



THE UNIVERSITY OF BRITISH COLUMBIA

sustainability

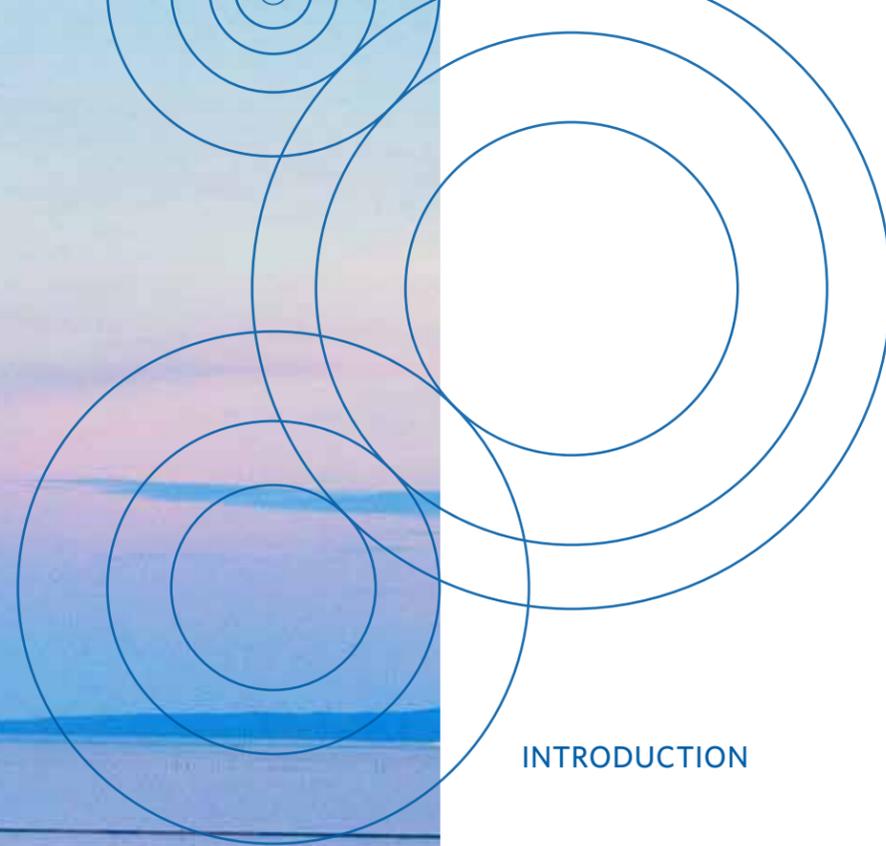
MAY 2020



2019

CARBON NEUTRAL ACTION REPORT





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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 one can realize their 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, 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.

Summary Statement for 2019 Carbon Reporting

As per the Provincial Directive¹ issued March 31, 2020, UBC is using the Greenhouse Gas (GHG) emissions created in 2018 as a temporary estimate for the 2019 GHG emissions. UBC's actual 2019 GHG emissions will be reported to the Province in September 2020.

This report contains mandatory information required to meet the revised provincial carbon reporting requirements for 2019 emissions. Full details of UBC's 2018 GHG emissions, including a detailed inventory by emissions source can be found online in the 2018 Carbon Neutral Action Report:

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

UBC's Vancouver campus sustainability plans and reports are available at:

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

UBC's Okanagan campus sustainability plans and reports are available at:

sustain.ok.ubc.ca/reports.html

EXECUTIVE SUMMARY



UBC has been a global leader in sustainability for over two decades, including opening Canada's first sustainability office in 1997 and meeting the Kyoto target for emissions reductions in 2007.

For two consecutive years, UBC has ranked #1 in the world for climate action according to the Times Higher Education (THE) ranking, based on the United Nations Sustainable Development Goals (SDGs).

In 2019, UBC continued to deliver on our bold climate action commitments; these actions to date have saved the university over \$6M in avoided carbon costs since 2007, including both carbon offset and carbon tax costs. UBC's Climate Emergency Declaration in December 2019 set an urgent focus on climate action with the need for drastic emissions reductions and a decisive shift away from fossil fuels, toward low-carbon and renewable energy sources.

The UBC Vancouver campus has taken vigorous measures to reduce our GHG emissions in recent years, including continued energy conservation initiatives, building retrofits and the pending expansion of the bioenergy plant; these combined initiatives will help advance GHG savings of over 60% below 2007 levels. Through energy conservation, community engagement, and incremental improvements

for new buildings, renovations and retrofits as outlined by our Green Building Action Plan, and with the update to our Climate Action Plan we will continue to make significant progress in reducing our campus GHG emissions.

The UBC Okanagan campus has moved quickly to advance GHG emission reductions despite the challenges of rapid growth. A district energy system, established over a decade ago, provides low carbon energy supply to buildings. Continued expansion and improvements in energy supply, alongside building energy demand management, carbon reduction and engagement actions helped us to achieve a net reduction in GHG emissions, despite a 267 percent increase in building growth over the past 15 years. Supplementing established campus sustainability plans and guidelines, our first Climate Action Plan is anticipated to accelerate targets and actions for carbon reduction.

The Intergovernmental Panel on Climate Change (IPCC) Special Report², the ongoing global climate strikes, and UBC's Climate Emergency³ provide a renewed urgency in accelerating our efforts to avoid the catastrophic effects of climate change. The climate emergency is one of the most pressing issues of our time and UBC will continue advancing sustainability and climate leadership across the institution. At this pivotal moment, the decisions and actions we take today will reverberate beyond our own borders and lifetimes.

¹ www2.gov.bc.ca/assets/gov/environment/climate-change/cng/guidance-documents/dir_of_clean_govt_notification_to_psos.pdf

² www.ipcc.ch/sr15

³ climateemergency.ubc.ca

UBC VANCOUVER

DECLARATION STATEMENT

This Carbon Neutral Action Report (CNAR) for the period January 1, 2019 to December 31, 2019 summarizes our emissions profile, the total offsets to reach net-zero emissions, the actions we have taken in 2019 to reduce our greenhouse gas emissions and our plans to continue reducing emissions in 2020 and beyond.

By June 30, 2020 the 2019 University of British Columbia Vancouver campus' Carbon Neutral Action Report will be posted to our website at:

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

Table 1: Emissions and Offset Summary Table

UBC Vancouver Campus GHG Emissions and Offsets for 2019 (tCO ₂ e)	
As per the Directive issued March 31, 2020, each PSO will use their 2018 GHG Emissions as a placeholder for the purposes of their 2019 CNAR.	
Total Emissions (tCO ₂ e)	64,209
Total BioCO ₂ ⁴ (tCO ₂ e)	19,719
Total Offsets (tCO ₂ e)	44,490
Total Offset Investment (\$25 per tCO ₂ e)	\$1,112,250

RETIREMENT OF OFFSETS

In accordance with the requirements of the *Climate Change Accountability Act* and Carbon Neutral Government Regulation, UBC Vancouver (**the Organization**) is responsible for arranging for the retirement of the offsets obligation reported above for the 2019 calendar year, together with any adjustments reported for past calendar years (if applicable). The Organization hereby agrees that, in exchange for the Ministry of Environment and Climate Change Strategy (**the Ministry**) 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.

EXECUTIVE SIGN-OFF



Michael White

Associate Vice-President, Campus & Community Planning,
University of British Columbia, Vancouver Campus

⁴ Biogenic emissions (BioCO₂) from biomass combustion are reported, but are not counted in emission totals for offset in accordance with Provincial reporting guidelines as the BioCO₂ released is part of the biogenic carbon cycle and would be released naturally during decomposition. 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.

ACTIONS TAKEN IN 2019 TO MINIMIZE EMISSIONS

The Vancouver Campus Climate Action Plan (CAP 2020) set bold GHG reduction targets from a 2007 GHG baseline, a 33% reduction target for 2015 (achieved in 2016), a 67% reduction target for 2020 (the upcoming Bioenergy Research and Demonstration Facility expansion will bring UBC close to this target), and a 100% reduction target for 2050. This plan has enabled significant success, achieving large operational savings, improving efficiency of buildings, increasing our resiliency and building a strong reputation as an international sustainability leader.



Bioenergy Research and Demonstration Facility

A. Stationary Fuel Combustion & Electricity (Buildings)

ENERGY SUPPLY

Bioenergy Research and Demonstration Facility

Since its start-up in 2012, the Bioenergy Research and Demonstration Facility (BRDF) has been pivotal in reducing UBC's GHG emissions. In combination with the Campus Energy Centre, UBC's primary energy source, it makes up UBC's district energy system that is used to heat many buildings on campus. What's unique about the BRDF is that it was the first project of this scale in North America capable of generating both clean heat and power using biomass, a plant-based, renewable energy alternative to fossil fuels.

By replacing conventional fossil fuels, such as natural gas, with biomass (clean and regional wood waste), the BRDF produces electricity and hot water that is distributed underground for use in campus buildings, offsetting over 150,000 GJ of natural gas consumption annually.

Based on this success, UBC is now expanding the capacity of the plant. Once the new boiler is operational, UBC will triple the capacity of its overall biomass plant, energizing two thirds of the district energy system with renewable

fuel sources. This increase in capacity will further diminish UBC's reliance on fossil fuels and lead to the reduction of an additional 13,000 to 15,000 tonnes of GHG emissions each year.

EXISTING BUILDINGS

Energy Conservation Targets

UBC Vancouver targets 4 GWh of electrical energy and 20,000 GJ of natural gas savings each year from energy conservation projects in order to offset UBC campus growth. UBC utilizes a combination of in-house engineering expertise and outside consulting firms to complete energy audits on a number of UBC buildings each year and implement projects to meet these targets.

Building Tune-Up Program

In partnership with BC Hydro, UBC Energy & Water Services implemented the building tune-up (Continuous Optimization) program in 2010 for UBC's core and academic buildings. Buildings will maintain their optimized states through real-time performance monitoring and analysis to identify further conservation opportunities. UBC further expanded this program in 2019, as BC Hydro's first customer to participate in the real-time energy management program, designed to identify and correct building inefficiencies as they arise.



LED Lighting Retrofit

Ventilation Optimization at Michael Smith Labs

In 2019, UBC Energy & Water Services completed the installation of the first Aircuity system in British Columbia. This innovative system takes air samples from the building's laboratories, testing them for various contaminants and comparing them against outdoor air levels. Where low levels of contamination are detected, airflow rates can be lowered, reducing the heating, cooling, and fan energy required. The project has successfully reduced minimum airflow rates in the building by 25% and is expected to reduce UBC's energy costs by almost \$75K each year.

LED Lighting Retrofit

LEDs provide improved lighting quality, reduce lamp maintenance, and significantly reduce energy consumption. The first phase of the program began in 2016, since then UBC has replaced over 53,000 fluorescent lamps with LED. The energy and maintenance savings, combined with funding from BC Hydro and Province of BC Carbon Neutral Program, results in a less than 2-year project payback. UBC Energy & Water Services estimates savings of over \$800K per year in energy and maintenance while reducing UBC's electrical peak demand by 3 MWs should this program replace all T8 lamps across campus.

Building Renewal

Many buildings have undergone energy efficiency upgrades over the years. In 2019, two major building renovations were completed within UBC's core campus: the Hebb Building Renewal and the Undergraduate Life Sciences Teaching Labs. Both buildings incorporate energy efficient features, such as air-tightness into their renewal, and are targeting LEED Gold certification.

NEW BUILDINGS

Green Building

With over 400 institutional and residential buildings on campus, building operations is the largest component of UBC's scope 1 and 2 GHG emissions. The UBC Green Building Action Plan outlines actions to accelerate higher levels of performance and regenerative design and operate the largest portfolio of green buildings at a Canadian university. Three major building projects were completed in 2019 and LEED registered with certification expected in 2020: the Undergraduate Life Sciences Teaching Labs, Gage Student Residence, Bus Transit Exchange and the Hebb Building Renewal.

Through UBC's Green Building Action Plan, a structured list of actions to reduce energy use and GHG emissions in buildings has been established and implemented. Experience in 2019 at UBC and beyond has shown that

existing building deep retrofits can achieve the same energy targets as new buildings. Moving forward, we do not expect energy targets to be different for new or existing buildings unless there are competing requirements (e.g. heritage value of façade).

Energy Modelling Guidelines

UBC energy modelling guidelines have been developed that will be required to improve the accuracy of building energy models and help reduce the performance gap often observed between modelled energy use and actual energy use. The modelling guidelines have been piloted on several projects in 2019 and will become policy in 2020.

Energy Targets

In order to incrementally reduce energy use and GHG emission over time, energy targets have been established for buildings that provide predictable requirements for new development. Mandatory energy use intensity (EUI), thermal energy demand intensity (TEDI), and domestic hot water (DHW) targets for new construction and major renovations are now clearly outlined for different building uses and project sizes.

Climate Ready Building Requirements

Due to the warming climate, UBC plans to future proof buildings in order to provide a comfortable environment for occupants over a building's lifetime. UBC has developed new Climate Ready Requirements for UBC Buildings that require thermal comfort modelling of spaces using future weather files. Based on this modelling, a descriptive pathway for cost effective upgrades over time is established. Most of these projects have pursued designs that are predicted to provide comfortable environments up until the year 2050.

Air-tightness Testing

Airtight buildings use less energy for heating and cooling with less heat transfer through the building envelope. Whole building air-tightness testing in alignment with the BC Energy Step Code is now mandatory for UBC building projects.

COMMUNITY ENGAGEMENT CAMPAIGNS

Seasonal Shutdown

This annual campaign organized by UBC Energy & Water Services, Building Operations, and Campus + Community

Planning, contributes to UBC's Climate Action Plan and energy reduction goals by engaging and educating staff and faculty about best practices in energy conservation. Overall, 30 buildings, 38 departments and 1,100 faculty and staff took part to champion additional energy-conservation actions in their departments by switching off electronics, unplugging small appliances, turning off lights, closing windows and blinds, and shutting down lab equipment.

Shut the Sash

Fume hoods at UBC consume up to 10 percent of campus energy due to the large volume of air that needs to be heated or cooled and moved through the hoods. In 2019, UBC lab users were engaged in a 6 week Shut the Sash competition to reduce energy loss through fume hoods. Lab buildings were the focus of engagement due to variable air volume and fume hood driven ventilation systems used. Behaviour adoption was tracked through participant registration, action items and the building management system (exhaust rate was monitored for each fume hood as a proxy for sash height) and compared to a baseline. The Shut the Sash campaign contributed to over \$10,000 in annual cost avoidance from energy savings.

Green Labs' Chill Up Challenge

The Chill Up Challenge encourages UBC researchers to adjust the temperature of laboratory ultra-low temperature (ULT) freezers as these consume significant amounts of energy. An increase of 10 degrees Celsius reduces equipment energy consumption by 20%, on average. In 2019, 29 additional ULTs were set to the energy saving temperature during the competition, resulting in participation of 40% in our Life Sciences Building and achieving electricity savings of 71,500 kWh per year. Our campus overall participation rate was found to be 33%. One of the key nudges used is to actively encourage researchers to upgrade to more energy efficient freezers through a newly launched ULT rebate program.

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

The Vancouver campus continues to source and optimize vehicle operations to reduce fleet emissions. Additional actions to reduce fleet emissions over the last year include:

- Several steps to improve the fleet efficiency, including updating our fleet policy to include key aspects of our



Electric Vehicle Charging Infrastructure

Green Fleet Plan, continued driver training on fuel efficient driving practices, and further increased our supply of electric vehicles.

- In 2019, UBC increased the use of shared vehicle programs by adding 6 additional Kia Soul electric vehicles, with increased carrying capacity over our current fleet of electric vehicles.
- UBC is responding to emerging technologies and transportation options in a number of ways, including, actions to support the transition to electric vehicles and prepare for autonomous vehicles by continuing to invest in electric vehicle charging infrastructure across campus. Over the past decade, UBC Parking has installed EV chargers and associated electrical infrastructure in all six campus parkades and select surface and underground lots. UBC now has over 70 level 2 electric vehicle chargers and 4 fast chargers available for public use within its parkades and lots.

C. Supplies (Paper)

Actions taken to reduce paper emissions in 2019 include:

- Implementation of the UBC Sustainability Purchasing Guide, designed to help UBC staff and faculty members or students purchase sustainable goods and services. In

2019, we continued to promote the Sustainable Purchasing Guide, encouraging the procurement of paper made from alternative fibre paper or paper with a minimum 30% post consumer recycled content.

- In 2019, some departments, including Building Operations and Sustainability and Engineering, switched to purchasing Sugar Sheet™ paper (equivalent GHG emissions to 100% recycled paper), which followed the successful adoption by UBC Student Housing & Community Services.

D. Fugitive Emissions

UBC Safety and Risk Services has developed specific pollution prevention policies, procedures and forms which aim to ensure regulatory compliance and improve communication with UBC operational departments/teams who manage refrigeration/air conditioning equipment on campus. Our operational departments directly implement mitigation measures through preventative maintenance of equipment by approved service contractors and following the current guidelines and environmental codes.

PLANS TO CONTINUE REDUCING EMISSIONS IN 2020 AND BEYOND

In 2019, UBC joined other organizations in declaring a climate emergency, with a renewed urgency to accelerate climate action with the need for drastic emissions reductions and a decisive shift away from fossil fuels toward alternative energy sources. The declaration reinforced key directions, including the planned update to the Vancouver Campus Climate Action Plan (CAP). Initiated in 2020, the CAP update will accelerate targets and actions for GHG reduction within a 2030 planning horizon, while widening the scope to areas that extend beyond operational GHG emissions.

A. Stationary Fuel Combustion & Electricity (Buildings)

ENERGY SUPPLY

With an efficient district energy system operating below campus, UBC can now strategically transition from the use of fossil fuel heating to low carbon and renewable energy sources. Once the bioenergy expansion is complete, UBC's Vancouver campus GHG emissions are predicted to be more than 60% lower than those in the 2007 baseline year. Decarbonization of UBC's district energy system will be a key focus for the CAP update, and several potential capital projects are being investigated to reduce reliance on fossil fuels. For example, natural gas currently accounts for 90% of UBC's operational GHG emissions, so reducing this consumption presents significant opportunity to further reduce GHG emissions.

EXISTING BUILDINGS

UBC Energy & Water Services continue to update the UBC Strategic Energy Management Plan (SEMP) outlining future energy conservation projects within existing buildings. The most recent SEMP can be found on the website at: energy.ubc.ca/energy-and-water-data/publications.

Additional 2020 and future existing building projects include:

- Installation of another contaminant monitoring demand control ventilation system at the Centre for Comparative Medicine is nearing completion. This implementation is expected to save around \$90K per year.
- A major variable speed drive installation project in UBC's main lab buildings, LED relamping, and round 2 of the continuous optimization program.

- Continue to deliver behaviour change engagement programming to students, staff, and faculty to encourage building energy conservation and advance a culture of sustainability across the UBC community.
- Pursue additional building retrofits and renewals (e.g. through seismic upgrades) to achieve further reductions in GHG emissions, energy and water.

NEW BUILDINGS

In 2020 we expect to continue development of GHG targets for new buildings, further develop life cycle costing for efficient and low carbon building systems comparisons and develop policy to reduce embodied carbon in buildings.

Complementing UBC's Climate Action Plan update and the Green Building Action Plan, the Community Energy and Emissions Plan (CEEP) outlines strategies for a low carbon future for UBC's residential community. The CEEP contains an energy and emissions reduction strategy that will result in an 85% reduction in GHG emissions and a 36% reduction in electricity use by 2050.

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

UBC will continue to implement the vehicle replacement strategy, by assessing operational requirements against alternative fuel vehicles available in the market and where feasible, procure alternative powered vehicles to replace fossil fuel based models. Vehicle analytics are also being investigated to identify opportunities for optimized utilization of the UBC fleet.

C. Supplies (Paper)

UBC will continue to promote the Sustainable Purchasing Guide within the campus community and encourage the purchase of paper with recycled content greater than 30%. An updated enterprise IT system is currently being implemented at UBC, which will eliminate many paper based processes and further reduce UBC's paper consumption.

D. Fugitive Emissions

UBC plans to continue replacing inefficient and older equipment and conduct preventative maintenance and upgrades to refrigeration/air conditioning equipment to minimize refrigerant leakage.

SUCCESS STORIES



Museum of Anthropology

Modernizing UBC's District Energy

The multi-year transformation of UBC's Academic District Energy System (ADES) halved its natural gas use through major conservation, efficiency, and renewable energy capital projects. Before the conversion, UBC's steam powerhouse had a peak steam load of 120 MWt (250,000 lb/hr) and was the leading seismic risk for the Vancouver campus. The decommissioned steam powerhouse was identified as the primary source of campus GHG emissions, historically producing more than 50K tonnes of GHG emissions annually.

The \$88M ADES Steam to Hot Water Conversion Project improved energy efficiency by more than 24%, used 2000 times less water than the steam system, and was instrumental in enabling UBC to achieve its 2015 GHG emissions reduction target. At present, UBC's ADES is energized by waste heat recovery from an upgraded biogas-fueled cogeneration engine and a renewable energy biomass gasification system.

In 2019, the last steam line was shut down permanently at UBC and more than 160 core academic buildings are now connected to the highly efficient hot water district energy system. This will result in further improvements to the system's overall efficiency and contribute to our efforts to eliminate carbon emissions at UBC.

Museum of Anthropology Tune-up

Throughout 2019, UBC Energy & Water Services partnered with UBC Building Operations to holistically address building inefficiencies at the Museum of Anthropology. Heating valves were replaced, repairs made to the humidification system, and extensive programming changes were made in the building controls system. The combined projects saved nearly 3,000 GJ of thermal energy in 2019 alone, with work continuing to further optimize the building in the future.

INITIATIVES TO SUPPORT ADDITIONAL GHG EMISSIONS REDUCTIONS



Zero Waste Foodware Strategy

While UBC is not required to offset scope 3 emissions (except paper) under the Provincial regulations, a number of initiatives are underway to measure and reduce Scope 3 emissions.

Zero Waste Foodware Strategy

The Zero Waste Foodware Strategy, adopted in June 2019, aims to tackle the millions of items of single use plastics entering the landfill each year. Starting in January 2020, fees were phased in on single use items. The plan was developed in consultation with all major food service providers on campus and a major communications and engagement campaign was launched in early 2020.

Rapid Transit

In February 2019, the City of Vancouver Council and TransLink's Mayors' Council on Regional Transportation endorsed a SkyTrain extension of the Millennium Line as the basis for future planning of rapid transit to UBC Vancouver. With this endorsement, UBC continues to advocate for the project with various levels of government and participate in project planning and design work being led by TransLink. Rapid transit will reduce direct

commuting emissions from personal vehicles, which are a major source of UBC's scope 3 emissions.

Vanpool Pilot Program

In 2019, UBC was selected to be part of a Vanpool Pilot Program managed by TransLink and Modo Carshare. The program was launched early in 2019 with approximately five vanpools. At the end of the year there were 10 vanpools carrying 58 people to and from UBC each day. This pilot has not only reduced GHG emissions from commuting by consolidating multiple vehicle trips into one, it has also provided a significant learning opportunity to TransLink and Modo and it has expanded carsharing into new municipalities.

Campus Bike Share Program

UBC administers a campus-wide hub-based bike share program to enable employees, students and residents to get around our 1,000 acre campus quickly and easily without the use of a personal vehicle. Since launching in August 2019, the bike share program has seen nearly 50,000 rides covering over 80,000 kilometers. The service provides an important first and last-mile



Campus Bike Share Program

connection for employees commuting to campus by transit who may otherwise be deterred by the long walk between the UBC bus exchange and their particular building.

Try an E-Bike Program

In 2019, UBC partnered with six local e-bike (electric bicycle) vendors as part of the Try an E-Bike program to enable staff and faculty members to test out e-bikes as a commuting option for free for 24 hours.

The intent of the Try an E-Bike program was to build awareness of the benefits of cycling with an e-bike for commuting and to reduce barriers to adoption through a purchasing guide and discounts from retailers. UBC is planning a second iteration of the program that will incorporate improvements as suggested by participant and e-bike shop partners and is also exploring offering the program annually.

Climate Friendly Food

The global food system is recognized to be a major contributor to GHG emissions and environmental degradation worldwide. A number of initiatives are

underway within UBC Food Services to help offer climate friendly and socially responsible foods to our campus community:

- More than 60% of ingredients are purchased from local producers (within 400km of UBC), such as the UBC Farm.
- Vegan and vegetarian options are readily available to reduce our impact on air, land, water and climate.
- A pilot project to quantify GHG emissions from UBC Food Services is currently underway, which will inform future opportunities and help expand scope 3 emissions tracking.

Styrofoam Recycling Program

The Styrofoam Reduction and Recycling Program aims to reduce Styrofoam packaging through collaboration with suppliers to find Styrofoam alternatives as well as providing a convenient means of recycling Styrofoam on campus. This program is intended for the UBC core research laboratories. Approximately 34 tonnes of Styrofoam have been recycled to date through the UBC Program, helping to reduce UBC's solid waste stream and its associated GHG emissions and environmental impacts.

UBC OKANAGAN

DECLARATION STATEMENT

This Carbon Neutral Action Report for the period January 1, 2019 to December 31, 2019 summarizes our emissions profile, the total offsets to reach net-zero emissions, the actions we have taken in 2019 to reduce our greenhouse gas emissions and our plans to continue reducing emissions in 2020 and beyond.

By June 30, 2020 the University of British Columbia's Okanagan campus' final 2019 Carbon Neutral Action Report will be posted to our website at

sustain.ok.ubc.ca/reports/cnar.





EMISSIONS AND OFFSET SUMMARY

UBC Okanagan Campus GHG Emissions and Offsets for 2019 (tCO ₂ e)	
As per the Directive issued March 31, 2020, each PSO will use their 2018 GHG Emissions as a placeholder for the purposes of their 2019 CNAR.	
Total Emissions (tCO ₂ e)	2,156
Total BioCO ₂	3
Total Offsets (tCO ₂ e)	2,153
Offset Investment	\$53,825

RETIREMENT OF OFFSETS

In accordance with the requirements of the Climate Change Accountability Act and Carbon Neutral Government Regulation, UBC Okanagan (the Organization) is responsible for arranging for the retirement of the offsets obligation reported above for the 2019 calendar year, together with any adjustments reported for past calendar years (if applicable). The Organization hereby agrees that, in exchange for the Ministry of Environment and Climate Change Strategy (the Ministry) 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.

EXECUTIVE SIGN-OFF



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

ACTIONS TAKEN IN 2019 TO MINIMIZE EMISSIONS

A. Stationary Fuel Combustion Electricity (Buildings)

The largest source of in-scope GHG emissions is from buildings. UBC Okanagan continued to target building-wide energy efficiency and GHG reduction actions through the development and implementation of energy and carbon reduction plans and activities in 2019.

CLIMATE LEADERSHIP PLANNING & ENERGY MANAGEMENT

In 2019, UBC joined other organizations in declaring a climate emergency, with a renewed urgency to enhance climate action. The declaration reinforced key directions, including the development of UBC Okanagan's first Climate Action Plan. Initiated in 2019, the Climate Action Plan accelerate targets and actions for carbon reduction, while widening the scope to areas that extend beyond operational emissions.

The campus district energy system currently provides low carbon energy supply to campus buildings. The first phase of a Low Carbon District Energy Strategy was completed in 2019, which resulted in a pro forma model for the current system that will be used to measure against various energy supply strategies, and the second phase of work is underway. The strategy will be fundamental to the development of the Climate Action Plan. It will support decisions specific to setting campus GHG targets, future building retrofits and future campus infrastructure expansion.

NEW BUILDINGS

In 2019, UBC Okanagan was awarded CleanBC's Better Buildings Net-Zero Energy-Ready Challenge's Construction and Design Incentive award for Skeena Residence, its first Passivhaus Project. Commencing construction in 2019, Skeena Residence and Nechako Housing Commons are two major capital projects to help meet the demand for on-campus student housing and dining facilities, while contributing to the campus' sustainable development. As work on these projects is currently underway, further project details are provided in the 2020 section of this report.

Additionally, construction of an Engineering Design Lab was completed in 2019. This modular building is designed with an envelope that meets NECB 2011 standards and

is supplied with electrical heat from air-sourced heat pumps. Demand controlled ventilation combined with heat recovery ventilators will reduce electricity consumption

EXISTING BUILDINGS

Heat Recovery Projects

Data centers on campus produce a significant amount of waste heat year-round. In order to recover and use waste heat produced by the Library Data Center during colder weather, a hydronic connection was been made between the library data centre and the new adjacent Commons building's central heating/cooling plant. This connection will allow cooling for the data centre from the Commons' central plant and waste heat reuse in the Commons building. It is expected to reduce energy consumption by 480 GJ of natural gas and 53 MWhr of electricity, and reduce GHG emissions by 24 tCO₂e per year.

Academic Building Upgrades

A ventilation system upgrade and optimization project supported by over \$82,000 in FortisBC electrical, gas and behavior change incentives, was completed in the Science Building. Measures implemented are expected to reduce energy costs by \$52,000 and emissions by 131 tCO₂e, through the reduction of 2,600 GJ of gas and 415,000 kWhr of electricity annually.

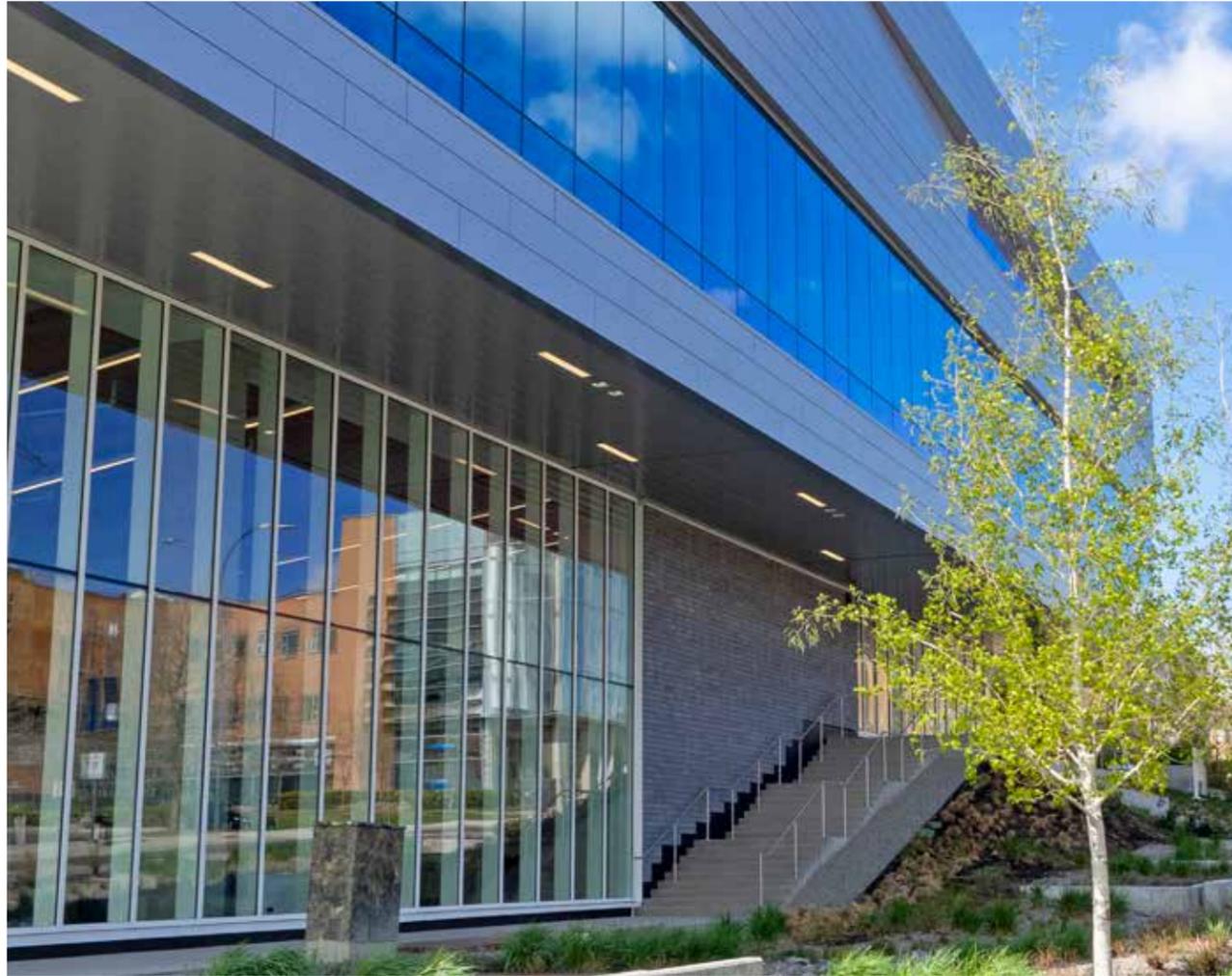
Measures included:

- laboratory airflows rebalanced, variable-frequency drives on the building's main exhaust fan motors installed;
- connected several laboratories to a system that monitors laboratory exhaust chemical content in order to allow for ventilation rate optimization; and,
- upgrade of key fume hoods to variable air volume flow.

In addition to physical upgrades, the campus also introduced a behavior change initiative - Shut the Sash. Through user-based implementation, lab students and staff can support the physical upgrades by closing the fume hoods when not in use. The behavior change program reduced energy use by 8,401 kWh and 94 GJ and 5 tCO₂e over the six-week challenge.

Student Residence Building Upgrades

The campus participated in the FortisBC Rental Apartment



Efficiency Program. The completed projects will reduce energy by 600 GJ, reduce carbon by 30 tCO₂e, conserve 2,920,000 L of water, and reduce associated costs by \$5,000 annually.

Operational Efficiency Projects

An Electric Demand Management Project reviewed strategies to reduce the campus' electrical demand to respond to regional electric grid peaks for shorter periods.

Exterior and interior Lighting upgrades were completed including the replacement of fluorescent tubes with LED lights in the Charles E. Fipke Centre for Innovative Research, the Arts & Sciences Centre, and the outdoor street lighting.

Building HVAC systems were recommissioned to support energy efficient Cold Weather Operation. Control sequencing upgrades and additional measures were implemented to avoid increased natural gas consumption during colder than expected weather. Buildings that were upgraded in 2019 were Creative & Critical Studies, Upper Campus Health and the University Centre.

DISTRICT ENERGY SYSTEM (DES) UPGRADES

In 2019, the following campus district energy system upgrades and expansion projects were completed:

- a new connection from the low district energy system (LDES) to the central heating plant (CHP). The CHP provides natural gas heating and cooling to five legacy buildings; the connection will significantly reduce this requirement;

- a low flow pump upgrade on the LDES, which will reduce electricity consumption by approximately 30,000 kWh per year and improve the use of groundwater;
- an Aquifer Recharge Pilot Program that will support increased system capacity through a bypass of the infiltration basin; and,
- additional vector wells for future expansion of the DES.

DEPARTMENT ACTIONS

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

- ongoing replacement of desktop computers with laptops and more efficient devices;
- device upgrades from spinning to hard drives, reducing waste, power consumption and replacement costs; and,
- phase-in approach to conduct ongoing program upgrades to remove step down transformers and install power sharing with splice.

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

In 2019, the Okanagan campus procured three new fleet vehicles, one of which included a hybrid car. Additional actions to reduce fleet emissions over the last year include the following:

- Retired two legacy gas vehicles from the facilities management fleet.
- 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 internal 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)

Actions implemented to reduce paper emissions in 2019 include:

- Researched alternative paper sources for inclusion on custom order list as an alternative source to tree-derived paper. As a result, Sugar Sheet™, a 100% tree-free product

derived from sugarcane processing bi-product, is offered by the campus' preferred supplier.

- 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.
- Completed deployment of the Find-Me printing option through the PaperCut™ print-tracking software on all campus printers for students, staff and faculty. The software provides a platform that delivers reports to clients on printing volumes, generating awareness of printing consumption, and promoting alternatives to printing. The software also allows users to print from any device on campus and only releases jobs when the user taps their card at the device within four hours of submission.
- In 2019, 469,000 pages were submitted to be printed, but not released within the 4-hour time period, therefore reducing GHG emissions by 2,111.2 kg and saving 5.83 trees.
- Compared to 2018, over 38,000 fewer pages were printed across campus.
- Continued to include power considerations in all purchasing decisions for new IT equipment and infrastructure. This ensures the equipment draws less power and that less cooling is required to control the ambient temperature of the spaces that house the infrastructure.
- Developed lifecycle plans for all infrastructure to ensure equipment is maintained to perform optimally and hardware is replaced with improved technologies that support reduced power consumption according to industry best practices.

D. Fugitive Emissions

The campus has effectively implemented projects to reduce the annual release of fugitive emissions over the last six years. In 2019, the campus continued to replace inefficient and older equipment and conduct preventative maintenance and upgrades to HVAC systems and associated appliances.

PLANS TO CONTINUE REDUCING EMISSIONS IN 2020 AND BEYOND



2019 construction of the Nechako Housing Commons targeting completion in 2021.

A. Stationary Fuel Combustion Electricity (Buildings)

CLIMATE LEADERSHIP PLANNING & ENERGY MANAGEMENT

The campus will continue the development of the Climate Action Plan, in alignment with the increased ambition of UBC's Climate Emergency Declaration for completion in Spring 2021. The vision, scope and schedule of activities are underway, with the first step of integrating emerging campus operations themes of the Climate Emergency engagement process. The plan will leverage and integrate parallel planning efforts, cross-campus climate action planning efficiencies, and the wider community engagement process. The plan will also include additional Scope 3 GHG reduction opportunities such as commuting, low carbon food, and embodied carbon.

Subsequent phases of the Low Carbon District Energy Strategy will be completed. Energy supply strategies will be tested for sensitivity to various conditions including climate change risks, utility costs, carbon costs, regulatory changes and flexibility of fuel sources, resiliency and cost of capital. It is anticipated that this work will support the Climate Action Plan, including decisions specific to setting campus GHG targets, as well as future building retrofits and campus infrastructure expansion.

A new ten-year Strategic Energy Management Plan will be developed in 2020. It will identify demand-reduction strategies, conservation projects, model various fuel-shifting opportunities, and create more detailed, shelf-ready projects to be considered over the first five years. It is expected that this work will support GHG target development associated with the Climate Action Plan by demonstrating GHG reduction opportunities as they relate to energy consumption.

Continued behavioral change and engagement programs (including potential virtual engagement opportunities) will provide opportunities to engage the campus in energy and carbon reduction planning and actions. Programs will target high impact opportunities in offices, labs and student residences, and will build on successes such as "Shut the Sash" - an opportunity for lab students and staff to support the physical upgrades by closing the fume hoods when not in use.

The campus has also entered into a partnership with the campus' School of Engineering faculty to develop a data analytics platform. Upon completion, the platform will provide improved data management, reporting capabilities and analytical tools, providing data to future energy planning projects.

NEW BUILDINGS

The Whole Systems Infrastructure Plan policy framework, the UBC Okanagan Design Guidelines, and new/emerging policy directions will continue to inform the design and construction of major capital projects.

Projects underway in 2020 include Nechako Housing Commons, a mixed-use 'hub' combining 220 student resident housing units with 24-hour services and amenities and a 500-seat dining hall. Social shared spaces integrated into the building's design will offer students many opportunities for social engagement. Targeted to achieve LEED® Gold certification this project is currently under construction, targeting completion in 2021. The facility will be connected to the campus' district energy system which provides a low carbon energy supply.

Currently under construction and targeting completion in August 2020, the Skeena Residence will provide 220 student resident units with house lounges, informal study space, activity room and laundry facilities. The project is targeting Passive House (Classic) certification, an internationally recognized energy standard, characterized by a highly efficient building envelope and heat recovery ventilation system. Equivalent to highest steps of the BC Energy Step Code, the project's design helps to achieve a net-zero energy-ready level of performance while minimizing incremental costs by incorporating integrated design and project delivery. Selected as a winner of CleanBC's Better Buildings Net-Zero Energy-Ready Challenge Awards, the project supports the City of Kelowna's Energy Step Code implementation by building local capacity in upper step design, specialized trades, and application of innovative products.

In 2020 the design of an Interdisciplinary Collaboration and Innovation (ICI) facility targeting LEED Gold certification will begin. This academic facility will be designed to foster interdisciplinary knowledge and support collaborative, team-based learning and innovative approaches to teaching.

Additional 2020 and future building projects include:

- Two modular buildings supplied by electrical heat from by air-source heat pumps. Demand-controlled ventilation combined with heat recovery ventilators will reduce electricity demand.
- Innovation Precinct Annex 1 renovation to provide interdisciplinary research space to faculty and students.
- Research greenhouse construction with potential for cost-effective energy conservation and low carbon energy supply.
- The future development of an outdoor gathering space

EXISTING BUILDINGS

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 ensure occupants receive good indoor air quality by increasing ventilation rates on demand. Recalibration of sensors ensures ventilation rates do not exceed requirements, in order to reduce energy costs.
- 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.

DISTRICT ENERGY SYSTEM UPGRADES

District energy system upgrades planned in 2020 include the following:

- The complete review of the current geothermal groundwater injection system to determine if a Groundwater Upgrade Project to support increased capacity is viable. If so, the addition of more recharge wells may be considered to enhance the existing infiltration basin.
- Implementation of the LDES low flow pump project to reduce energy consumption and extend the life of the pumps used to circulate water through the low



temperature district energy system (LDES) loop. The campus will be replacing the 125hp pumps with a 15hp pump, which will improve the geothermal heat extraction effectiveness during shoulder seasons and reduce energy consumption by 30,000 kWh annually.

- Complete the conversion of the Science building to low temperature heating system, reducing the building's reliance on natural gas for its HVAC needs.

DEPARTMENT ACTIONS

Operational Efficiency Projects

Key operational departments will continue to implement building systems' efficiency projects in the coming years, including HVAC system efficiency maintenance and investigation of strategies to reduce electrical demand through the Electric Demand Management project.

In addition, key departments will continue to implement projects that support energy reduction at the campus level, including:

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

Student Housing and Hospitality Services: Residence Buildings Portfolio

- Addition of building automation system to Monashee residence.

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 internal 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)

- Implement awareness messaging prompts through the PaperCut™ print-tracking software to increase user awareness around reduced paper consumption behaviors to align with implementation of printing charge increases.
- 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.
- Continue to replace older student Xerox printers with new Ricoh devices. These new devices will enable students to use "FindMe Printing" to print from any device on campus, and only releases jobs when the user taps their card at the device within four hours of submission. These changes reduced the number of low usage printers and fleet costs across campus, standardized the student printing fleet for increased efficiency, support and maintenance, and lowered the potential for mixed up print jobs reducing paper waste.
- Continue to invest in improved and more sustainable technologies which provide better performance with a reduced environmental impact. This includes implementing solutions which digitize fax transmissions to reduce paper consumption.

D. Fugitive Emissions

Continue to replace inefficient and older equipment and conduct preventative maintenance and upgrades to HVAC systems and associated appliances.

In 2019, UBC Okanagan was awarded CleanBC's Better Buildings Net-Zero Energy-Ready Challenge's Construction and Design Incentive Award for Skeena Residence, its first Passivhaus Project. The Net-Zero Energy-Ready

Challenge (NZERC) is one of CleanBC's programs aimed at making buildings all over the province less polluting, more comfortable and energy-efficient. Net-zero energy-ready buildings are designed and built to be so efficient that they could meet all or most of their own energy consumption requirements with renewable energy technologies.

The Skeena Residence will be a six story, 6,750 GSM facility, consisting of 220 units with house lounges, informal study space, activity room and laundry facilities. The project is targeting Passive House (Classic) certification, an internationally recognized energy standard characterized by a highly efficient building envelope and heat recovery ventilation system. Equivalent to highest steps of the BC Energy Step Code, the project's design helps to achieve a net-zero energy-ready level of performance while minimizing incremental costs by incorporating integrated design and project delivery. As a winner of CleanBC's Better Buildings Net-Zero Energy-Ready Challenge Awards, the project supports the City of Kelowna's Energy Step Code implementation by building local capacity in upper step design, specialized trades, and application of innovative products.

Supporting the growing demand for on-campus student housing and student recruitment and retention, the residence will enhance campus life environment and services, which will help students succeed academically and socially. The new residence will also influence the social, economic and environmental sustainability of our growing campus and neighboring community, while adapting and managing future climate risks. Specific measures include:

- Integration of leading-edge green building "Living Lab" research for UBCO Faculty and green building innovation of provincial, national and international significance.
- Designed to achieve a minimum indoor water use reduction of 35 per cent compared to a base building design.
- Facilities to manage all rainwater on-site while providing social amenity and ecological co-benefits.
- Inclusion of non-invasive landscape plants appropriate for site conditions, climate and design intentions, and restoring appropriate plants and plant communities native to the ecoregion of the site.
- Reduction of commuter traffic and support for active transportation modes..

SUCCESS STORIES



2019 construction of the Skeena Housing targeting completion in 2020.

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INITIATIVES TO SUPPORT ADDITIONAL GHG EMISSIONS REDUCTIONS



The UBC Okanagan Transportation Plan is currently being initiated to support implementation of the 2015 Campus Plan to respond to advances in planning and development on and surrounding the campus, and contribute to UBC's commitment to address the Climate Crisis. The Transportation Plan will support the Climate Action Plan's overall strategy to address scope 3 commuting emissions by providing transportation targets and supportive

policies/actions; and recommendations for infrastructure improvements and Transportation Demand Management (TDM) strategies that reduce GHG emissions through improved campus connectivity, sustainable transportation opportunities and reduced Single Occupancy Vehicle (SOV) use. This work is targeting completion mid-December 2020.



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