the reduction target of 67% below 2007 levels by 2020 that was established in the existing Climate Action Plan. Continued implementation of the Zero Waste Action Plan, primarily through completing installation of over 600 indoor multi-stream recycling stations across academic buildings Conducted an extensive range of research projects into the effectiveness of engagement tools and strategies in changing waste sorting behavior	

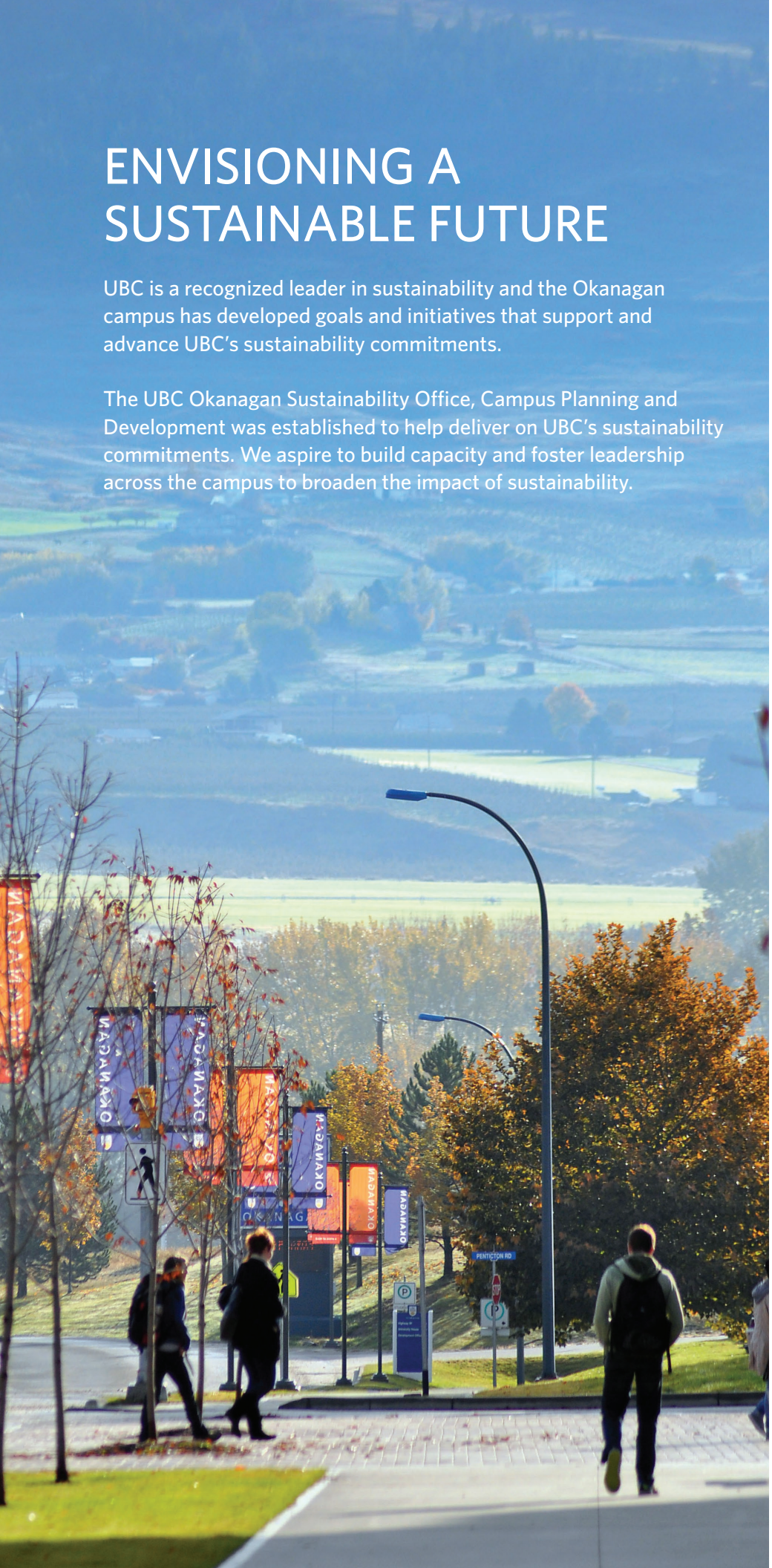
PART B

UBC Okanagan Campus Emission Details

ENVISIONING A SUSTAINABLE FUTURE

UBC is a recognized leader in sustainability and the Okanagan campus has developed goals and initiatives that support and advance UBC's sustainability commitments.

The UBC Okanagan Sustainability Office, Campus Planning and Development was established to help deliver on UBC's sustainability commitments. We aspire to 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 2015 Carbon Neutral Action Overview Report contributes to 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 2015 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.

Acknowledgements
Many unit level actions reflected in this report have contributed to the reduction of campus carbon emissions. Their continued commitment to sustainable development has been instrumental to advancing the campus' collective sustainability goals.

Business Operations
Campus Operations and Risk Management
Campus Planning and Development
Finance
IT, Media and Classroom Services
Payment and Procurement Services

Prepared by
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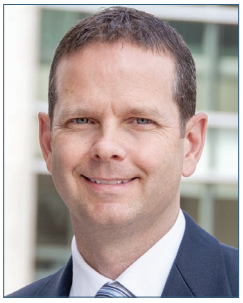
EXECUTIVE SUMMARY AND DECLARATION

UBC's Okanagan campus continued to exemplify its commitment to environmental performance in 2015 through the continuous optimization of campus facilities and district energy systems, the ongoing pursuit of operational improvements and efficiencies, and the integration of sustainability in campus planning.

Over the past year, the campus achieved a 17 per cent reduction in absolute carbon emissions, 14 per cent of which is attributable to a reduction in building emissions. A strategic focus on demand side energy reduction—with the support of over $85,000 in provincial Carbon Neutral Capital Program (CNCP) funding, ongoing routine capital investments, and FortisBC partnership funding—contributed to this achievement.

In 2015, the campus undertook a significant building and infrastructure analysis as part of a broader sustainability planning process that helped to advance early actions toward the achievement of the campus' 2050 Whole Systems Goals. Arising from the UBC-endorsed Campus Plan (2015), the Whole Systems Infrastructure Plan will provide the roadmap and implementation framework for future infrastructure needs and environmental stewardship to support sustainable campus growth, community well-being and ecological resilience.

In the coming year, the campus will focus on the implementation of our plans through leading policy, the establishment of innovative programs and the implementation of energy and infrastructure projects, with the objective to achieve energy and greenhouse gas emission reductions. Integral to this process will be the incorporation of whole systems recommendations into planning and operational projects currently underway.



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, 2015 to December 31, 2015 summarizes our emissions profile, the total offsets to reach net-zero emissions, the actions we have taken in 2015 to reduce our greenhouse gas emissions, and our plans to continue reducing emissions in 2016 and beyond.

By June 30, 2016, the 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 2015 (tCO_2e)	
GHG Emissions created in Calendar Year 2015:	
Total Emissions (tCO_2e)	2,601
Total Offsets (tCO_2e)	2,599
Adjustments to GHG Emissions Reported in Prior Years:	
Total Emissions (tCO_2e)	0
Total Offsets (tCO_2e)	0
Grand Total Offsets for the 2015 Reporting Year:	
Grand Total Offsets (tCO_2e)	2,599

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 2015 calendar year, together with any adjustments reported for past calendar years. The Organization hereby agrees that, in exchange for the Ministry of Environment ensuring that these offsets are retired on the Organization's behalf, the Organization will pay 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.

2015 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 2014 - 2015

Source	2014 Emissions (tonnes CO_2e)	2015 Emissions (tonnes CO_2e)	Change from 2014 to 2015
Buildings	2,746	2,370	-14%
Fleet	42	45	+9%
Paper	69	63	-8%
Fugitive	268	122	-54%
Total Emissions	3,125	2,601	-17%
Total Offsettable emissions	3,123	2,599	-17%

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

Table 1 demonstrates an absolute campus GHG emission reduction of 17 per cent over the 2014 reporting year, which will result in a $14,000 carbon offset savings to the university. Building emissions have been reduced by 14 per cent. Contributing factors to this reduction include a focus on demand side energy reduction through building optimization, CNCP projects, routine capital investments, building re-commissioning, maintenance of the District Energy System (DES), behaviour change, and a more temperate heating season. Detailed information on measures implemented to achieve a reduction in emissions over the previous and baseline years can be found in the Emissions Reduction Activities section of this report.

Carbon Neutral Offsets in 2015

In accordance with the campus SMARTTool[1] reporting and as required by the Greenhouse Gas Reduction Targets Act (GGRTA), offsets required to achieve carbon neutrality in 2015 total 2,599 tCO_2e. As part of the Okanagan campus' 2015 GHG emissions profile, two tCO_2e do not require offsets.

[1] *Protocols established in 2014/2015 BC Best Practices Methodology for Quantifying Greenhouse Gas Emissions*

EMISSIONS REDUCTION ACTIVITIES

ACTIONS TAKEN TO REDUCE GREENHOUSE GAS EMISSIONS IN 2015

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 91 per cent of in-scope emissions in 2015. However, notably, absolute building emissions decreased by 376 tCO_2e or 14 per cent as compared to the 2014 reporting year. This demonstrates a continued emissions reduction trend over prior reporting years. Specific actions taken in 2015 to reduce building emissions include the following:

ACTIONS:

Academic & Administration Buildings

- Implemented Energy Conservation Measures (ECMs) in two remaining legacy academic facilities under the final phase of the Building Optimization Program (BOP), projected to save *160 tCO_2e annually.
- Completed domestic hot water upgrade project in Science building projected to save 48,900 kWh, 177 GJ and $1,361 in operational costs and 19 tCO_2e annually.
- Completed domestic hot water upgrade and boiler replacement project in Charles E. Fipke building anticipated to reduce carbon emission by 10 tCO_2e annually.
- Undertook evaluation of overall building use in five academic and administration buildings.
- Connected WIFI occupancy control in two academic buildings.
- Implemented sub-metering in seven locations to improve measurement of energy consumption and conservation planning, including peak demand.
- Completed audit of lighting systems in academic buildings and parking lots to baseline to inform future lighting upgrades.
- Completed Engineering, Management and Education (EME) building commissioning to fix HRV heat recover and heat pump.
- Conducted lighting retrofits in Engineering, Management and Education (EME) building, Fipke Theatre and parking lot R.
- Fostered energy-reduction behaviour change among building occupants to support energy efficient actions such as turning off lights and powering down equipment when not in use.
- Early implementation of opportunities to improve building performance identified through a UBC system-wide whole systems infrastructure planning exercise undertaken in 2015.

Residence Buildings

- Undertook evaluation of overall building use in seven residence buildings.
- Replaced all washers and dryers with newer models.
- Implemented laundry appliance programming update to allow for half-hour drying cycles.
- Conducted lighting retrofits and upgrades to Cassiar residence, replacing 110 fixtures utilizing T5 (55W) bulbs with efficient LED (24W) bulbs, projected to reduce electricity consumption related to building lighting by 78 per cent.

** Emissions savings based on emission factors for natural gas and electricity by buildings, as illustrated in Table 1: Stationary Fuel Combustion (p.12) and Table 3: Purchased Electricity (p.15) of the 2014/2015 B.C. Best Practices Methodology for Quantifying Greenhouse Gas Emissions.*

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

In 2015, fleet vehicles accounted for 45 tCO_2e, or 1.7 per cent of campus total emissions, up four tCO_2e from 2014. Higher use of the research fleet is a contributing factor for this increase. Although there was a slight increase in fleet emissions, the campus has achieved a 33 per cent absolute reduction in fleet emissions since 2010. Specific actions taken in 2015 to reduce fleet emissions include the following:

ACTIONS:

- Converted 100 per cent of UBC Okanagan's golf carts to electric models.
- Reduced campus fleet by two Faculty research vehicles.
- 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.

C. Supplies (Paper)

In 2015, emissions from paper accounted for 63 tCO_2e, or 2.4 per cent of total in-scope campus emissions. This demonstrates a reduction of eight per cent over 2014. An increase in higher PCR content paper purchases in 2015 and a reduction of overall package purchases are contributing factors to this reduction. Specific actions taken in 2015 to reduce this scope area include the following:

ACTIONS:

- Completed full implementation of PaperCut™ print tracking software program to students. Further information on PaperCut™ can be found in the Above and Beyond Reporting section of this report.
- Completed preliminary implementation of PaperCut™ print tracking software program to faculty and staff at departmental and unit level.
- Continued to expand workstation video conference technology availability and accessibility, integrating smaller systems with existing larger meeting room systems.
- Continued to promote purchase of paper with 30 per cent or greater post-consumer waste content.
- Continued to ensure that wheat sheet paper is available to order from the custom list, as an alternative source to tree-derived paper.
- Continued to increase the number of digital signs and electronic communication platforms available across campus to share campus news, activities and events, thereby reducing the reliance on paper-based promotional materials.

D. Fugitive Emissions

In 2015, 122 tCO_2e in-scope HFCs accounted for 4.7 per cent of total campus fugitive emissions, which is a reduction of 54 per cent from 2014.

ACTIONS:

- Continued the preventative maintenance and upgrades to HVAC system and associated appliances to minimize fugitive emissions.

The Geo-Exchange Building houses the District Energy System (DES). The DES is an energy distribution system that provides heating and cooling to new academic buildings and heating to legacy academic facilities on campus. The system derives a portion of its energy from renewable aquifer-sourced ground heating, which significantly reduces the campus' reliance on traditional gas-fired heating systems and effectively reduces associated greenhouse gas (GHG) emissions.

PLANS TO CONTINUE REDUCING GREENHOUSE GAS EMISSIONS 2016-2017

In 2015 the campus undertook a substantive sustainability planning exercise to identify short term and long term measures toward its carbon and energy reduction goals. This section describes planned actions across buildings, fleet and procurement in the coming year.

A. Stationary Fuel Combustion, Electricity (Buildings)

- Develop proposals to convert gas-fired hot water tanks in legacy academic facility to heat pumps for domestic hot water use.
- Implement routine capital project to replace the Arts Building Chiller CH-2 and Administration Building Chiller (subject to funding).
- Implement routine capital project to replace Administration building cafeteria make-up air unit, anticipated to reduce carbon emissions by 69 tCO_2e per year (subject to funding).
- Re-commission and balance air, water and controls in one building per year.
- Continue to implement sub-metering and BMS enhancements for better measurement of energy consumption and conservation planning, including peak demand.
- Continue to complete audits of campus lighting systems to inform future lighting upgrades in buildings and parking lots.
- Continue LED bulb replacement in remaining residence buildings.
- Complete full automation of residence buildings.
- Complete hot water heater replacement review.
- Complete planned energy study for CHP, DES and building heat pumps.
- Complete additional sourcing of alternative heating and cooling for DES.
- Complete an energy study on the Administration building.
- Implement FortisBC's Partners In Energy Program, a program that provides direct lighting rebates at the point-of-sale.
- Continue implementation of the UBC Okanagan Whole Systems Infrastructure Plan, including the following actions :
  - Secure seed funding to implement Year 1 Energy Conservation Measures identified in the Plan.
  - Develop an Energy Team and Energy Committee.
  - Complete and begin implementation of a five-year Strategic Energy Management Plan.
  - Continue to assess routine capital plan to determine energy efficient implementation options that respond to recommendations of the Whole Systems Infrastructure Plan and Strategic Energy Management Plan.
  - Develop and obtain endorsement of a campus-wide energy policy.
  - Implement CNCP project Lab Air Volume Control and Green Labs Education in Science building laboratories (funding pending). Projected energy reductions total 278,900 kWh and 1,050 GJ, saving $26,600 in operational costs and 58 tCO_2e annually.
  - Develop and begin implementing a three-year behaviour change energy and environmental stewardship plan.
  - Update campus design guidelines and define new construction recommendations for efficient buildings (i.e. solar-thermal ready).

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

- Continue the 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.

- Continue to encourage fleet carpooling, walking or cycling, and consolidating off-campus trips to reduce operational reliance on fleet vehicles.

C. Supplies (Paper)

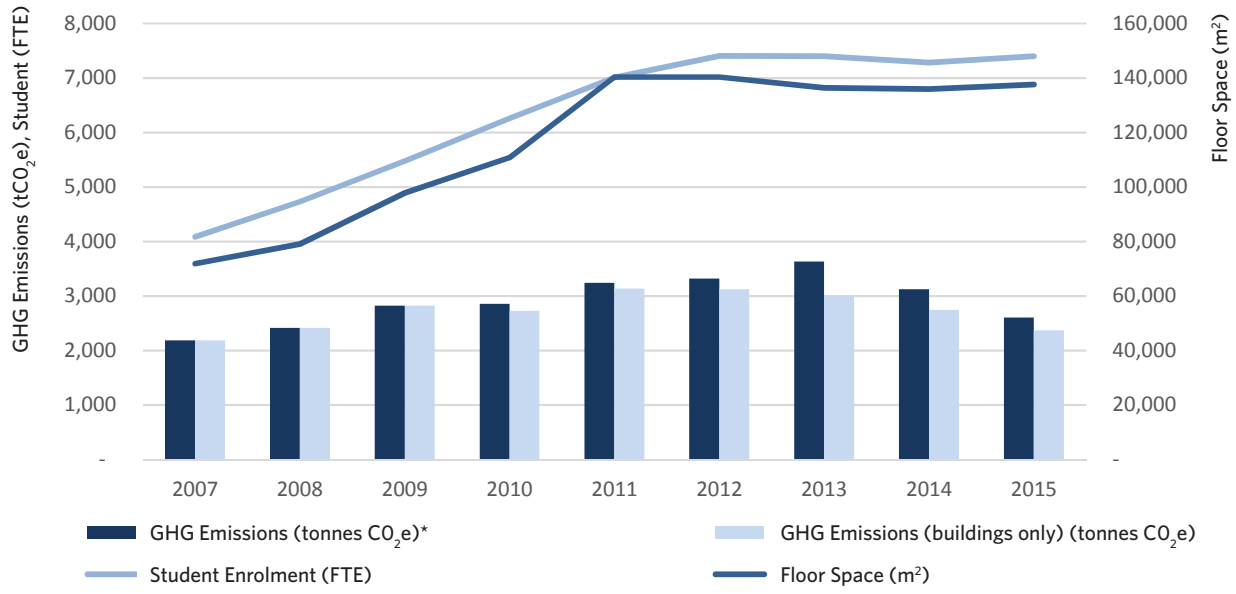
- Complete a review of alternative web-conferencing software LYNC.
- Complete the full implementation of PaperCut™ print tracking software to faculty and departments, providing a platform that delivers reports to clients on printing volumes and generates awareness and promotes alternatives to printing.
- Implement Xerox fleet enhancement.
- Continue to promote the purchase of paper with 30 per cent or greater post-consumer recycled content.
- 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 electronic communication platforms within buildings to share news, activities and events, thereby reducing the reliance on paper-based promotional materials.
- Continue the replacement of desktop computers with laptops and more efficient devices as part of IT, Media and Classroom Services' Computer Replacement Program.

EMISSIONS IN GREATER DETAIL

COMPARISON TO BASELINES

Figure 1 provides a comparison of absolute campus and building emissions since 2007 relative to growth. From 2007 to 2015, student enrolment increased by 81 per cent while floor space has increased by 91 per cent. Despite growth, absolute emissions have remained relatively steady, largely due to sustainable development through investment in district energy systems (DES) infrastructure and operation. The DES has significantly reduced the campus' reliance on gas-fired heating equipment.

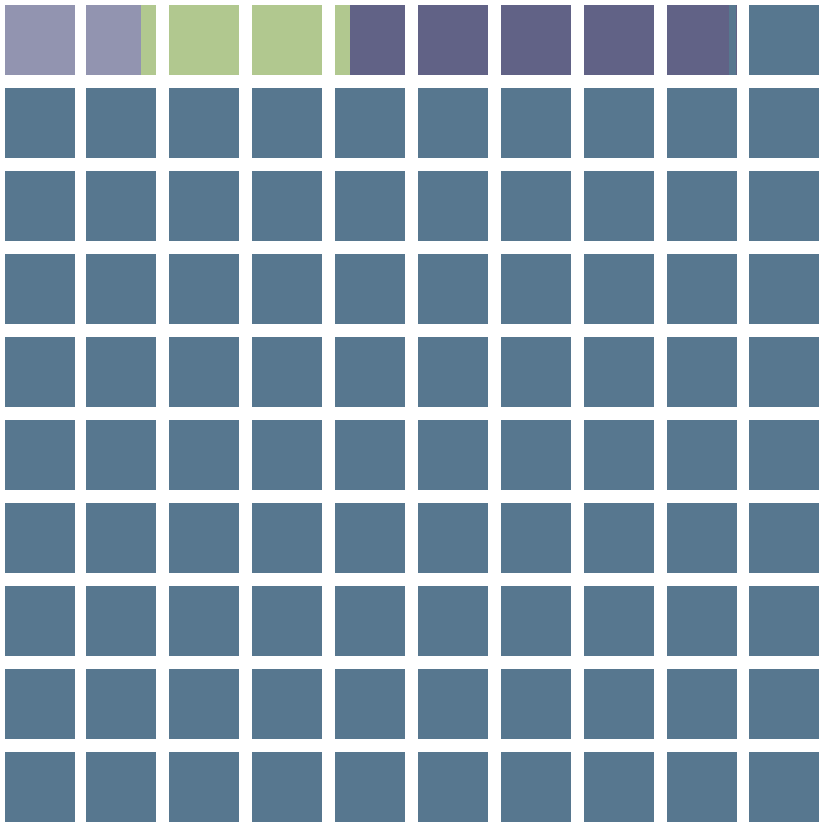
Figure 1 Absolute GHG emissions relative to growth 2007-2015



**Total GHG Emissions for 2007-2009 reported buildings only emissions; 2010-2015 includes all in-scope emissions.*

GHG EMISSIONS BY SOURCE

UBC OKANAGAN GREENHOUSE GAS EMISSIONS BY SOURCE FOR THE 2015 CALENDAR YEAR (tCO_2e*)



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

1.7% 45	Mobile (fleet and other mobile equipment)
2.4% 63	Supplies (Paper)
4.7% 122	Fugitive (Refrigerants)
91.2% 2,370	Stationary (Building Heating and Generators) and Electricity

TOTAL EMISSIONS: 2,601

OFFSETS APPLIED TO BECOME CARBON NEUTRAL IN 2015

(Generated May 5, 2016 2:36 p.m.)

Total offsets required: 2,599. Total offset investment: $64,975.
Emissions which do not require offsets: 2. **

*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.

ABOVE AND BEYOND:
Promoting a Culture of Sustainability

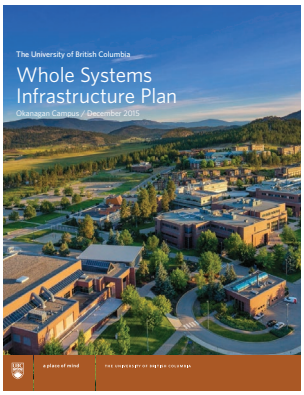
ENERGY CONSERVATION PHILOSOPHY & PRACTICES

Whole Systems Approach to Sustainability Planning

The UBC Okanagan Whole Systems Infrastructure Plan (Plan) was conceived during the 2015 Campus Plan development process to assess and plan for future infrastructure needs that support campus growth and climate change impacts. The Plan establishes a long-term roadmap and a five-year implementation plan to achieve campus sustainability performance across built and natural environments to 2030 and beyond.

The Plan takes a fundamentally different approach from traditional engineered infrastructure systems, where we would typically look at infrastructure investment on a system-by-system basis. As the whole systems name implies, it views the entire campus as a system and identifies a number of strategic opportunities through existing operations and upcoming capital projects to reduce long-term operational costs, maintenance, and improve campus performance over the long term.

Through the development of the Okanagan Campus Plan (2015), the campus established the following set of performance goals for the campus that have guided the development and creation of the Plan. The campus' economic sustainability is at the forefront of the Plan's implementation and the following goals are rooted in the need to constantly improve operational efficiencies, develop best practices, reduce infrastructure costs, and ensure that infrastructure decisions are made in a fiscally responsible manner to support the long term financial sustainability of the campus.



2050 WHOLE SYSTEMS SUSTAINABILITY GOALS

GOAL #1: Achieve a net positive performance in operational energy and carbon.

GOAL #2: Implement a framework that supports low embodied carbon in future development.

GOAL #3: Optimize water quality, supply and security.

GOAL #4: 100 per cent diversion of stormwater from municipal systems.

GOAL #5: Strive towards full waste recovery/reuse.

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

In order to achieve the performance goals, the following Plan objectives were created to provide an overarching framework for analysis and assessment of recommendations proposed for implementation.

- Reduce long term operational costs, reduce maintenance, and improve performance.
- Respond to potential future growth and climate risks, including the management of energy, carbon, water and waste, and associated costs; protect and enhance biodiversity and ecological assets on campus.
- Provide a framework to engage the academy and campus community in the Plan's implementation through research, student learning and stewardship.
- Contribute to the well-being of students, faculty and staff and improve productivity and performance, making the campus a desirable place to work, live and learn.
- Exemplify UBC's sustainability leadership by responding to its sustainability aspirations in Place and Promise: The UBC Plan, Aspire, The UBC Okanagan Campus Plan (2015), The UBC Climate Action Plan, and regenerative sustainability in the UBC 20-Year Sustainability Strategy (2014).

ENERGY AND CARBON REDUCTION PROGRAMS PROVIDING RESULTS

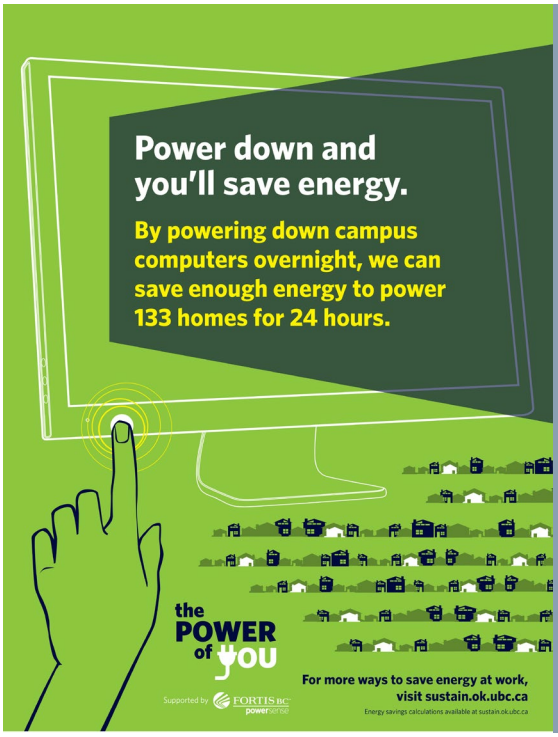
Building Optimization

Last year represented the final year of the Building Optimization Program (BOP), a three-year program developed in partnership with UBC and FortisBC to implement energy conservation measures in five legacy academic facilities across campus. In 2015, the Building Optimization Program saved the campus over $150,000 in ongoing annual utility costs in a 0.7 year payback period—the equivalent to a 140 per cent return on investment.

Building optimization is supported by the Power of You, an executive-endorsed voluntary behaviour change energy conservation program.

Lighting Upgrades

A number of interior and exterior lighting upgrade projects were undertaken in the academic, administration and residence buildings in 2015, which achieved nearly $3,000 in FortisBC rebates and direct point-of-purchase rebates in-store. Lighting upgrades in academic and administration buildings included the removal of ballasted pot lights, wall packs and compact fluorescents for replacement with energy efficient LED alternatives. The Cassiar residence underwent a lighting upgrade that involved the replacement of 110 fixtures utilizing two T5 (55W each) bulbs with 110 more efficient LED (24W) bulbs. This upgrade is projected to reduce electrical consumption related to lighting by 78 per cent.



The Power of You

The Power of You engages the campus community in a range of energy reduction campaigns across offices, classrooms, labs and student residences that has contributed to energy awareness and efficiency on campus.

Actions taken by key operational departments in 2015 in response to the Power of You Turn Off the Lights and Power Down campaigns involved a staff-led audit across academic and administration buildings. As a direct result of the audit, over 7,000 lights and 250 projectors and monitors were turned off or powered down and over 1,500 windows were closed at night, contributing to campus energy savings.

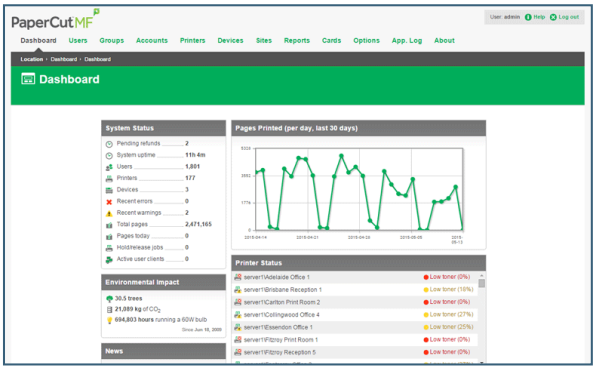
In 2016 the campus will complete the development of a new three-year Behaviour Change Energy and Environmental Stewardship Plan—a key recommendation of the Whole Systems Infrastructure Plan, in order to leverage and scale up the Power of You's success. The energy stewardship plan will continue to focus on community engagement, awareness and education designed to build capacity and encourage voluntary energy, waste and water conservation actions, as well as measures to support campus ecology and biodiversity.

Campus Irrigation Project

Anticipating significant improvements to irrigation efficiency, water conservation and associated costs, the campus initiated phase two of a three-year irrigation upgrade project in 2015. This phase focuses on a second zone, selected by priority, and will identify deficiencies related to irrigation distribution uniformity, water savings and maintenance. Implementation of projects, such as transitioning from spray to drip irrigation and installing water meters by zone, were completed.

Paper Reduction Program: PaperCut™

UBC's Okanagan campus launched the PaperCut™ software program in 2015. The program provides the opportunity to monitor and reduce paper consumption through measures which include print reporting, secure print release and multi-machine printing capabilities. The program's first stage of implementation enables students to monitor, measure and receive printing awareness prompts. Preliminary program services were introduced to faculty and staff, with the intention to roll-out the full scale of program services in 2016.



Student Engagement in Campus Operations and Planning

The campus continued to support student engagement in sustainability projects that yield benefit to campus planning and operations while integrating meaningful student learning opportunities.

Student capstone projects undertaken by engineering students in 2015 include a Stormwater Catchment Project and a Campus Renewable Energy Biomass Feasibility Project. The biomass project is intended to help inform a key recommendation within the Whole Systems Infrastructure Plan, which identifies future conversion of campus energy systems to biomass once an optimal District Energy load has been achieved. The Stormwater Catchment Project will provide input into the development of an Integrated Stormwater Management Plan for the campus.

Student Leadership in Sustainability

UBC Okanagan Purcell Residence students have established a team aimed toward building sustainability leadership among peers through behaviour change and awareness program initiatives. In 2015, students led a recycle your coffee cup campaign which raised awareness about the amount of waste generated from single-use disposable cups that could have been otherwise diverted from the landfill through campus recycling programs. The students subsequently developed composting and refundable container pilot programs which were successfully adopted. As a direct result of this success, it is anticipated that both programs will be implemented across student residences commencing in 2016/17.

PurNiKal Classic

The PurNiKal Classic is a student-led social engagement program developed by student resident advisors to unite Integrated Learning Communities (ILCs), groups of students living in residences in civic engagement across the campus. The program builds social sustainability into the fabric of campus life, encouraging health, well-being and a sense of belonging and comradery among students.

Four events were hosted in 2015 between three student residences engaged in a friendly, fun-spirited competition. Themes included: Be a Civic Leader, Be Sustainable and Engage Traditions.

Under Be Sustainable participants were encouraged to:

- Take public transit
- Explore the Learning Garden
- Go on a hike
- Clean up outside by picking up garbage or recycling
- Get a plant for your room (bonus for naming it)
- Use a reusable container or mug at the cafeteria
- Find the Geothermal Building and #WhatGeothermalMeans

Seventy-three per cent of invited residents participated in the initiative.

Integrated Learning Communities (ILC):

- Expressive Arts Community
- Healthy Living Community
- Indigenous Community
- Innovation and Technology Community
- International and Global Leadership
- Leadership and Civic Engagement Community
- Sustainable Leadership Community

Students Vote "Yes" to Continued U-Pass Program

The Universal Bus Pass (U-Pass) Program was initiated at UBC's Okanagan campus in 2007, in partnership with the UBC Students' Union Okanagan, BC Transit, the City of Kelowna and the Regional District of Central Okanagan. The U-Pass provides students a low-cost, sustainable transportation option to campus provided by Kelowna Regional Transit. Aligned with a general fare increase proposed by the Kelowna Regional Transit partners, a student referendum was held in 2015 in which 84 per cent of voting students gave the green light to raise the U-pass from $60 to $70 per term—the same cost as a single-month adult pass. The Senior Executive team at UBC Okanagan remains committed to a 10 per cent subsidy of the student U-Pass fees.

UBC Okanagan Actions Survey

Part 1 - Actions Taken to Reduce Emissions

1) Stationary Sources (Buildings, Power Generators, Ext. Lighting) Fuel Combustion, Electricity use, Fugitive Emissions: Please indicate which actions your PSO took in 2015:

Survey Question	Response
Have developed an overall strategy/plan to reduce energy use in your organization's buildings inventory:	Yes
Over the past three years, the Building Optimization Program (BOP), established in partnership with FortisBC has formed the basis of the campus' overall energy and carbon reduction strategy. In 2015 the Building Optimization Program saved the campus over $150,000 in ongoing annual utility costs in a 0.7 year payback period – the equivalent to a 140% return on investment. This program is supported by the Power of You, an executive endorsed voluntary behaviour change energy conservation program. The campus is currently completing a Whole Systems Infrastructure Plan which provides the blueprint for future infrastructure needs; and carbon, energy and water reduction measures that support sustainable campus growth and the wellbeing of the campus community and ecology. With the long-term goal to achieve a net positive performance in operational energy and carbon, the Plan provides policy-level guidance and a 5-Year Plan to reduce energy and resource consumption, greenhouse gas emissions, and associated costs to the campus.	
Undertook evaluations of building energy use:	Yes
Performed energy retrofits on existing buildings	Yes
Built or are building new LEED Gold or other "Green" buildings	No
Academic & Administration Buildings: • Implemented Energy Conservation Measures (ECMs) in two remaining legacy academic facilities under the final phase of the Building Optimization Program (BOP), projected to save 160 tCO2e annually. • Completed domestic hot water upgrade project in Science building projected to save 48,900 kWh, 177 GJ and $1,361 in operational costs and 19 tCO2e annually. • Completed domestic hot water upgrade and boiler replacement project in Charles E. Fipke building anticipated to reduce carbon emission by 10 tCO2e annually. • Undertook evaluation of overall building use in five academic and administration buildings. • Connected WIFI occupancy control in two academic buildings. • Implemented sub-metering in seven locations to improve measurement of energy consumption and conservation planning, including peak demand. • Completed audit of lighting systems in academic buildings and parking lots to baseline to inform future lighting upgrades. • Completed Engineering, Management and Education (EME) building commissioning to fix HRV heat recover and heat pump.	

- Conducted lighting retrofits in Engineering, Management and Education (EME) building, Fipke Theatre and parking lot R.
- Fostered energy-reduction behaviour change among building occupants to support energy efficient actions such as turning off lights and powering off equipment when not in use.
- Early implementation of opportunities to improve building performance identified through a UBC system-wide whole systems infrastructure planning exercise undertaken in 2015.

Residence Buildings:

- Undertook evaluation of overall building use in seven residence buildings.
- Replaced all washers and dryers in all residence laundry facilities with newer models.
- Implemented laundry appliance programming update to allow for half-hour drying cycle opportunity.
- Conducted lighting retrofits and upgrades to Cassiar residence replacing 110 fixtures utilizing two T5 (55W) bulbs with an efficient LED (24W) fixture, projected to reducing electricity consumption related to building lighting by 78 per cent.

2) Mobile Sources (Fleet, Off-road/Portable Equipment) Fuel Combustion: Indicate which actions your PSO took in 2015:

Survey Question	Response
Have put in place an operations policy/program to support systematic reductions in fleet related emissions:	Yes
Continued implementation of fleet anti-idling policy established in 2010	
Replaced existing vehicles with more fuel efficient vehicles (gas/diesel):	No
Replaced existing vehicles with hybrid or electric vehicles	Yes
Reduced the overall number of fleet vehicles	Yes
Took steps to drive less than previous years	Yes

- Converted 100 per cent of UBC Okanagan's golf carts to electric models.
- Reduced campus fleet by two Faculty research vehicles.
- 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.

3) Supplies (Paper): Indicate which actions your PSO took in 2015:

Survey Question	Response
Have put in place an operations policy/program to facilitate a systematic reduction in paper-related emissions: (e.g., policy to purchase 100% Recycled Content; default to double-sided printing)	No
If yes, please describe: N/A	
Have put in place an operations policy/program to facilitate behavioural changes from paper use: (e.g. awareness campaign to reduce paper use)	Yes
Through the UBC BuySmart system, departments are recommended to purchase at minimum paper containing 30 per cent Post-Consumer Recycled content. UBC Okanagan's campus launched the PaperCutTM software program in 2015. The Program provides the opportunity to monitor and reduce paper consumption through measures which include print reporting, secure print release and multi-machine printing capabilities. The program's first stage of implementation enables students to monitor, measure, and receive printing awareness prompts. Preliminary program services were introduced to faculty and staff, with the intention to roll-out the full scale of program services in 2016.	
Used only 100% recycled paper	No
Used some recycled paper	Yes
Used alternate source paper (e.g., bamboo, hemp, wheat etc.)	Yes
• Completed full implementation of PaperCut$_{TM}$ print tracking software program to students. Further information on PaperCut$_{TM}$ can be found in the Above and Beyond Reporting section of this report. • Completed preliminary implementation of PaperCut$_{TM}$ print tracking software program to faculty and staff at departmental and unit level. • Continued to expand workstation video conference technology availability and accessibility, integrating smaller system with existing larger meeting room systems. • Continued to promote purchase of paper with 30 per cent or greater post-consumer waste content. • Continued to ensure that wheat sheet paper is available to order from the custom list as an alternative source to tree-derived paper. • Continued to increase the number of digital signs and electronic communication platforms available across campus to share campus news, activities and events, thereby reducing the reliance on paper-based promotional materials.	

4). Other Sustainability Actions:

Business Travel

Business Travel	Response
Created a low-carbon travel policy or travel reduction goal: (low-carbon = lowest emission of greenhouse gas per kilometer per passenger)	No
Encourage alternative travel to meetings (e.g., bicycles, public transit, walking)	Yes
Encouraged or allow telework/working from home:	Yes
Other: N/A	

Education and Awareness	Response
Have a Green/Sustainability/Climate Action Team:	Yes
Supported green professional development: (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
Other: N/A	

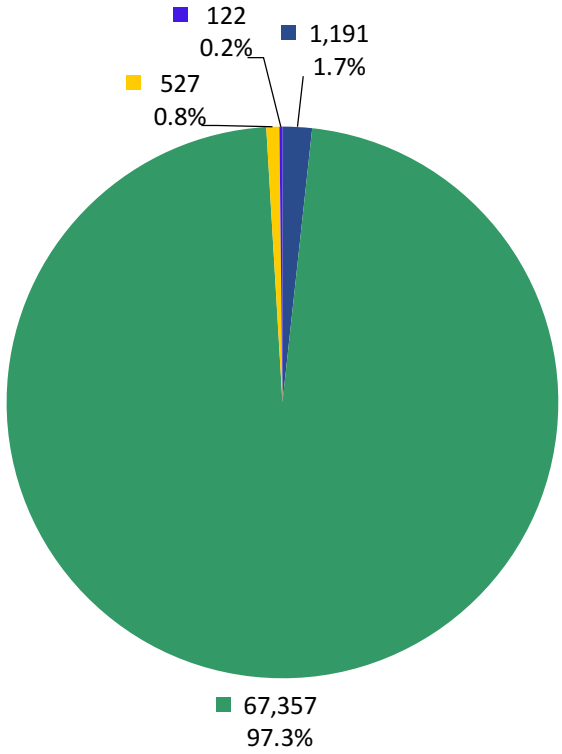
Adaptation Planning for Climate Change	Response
Have assessed whether increased frequency of extreme weather events and/or long term changes in climate will affect your organization's infrastructure, its employees and/or its clients:	Yes
Have incorporated these anticipated changes in climate into your organization's planning and decision making:	Yes
Other: N/A	

Other Sustainability Actions	Response
Established a water conservation strategy which includes a plan or policy for replacing water fixtures with efficient models:	Yes
Have put in place an operations policy/program to facilitate the reduction and diversion of building occupant waste stream from landfills or incineration facilities: (e.g., composting, collection of plastics, batteries)	Yes
Established green standards for goods that are replaced infrequently and/or may require capital funds to purchase: (e.g., office furniture, carpeting, etc.)	No
Incorporated lifecycle costing into new construction or renovations:	Yes
Please refer to the UBC Okanagan's 2015 Carbon Neutral Action Overview Report.	

PART C

Emission Source Report

UNIVERSITY OF BRITISH COLUMBIA GREENHOUSE GAS EMISSIONS BY SOURCE FOR THE 2015 CALENDAR YEAR (TCO_2E*)



Total Emissions: 69,197

- Mobile Fuel Combustion (Fleet and other mobile equipment)
- Stationary Fuel Combustion (Building Heating and Generators) and Electricity
- Supplies (Paper)
- Fugitive Sources

Offsets Applied to Become Carbon Neutral in 2015 (Generated May 17, 2016 4:48 PM)

Total offsets required: **50,039**. Total offset investment: $**1,250,975**. Emissions which do not require

*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.

2015 CARBON NEUTRAL ACTION OVERVIEW REPORT

a place of mind
THE UNIVERSITY OF BRITISH COLUMBIA

sustainability