

# 2021

CLIMATE CHANGE  
ACCOUNTABILITY REPORT  
UBC OKANAGAN



THE UNIVERSITY OF BRITISH COLUMBIA  
Okanagan Campus

## EXECUTIVE SUMMARY



In 2021, UBC Okanagan continued to demonstrate its commitment to environmental leadership and UBC's Climate Emergency Declaration.

Despite developing a new carbon reduction plan and implementing actions that align with the BC provincial government's carbon neutral mandate and our long-term net-positive goal, we were challenged by a 348 tCO<sub>2</sub>e increase in greenhouse gas (GHG) emissions compared to 2020. This is largely attributed to a 2021 update to the provincial electricity emissions intensity factor,<sup>1</sup> and our campus operations growth in the latter part of the year. When compared to the 2013 baseline, we achieved a 31 per cent reduction in absolute GHG emissions in 2021. UBCO continued to develop energy efficient, high performance buildings that contribute to the continued reduction of our overall campus GHG emissions over time. We also reduced our total offset liability by 203 tCO<sub>2</sub>e through renewable natural gas—a carbon neutral alternative fuel.

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In 2021, UBCO received the UBC Board of Governor's endorsement for its first *Climate Action Plan 2030* (UBCO CAP 2030). Developed in response to UBC's Climate Emergency Declaration, the UBCO CAP 2030 establishes an ambitious set of scope 1, 2 and 3 GHG reduction targets that align with the Paris Agreement's target to limit global warming to 1.5°C. The UBCO CAP 2030 provides a bold course of actions to meet targets, ensures accountability, and demonstrates how we are accelerating emission reductions over time.

We also continued to advance the *Strategic Energy Management Plan* and the *Low Carbon Energy Strategy*. These documents informed the UBCO CAP 2030 operational GHG reduction targets and actions needed to achieve them on the path to our 2050 net positive operational energy and carbon goal.

In 2021, UBCO's newest residence, **Nechako Residence and Commons Block**, was completed. Targeting LEED® Gold certification, this new facility is connected to the campus' low-carbon district energy system to reduce the building's reliance on fossil fuels for energy supply. Nechako, coupled with the Skeena Residence—UBC's First Passive House building opened in 2020—has increased the sustainability of on-campus housing by 28 per cent.

In the coming year, UBCO will focus on the development of two new major capital projects currently in design. The **Interdisciplinary Collaboration and Innovation (ICI) building** will target a minimum LEED® Gold Certification, while aiming to reduce the carbon footprint of the building and its operations. With the aim to serve future regional needs, **UBCO Downtown Kelowna** will expand UBC's presence while working to meet LEED® Gold Certification and Step 3 of the BC Energy Step Code.

Implementation of the UBCO CAP 2030 will begin with the development of new strategic policy mechanisms to achieve the Plan's operational GHG emission reduction target. **UBC's LEED® Implementation Guide v4.1**, currently in development, will include energy and atmosphere requirements tailored to the Okanagan campus in an effort to reduce operational and embodied carbon. In support of the UBCO CAP 2030, decarbonization of the campus' energy supply will continue by implementing the **Low Carbon Energy Strategy**. **Campus engagement programs** will be updated to support successful delivery of the UBCO CAP 2030's collective impact.

### Rob Einarson

Associate Vice-President, Finance and Operations  
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<sup>1</sup> In 2021, the Province assessed and increased the amount of carbon associated with electricity production—the electricity emissions intensity factor—which has a direct impact on the calculation of carbon associated with electricity usage by the campus.

## DECLARATION STATEMENT

This *PSO Climate Change Accountability Report* for the period January 1, 2021 to December 31, 2021, summarizes our greenhouse gas emissions profile, the total offsets to reach net-zero emissions, the actions we have taken in 2021 to reduce our GHG emissions, and our plans to continue reducing emissions in 2022 and beyond.

By June 30, 2022, UBCO's final 2021 Climate Change Accountability Report will be posted to our website at [sustain.ok.ubc.ca/reports/ccar](https://sustain.ok.ubc.ca/reports/ccar).

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# 2021 EMISSIONS OVERVIEW

## GHG EMISSION AND OFFSETS

GHG Emission created in Calendar Year 2021	
Total Emissions (tCO <sub>2</sub> e)	2,499
Total BioCO <sub>2</sub> (tCO <sub>2</sub> e)	204
Total Offsets (tCO <sub>2</sub> e)	2,295
Adjustments to Offset Required GHG Emissions Reported in Prior Years	
Total Offsets Adjustment (tCO <sub>2</sub> e)	0
Grand Total Offsets for 2021 Reporting Year	
Grand Total Offsets (tCO <sub>2</sub> e) to be Retired for 2021 Reporting Year	2,295
Offset Investment (\$25 per tCO <sub>2</sub> e)	\$57,375

### Retirement of Offsets

In accordance with the requirements of the *Climate Change Accountability Act* and Carbon Neutral Government Regulation, UBCO (**the Organization**) is responsible for arranging for the retirement of the offsets obligation reported above for the 2021 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.

## GREENHOUSE GAS EMISSIONS

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

**Table 1** provides a breakdown of GHG emissions by source on the Okanagan campus. Of note, there was a 16 per cent (348 tCO<sub>2</sub>e) increase in Total Emissions compared to the previous year. However, due to the use of renewable natural gas, a carbon-neutral fuel, Total Offsets were only increased by seven per cent (149 tCO<sub>2</sub>e). This will increase the cost of offsets by \$3,725 (excl. tax) over the previous year. Despite the collective 56 tCO<sub>2</sub>e reduction of emissions demonstrated by fleet, paper and fugitive emission sources, building emissions increased by 405 tCO<sub>2</sub>e. The impact is largely due to the increase of the electricity emissions factor.<sup>2</sup>

We also grew our campus operations in the latter part of 2021. Notwithstanding, UBCO continued to implement specific energy and carbon mitigation measures that are detailed in the "Actions Taken in 2021 to Minimize Emissions" section of this report.

**TABLE 1 GHG COMPARISON BY SOURCE BETWEEN 2020-2021**

Source	2020 Emissions (tonnes CO <sub>2</sub> e)		2021 Emissions (tonnes CO <sub>2</sub> e)		Changes from 2020 to 2021	
Buildings	2,024	94%	2,429	97%	+20%	+405 tCO <sub>2</sub> e
Fleet	49	2%	38	2%	-21%	-10 tCO <sub>2</sub> e
Paper	10	0.5%	6	0.2%	-40%	-4 tCO <sub>2</sub> e
Fugitive Emissions	68	3%	26	1%	-61%	-42 tCO <sub>2</sub> e
<b>Total Emissions *</b>	<b>2,151</b>	<b>100%</b>	<b>2,499</b>	<b>100%</b>	<b>+16%</b>	<b>+348 tCO<sub>2</sub>e</b>
<b>Total Offsets</b>	<b>2,146</b>	<b>100%</b>	<b>2,295</b>	<b>100%</b>	<b>+7%</b>	<b>+149 tCO<sub>2</sub>e</b>

\* Totals may not sum due to rounding

## CARBON NEUTRAL OFFSETS IN 2021

In accordance with the Clean Government Reporting Tool, and as required by the *Climate Change Accountability Act* (CCAA), offsets required to achieve carbon neutrality in 2021 total 2,295 tCO<sub>2</sub>e. As part of the UBCO's 2021 GHG emissions profile, 204 tCO<sub>2</sub>e do not require offsets.

<sup>2</sup> BC Provincial Government: Electricity emission intensity factors for grid-connected entities.

# EMISSION REDUCTION ACTIVITIES

## ACTIONS TAKEN IN 2021 TO MINIMIZE EMISSIONS

The following provides an overview and plans reported in the CCAR Actions Form, Part 1.

### A. Stationary Sources (e.g. buildings, power generations)

The largest source of campus in-scope GHG emissions is from buildings. In 2021, UBCO continued to target building energy efficiency and GHG reduction actions by implementing energy and carbon reduction plans and activities. However, an increase to the provincial electricity emissions factor, and the growth of campus operations in the latter part of the year contributed to a 20 per cent – or 405 tCO<sub>2</sub>e – increase in building emissions over the previous year.

#### CLIMATE LEADERSHIP PLANNING AND POLICY IMPLEMENTATION

UBCO completed and received endorsement from the UBC Board of Governors for its first **Climate Action Plan 2030** (UBCO CAP 2030) in December 2021.

In line with the Paris Agreement target to limit global warming to 1.5°C, the UBCO CAP 2030 establishes ambitious goals to achieve a 65 per cent reduction of operational emissions and a 45 per cent reduction of extended emissions by 2030. The UBCO CAP 2030 provides a clear pathway to meet our GHG reduction targets, as well as accountability measures to demonstrate how we are enacting bold changes to address UBC's Climate Emergency Declaration. The Plan further supports the longer-term goal of achieving a net positive performance in operational energy and carbon by 2050, as established in the UBCO Whole Systems Infrastructure Plan.

We also began developing several UBCO CAP 2030 policy mechanisms to support the achievement of operational GHG reduction targets. The **UBC LEED® v4.1 Implementation Guide** will, for the first time, include guidance specific to the climate, energy and environment on the Okanagan campus. When completed in 2022, the Guide will provide project teams with the UBC-specific direction required to optimize LEED®, which is tailored to each campus. The Guide will identify credits that are mandatory and/or expected because of their alignment with UBCO policies.

#### ENERGY INITIATIVES

UBCO continued to develop and implement targets and actions that align with, and support, energy and emissions reduction goals in the UBCO CAP 2030. Key plans include the **Strategic Energy Management Plan** (SEMP), which provides a suite of demand-side management projects to reduce energy consumption and associated emissions, and the **Low Carbon Energy Strategy**, which guides future low carbon district energy system development and investments.

- The SEMP projects that were implemented in 2021 are estimated to have reduced energy and emissions by 655,000 kWh, 2,800 GJ and 146 tCO<sub>2</sub>e, annually.
- UBCO completed a review of recommended projects identified in phase four of the Low Carbon Energy Strategy that support the UBCO CAP 2030 reduction targets in the coming years.

A portion of natural gas used by the Central Heating Plant (CHP) – which provides heating to the campus' legacy buildings – was substituted with **renewable natural gas** (RNG). The use of RNG reduced the campus' 2021 emissions profile by 203 tCO<sub>2</sub>e. As it is considered carbon neutral, no offsets are required.

A **Net Positive Modelling Study** on UBCO began in 2021 to inform project-specific performance targets for new buildings based on the Okanagan climate and building archetype. Upon completion, this project is anticipated to establish Total Energy Use Intensity (TEUI), Thermal Energy Demand Intensity (TEDI), and Greenhouse Gas Intensity (GHGI) targets for each archetype, as well as Energy Conservation Measures (ECM) bundles, costing and financial analysis. Applicability of the proposed strategies to existing building retrofits will also be considered.

UBCO entered into the second year of a three-year partnership with the campus' School of Engineering faculty to develop and implement an **energy monitoring and data management platform**. Upon completion, the platform will provide improved data management, reporting capabilities and analytical tools, informing future energy planning projects.

Additionally, UBCO continued working to update the **Infrastructure HVAC Asset Management database**, potentially linking it to major capital retrofit projects on campus in the near future. This involves consolidating campus-wide direct digital controls (i.e., building automation systems), physical meters and manual metering points in one location, as well as further developing a meter tree. This project will also provide additional input into the data analytics platform UBCO is developing with the School of Engineering.

## NEW BUILDINGS

UBCO completed construction of the **Nechako Residence and Commons Block**, a mixed-use facility that helps to meet the demand for on-campus student housing by supplying 220-resident units along with 24-hour social amenities and a 450-seat dining facility, in 2021. The facility, targeting LEED® Gold certification, is connected to the campus' district energy system that provides a lower carbon energy supply. Among its sustainable features, the facility provides a low-waste, plant-forward cafeteria, and meets the campus' 100 per cent rainwater retention goal through a multi-level raingarden.

UBCO's **Skeena Residence** attained **Passive House Certification** following its 2020 completion. This accomplishment makes UBCO the first campus in Canada to achieve a passive house-certified student residence.

Finally, UBCO began planning for a future mixed-use building for **UBCO Downtown Kelowna** and continued the design of a new **Interdisciplinary Collaboration and Innovation (ICI) building**. With an aim of serving future regional needs, the downtown building will expand UBC's presence in Kelowna, while actively working toward meeting LEED® Gold Certification and Step 3 of the BC Energy Step Code. The ICI building will target a minimum of LEED® Gold Certification and will integrate the goal to reduce the carbon footprint of the building and its operations.

## EXISTING BUILDINGS

UBCO completed a **recommissioning study on the Arts Building** in 2021. The final report is expected to identify deficiencies in the operation of the building that are wasting energy, such as increasing equipment wear and tear, or decreasing occupant comfort. Upon implementation of all recommended improvement measures, it is expected that 58,900 kWh and 130 GJ of energy will be conserved, reducing emissions by 9 tCO<sub>2</sub>e, annually.

A **Demand Controlled Ventilation (DCV)** upgrade project was completed in the 15 laboratories in the **Science Building**. The ventilation rate of non-critical laboratory spaces is not strictly controlled, causing significantly higher air changes per hour than required for occupant health and comfort. The use of upgraded control equipment and strategies to reduce and standardize air changes during both occupied and unoccupied hours will be considered. Proposed measures are expected to reduce energy use by 66,800 kWh and 800 GJ, lowering GHG emissions by 43 tCO<sub>2</sub>e, annually.

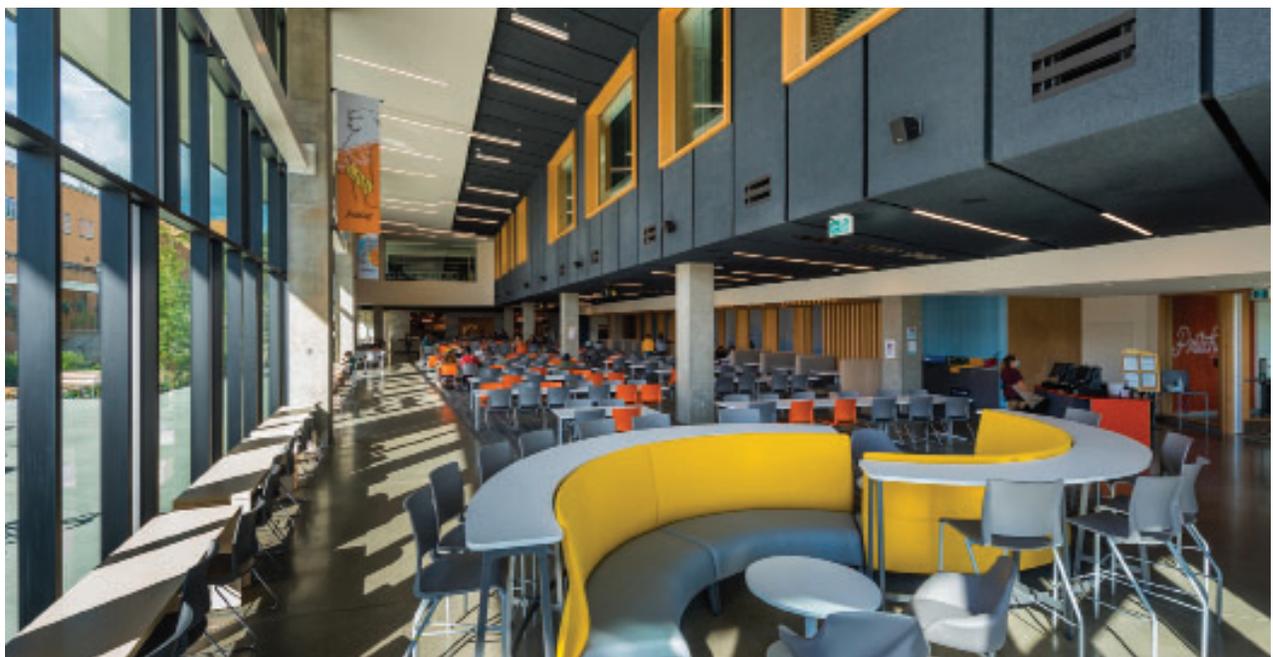
In addition to physical upgrades completed in the Science building, the campus ran the **2<sup>nd</sup> Annual Shut the Sash Challenge** to support energy conservation through user-based action. Lab students and staff support the physical upgrades by closing fume hoods when not in use. The education and awareness program supported the reduction of energy use by 33,031 kWh and 123 GJ and 7.5 tCO<sub>2</sub>e over the six-week challenge.

**Lighting upgrade** work to switch out inefficient light bulbs to LED lights in academic and administration buildings continued in 2021. To date, these efforts are estimated to have conserved 600,000 kWh of electricity, and reduced emissions by 6 tCO<sub>2</sub>e, annually.

## IT INFRASTRUCTURE ACTIONS

A number of information technology projects designed to streamline efficiencies and reduce energy consumption were completed in 2021, including:

- ongoing replacement of desktop computers with laptops that are newer, and more efficient;
- upgrading staff and faculty devices from spinning hard drives to solid state drives to reduce waste, power consumption and replacement costs;





- continued replacing older power distribution units with newer and more efficient models across campus. These devices distribute electric power to racks of computers and networking equipment located in campus data centres and building communication rooms;
- replacing several step-down transformer uninterruptible power supply units with power sharing, splice devices. These devices are more efficient, less noisy and generate less heat; and
- powering off many on-campus devices that were not being used during the COVID-19 pandemic.

## B. Mobile Sources (e.g. Fleet vehicles, off-road/portable equipment)

In 2021, fleet vehicles accounted for 38 tCO<sub>2</sub>e, or two per cent of the campus' total emissions. This is a 21 per cent (10 tCO<sub>2</sub>e) reduction from 2020. This reduction is attributed to the decreased use of campus operational fleet due to the COVID-19 pandemic.

Additional actions taken in the last year to reduce fleet-related emissions, include:

- the purchase of a new 2021 Ford 150 Hybrid truck for operational fleet use, reducing the reliance on traditional fuel purchases;
- the addition of two Level 2 charging stations for electric vehicles. The campus now offers 14 dedicated electric vehicle parking stalls to commuters;
- continued reducing reliance on fleet vehicles by consolidating off-campus trips, decreasing the number of trips, and encouraging fleet carpooling, walking or cycling;
- continued stewardship of sustainable mobile-fuel combustion by adhering to sustainable fleet procedures, replacing retired fleet vehicles with electric and energy-efficient models, and ongoing training and education to support sustainable fleet use; and
- continued monitoring the impact of remote work/learn on campus fleet vehicle emissions.

## C. Paper Consumption

Ongoing remote working and learning in 2021 resulted in a second year of significant reductions in paper purchases and paper use. Emissions from paper accounted for 6 tCO<sub>2</sub>e, or 0.2 per cent of total in-scope campus emissions in 2021, a 40 per cent reduction from 2020.

Additional paper reduction activities, include:

- Providing Sugar Sheet™, a 100 per cent tree-free product derived from sugarcane processing bi-product, as an alternative to traditional paper through UBCO's preferred supplier.
- Promoting the purchase 30 per cent or greater post-consumer recycled content paper on the campus' procurement website.

- Continued use of digital screens and related communications platforms to share news, activities, and events to reduce the reliance on paper-based promotional materials.
- Ongoing use of the Find-Me printing option through the PaperCut™ print-tracking software on all campus printers for students, faculty and staff. The software delivers reports to clients on print volumes to generate awareness of consumption, and promote 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 2021, 167,000 pages were submitted to be printed, but not released within the four-hour time period, reducing GHG emissions by 524 kgCO<sub>2</sub>e, saving 1.45 trees.
  - In 2021, there continued to be a significant reduction in page impressions, down 40 per cent from 2020, and 330 per cent from 2019. This is attributed to vastly on-campus reduced student and staff numbers due to the COVID-19 pandemic.
- 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.
- Key departments developed lifecycle plans for all infrastructure. These plans 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

Hydrofluorocarbon (HFC) emissions accounted for one per cent of total campus emissions, or 26 tCO<sub>2</sub>e. This is a 61 per cent (42 tCO<sub>2</sub>e) reduction from 2020 that is attributable to regular maintenance and replacement of older and inefficient refrigerant equipment.

Additional actions taken in the last year include:

- The final phase of construction of the Nechako Residence and Commons Block included the installation of centralized chillers for climate control, instead of individual Packaged Terminal Air conditioners (Ptac) units within individual residences. Centralized chillers reduce the facility's reliance on traditional fossil fuels and refrigerants.
- Continued to centralize campus cooling loads to reduce the amount of equipment requiring refrigerants on campus.
- Continued replacing inefficient and older equipment, while performing preventative maintenance and upgrades to existing HVAC systems and associated appliances.

# PLANS TO CONTINUE REDUCING EMISSIONS IN 2022 AND BEYOND

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

## A. Stationary Sources (e.g., buildings, power generation)

### CLIMATE LEADERSHIP PLANNING AND POLICY IMPLEMENTATION

In 2022, UBCO will focus on implementing the **UBC Okanagan Climate Action Plan 2030** (UBCO CAP 2030) to reduce operational and extended GHG emissions. A number of quick-start actions initiated in 2021 will be completed in 2022, and new phases of plan implementation will begin.

**UBC's LEED® v4.1 Implementation Guide** will be completed and launched in 2022. The Guide will provide project teams with the UBC-specific guidance required to optimize LEED® on both UBC campuses, including specific guidance for the Okanagan campus for the first time. The Guide will identify credits that are mandatory and/or expected because they align with UBCO policies.

UBCO will also continue to pursue **high performance building targets and policy standards** to meet the UBCO CAP 2030's operational and extended GHG emission reduction targets. Low embodied carbon policy options will begin to be considered based on whole building life cycle studies that will be completed for major capital projects, including the **UBCO Interdisciplinary Collaboration and Innovation Building (ICI)**.

### ENERGY INITIATIVES

UBCO will implement subsequent phases of the **Low Carbon Energy Strategy**. Pending funding approval, future projects will include the development of an initial district heating and cooling 4 pipe distribution. This distribution will run from the Innovation Precinct cluster plant to serve pre-existing buildings to the north of campus, as well as high-lift heat pumps and thermal storage adjacent to the geo-exchange building. This project will displace natural gas use and provide servicing to heat pumps that generate hot and chilled water. This water will be distributed to all new buildings within the associated building cluster (cluster plant). This cluster plant will be located within the future ICI building. Implementation of deep retrofits are also planned on existing buildings, including Creative & Critical Studies, Engineering, Management & Education, Arts, Sciences, and the gymnasium.

The implementation of projects approved from the new 10-year **Strategic Energy Management Plan** will continue in the coming year. Selected projects include ventilation demand-reduction, recommissioning, and energy conservation projects in the Science building, Charles E. Fipke Centre for Innovative Research, and Arts & Sciences Centre. Combined, these projects are estimated to reduce energy use by 458,000 kWh and 4300 GJ, and emissions by 216 tCO<sub>2</sub>e, annually.

UBCO will continue to displace a portion of natural gas used by the CHP, which provides heating to the campus' legacy buildings, with **renewable natural gas** (RNG). The use of approximately 5,000 GJ of RNG will reduce the campus' emissions profile by an estimated 249 tCO<sub>2</sub>e annually as it is considered carbon neutral and requires no offsets.

Completion of **project-specific performance targets** for new buildings will establish Total Energy Use Intensity (TEUI), Thermal Energy Demand Intensity (TEDI), and Greenhouse Gas Intensity (GHGI) targets for each campus building archetype as well as ECM bundles, costing and financial analysis.

UBCO will also enter into the final year of a three-year partnership with UBCO's School of Engineering faculty to develop and implement a **data analytics platform**. Upon completion, the platform will provide improved data management, reporting capabilities and analytical tools, to inform future energy planning projects.

Additionally, UBCO will continue working to advance and update the **Infrastructure HVAC Asset Management database**, potentially linking it to major capital retrofit projects on campus in the near future. This involves consolidating campus-wide direct digital controls (i.e., building automation systems), physical meters and manual metering points to one location, as well as further developing a meter tree. This project will provide further input into the Data Analytics platform and to the asset management module of the **Enterprise Maintenance Management System**. The asset management module, to be adopted in the coming year, will provide a database of campus equipment that lists expected replacement dates in order to plan for equipment renewal and modernization consistent with long-term strategies.

### NEW BUILDINGS

Anticipated to achieve occupancy in 2025, the **UBCO Downtown Kelowna** building aims to support future regional needs, while actively working toward meeting LEED® Gold Certification and Step 3 of the BC Energy Step Code. The proposed 100,000 sq. ft. building will offer academic, research and residence space. It is also intended to enhance community engagement through the provision of a public atrium space, an engagement learning suite for community programs, meetings and workshops; a creative innovation space; and a gallery capable of welcoming artwork from around the world to the Okanagan.

Targeting a minimum LEED® Gold certification, the final design for the future **Interdisciplinary Collaboration and Innovation (ICI) building** will integrate the goal to reduce its building and operational carbon footprint. Aiming to achieve occupancy

in 2025, ICI is intended to foster interdisciplinary knowledge and support collaborative, team-based learning and innovative approaches to teaching.

Future building projects will comply with UBCO's green building and sustainability policies and guidelines, including:

- an Outdoor Gathering Space that aims to advance Indigenous teachings and learnings through the support of land-based learning, teachings and nature interpretation in the Syilx Okanagan language;
- the Office Modular 2 that will provide additional office space to campus departments; and
- a second childcare expansion that will increase the available childcare spaces by 37, a 66 per cent increase.

### EXISTING BUILDINGS

In the coming year, UBCO will undertake recommissioning studies and projects in the following buildings:

- Creative & Critical Studies will be studied to provide deep retrofit recommendations and individual replacement options for main and terminal HVAC equipment. The following deliverables are expected from this study:
  - Overall HVAC system retrofit strategy to fulfill a major building upgrade.
  - Recommendations for replacement of individual system and terminal HVAC equipment if equipment fails before end of life.
  - Updates to equipment lists to include replacement suggestions and costs.
- Studies will be conducted on the Arts & Sciences Centre, Charles E. Fipke Centre for Innovative Research, as well as the Science and Arts buildings to determine the feasibility of upgrading the laboratory demand controls for ventilation systems. The ventilation rate of non-critical laboratory spaces is not strictly controlled causing significantly higher air changes per hour than required for occupant health and comfort. The use of upgraded controls equipment and strategies will be considered to reduce and standardize air changes during both occupied and unoccupied hours.
- Charles E. Fipke Centre for Innovative Research will also undergo a feasibility study to increase waste heat recovery of exhaust air. Currently, the strobic system – which is composed of three fans – exhausts air to the atmosphere without any heat recovery. The feasibility study is expected to provide a sufficient level of detail to support a business case whether or not to proceed with the energy conservation measure. Additionally, heat in the building is currently being served by stand-alone boilers and heat from the low temperature district energy system. This study will also consider installation of a glycol runaround loop to recover heat from the exhaust allowing for the heat to be used to pre-heat supply air to another unit.



UBCO will also renovate the **University House**, a single-family house and the first building constructed on campus. The intent of the project is to co-locate core departments in a shared space to maximize opportunities for collaboration. Energy saving measures to be implemented during the renovation include replacing the existing propane heating system with an air source heat pump and installing additional insulation.

UBCO will also initiate a night time flush program. Night flushing, or night ventilation, is a passive cooling technique that utilizes the outdoor diurnal temperature swing and the building's thermal mass to pre-cool a building through increased outdoor airflow at night. This allows radiant cooling to take place during the day when the building is occupied. UBCO is developing a sequence of operation strategy to be implemented in all the academic buildings, where applicable.

Finally, two legacy domestic hot water systems in the Cassiar Residence will be replaced with two residential condensing boilers and storage tank systems that have 95 per cent efficiency ratings. Additionally, the LED light switch-out program will continue to be implemented on a failure-based need.

## IT INFRASTRUCTURE ACTIONS

UBCO will continue to implement projects that support energy reduction, including:

- replacing desktop computers with laptops and more efficient devices as part of UBCO's IT Computer Replacement Program;
- phasing out desktop towers with docking stations to reduce power consumption;
- applying a phase-in approach to replace step-down transformer uninterruptible power supply units with power sharing, splice devices; and
- reducing the number of digital screens used for campus messaging and emergency alerts from 28 screens to 18 and replace 12 legacy screens with newer, more energy efficient models.

## B. Mobile Sources (e.g., fleet vehicles, off-road/portable equipment)

- Study the potential of converting electric golf cart batteries to a more recyclable lithium ion option.
- Complete the construction of a new equipment shed for UBCO's 100 per cent electric golf cart fleet. The new building – which will be serviced by electricity – will aid in prolonging the life of the fleet and other battery powered equipment by protecting it from the extreme fluctuations in temperature. The building also offers a space to perform maintenance, reducing the transportation of equipment to an off-campus, third-party mechanic.
- UBCO will continue reducing its reliance on fleet vehicles by consolidating off-campus trips, and decreasing the number of trips taken by encouraging fleet carpooling, walking or cycling.
- Continue to encourage sustainable mobile-fuel combustion by adhering to internal sustainable fleet procedures, replacing of retired fleet vehicles with electric and energy-efficient models, and ongoing staff training and education to support sustainable fleet use.



## C. Paper Consumption

- Implement messaging prompts through the PaperCut™ print-tracking software to increase user awareness about reducing paper consumption behaviours to align with implementation of printing charge increases.
- Continue to promote the purchase of 30 per cent or greater post-consumer recycled content paper, as well as alternative, tree-free options, including Sugar Sheet™.
- 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 invest in improved and more sustainable technologies, which provide better performance with a reduced environmental impact. This includes implementing solutions that digitize fax transmissions (i.e., fax to email) to reduce paper consumption.
- Contemplate introducing additional fees to support convenience printers (i.e., printers that are setup in offices or lab spaces for convenience access, in addition to main fleet printers) to further encourage the use of fleet printing. Field printing increases efficiencies by consolidating devices and increasing access to printer capabilities (e.g., colour printing, etc.)

## D. Fugitive Emissions

- Research and identify alternative refrigerants for those being phased out (i.e., R410a and R134a).
- Continue to centralize cooling loads from buildings to reduce the amount of equipment requiring refrigerant on campus, where possible.
- Implement the use of district scale CO<sub>2</sub> heat pumps to replace HVAC equipment which relies on traditional fossil fuels and refrigerants to heat and cool campus buildings.
- Continue to replace inefficient and older equipment.
- Conduct preventative maintenance and upgrades to HVAC systems and associated appliances.
- Continue to replace individual Ptac units in residences, on an as-needed basis.



# CAMPUS EMISSION TRENDS

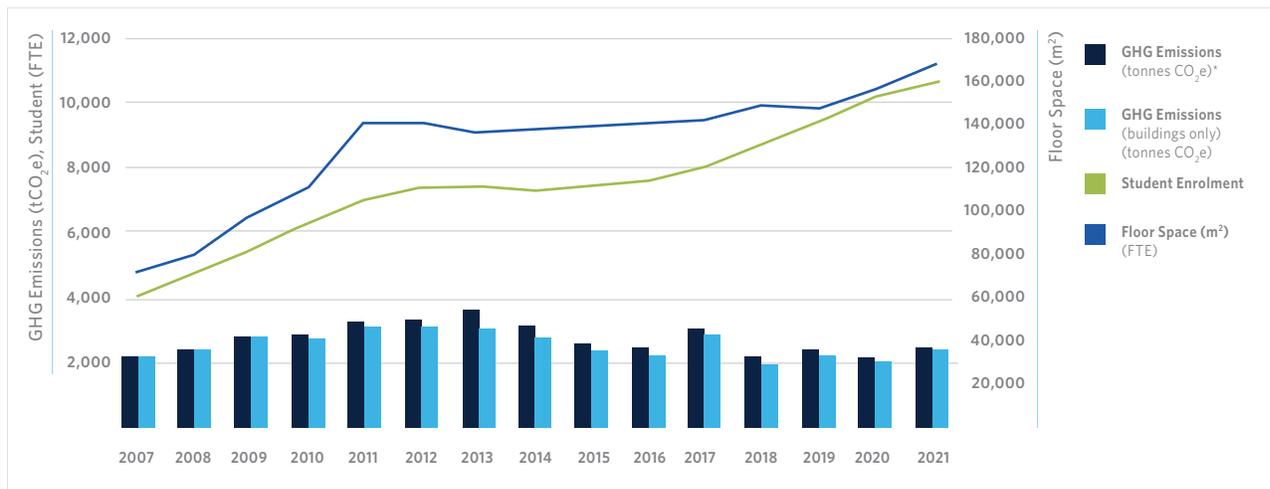
## COMPARING EMISSIONS TO GROWTH

**Figure 1** shows growth trends and total campus and building greenhouse gas emissions between 2007 to 2021. Despite the significant increases in floor area and student enrollment by over 130 and 160 per cent respectively since 2007, total GHG emissions have remained fairly stable.

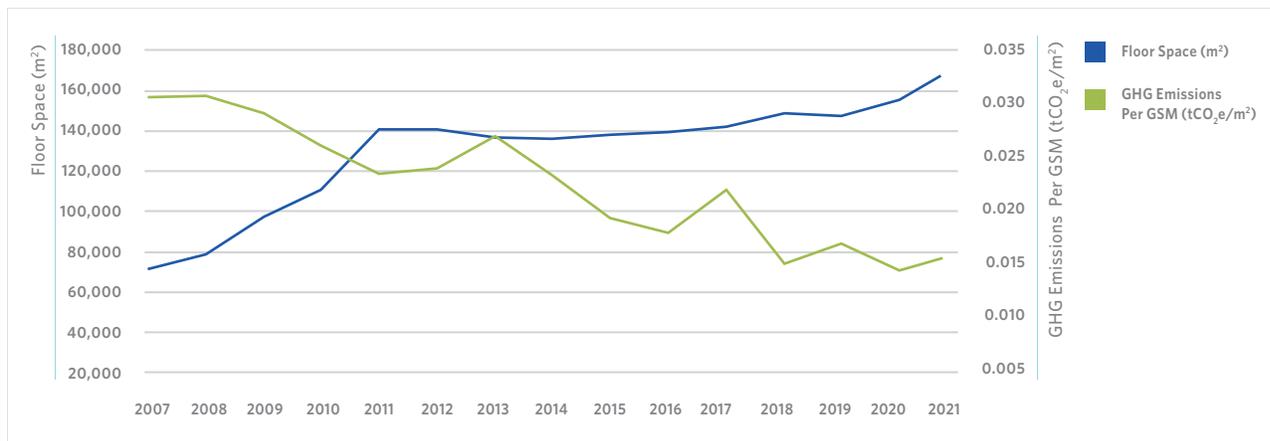
In 2021, UBCO reported an increase in total emissions by 16 per cent. The increase in the electricity emissions factor as well as the growth of our campus operations in the latter part of 2021 were factors that contributed to this change.

Another way to demonstrate campus GHG emissions performance that accounts for changes in growth is intensity-based. For example, **Figure 2** demonstrates the emissions intensity trend relative to campus growth in floor area from 2007 to 2021. Despite the significant floor area growth, GHG emissions per building gross square meter (m<sup>2</sup>) dropped from 0.030 in 2007 to 0.015 in 2021, a reduction of 51 per cent.

**FIGURE 1 ABSOLUTE GHG EMISSIONS RELATIVE TO GROWTH: 2007-2021**



**FIGURE 2 GHG EMISSIONS INTENSITY RELATIVE TO BUILDING GSM: 2007-2021**



# ABOVE AND BEYOND

## CLIMATE POLICY DEVELOPMENT

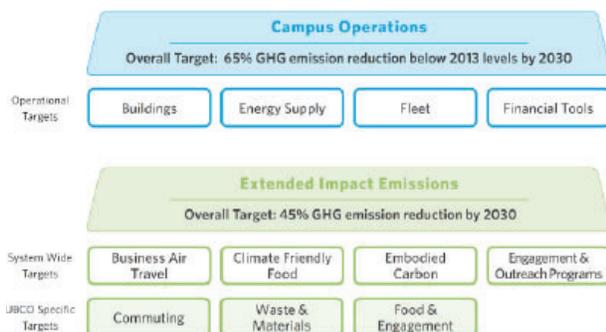
UBC's Climate Emergency Declaration provides a clear mandate to accelerate action to reduce UBC's operational GHG emissions, but it also extends beyond campus operations to emissions from areas such as waste, commuting and air travel.

In 2021, the UBC Board of Governors endorsed UBCO's first **Climate Action Plan 2030** (UBCO CAP 2030). The UBCO CAP 2030 establishes a bold course of action to accelerate GHG emission reductions from campus operations and extended (indirect) sources. These sources include how we travel to campus, our food choices, the amount of waste we produce, and how much business air travel we do leading up to 2030.

The UBCO CAP 2030 provides the overarching campus climate policy direction needed to make informed, strategic policy and investment decisions. UBCO CAP 2030 aims to reduce GHG emissions, medium-to-longer-term operational costs associated with increased carbon pricing, as well as demonstrate UBC's commitment and leadership to address climate change. This Plan takes adaptive measures in response to climate change and articulates UBCO's immediate climate adaptation response and actions going forward.

The UBCO CAP 2030 addresses how climate action is envisioned to advance across operational and extended impact emission areas, and is rooted in supporting the academic mission. It provides a critical platform for climate-informed teaching, learning and research and aligns with the vision and values of multiple campus plans. Notably, this Plan supports Outlook 2040's vision of a globally-connected, regionally-engaged campus, is responsive to 'grand' global challenges including climate change, and further progresses UBCO towards its long-term goal to achieve a net positive performance in operational energy and carbon by 2050.

### UBCO CLIMATE ACTION PLAN 2030 TARGETS



Successful delivery of the UBCO CAP 2030 will rely on the engaged participation of the entire UBC community to achieve collective impact. This is especially true for addressing UBC's extended impacts, such as commuting, air travel, food and waste. Supported by UBCO's program development, tools, resources, and purchasing policies, students, faculty and staff have an opportunity to take action and contribute to these emissions reductions through their individual choices.

Developed in parallel to the UBCO CAP 2030 and completed in 2021, the **UBCO Transportation Plan** provides direction to shift towards more sustainable modes of travel. To support ongoing campus growth and reduce commuting emissions, the Plan establishes a roadmap for meeting the transportation needs of the campus through to 2040, describes the University's Vision for the future of transportation, and articulates related objectives, targets, strategies and actions. Implementation of this plan is required to achieve the UBCO CAP 2030's commuting GHG reduction target.





## COLLECTIVE COMMUNITY ENGAGEMENT

In 2021, despite hybrid work/learn arrangements in response to the COVID-19 pandemic, UBCO continued to find innovative ways to engage its campus community in climate action.

### Extended Emissions (Scope 3) Reduction Activities

Early in 2021, programs focused on commuting and waste emission reduction activities were implemented. Campus participation in the annual spring and fall **GoByBike Week** demonstrated a strong, enduring commitment by our students, faculty and staff to use active transportation (i.e., in instances where travel to and from campus was appropriate, and also for personal commuting) for their daily commutes. During these virtual events, riders logged 942 trips, rode over 15,900 kms and reduced commuting emissions to and from campus by 3,448 kgCO<sub>2</sub>e.

UBCO also initiated a **pilot program to collect and recycle single use medical masks** and gloves from occupied laboratories and departments that handle non-hazardous materials. The pilot project has resulted in the successful collection and diversion of 13 kgs of material from the landfill. It is anticipated that expansion of the recycling program to additional laboratories will occur in mid-2022, following a review of the pilot's outcomes.

### Direct Emission (Scope 1 & 2) Reduction Activities

The Power of You, UBCO's signature behaviour change program, delivered on campus engagement activities that aligned with the return of on campus activities. In 2021, the program offered a **2<sup>nd</sup> Annual Shut the Sash Challenge** to encourage laboratories to close their fume hoods when not in use. This initiative engaged over 40 undergraduate students and resulted in a reduction of 33,031 kWh, 123 GJ and 7.5 tCO<sub>2</sub>e over the six-week challenge.

Additionally, key operational departments completed campus-wide actions. This included nightly energy reduction audits in response to the **Power of You: Lights Out and Power Down** campaigns. Staff turned off or powered down over 1,735 lights and 10 projectors/screens, and closed 48 windows as a direct result of these initiatives. Since the initiation of these voluntary audits in 2015, dedicated staff members have contributed to campus energy conservation efforts by completing 1,154 audits, turning off 32,420 lights, powering down 512 projectors/screens, and closing 3,101 windows.

In the coming year, subject to resources, UBCO will realign its existing behaviour change program with an evidence-based strategy affecting high impact areas to reduce GHG emissions, a key area of focus in the UBCO CAP 2030.

# PUBLIC SECTOR LEADERSHIP

## CLIMATE RISK MANAGEMENT

Driven by local conditions, recent climate events and rapid regulatory changes, UBCO is incorporating climate adaptation, resiliency and biodiversity considerations into campus planning and operations.

### Early Integration of Climate Adaptation Planning

Early development and implementation of key sustainability plans and policies that respond to the risks associated with climate change are described in this section.

The **UBCO Whole Systems Infrastructure Plan** (WSIP, 2016) outlines high-level, sustainable campus development tactics to ensure that UBCO is resilient to future growth, as well as changes to utility rates and the climate. The WSIP set UBCO's first climate action goal to achieve a "net positive performance in operational energy and carbon" by 2050. The Plan integrates climate sensitivity analysis for energy and carbon reduction measures; landscape, ecology and biodiversity actions and proposed performance indicators.

The **UBCO Integrated Rainwater Management Plan** (IRMP, 2017), was developed to responsibly manage the rainwater that falls on campus. It also supports natural hydrological cycle with co-benefits to campus ecology and biodiversity. As part of the IRMP's development, UBCO completed the following assessments:

- an overland flood path assessment to identify buildings in the campus core at risk of flooding in extreme rainfall events, and
- an assessment of its existing grey water infrastructure, which is currently at capacity.

The Plan achieved 100 per cent diversion of rainwater from the municipal system by utilizing stormwater modelling and predicted climate changes to provide infrastructure resiliency. The successful achievement demonstrates best practice in green infrastructure and low impact development.

Adherence to, and implementation of, the IRMP's recommended measures—including the use of Low Impact Development techniques and overland flow path routing—are essential to reducing the impacts of future risks related to climate change.

Additional climate adaptation planning developed to-date identify short, mid and long-term opportunities:

- Climate modelling for new buildings (e.g., Skeena Passive House Project).
- Biodiversity and ecology recommended performance indicators, actions and co-benefits and implementation of multiple actions (WSIP, 2016).
- Climate Adaptive Design Recommendations (UBCO Design Guidelines, 2018).

- Wildlife and Species protection and restoration planning (ongoing).
- More active and passive cooling into its buildings to mitigate future impacts.

### Current and Future Climate Adaptation Planning

While the UBCO CAP 2030 focuses on climate mitigation to reduce fossil fuel impacts, responding to climate change will also require the development of adaptation strategies to reduce the effects of climate change. Climate adaptation, resilience and biodiversity planning will prepare UBCO to protect its infrastructure and ecological assets against future climate risk. It will also lay the groundwork for new regulatory climate resiliency planning and reporting requirements, expected to result from the release of Clean BC's Climate Preparedness and Adaptation Strategy, in 2022.

Actions required to build campus adaptation and resiliency are described in the UBCO CAP 2030 and include the following key areas:

- There will be a continued immediate campus response to the recent heat wave and wildfires, with a focus on building retrofits, addressing indoor air quality measures for wildfire smoke.
- UBCO will develop procedures and protocols for facility managers in response to increased summer temperatures, and decreased outdoor air quality due to wildfire smoke for new and existing buildings (e.g., implement CO<sub>2</sub> sensors in air handler units as a proxy for Indoor Air Quality Monitoring, as well as automated smoke mitigation operational sequences to reduce amount of indoor air when critical thresholds are reached).

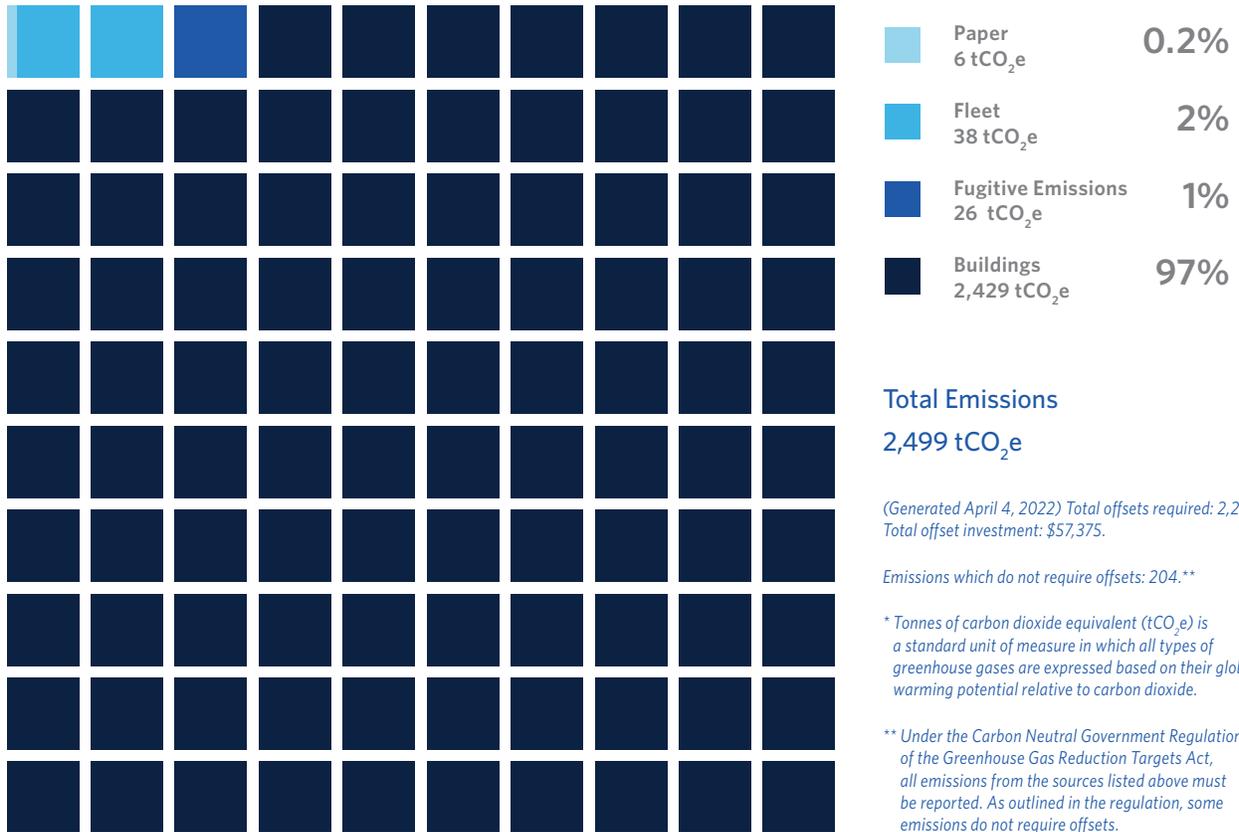
UBCO has also begun the development of a **multi-hazards study** to inform short, medium and long-term opportunities to reduce climate-related risks to campus infrastructure.

From a policy perspective, UBCO will begin to focus on adapting UBC's **Climate Ready Building Requirements** for new construction. UBCO will also begin to scope the development of a broader Climate Adaptation, Resiliency and Biodiversity Strategy that incorporates other related plans, policies and initiatives as a subsequent UBCO CAP 2030 phase.



# EMISSIONS PROFILE 2021

## UBC OKANAGAN GREENHOUSE GAS EMISSIONS BY SOURCE FOR THE 2021 CALENDAR YEAR (tCO<sub>2</sub>e\*)



2021

CLIMATE CHANGE  
ACCOUNTABILITY REPORT  
UBC OKANAGAN

Skeena

UBC International House



THE UNIVERSITY OF BRITISH COLUMBIA

sustainability