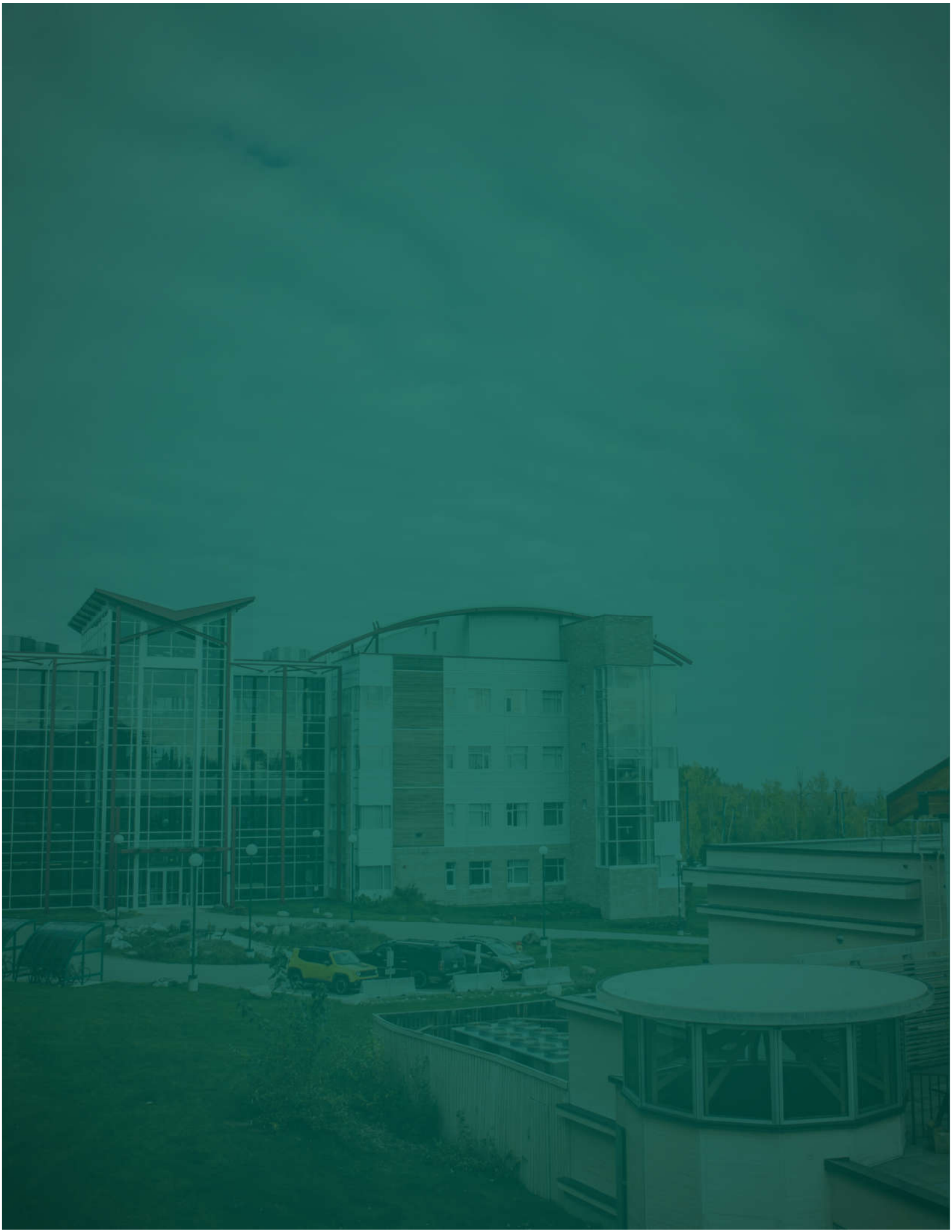


**2021 PSO**  
**Climate**  
**Change**  
Accountability  
**Report**





# 2021

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## Foreword from President and Vice Chancellor Geoff Payne

With the tragic wildfires and floods we witnessed so close to home, 2021 showed us once again the stark reality of climate change. There is no time to delay in our pursuit of a more sustainable world that we can safely pass on to future generations. UNBC has a responsibility to play a leading role, both in our region and beyond, towards that goal. As outlined in this Climate Change Accountability Report, we continue to make meaningful strides in our efforts to reduce emissions. This includes successes such as the return of our Bioenergy Plant to full service after recent maintenance challenges, as well as the continued efforts to reduce our energy usage, for example through the adoption of Passive House design in our new buildings.

We are Canada's Green University because the UNBC community is committed to working together to find ways to make our operations more efficient and sustainable every day. Our students, faculty, and staff all play an integral role in ensuring UNBC continues to be a leader in environmental stewardship. However, we still have much to do. That is why I am in full support of our newly formed Green University Strategic Vision Task Force, which will empower leaders from across our community to help evolve the strategic vision for sustainability at UNBC.

The climate challenges we face are stark and clear for all to see. Yet I remain optimistic that we can still effect meaningful change. At UNBC, we must continue to lead and work together tirelessly to put impactful actions in place that will ultimately help build a more sustainable world.

## Declaration Statement

This PSO Climate Change Accountability Report for the period January 1, 2021 to December 31, 2021 summarizes our greenhouse gas (GHG) 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, the University of Northern British Columbia's final 2021 Climate Change Accountability Report will be posted to our website at [www.unbc.ca](http://www.unbc.ca)



## Emission Reductions: Actions & Plans

### Stationary Sources

#### Actions Taken to Minimize Emissions

Stationary energy use in buildings is the most significant contributor of emissions at UNBC. In 2021, building energy use contributed to more than 97% of total emissions. As in previous years, UNBC continued to implement measures in 2021 to reduce emissions from stationary sources. One of the most impactful projects completed was the first phase of Round 2 of the Continuous Optimization program. Undertaken in partnership with BC Hydro, the Continuous Optimization program involves investigating existing building systems to identify and implement opportunities for energy savings. The first round of the program took place between 2013 and 2017, tackling nine of the largest buildings at the Prince George campus. Eight of those nine buildings were then selected for a second round of the program. In this second round, the first set of buildings completed in 2021 included the Agora, Research Laboratory, and Teaching Laboratory. A total of 25 existing measures were reconfirmed and 13 new measures implemented, including controls optimization, equipment scheduling, and new installations and upgrades. In total, from this first phase completed in 2021, it is expected that electricity savings will be over 1 million kWh per year and fuel savings over 6,000 GJ per year, ultimately leading to an emissions reduction of approximately 105 tonnes of CO<sub>2</sub>.

Another major effort in the pursuit of increasing energy efficiency and reducing emissions is the multi-year series of heat exchanger upgrade projects that UNBC is undertaking. In 2021, a comprehensive upgrade was completed for the heat exchanger system in the Dr. Donald Rix Northern Health Sciences Centre, following on from upgrades completed in previous years, including in the Power Plant, Charles J. McCaffray Hall, Teaching & Learning Centre, and the Conference and Northern University Student Centre. The main intent of these projects is to replace aging inefficient heat exchanger systems with newer more efficient systems. This entails replacing large inefficient plate-and-frame heat exchangers with smaller more efficient brazed plate heat exchangers. Additionally, this often involves replacing multiple large inefficient fixed speed pumps with fewer and smaller variable speed drive pumps. The redesigns can also include decoupling systems so that they can be run independently, such that equipment can be shut down when not needed. These optimizations, large and small, ultimately improve the efficiency of each system that is upgraded, thereby resulting in reduced energy consumption.

In 2021, UNBC completed its second Passive House certified building: the new Facilities Management Building (Figure 1). Building on the success of the Passive House certified Wood Innovation Research Lab completed in 2018, the new building applies various energy efficiency design measures to minimize its emissions. This includes a free cooling system wherein the building is cooled using a side stream of water from the campus domestic cold water system, instead of drawing from the main chilled water system. The Passive House design of the building ensures that its energy demands are comparatively minimal even in extreme cold or hot weather. The building is also connected to the bioenergy district heating system. Additionally, with its cantilevered design, the building demonstrated that Passive House design can also be incorporated into a unique shape.

Another important success in 2021 has been the more consistent operation of the Bioenergy Plant after recent maintenance issues. Since it began operating in 2011, the Bioenergy Plant at UNBC (Figure 2) has been the most important factor in reducing emissions, supplying up to 85% of the peak heating demand of the Prince George campus, which otherwise would be supplied by combustion of natural gas. Through both the Bioenergy Plant and the smaller Pellet Boiler that supplies



Figure 1:  
**Facilities Management Building**

heat to a number of small buildings through the winter, UNBC has been able to reduce its annual building emissions consistently by more than 60% compared to 2007 baseline levels. However, major maintenance issues, especially in 2019, had a detrimental effect on emissions reduction as the Bioenergy Plant had to be shut down for prolonged periods, resulting in increased use of the natural gas boilers. After significant efforts, including the replacement of the boiler, these maintenance issues have now been resolved, and the Bioenergy Plant is again operating optimally and displacing the use of natural gas.

### Plans to Continue Reducing Emissions

Looking ahead, UNBC will continue to work on the second round of the aforementioned BC Hydro Continuous Optimization program. The second phase of buildings was recently completed in March 2022 and work is already underway on the third phase to be completed in 2023. It is expected that these projects will result in significant electricity and fuel savings, and thus further reduce UNBC's annual building emissions.

As part of the ongoing initiative to upgrade our heat exchanger systems, multiple systems will be upgraded in the Agora building in the summer of 2022. These upgrades will provide several energy efficiency improvements, thereby reducing energy usage and emissions. Further similar upgrades in other buildings, including the energy intensive Research Laboratory, are planned to be completed in the coming years. One of the positive byproducts of the upgrades is that the return temperature of the main district heating loop is anticipated to decrease, which should eventually allow for low temperature heat recovery.

UNBC is also investigating various low carbon electrification opportunities to further displace the use of natural gas. This includes the potential conversion of domestic water heating from natural gas boilers to electrically powered heat pumps at the Northern Sport Centre (NSC). The NSC is not connected to the bioenergy district heating system and currently relies only on natural gas for its heating needs, thus providing a potential opportunity for low carbon electrification. Similarly, as the Maintenance Building currently uses propane for its space heating, a new heat pump system will also be investigated to replace the propane system.

In order to avoid the prolonged unplanned maintenance downtime that was incurred in the Bioenergy Plant in 2019 and 2020, long term major maintenance planning is being carried out with the assistance of the original equipment manufacturer. This will help establish the schedule and budget for necessary major maintenance activities that have to be carried out in the coming years to ensure the continued reliable operation of the Bioenergy Plant, thereby limiting the use of natural gas for heating.

Longer term plans to reduce emissions include investigating opportunities for heat recovery in the Bioenergy Plant and the primary district heating loop, which could have a significant effect on reducing energy consumption. Additionally, the Passive House standard that has been adopted for new buildings will also be investigated for application in retrofits of existing buildings, such that their energy demand and consequent emissions can also be minimized.

## Mobile Sources

### Actions Taken to Minimize Emissions

Fleet emissions in 2021 represented approximately 2% of total emissions. The size of the fleet reduced from 30 vehicles in 2020 to 28 vehicles in 2021. There are only five non-research fleet vehicles, one of which is a fully electric Nissan Leaf that is used by the Facilities Department. The Nissan Leaf is the main light-duty vehicle for travelling on the main campus and within Prince George. It is expected that fleet travel would have also decreased due to the COVID-19 pandemic and the increased use of communications technology to carry out virtual meetings instead of physical site visits.



Figure 2:  
**Bioenergy Plant**

In 2021, UNBC completed upgrades to its three electric vehicle charging stations, installing new Siemens Level 2 chargers, as pictured in Figure 3. These chargers are freely accessible and users only have to pay for parking. The updated chargers will provide fast, reliable, and convenient charging. This will support the use of electric vehicles by the university and wider community of Prince George, while also providing a scenic charging destination for those driving through the city. The previous chargers prior to the upgrade were older, slower, and only intermittently reliable.

### **Plans to Continue Reducing Emissions**

As fleet vehicles are replaced, UNBC will review alternative zero emissions options where feasible in order to further reduce fleet emissions, as was done successfully in the case of the Facilities Nissan Leaf. This will require collaboration between departments including the user groups and Procurement, and will likely take the form of a zero emissions fleet procurement policy, setting out a standard process for fleet vehicle replacement that prioritizes zero emission vehicles. There are already opportunities being identified wherein zero emission vehicles may be a viable replacement for certain vehicles reaching end of life. It should be noted that the majority of fleet vehicles are research vehicles that tend to travel to remote locations and typically need to be able to store and tow heavy equipment, as well handle rough terrain. The improvement of charging infrastructure in remote areas and increased availability of affordable zero emission vehicles that can meet these requirements will be important in enabling a faster conversion to a zero emission fleet. In addition, with the increasing adoption of electric vehicles by the UNBC community and anticipated increase in electric fleet vehicles, further planning will be carried out on the long term strategy for charging electric vehicles on campus.



**Figure 3:**  
**Level 2 Electric Vehicle Chargers**

In 2022, a new gas fleet card system is being adopted to replace the existing system. It is anticipated that this will allow for easier data tracking of fuel consumption. While the program is voluntary, all fleet vehicle owners were strongly encouraged to participate. The transition to the new system provided an opportunity to connect with the fleet vehicle owners and reiterate the importance of tracking and reducing fleet emissions.

### **Paper Consumption**

#### **Actions Taken to Minimize Emissions**

In 2021, paper emissions accounted for less than 1% of total emissions. At 18.9 tonnes of CO<sub>2</sub>, this was the lowest year for paper emissions since reporting began in 2010. While this may have been skewed somewhat by the effects of COVID-19, paper emissions have been decreasing significantly even before COVID-19: paper emissions were already at 19.2 tonnes of CO<sub>2</sub> in 2019, a significant reduction from the high point of 79.8 tonnes in 2011. This is owing to a decrease in the overall use of paper and an increase in the amount of recycled and alternative fibre content in paper that is purchased, which continued in 2021.

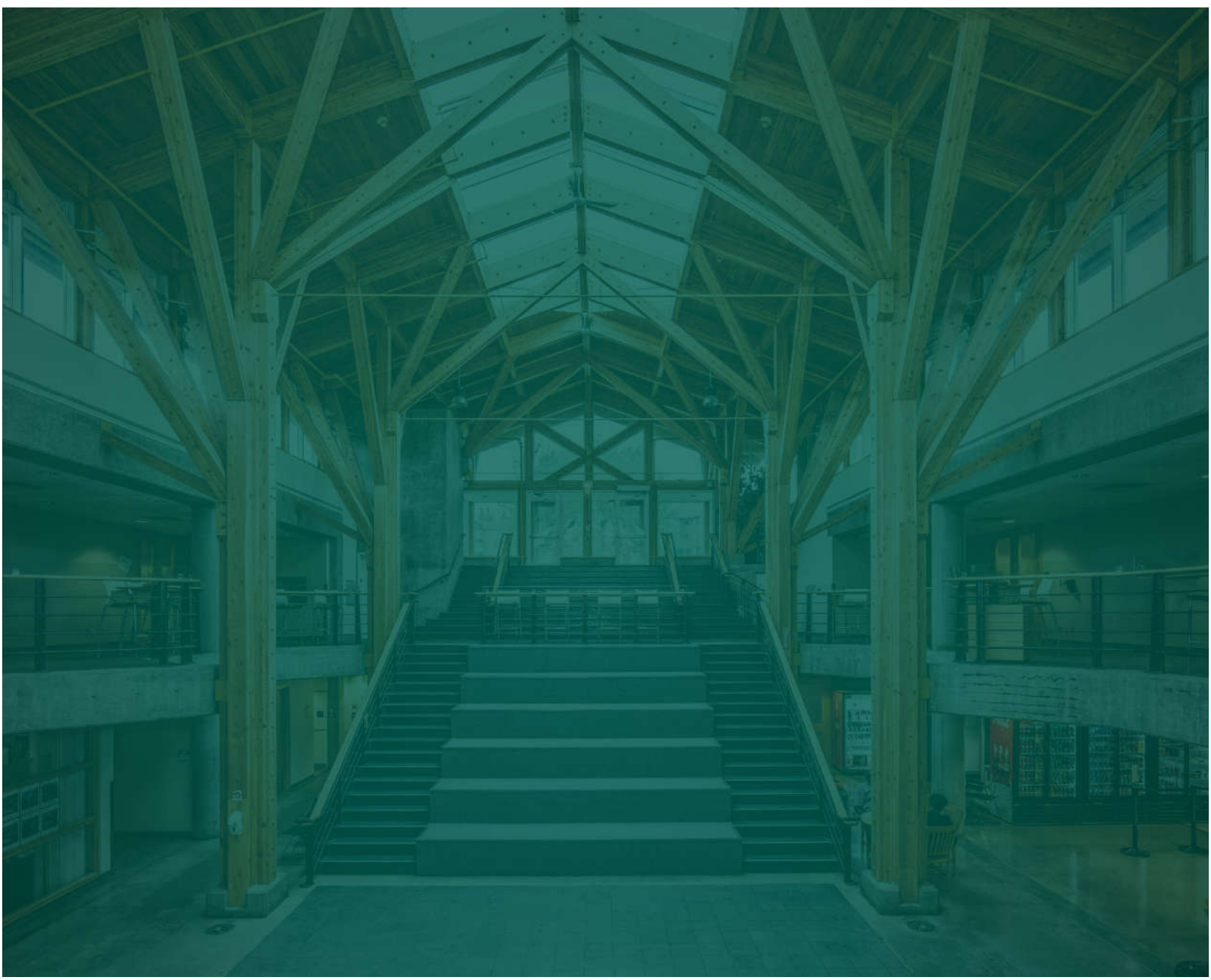
UNBC procured a significant amount of paper with recycled content and alternative fibre sources in 2021. This included 2,400 units (1 unit = 500 sheets) of Sugar Sheet paper which is sourced from waste fibre generated from sugar cane processing. This was in addition to over 1000 units of paper with recycled content ranging from 10% to 30%. Paper without any recycled content or alternative fibre accounted for only 11% of the total amount purchased.

The continued transition from paper to digital processes, such as the more prevalent use of digital signatures, also contributed in reducing paper emissions. The increased use of virtual instead of in-person meetings would have also reduced the usage of paper materials for meetings. Tools such as PaperCut for printing also provide a mechanism for individual users, including staff, to monitor their paper usage and limit unnecessary printing.



## Plans to Continue Reducing Emissions

UNBC will continue to increase the proportion of paper that is procured with recycled content and from alternative fibre sources, with the aim of reducing the overall emissions intensity of paper consumption. In addition to procurement practices, paper consumption will also be reduced through the continued transition from paper-based to digital workflows; a number of such projects are already underway and being implemented by the UNBC Information Technology Services department.





## 2021 GHG Emissions and Offsets Summary Table

### University of Northern British Columbia 2021 GHG Emissions and Offsets Summary

GHG Emissions created in Calendar Year 2021	
Total Emissions (tCO <sub>2</sub> e)	7,182
Total BioCO <sub>2</sub>	4,528
Total Offsets (tCO <sub>2</sub> e)	2,654
Adjustments to GHG Emissions Reported in Prior Years	
Total Offsets Adjustment (tCO <sub>2</sub> e)	3
Grand Total Offsets for the 2021 Reporting Year:	
Grand Total Offsets (tCO <sub>2</sub> e) to be Retired for 2021 Reporting Year	2,657
Offset Investment (\$25 per tCO <sub>2</sub> e)	\$66,425

### Retirement of Offsets

In accordance with the requirements of the Climate Change Accountability Act and Carbon Neutral Government Regulation, University of Northern British Columbia (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.

## Climate Risk Management

UNBC completed a recent Risk Assessment within the Facilities department that included climate related risks, including wildfires, disruptions to campus water supply, and potential situations that would require campus evacuation. Various actions were identified from that assessment, including the replacement of critical underground domestic water valves (an initiative that is already underway), and the ongoing work on wildfire risk mitigation in the forested areas of the Prince George campus. UNBC has also partnered with the City of Prince George on flooding risks related to Shane Lake dam and the Shane Creek watershed.

Forest management to mitigate wild fire risks is an ongoing and constant priority for the university, which has only been further emphasized in the wake of more frequent and severe wildfires in recent years. To prepare for wildfire smoke, the Facilities department has reviewed the outdoor air flushing programming and capabilities. Additional spare air filters are also secured each fire season due to more frequent replacements being required.

Severe heat waves are another climate risk identified for UNBC, as was evident in 2021. Start-up prep and maintenance of the chilled water system has taken on additional importance. Localized individual AC units have also received similar attention to ensure they are functioning well. Additionally, mechanical cooling is included in the specification for all new buildings, largely as a provision for current and future climate change impacts. The rising peak summer temperatures will also inform the investigation into the replacement or upgrade of the existing cooling towers, and any other central chilled water system upgrades. As has been observed in recent years, preparing for and reacting to increasingly severe climate events does incur additional costs, including in the form of increased utility costs (e.g. high electricity use for chillers during a heat wave) and increased maintenance costs (e.g. cost of additional spare filters due to wildfire smoke).

Recent years have also shown the value of having back-up systems. For example, when the Bioenergy Plant had unplanned prolonged shutdowns due to maintenance issues in 2019 and 2020, existing natural gas boilers were used to maintain heating on campus. Similarly, in the event of power outages, diesel generators automatically start up to power emergency circuits. For emergency situations in which most students and staff cannot go to the campus, COVID-19 has proven that the university is still able to function and deliver most of its core services remotely using communication technologies like video conferencing.

The two most recently constructed UNBC buildings have both been Passive House certified, and all future new buildings are expected to meet the same standard. This strategy will be beneficial for the university's resilience to a changing climate. Passive House buildings are more resilient to both higher and lower temperature extremes. They require less energy to operate and are slower to lose or gain heat in the case of a power outage. As a longer term measure, UNBC will also investigate adopting the same Passive House strategies in potential retrofits of other existing buildings.

## Other Sustainability Initiatives

There are a number of ongoing initiatives at UNBC that support sustainability, including the following:

- The Green University Strategic Vision Task Force is a newly formed group that builds on the previous Green University Planning Committee, and acts as a central multi-stakeholder committee consisting of senior administration, staff, faculty, and students. This Task Force will be responsible for overseeing the overall strategic vision for sustainability at UNBC.
- UNBC is one of four research universities in British Columbia that hosts program coordinators for the Pacific Institute for Climate Solutions (PICS). Through PICS, UNBC collaborates with other universities on shared climate related initiatives.
- UNBC has been part of BC Hydro's Energy Management program since 2010. Through this program, BC Hydro helps to fund the Energy Manager position as well as a variety of energy conservation projects and campaigns. This includes the Energy Wise Network program, through which UNBC organizes an energy conservation campaign every year for students, staff, and faculty. The most recent such campaign centered around an Energy Bingo game that included a number of tasks to engage participants in energy conservation and sustainability.

- The Facilities department continues to provide tours to interested visitors of the Bioenergy Plant and Pellet Boiler, as well as more recently the new Passive House certified buildings. In addition, the Energy Manager or Facilities Director will provide guest lectures or collaborate with the academic departments for research or coursework (e.g. providing a tour of roof solar panels for a student group doing a project on a solar power plant). UNBC also participates in external sustainability activities, such as the Prince George Electric Vehicle Experience event that took place in October 2021 (Figure 4).
- UNBC established a recycling program in 1992, which today includes an in-house recycling centre to collect and compact its recyclables, allowing for comprehensive collection of materials. UNBC also offers recycling receptacles for batteries as well as a drop-off bin for recyclable electronics. Additionally, during demolition on renovation projects, the Facilities team preserves as much reusable material like furniture, insulation, and lighting as possible so that it can be reused where needed in the future.
- UNBC maintains a Green Fund that provides seed grants for innovative research, education, and civic engagement projects that promote sustainability at UNBC. The program was started in 2009 through a levy on parking fees. It has funded over \$150,000 worth of projects.
- The Energy Conservation Revolving Loan Fund is maintained by the Energy Manager and provides funds to implement energy efficiency projects. Energy cost savings are used to repay the loan and fund future energy projects. The fund was created in 2012 when \$250,000 was made available for energy project funding. To date, projects worth a total of \$3 million have been funded.
- To promote cycling to campus, UNBC offers secure covered bike storage, six stand-alone high-security bike lockers, a bike repair station, shower facilities, and lockers for cyclists. In addition, all UNBC undergraduate and graduate students participate in the U-Pass transit program, which offers a discounted rate for unlimited access to public transit. For those commuting by car, UNBC also supports a carpooling program with a discounted parking permit.
- In partnership with the Feed BC program, UNBC Food Services supports local agriculture and food businesses through local food production, procurement, and active student engagement.
- As an additional sustainability benefit of the Bioenergy Plant, bio-ash resulting from the process is collected and used as a fertilizer at a local farm, through a permit from the BC Ministry of Environment, thereby diverting it from simply being landfilled.



**Figure 4:**  
**UNBC at the 2021 Prince George Electric Vehicle Experience Event**

## Success Stories

The Continuous Optimization program, supported by BC Hydro, continues to be very beneficial in reducing energy usage and consequent emissions at UNBC. In 2021, UNBC concluded the second round of Continuous Optimization for the first phase of buildings: the Agora, Research Laboratory, and Teaching Laboratory. A number of existing measures were verified and confirmed, while several new energy efficiency measures were implemented. By reducing electricity and fuel usage, it is expected that the measures for these three buildings alone will reduce emissions by 105 tonnes of CO<sub>2</sub> annually. In addition, the cost savings will be approximately \$160,000 annually in avoided utility costs. Significant savings are similarly expected as UNBC completes the second and third phases of the second round of Continuous Optimization. The Continuous Optimization program is another example of the success that UNBC has had working closely with BC Hydro since joining the Energy Management program in 2010.

2021 also saw the successful completion of the Facilities Management Building (FMB), UNBC's second Passive House certified building. It offered a number of design challenges that were different from the first UNBC Passive House certified building: the Wood Innovation Research Lab (WIRL) that was completed in 2018. This included incorporating a unique cantilever design that is not typical for Passive House buildings that tend to be more box-like in shape. The building also has no gas connections and is tied into the bioenergy district heating system. Furthermore, it is cooled without additional energy input by using the campus domestic cold water system. Both FMB and WIRL have proven that different types of buildings can be successfully built to a Passive House standard in Northern BC, on budget and on schedule, using local materials and contractors. Not only will these buildings use significantly less energy, they will also be more resilient to the changing climate.

One final success story to highlight was not completed in 2021, but was recently revisited as part of a student tour: the solar panel system on the roof of the Conference and Northern University Student Centre, as shown in Figure 5. The solar panels were installed in 2015 when sixteen undamaged panels were donated by School District 57 after a fire at a local elementary school. UNBC procured nine additional panels and the system was installed mainly as a teaching instrument, to showcase a renewable energy source in action and provide an experiential learning opportunity for students at all levels. In the seven years since install, all the solar panels have remained successfully operating without any need for maintenance, simply generating and supplying power to the building. The solar panel energy data can be viewed easily in real-time. To date, the solar panels have generated more than 35,000 kWh of energy, meeting the expected design capacity of 5,000 kWh per year. Thus they remain a valuable demonstration of renewable energy generation at UNBC.



Figure 5:

## **Solar Panels on the Roof of the Conference and Northern University Student Centre**



## Executive Sign-off

Signature



Rahim Somani

Name (please print)

May 24, 2022

Date

Vice-President, Finance and Administration

Title

If you have an idea of how UNBC can further reduce its GHG emissions or if you have a success story to share, please contact Energy Manager Sahil Dino at [sahil.dino@unbc.ca](mailto:sahil.dino@unbc.ca)

