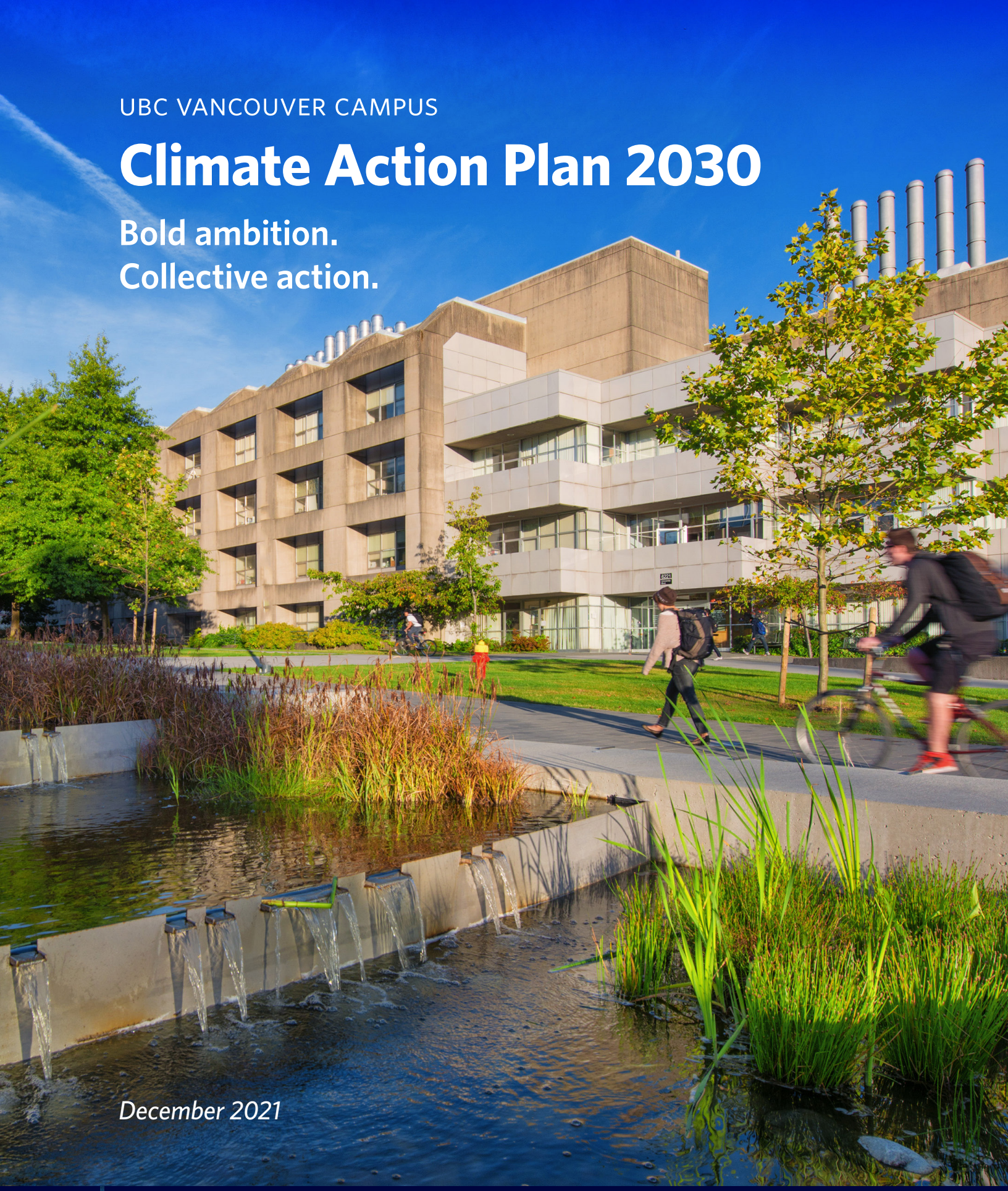
UBC VANCOUVER CAMPUS

Climate Action Plan 2030

Bold ambition.
Collective action.



December 2021

THE UNIVERSITY OF BRITISH COLUMBIA

ACKNOWLEDGMENT

We begin by acknowledging that UBC's Vancouver-Point Grey campus is located on the traditional, ancestral and unceded territories of the xʷməθkʷəy̓əm (Musqueam) people. The land it is situated on has always been a place of learning for the Musqueam, who for millennia have passed on their culture, history, and traditions from one generation to the next on this site.

sʔiːɬqəý qeqən (Double-Headed Serpent Post)"
Brent Sparrow Jr., Musqueam
PHOTOGRAPHER: UBC BRAND & MARKETING/HOVER COLLECTIVE

Cover: Aerial View of UBC
PHOTOGRAPHER: UBC BRAND & MARKETING/HOVER COLLECTIVE

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Executive Summary

Building on two previous Climate Action Plans and significant GHG reductions already achieved, UBC Vancouver's Climate Action Plan (CAP 2030) sets a bold vision and accelerated pathway for a broader scope of emission reductions in response to UBC's 2019 Declaration on the Climate Emergency:

> *CAP 2030 will position UBC as a model of how universities can mobilize to address the climate emergency and Paris targets through bold, impactful actions to accelerate and deepen GHG reductions across operations, and expanded action to reduce extended emissions.*

UBC's Climate Emergency Declaration recognizes the severity, complexity, disproportionate impacts of, and responsibilities for, the climate crisis. It commits UBC to develop a collective response that embeds climate justice throughout its activities and priorities. With this endorsement, the UBC Board of Governor's emphasized that climate action continues to be a top strategic priority for the University. Specifically, the Declaration gives impetus for UBC to update plans to address the climate crisis with the urgency it requires.

The Climate Emergency Declaration and Climate Emergency Community Engagement process reaffirmed UBC's commitment to accelerate emissions reductions in alignment with the Paris Agreement of limiting global warming to 1.5°C. Meeting the 1.5°C Paris Target (IPCC pathway) requires a global net anthropogenic GHG reduction of 45% from 2010 to 2030 and reaching net zero around 2050.

This Plan sets targets that will accelerate and broaden UBC's climate action with a 2030 GHG reduction target of 85% on operational emissions (2007 baseline year) and 45% on extended emissions (2010 baseline year), in addition to advancing UBC's target for net-zero operational emissions to 2035—15 years ahead of the original 2050 target. This Plan helps to advance many facets of UBC's strategic plan goals by creating platforms for climate informed teaching, learning and research, and leverages multiple Campus as a Living Laboratory opportunities to maintain UBC's reputation and leadership position in climate action and sustainability.

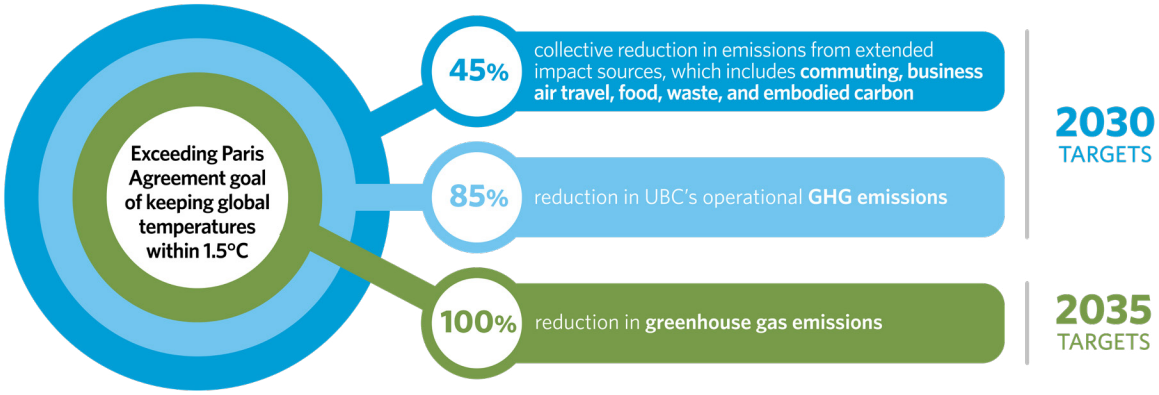

Figure 1: CAP 2030 Targets

CAP 2030 addresses operational emissions (buildings, energy and fleet), which are within existing CAP reduction targets, and extended emissions (commuting, food, business air travel, embodied carbon, waste and materials, and paper), which are considerably larger and are now being included to align with the intent of UBC's Climate Emergency Declaration.

Without further commitment to accelerate action across all areas, UBC's GHG emissions will continue to increase substantially, risking UBC's reputation and the many associated benefits, and exposing the institution to considerable energy and carbon liabilities in the future.

In 2022, UBC will pay a carbon price of $75 for each tonne of carbon dioxide (tCO_2e) emitted ($50/$tCO_2e$ for BC Carbon Tax and $25/$tCO_2e$ for public sector offset requirements). UBC Vancouver currently pays overall carbon costs of around $3 million per year. This will increase in the future if UBC does not continue to decrease scope 1 and 2 carbon emissions, and as carbon pricing escalates as part of government climate policy. Given that equipment and infrastructure exist for many years, UBC's expected future carbon liability would accumulate to approximately $100 million over the next 20 years if no further actions are taken to reduce carbon emissions. Without UBC's past action, this liability would have been more than double this amount.

Over 130 staff, faculty and students from across both campuses were engaged to develop CAP 2030 targets, actions and implementation pathways across all goal areas. Through an online survey and virtual public engagement events, we heard from 764 participants from the Vancouver Campus about the emerging CAP 2030, and the barriers and opportunities for climate action on campus. This Plan puts forward UBC Vancouver-led and system-wide actions that, if all actions, strategies and plans articulated in this Plan are implemented will achieve the 2030 GHG targets.

CAP 2030 is a UBC-wide effort across both the Vancouver and Okanagan campuses, and will require continued leadership, increased resourcing, and cross-campus engagement with the academy and collaboration from many units across both campuses. The CAP is accompanied by an accountability framework that outlines responsibilities for implementation, monitoring progress, and governance for decision making over time.

1. Introduction

1.1 A CALL TO URGENT ACTION

UBC has established a clear Vision Statement for climate action that guides accelerated action in the Climate Action Plan 2030 (CAP 2030) for both the Vancouver and Okanagan campus:

> *CAP 2030 will position UBC as a model of how universities can mobilize to address the climate emergency and Paris targets through bold, impactful actions to accelerate and deepen GHG reductions across operations, and expanded action to reduce extended emissions.*

Three objectives for the UBC Vancouver Climate Action Plan are reflected in UBC's Climate Emergency Declaration mandate.

01	Setting new targets that accelerate UBC's path toward achieving net zero emissions target prior to 2050.
02	Applying a climate justice lens to the policies and actions developed in CAP 2030.
03	Expanding CAP scope to include areas of influence extending beyond UBC's operations, such as commuting, air travel, food systems, materials and waste.

These objectives provide direction to help achieve the Vision while considering the inequitable impacts (i.e. human and nature's justice) of climate change and subsequent responses on marginalized communities, including an understanding that the ability to partake in sustainable actions may be constrained by lack of privilege and inequality.

UBC'S CLIMATE EMERGENCY DECLARATION

The UBC Climate Emergency Declaration was prompted by a student-mobilized open letter signed by over 1,600 students, staff, faculty and campus organizations and participation of over 5,000 UBC students, faculty and staff in the September 27th, 2019 Global Climate Strike.

UBC's Board of Governors unanimously endorsed a Declaration on the Climate Emergency in December 2019, joining over 1,700 jurisdictions around the world making similar declarations around this time.

In February 2020, UBC launched a Climate Emergency Community Engagement process, overseen by a task force of students, staff and faculty, with support and input from the UBC Climate Hub. This process resulted in the UBC Climate Emergency Engagement Final Report and Recommendations identifying nine overarching strategic priorities to advance climate action, including "supporting the forthcoming recommendations and new interim emissions targets emerging from the Climate Action Plan 2030 process".

The Climate Emergency Declaration and Climate Emergency Community Engagement process reaffirm UBC's commitment to accelerate emissions reductions in alignment with the Paris Agreement of limiting global warming to 1.5°C[1]. Meeting the 1.5°C Paris Target (IPCC pathway) requires a global net anthropogenic GHG reduction of 45% from 2010 to 2030 and reaching net zero around 2050.

UBC's declaration recognizes the severity, complexity, disproportionate impacts of, and responsibilities for, the climate crisis. It commits UBC to develop a collective response that embeds climate justice throughout its activities and priorities. With endorsement in principle of the Report and Recommendations from UBC's Climate Emergency Task Force, the UBC Board of Governors emphasized that climate action continues to be a top strategic priority for the University, providing direction for UBC staff to update plans to address the climate crisis with the urgency it requires.

CAP 2030 represents a significant step as the third CAP for the Vancouver Campus, building on existing climate achievements guided by CAP 2010 and CAP 2020. Informed by the Vision Statement and Objectives, this Plan provides UBC Vancouver-specific greenhouse gas (GHG) emission reduction targets and actions, as well as cross-campus (Vancouver and Okanagan) actions that support UBC system-wide GHG emission reduction targets across all action areas.

[1] *https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement, accessed 13th August 2021*

1.2 PURPOSE OF THE UBC CAP 2030

This Plan provides the overarching campus climate policy direction to make informed and strategic policy decisions to reduce GHG emissions, to increase climate adaptation and increase climate resiliency.

Climate Adaption is the process of adjustment to actual or expected climate and its effects to live with and minimize destruction and suffering. Climate resiliency can be thought of as an ongoing process of diverse, interconnected relationships and processes that activate and build up resilience-enhancing capacities within and across a community.

Implementing the Plan will reduce medium to longer term operational costs associated with increased carbon pricing, increase the future resiliency of the campus to withstand the impacts of acute climate shocks and events resulting from climate change, and to continue to demonstrate UBC's commitment and leadership to address climate change through a climate justice lens.

Some actions in this Plan are already underway, or set to begin, while others will require further study to advance. Through strategic investment decisions in high impact climate action areas over the next 10 years, UBC Vancouver is setting a course to leverage institutional, operational and intellectual capacities to chart a leadership path for other similar post-secondary institutions to emulate. These investments will help support research, attract and retain faculty, staff and students, and be a role model for other universities to follow.

Further, the anticipated advancement in campus de-carbonization and energy efficient technologies will provide a platform to enhance teaching, learning, and research, by partnering with faculty researchers devoted to help advance innovation in these areas and promote Campus as a Living Laboratory, positioning the University as a testbed of innovation.

1.3 CLIMATE ACTION: A LONG RUNNING PRIORITY FOR UBC

Climate action has been a priority for UBC for the past two decades, especially with regards to operational emissions (scope 1 and 2). UBC achieved its Kyoto Protocol targets for academic buildings five years ahead of schedule through major energy efficiency upgrades, including the ECOTrek project, which formed part of UBC's first Sustainability Strategy.

UBC's first Climate Action Plan in 2010 set a decarbonization pathway to a 100% GHG reduction by 2050 (net zero), with interim targets for a 33% GHG reduction for 2015 and 67% for 2020. These targets guided multiple new projects and initiatives including the introduction of bio-energy, energy conservation and advancing high performance green buildings. For example, the Bio-energy Research and Demonstration Facility (BRDF), represented one of the major projects that helped UBC achieve operational GHG savings of over 35% from 2007. The new BRDF expansion project (which was completed in September 2021) will help achieve a total reduction in campus operational emissions of approximately 60% compared to 2007. This represents a major achievement and will move UBC significantly closer to its target of a 67% reduction in GHG emissions.

UBC has built a strong global reputation on climate action; in 2019, Times Higher Education ranked UBC as the top university globally in addressing the climate crisis. UBC has also played an important role in elevating this issue across the global university network, including through the University Climate Change Coalition (UC3), the University Alliance for Sustainability (UAS), the International Sustainable Campus Network (ISCN) and the U7+ Alliance that help ensure higher learning institutions across the globe are effective agents of change.

1.4 KEY DRIVERS FOR THIS PLAN

In 2018, the Intergovernmental Panel on Climate Change (IPCC) released a special report on the impacts of global warming. It determined the impacts of climate change would likely be worse than previously expected, and the previously assumed safe limit of a 2°C increase would result in irreparable damages, and an increased chance of runaway climate change. The Report found that limiting warming to 1.5°C would help protect against the worst changes. It is commonly understood that the 1.5°C limit should be seen as the maximum safe level. Limiting climate change to this level will require global net anthropogenic GHG reductions of 45% by 2030 (below a 2010 baseline), and to net zero by 2050. Global climate models are warning of an alarming 3-4°C increase in temperatures by the end of the century.

2021 IPCC REPORT

With the latest IPCC Report (Climate Change 2021: The Physical Science Basis[2]) comes a renewed urgency to act to limit severe climate change. Based on this report, **"only rapid and drastic reductions in greenhouse gases in this decade can prevent such climate breakdown, with every fraction of a degree of further heating likely to compound the accelerating effects."**

Key highlights from the IPCC Report include:

A3: Increased extremes in heatwaves, heavy precipitation, droughts, tropical cyclones, and their connection to human influence, has strengthened.

B1: Global warming of 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions CO_2 and other greenhouse gas emissions occur in the coming decades.

D1: Limiting human-induced global warming to a specific level requires limiting cumulative CO_2 emissions and rapid and sustained reductions in CH_4 methane emissions to limit the warming effect and improve air quality.

[2] https://www.ipcc.ch/report/sixth-assessment-report-working-group-i/, *accessed 13th August 2021*

In September 2019, millions of people around the world participated in peaceful marches in the lead up to the United Nations Climate Summit. The marches, initiated by the youth-led climate movement Fridays For Future, built on the environmental activism of Indigenous Peoples, who have historically and continue to be on the front lines of both the impacts of climate change and the activism required to progress towards a more sustainable and just future for generations to come.

Figure 1: UBC Climate Strike, September 2019 [Photo: Joachim Zens]

A purpose of these student led marches and strikes was to raise awareness of the disproportionate impact climate change is having and will continue to have on the future of today's youth. Expanded through student activism to include allies of all ages, the September 2019 climate marches became some of the largest protest movements in the world, and were a catalyst for a series of Climate Emergency Declarations to be made globally, including by UBC.

SUMMER 2021 HEAT WAVE

The heat wave and subsequent wild fires experienced in Summer 2021 provided a renewed focus on the urgency of climate action, through mitigation, adaptation and resiliency lenses. Climate scientists[3] noted that the **"extreme heat was virtually impossible without human-caused climate change".**

Similarly, wildfires driven by the hotter climate are becoming more and more common in our province, releasing huge quantities of GHG emissions and smoke pollution, impacting our unique biodiversity, displacing communities and magnifying mental health and wellbeing risks across BC and beyond.

This has presented significant challenges to human health and the biodiverse ecosystems that sustain us. Critical impacts include the unprecedented displacement of people and wildlife, and hazardous air-quality and heat waves across BC and beyond, leading to health complications and deaths, and affecting the ability for thousands of people to work and live comfortably across the province. Severe and increasingly common events such as heat waves and intense rain represent an opportunity to leverage nature-based solutions for heat stress, through the shading provided by the urban tree canopy and rainwater management provided by vegetation and green spaces.

1.4.1 INTERNAL POLICY DRIVERS

CAP 2030 is informed by and supports the implementation of several important UBC Plans, including UBC's Strategic Plan: Shaping UBC's Next Century, which asserts UBC's climate leadership as a key priority. It states,

> *"The challenges around climate change are high. We need to intensify our academic and operational efforts on our campuses, in affiliated communities around the world. We must go beyond minimizing harm to becoming net contributors to human and ecological health."*

The UBC CAP 2030 will help define how sustainability and climate change will support UBC's efforts to shape the next century. CAP 2030 also helps to advance two of the nine strategic priority areas identified by UBC's Climate Emergency Task Force Report that was endorsed in principle by the UBC Board of Governors. These include accelerating UBC's emissions reductions in response to the Climate Emergency and supporting community wellbeing in the face of the climate crisis.

CAP 2030 additionally aligns with the values and visions set forth in many of UBC's existing plans and initiatives, including the Inclusion Action Plan, the Indigenous Strategic Plan the Wellbeing Strategic Framework; wellbeing also represents a guiding priority with multiple co-benefits across many of the emissions themes contained within CAP 2030, particularly those related to extended emissions.

[3] *https://www.worldweatherattribution.org/western-north-american-extreme-heat-virtually-impossible-without-human-caused-climate-change/, accessed 13th August 2021*

1.4.2 EXTERNAL POLICY DRIVERS

Many rapidly-changing external policy drivers have influenced the direction of CAP 2030, and will continue to inform this Plan's direction as it is implemented.

Transportation & Land Use	1.	BC Government's *Zero-Emission Vehicle Act*: 100% of new vehicle sales to be zero-emission vehicles by 2040, including 10% by 2025 and 30% by 2030
	2.	BC Government's *Renewable & Low Carbon Fuel Requirements Regulation*: reduce lifecycle carbon intensity of fuel by 20% by 2030
Buildings	3.	BC Building Step Code: 20% more energy efficient by 2022 and 80% more efficient by 2032 (net zero energy ready standard)
	4.	Federal Government's escalation of carbon price on fuels to \$170 / tCO_2e by 2030. Public sector offset requirements add an additional \$25 / tCO_2e to this cost[4]
	5.	BC Government's amendment for increased supply of clean fuel sources to support transition to renewable fuel economy
	6.	BC Government's updated GHG emission intensity factors for electricity use in BC integrated grid-connected entities
	7.	BC Government's requirement for post-secondary capital project submissions to reduce GHG emissions by 50% (relative to LEED Gold)
Waste	8.	BC Government organic waste: 95% of organic waste diverted from landfills and turned into other products by 2030

As the provincial and federal governments continue to increase the carbon tax associated with fossil fuel purchases, and with the continued mandate to purchase carbon offsets to maintain a carbon neutral public sector in BC, UBC's carbon liability will continue to grow over time without further climate action.

In 2022, UBC will pay a carbon price of \$75/tCO_2e emitted (\$50/tCO_2e for BC Carbon Tax and \$25/tCO_2e for public sector offset requirements). UBC Vancouver currently pays overall carbon costs of around \$3 million per year. This will increase in the future if UBC does not continue to

[4] *To support these reductions by discouraging pollution-intensive investments and increasing affordability of cleaner options, the federal government is also proposing to increase the carbon price by \$15/ tCO_2e per year, starting in 2023, rising to \$170 per tonne of carbon pollution in 2030. Existing carbon offsets as part of BC's Climate Change Accountability Act add another \$25/ tCO_2e to this price. The CleanBC Renewable Gas Mandate is estimated to add an additional \$45/ tCO_2e to this price by 2030.*

decrease scope 1 and 2 carbon emissions, and as carbon pricing escalates as part of government climate policy. Given that building systems, equipment and energy supply infrastructure exist for many years, UBC's expected future carbon liability would accumulate to approximately $100 million over the next 20 years if no further actions are taken to reduce carbon emissions. Without UBC's past action, this liability would have been more than double this amount.

2. CAP 2030 Approach

2.1 BEYOND MITIGATION: INCREASING ADAPTATION AND RESILIENCY

While this Plan focuses on the development of mitigation strategies to reduce fossil fuel impacts, responding to climate change will also require the development of just, equitable and accessible adaptation strategies to reduce the impacts associated with the increasing frequency and severity of climate change events. Foundational climate adaptation and resiliency strategies have already been integrated into a number of campus plans and guidelines. Specific examples include the Integrated Stormwater Management Plan (ISMP), Water Action Plan (WAP), and the Green Building Action Plan (GBAP); these adaptation and resiliency strategies will also be integrated into future planning, including the upcoming Campus Vision 2050 Plan. A future Climate Adaptation Resiliency and Biodiversity Strategy will act as a hub for this work and link to other existing and future plans, policies, and initiatives across UBC.

Given the severity and increased frequency of climate change events, UBC is integrating a number of adaptive responses as part of our mitigation efforts now - e.g. assessing cooling capacities, nature based solutions, and access to address increased heat wave events, the Green Building Action Plan is updating the Climate Ready Building Requirements that advance implementation of adaptive responses immediately, and introducing new criteria for building retrofits that also consider passive and active cooling measures such as those used in the UBC Macleod Building.

Figure 2: UBC Macleod Building rendering

The UBC Macleod Building renewal will include the replacement of outdated mechanical and electrical systems, as well as envelope replacement to energy efficient systems.

2.2 AN INTEGRATED UNIVERSITY INITIATIVE

Realizing the vision and ambition of CAP 2030 will require UBC to activate all institutional, intellectual, operational and community capacities. Some of the most innovative research into demonstratable climate solutions is happening right here at UBC. The CAP 2030 process is an opportunity for the University's operations and research communities to work together through applied research to solve our climate challenges (i.e. projects such as UBC's new $23m Renewable Energy Hub will be a testbed for low carbon innovation). UBC's Campus as a Living Laboratory programs are driven by the University's operational and sustainability commitments, and have a well-established track record of success to develop, pilot and scale innovative processes and solutions. Key examples focusing on innovative low carbon solutions, include the BRDF and its new expansion.

Figure 3: Renewable Energy Hub rendering [Photo: Dialog]

The Renewable Energy Hub will transform an entire city block at UBC into a smart energy district, including the province's first-ever hydrogen refuelling station for light- and heavy-duty vehicles.

The SEEDS Sustainability Program creates applied student-led research and interdisciplinary collaborations that utilize the Campus as Living Laboratory. Examples include creating robust interdisciplinary partnerships and research clusters between UBC's students, staff and faculty. These Campus as a Living Laboratory programs were key to informing the development and implementation of the original CAP 2010 and the CAP 2020, and will continue to be leveraged for the CAP 2030. Collaboration is ongoing to determine the next breakthrough clean energy and climate solutions at UBC. Continuing to leverage this strength in the future will be key to meeting UBC's aggressive climate targets and to accelerate the uptake of UBC-created solutions beyond our campus.

In addition to institution-level change, successful delivery of UBC's climate action will require the full breadth of the UBC community to be engaged and participate to achieve collective impact. This is especially true for addressing UBC's extended impact emissions sources, such as commuting, air travel, food and waste. Supported by UBC's existing and emerging policies, programs, infrastructure, tools and resources, UBC students, faculty and staff, through choices and as a community, have an opportunity to take relevant actions and contribute to these emissions reduction areas.

The Bioenergy Research Demonstration Facility (BRDF) produces renewable energy for UBC's campus using wood waste biomass. This helps reduce UBC's GHG emissions and supports research projects on innovative clean energy systems.

Figure 4: Bioenergy Research Demonstration Facility (BRDF)

2.3 LESSONS FROM THE COVID-19 PANDEMIC

The Plan was initiated during the COVID-19 pandemic and racial justice protests of 2020. The impacts of COVID-19 heightened public awareness of the historical and ongoing systemic, structural and institutional inequities and racism against Indigenous, Black, and People of Colour communities. These events deeply shaped what was heard from the community, and have been articulated in the recommendations. This work recognizes that climate justice must be advanced in conjunction with institutional responses to today's multiple intersecting crises - the pandemic, an opioid crisis, intense racial injustice and an economic recession/affordability crisis - which compound inequalities faced by marginalized populations. Some reflections triggering further policy development include leveraging learning from remote working and online class delivery, ensuring flexibility and accommodations remain in place to support student, staff, and faculty well-being, and optimizing the use of space to reduce energy, GHG emissions, and associated costs. Specific lessons and actions emerging from the COVID-19 pandemic are referenced in the relevant sections below.

With classes moved online and a significant reduction in on-campus activities during 2020 and 2021, the pandemic also had an impact on UBC's operational and extended emissions. Despite

this, the pandemic has had little impact on the analysis presented in this plan as most findings are based on the data collected in pre-pandemic periods. Moving forward, the impacts of the COVID-19 pandemic on campus travel patterns, air travel, and the other issues and opportunities it presents for the near future will be monitored through the CAP 2030 implementation process.

2.4 A CLIMATE JUSTICE LENS

The application of a climate justice lens will ensure equity, inclusion, diversity, and accountability are upheld and advanced while accelerating climate action as marginalized and vulnerable populations are often disproportionally impacted by climate change.

CLIMATE JUSTICE

Climate change and environmental harms are known to disproportionately affect the marginalized and the underprivileged, and to compound and magnify those existing inequalities; 'climate justice' addresses this by tying social justice lenses into a climate action approach. Climate justice frameworks have evolved out of past and ongoing activism driven by Indigenous peoples, Black communities, people of colour, gender inequity, and grassroots movements mobilizing to resist persistent impacts of environmental racism and systemic oppression. Climate justice also addresses preventable health and wellbeing impacts, and protecting human rights. It does so through acting on distributive justice, procedural justice, and restorative justice, in order to form a more holistic approach to recognizing and addressing the ways in which underprivileged populations are differently affected by climate change and its consequences.

A climate justice lens recognizes responsibility and accountability for causes of climate change, the inequitable burdens of climate change impacts and an awareness of intersecting vulnerabilities, systemic and structural injustices. Climate justice might generally be thought of as advocating for what is right, fair, appropriate or deserved in relation to climate change drivers and impacts.

Throughout the development of the CAP 2030 actions, working groups have reflected on how to advance climate action in a way that considers the needs of those with fewer resources and those who use too many. Engaging principles of climate justice are particularly relevant when developing climate actions related to food systems, commuting and business air travel. This Plan's actions are designed to align with embedding wellbeing, community resilience, equity and diversity across university systems and structures – foundational to the UBC Wellbeing Strategic Framework, Inclusion Action Plan and Indigenous Strategic Plan. This approach is ongoing and achieves significant co-benefits across many of this Plan's emission themes, particularly those related to extended emissions.

2.5 CO-BENEFITS TO CLIMATE ACTION AND RISK MANAGEMENT

Taking strong action on climate change is critical to improving UBC's contribution to reducing globally harmful GHG emissions, however, this is far from the only benefit. Advancing an ambitious CAP 2030 will further many other UBC interests, including:

- Protecting UBC against the increasing costs of carbon taxes and pricing at the provincial and federal level;
- Mitigating UBC's exposure to future volatility in conventional energy costs and supply chains;
- Increasing resiliency, capacity, and diversification of UBC's energy infrastructure and green infrastructure in the face of climate change;
- Future-proofing UBC's buildings to the impacts of climate change, through the use of a passive measures first approach, while integrating whole systems infrastructure considerations regarding active cooling strategies;
- Leveraging student and faculty-led applied research to utilize the Campus as Living Laboratory;
- Sharing and amplifying UBC's place-based climate research and solutions that help accelerate climate action at a local, regional and global scale;
- Leveraging technology innovation, research, and development at UBC with Industry and utility partners;
- Leveraging external funding and partnerships to advance key research and innovation priorities by UBC;
- Pursuing external funding and investments into University infrastructure priorities;
- Supporting sustainability challenges within the institution and capitalizing on teaching, learning, and research opportunities;
- Bolstering UBC's internationally recognized reputation and leadership in climate action and sustainability in operations and research;
- Strengthening the UBC community's resilience and sense of individual and collective agency by equipping/supporting community members to take action on climate change; and
- Increasing UBC's overall community resilience, mental health and wellbeing.

These co-benefits will be considered alongside technical and financial risks, and other criteria when assessing future investments in CAP 2030 priorities.

3. Plan Development

3.1 PLANNING PROCESS

In April 2020, the Board of Governors endorsed climate action as a key sustainability focus area for UBC campuses. Following this leadership endorsement, the CAP 2030 process launched in May 2020. The process was led by Campus and Community Planning, with strategic oversight and direction provided by the Operational Sustainability Steering Committee with representation from faculty and administrative leadership.

The CAP 2030 planning process built upon the significant success that UBC has had to date for campus operations. It also leveraged recommendations from the climate emergency engagement process as well as expertise across UBC through topic-based working groups and technical committees.

UBC working groups were established to develop targets and actions for all CAP topic areas. Actions in areas that apply to both Vancouver and Okanagan campuses, such as business air travel, food systems, and embodied carbon, were identified. Targeted staff, faculty, students, and external subject matter experts were engaged to develop the CAP recommendations based on the following themes:

- Energy Supply and Buildings
- Fleet
- Commuting
- Business Air Travel
- Embodied Carbon
- Food Systems
- Engagement and Outreach Programs
- Waste, Materials and Paper
- Financial Tools

Emerging directions and draft targets for CAP 2030 – Vancouver and Okanagan Campuses - were presented to the Board of Governors in February 2021. The CAP 2030 process, Figure 5, illustrates the overall timeline and key stages in the planning process.

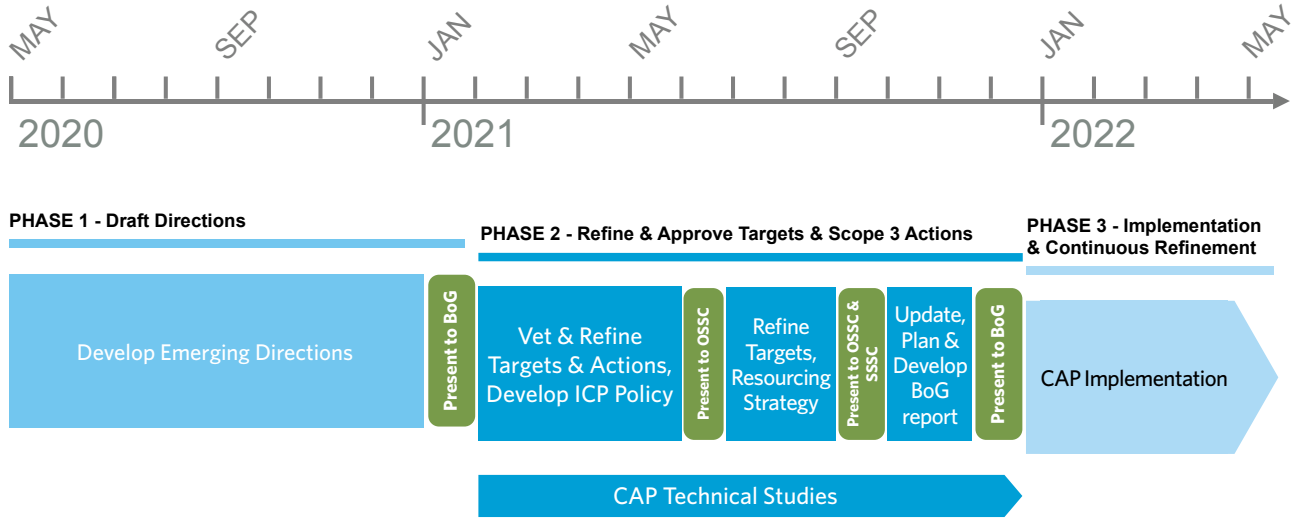

Figure 5: CAP 2030 Process Overview

CAP 2030 working group members were instructed to consider key elements from the Climate Emergency Declaration, with a specific focus on including a climate justice lens to help evaluate priority actions. Engagement and vetting of working group actions was conducted at the director's level for many units across UBC to define ownership, alignment, support and responsibility for actions as part of an overall CAP Accountability Framework (Appendix B) through a distributed approach to CAP implementation.

As actions were developed and refined, targeted stakeholder meetings were held with key staff from the units responsible for leading or supporting specific campus actions. The intent of these meetings was to gather support for implementation, identify resources currently being mobilized, identify where additional resources are needed, and to confirm roles and responsibilities moving forward.

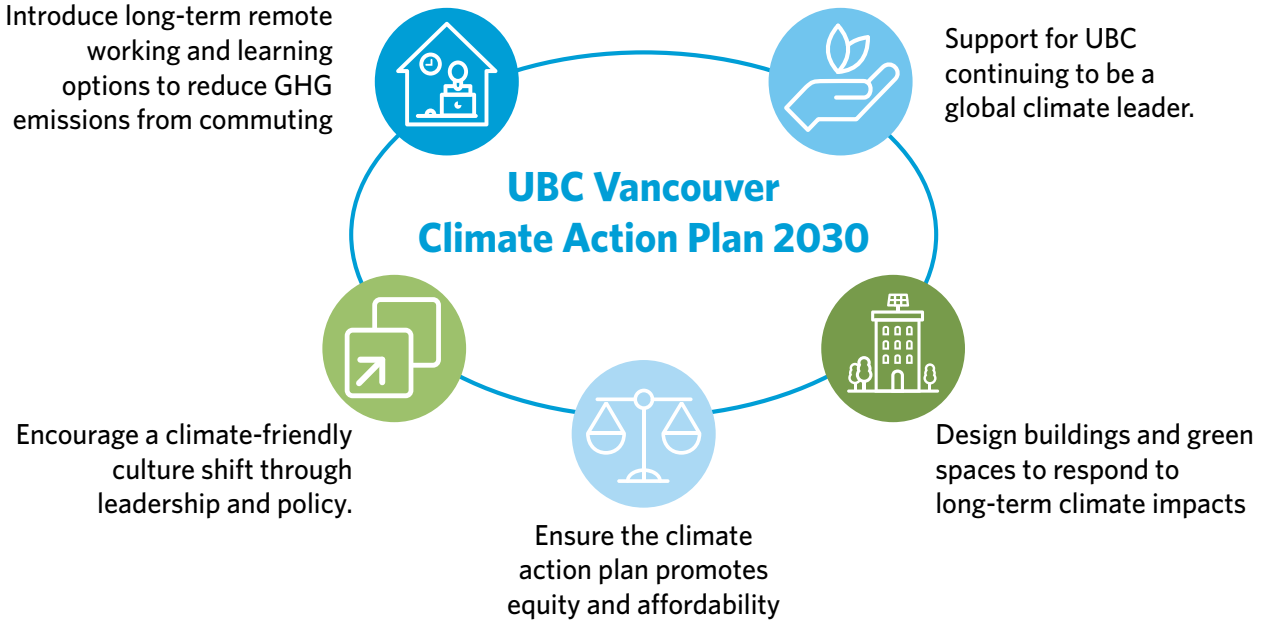

Figure 6: CAP 2030 Public Engagement - Key Messages Received

3.2 PUBLIC ENGAGEMENT PROCESS

From March 29 to April 16, 2021, the Campus and Community Planning team led an engagement process for the entire university community. This was an opportunity for staff, students and faculty to learn about the emerging CAP 2030 themes, ask questions, and share perspectives.

Through an online survey and virtual events, we heard from 764 participants from the Vancouver Campus about the emerging CAP 2030, and the barriers and opportunities for climate action on campus. Figure 6 presents a snapshot of the main themes that we heard from the UBC community during the public engagement period.

Further information on the main themes heard during the UBC CAP 2030 public engagement process can be found in the Engagement Summary Report (Appendix D).

4. Addressing Climate Change

4.1 UBC GHG EMISSION SOURCES

The GHG emissions for UBC's Vancouver campus are generated from various sources, as illustrated in Figure 7 below.

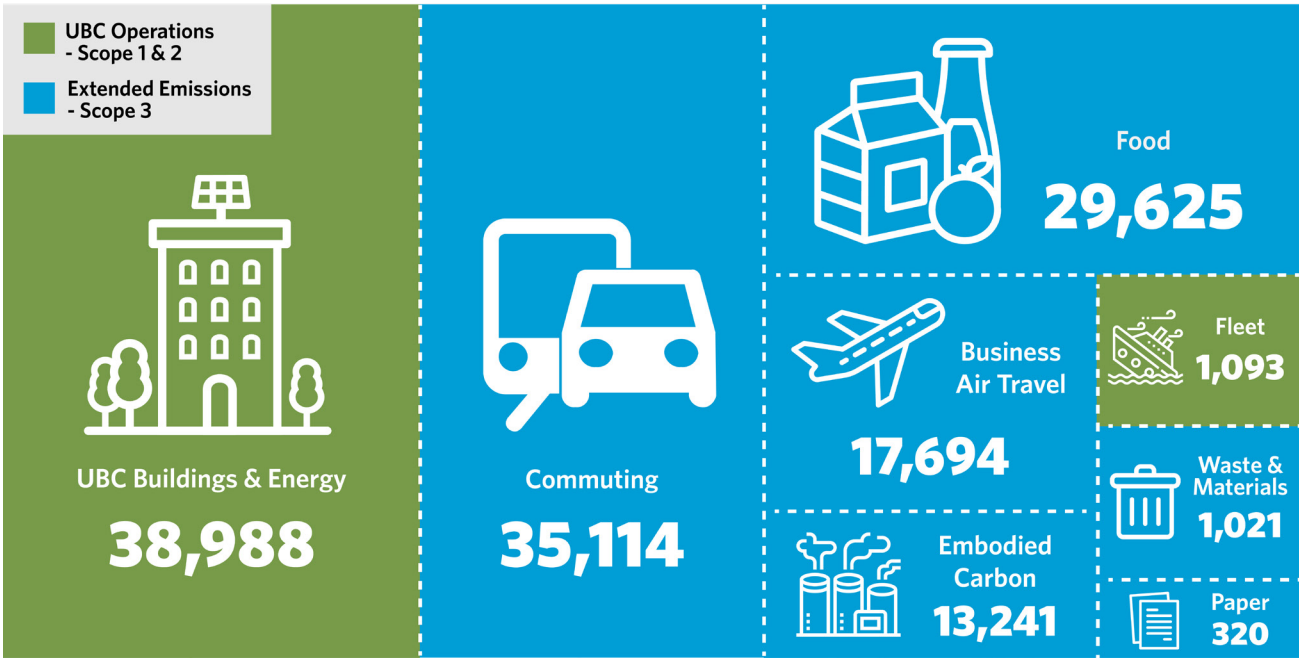

Figure 7: UBC's Operational and Extended Emissions (tCO_2e)
[Note: Extended emissions are estimated and less accurate than campus operations GHG values which are reported more rigorously as part of UBC's annual carbon reporting under BC's Climate Change Accountability Act. For the Waste and Materials category, emissions shown only include those from disposal and do not include life cycle emissions, which are much larger]

4.1.1 CAMPUS OPERATIONS (SCOPE 1 AND 2)

Campus operations emissions are those over which UBC has direct control and on which UBC pays carbon offset taxes through the provincial carbon neutral legislative requirements for public sector organizations in BC. Sources include emissions from buildings, campus energy facilities, and fleet vehicles. Reducing these emissions requires infrastructure change and capital investments. To date, these emissions have been successfully reduced by enhancing the energy performance of buildings and district energy supply.

Heating and operating buildings account for approximately 97% of UBC total campus operations emissions, and the vast majority of these come from burning natural gas (86%), as this fossil fuel (mostly composed of methane, CH_4) has significantly higher GHG emissions than BC's clean electricity (primarily sourced from clean and renewable hydropower). Emissions generated through campus operations are defined as emissions from sources directly controlled and operated by UBC, including combustion of natural gas on campus (scope 1), and from upstream emissions from electricity consumed on campus (scope 2).

Figure 8 illustrates the dominant role of natural gas in UBC's buildings and District Energy System (DES) emissions. Electricity emissions only accounted for 6% of total Campus Operations emissions in 2019. However, the relative importance of these emissions will increase in the future as electricity use increases to help displace fossil fuel use to meet climate targets.

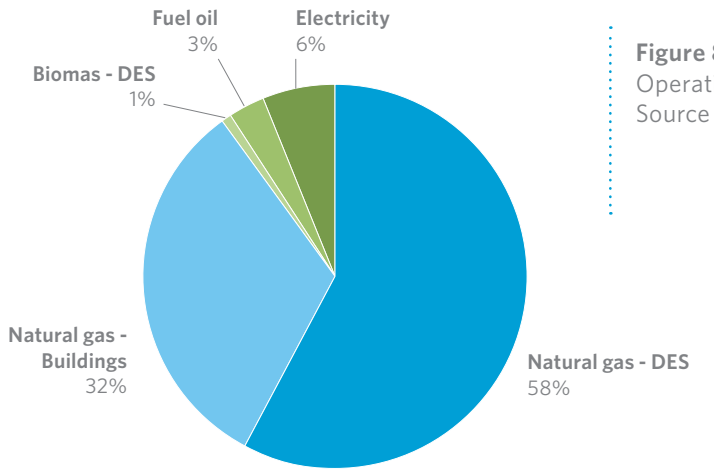

Figure 8: UBC Campus Operations Emissions by Energy Source (2019)

GHG emissions from electricity are calculated using electricity emissions factors for BC have become somewhat volatile due to a change in emissions factor approach. Analysis for CAP 2030 targets and actions has been based on recent provider-based electricity emissions factors and this area will be monitored as these factors continue to evolve in the future.

The University is on track to reduce operational emissions by approximately 60% below 2007 levels, with the first full year of the bio-energy expansion project operating in 2022, outperforming the Paris Agreement 1.5°C target of 45% reduction. However, even more aggressive targets are required to maintain UBC's sustainability and climate action leadership position and meet the intent of UBC's Climate Emergency Declaration. The CAP targets address emissions from institutional buildings including core infrastructure, academic, and student housing; excluded are off campus buildings and UBC's neighborhood developments. Neighbourhood emissions will be addressed by a future update to the Community Energy and Emissions Plan (CEEP), the Residential Environmental Assessment Program (REAP) and the Neighbourhood Low Carbon Energy Strategy.

4.1.2 EXTENDED IMPACT EMISSIONS (SCOPE 3)

Extended impact emissions occur from activities that are not always fully controlled by UBC, but that the institution impacts and influences through purchasing decisions, plans, policies, guidelines, behavioral change programs, and others. These emissions are generally referred to as scope 3 emissions and include sources such as commuting to and from campus, business air travel, food consumed on campus, waste, and the embodied carbon associated with the construction of new buildings and retrofits. While UBC has influence on these emissions the University is not currently responsible for carbon offset payments associated with them under the provincial carbon neutral legislation. These extended impact emissions are almost 2.5 times larger than campus operations emissions as illustrated in Figure 7. CAP 2030 is the first time UBC has made an explicit mandate to set reduction targets for extended impact emissions.

4.2 CAP 2030 PLAN – TARGETS

The global climate crisis is accelerating, and strong collective action must be taken to avoid the worst impacts. With CAP 2030, UBC is committing to build upon past successes to achieve deep carbon reductions for campus operations and extended impacts emissions by 2030, with a future goal to go beyond net zero (see Figure 9). Through strategic investments in climate action, UBC will be leveraging its institutional, operational and intellectual capacities to chart a leadership path for other post-secondary institutions to follow.

4.2.1 REDUCE CAMPUS OPERATIONS EMISSIONS BY 85% BY 2030

The existing CAP 2020 target for operations was for a 67% GHG reduction by 2020, and UBC will be close to achieving this reduction with the BRDF expansion. With CAP 2030, UBC is setting a target of 85% GHG emission reduction below 2007, significantly exceeding the 1.5°C Paris Agreement emissions targets. Reducing emissions by 85% translates to eliminating virtually all conventional fossil fuel[5] use from campus operations.

[5] *Some fossil fuels may still be required for specialized purposes or uses that don't have viable alternatives.*

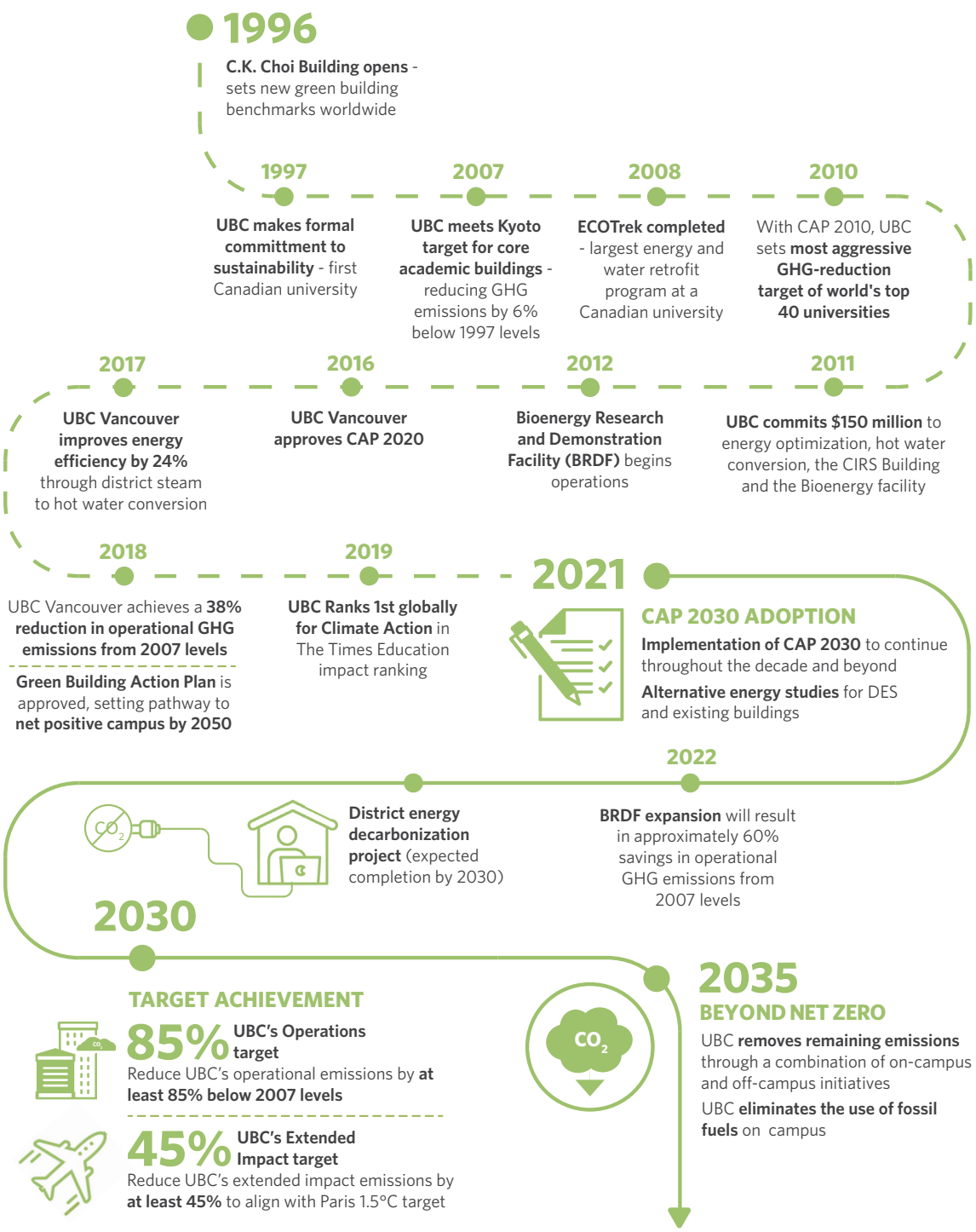

Figure 9: UBC's Climate Action – Past Successes and Future Milestones

4.2.2 NET ZERO CAMPUS OPERATIONS EMISSIONS BY 2035

The previous campus operations net zero target, or 100% GHG reduction, was set at 2050. CAP 2030 sets a new accelerated target of net zero by 2035, which will address the remaining emissions from low carbon energy that remain after most fossil fuels are eliminated. The technology solutions for this, such as carbon capture, are still emerging and have not been proven at a wide scale, which will provide an opportunity for partnering with faculty researchers who are advancing innovation in this area. Figure 10 shows the historical operations emissions, plus the impact of actions that can cumulatively reduce emissions by 100%, or net zero.

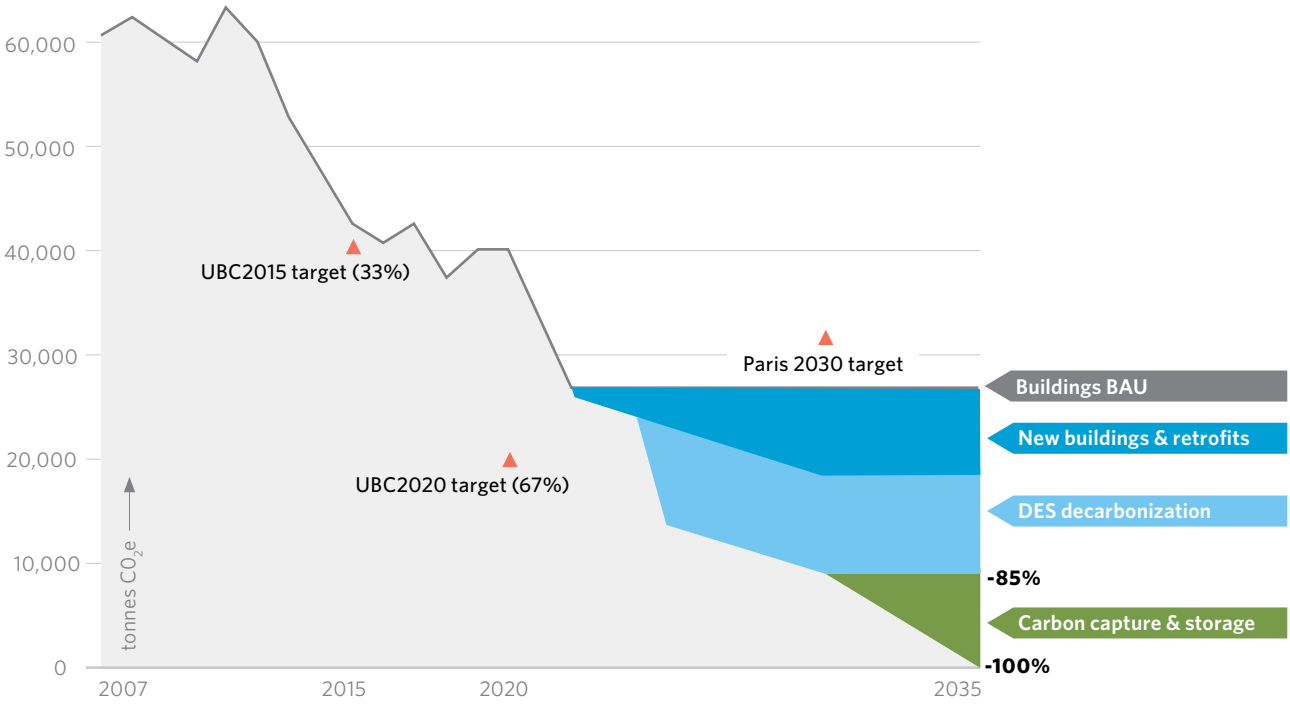

Figure 10: UBC Campus Operations Emissions Reductions Targets

UBC is well-positioned to achieve deep carbon reductions and accelerate decarbonization of its core operations to meet targets. A combination of factors including UBC's history of successfully reducing emissions, accelerating technology innovation, and increasing community support for action will help to advance UBC's climate ambition. Given the size of UBC's Vancouver Campus, this can serve as an invaluable demonstration for how other campuses and neighbourhoods could achieve decarbonized energy use. A hierarchy of decarbonization principles has been developed to create a clear pathway for UBC to achieve net zero operational emissions, as shown in Figure 11 below.

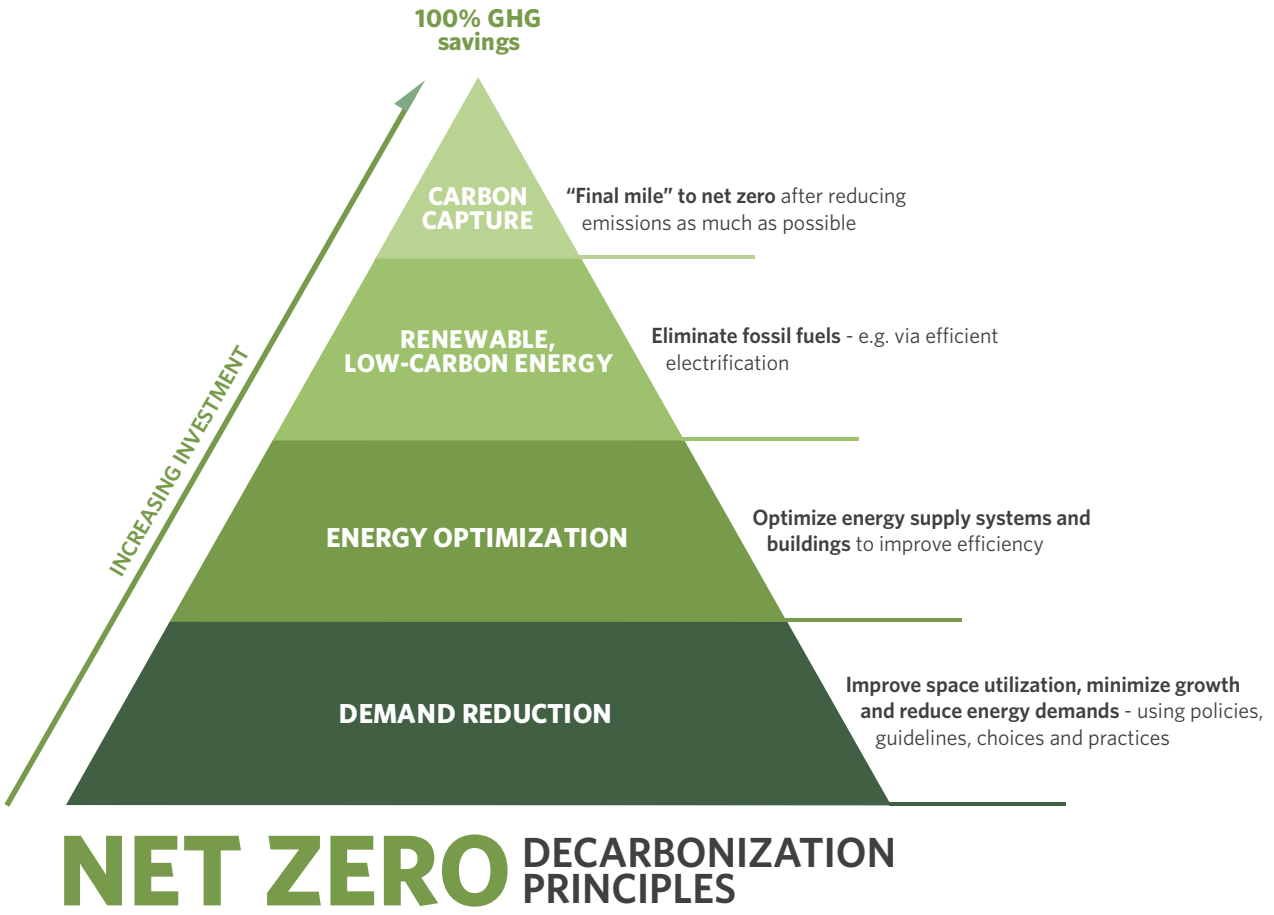

Figure 11: Net Zero Decarbonization Principles

4.2.3 REDUCE EXTENDED IMPACT EMISSIONS BY 45% BY 2030

For the first time, UBC is creating reduction targets for extended impacts emissions; CAP 2030 sets a target for a 45% reduction from 2010 levels, reaching the Paris Agreement 1.5°C target by 2030 as shown in Figure 12. This is in line with the mandate given by UBC's Climate Emergency Declaration.

Achieving this target will require institutional leadership in addition to strong buy-in and support from UBC's students, staff and faculty, who through their own choices and activities have a strong influence over these emissions.

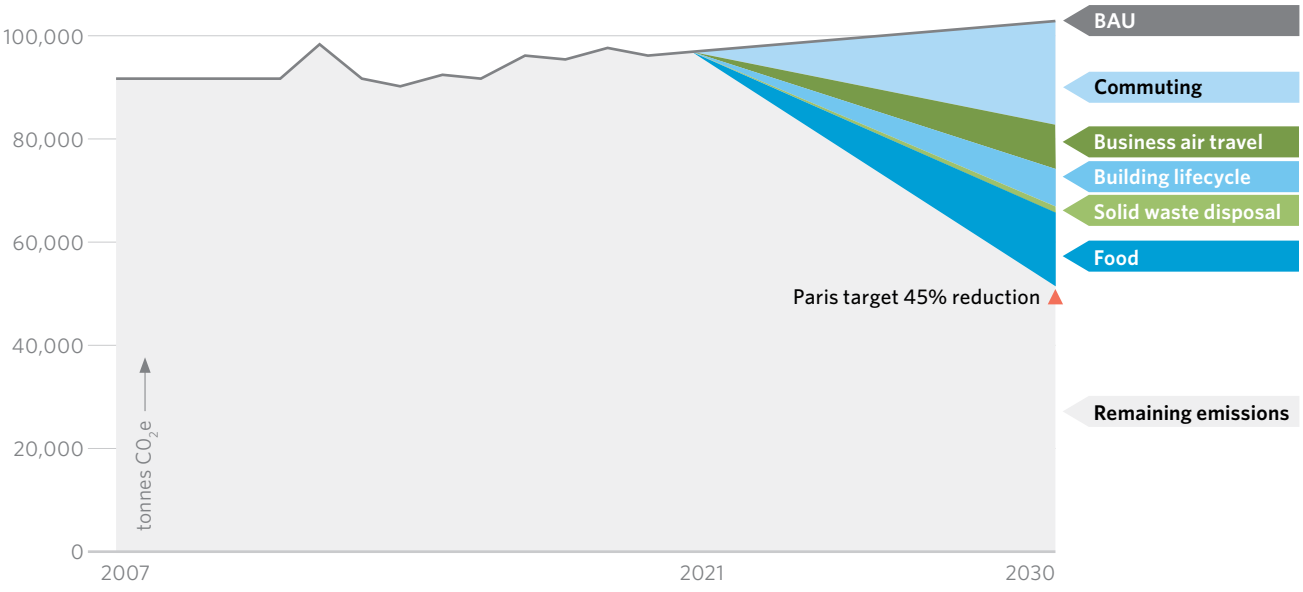

Figure 12: UBC Extended Emissions and Target
[Note: the waste emissions shown above only include those from disposal and do not include life cycle emissions, which are much larger]

5. CAP 2030 Plan Targets, Strategies and Actions

This section contains a high-level summary of key actions identified in the CAP 2030 working group process, broken down across all action areas. It is intended to provide an overview of areas of focus, specific targets, key actions, and the overall level of ambition of CAP 2030.

5.1 CAMPUS OPERATIONS

5.1.1 ACADEMIC DISTRICT ENERGY SYSTEM

Target: By 2030, 100% of the energy used by the Academic District Energy System will come from low carbon sources[6].

Rationale: The Academic District Energy System (ADES) provides the major source of heat to campus buildings via a network of hot water pipes under campus. Heat for the ADES is provided by renewable biomass from the BRDF and fossil fuel based natural gas from the Campus Energy Centre (CEC). This district energy system has also been the single largest source of UBC's GHG reductions, with district energy specific emissions declining from approximately 50,000 tCO_2e in 2007 to 24,400 tCO_2e in 2019, in large part due to the steam to hot water conversion and the use of biomass to reduce natural gas consumption.

Figure 13: UBC Campus Energy Centre [Photo: https://www.naturallywood.com/project/ubc-campus-energy-centre/, accessed 13th August 2021]

[6] *Low carbon energy sources include renewable energy such as BC Hydro grid electricity, locally generated renewable electricity, solar, biomass, renewable natural gas (RNG), etc.*

The new bio-energy expansion will achieve a 75% reduction in ADES GHG emissions, with 70% of the energy coming from low carbon biomass and Renewable Natural Gas (RNG), while also expanding heating services to new buildings. Figure 14 illustrates how low carbon biomass energy and RNG (significant use as Cogen fuel) will meet the majority of baseload requirements, with natural gas predominantly used for shoulder and peak times during fall and winter.

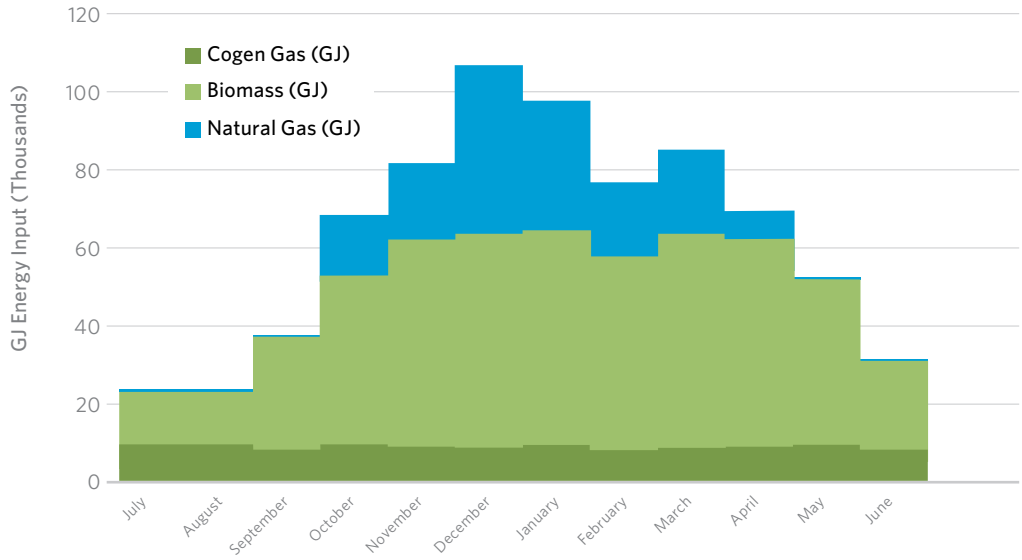

Figure 14: ADES Fuel Sources (Summer 2021 - Summer 2022)

Academic District Energy System

Actions: Immediate (Start F2021-22)

- Undertake a comprehensive technical and financial feasibility analysis to identify the most promising low carbon energy supply option(s) for the UBCV ADES – this study is already underway and will be completed in 2022, a number of technologies are being investigated through a detailed evaluation process against a number of key criteria – see Resourcing Strategy in Appendix A.
- Continue to prioritize energy demand side management efforts to offset all energy increases due to campus growth.
- Develop a UBC Vancouver campus energy strategy, including developing key guiding principles, to inform UBC's transition to clean energy and net zero emissions.

Academic District Energy System

Actions: Short Term (By 2024)

- Collaborate and explore strategic partnership opportunities with BC's major utilities to increase UBC's access to a diversity of low carbon energy supplies.

Academic District Energy System

Actions: Medium Term (By 2030)

- Implement low carbon ADES supply and demand solutions. Begin with initial projects by 2025, with a goal of achieving 100% low carbon energy by 2030.
- Explore and evaluate potential solutions to reach and accelerate UBC's net zero target, such as carbon capture, to address the remaining emissions from low carbon energy sources and hard to abate applications.

5.1.2 BUILDINGS

Target: By 2030, new buildings and building renewals will target near zero operational emissions[7], and existing building emissions will be reduced to reach a target developed as part of the Existing Building Decarbonization Plan.

Rationale: Heating and operating UBC's buildings represents 97% of total Campus Operations emissions[8], and this energy currently accounts for about $22 million in annual energy costs. Direct natural gas consumption by buildings (i.e., buildings that are not connected to the ADES) represent about 30% of the total. Ensuring new buildings are built to high performance, existing buildings are strategically retrofitted, and that energy supplied to buildings becomes increasingly low-carbon is imperative for UBC to achieve its bold GHG emission reduction ambitions, minimize energy consumption and reduce escalating carbon costs.

Figure 15: UBC Nest Building with roof top garden

[7] *Near zero operational emissions assumes that building level, future energy and GHG intensity targets are being met and all energy supply is from low carbon ADES, BC Hydro electricity, and/or renewable natural gas.*

[8] *UBC's buildings include a lot of energy intensive laboratory space. Due to equipment such as fume hoods and steam and humidification systems, energy consumption of these buildings is materially larger than for traditional buildings, which tend to be dominated by space and water heating.*

BUILDINGS

Actions: Immediate (Start F2021-22)

- Eliminate fossil fuel equipment installation in new and existing buildings, unless sufficient amounts of RNG are secured for the lifetime of the equipment[9].
- Develop an Existing Building Decarbonization Plan that integrates with maintenance and renewal programs, and a resourcing strategy to support incremental costs.
- Develop GHG targets and an action plan for the buildings in the UBC Properties Trust building portfolio that align with the CAP 2030 scope.

BUILDINGS

Actions: Short Term (By 2024) & Medium Term (By 2030)

- All buildings on campus will connect to the ADES. If the project does not connect to the ADES it should apply for a variance. If projects cannot connect into the ADES they are required to achieve net zero carbon certification (design and operation).
- Develop and implement new building and renewal project GHG intensity targets by building type, incorporating more energy efficient designs and low carbon energy sources, and creating a life cycle costing process that deals with capital budgets to meet low carbon design requirements.
- Implement building retrofits strategically as per the above plan (Existing Building Decarbonization Plan) and funding.
- Research and track building space utilization and changes due to remote activity, and explore opportunities for energy reductions through space utilization and mitigating growth of new floor space.
- Develop a process to reduce emissions from refrigerants used in buildings.

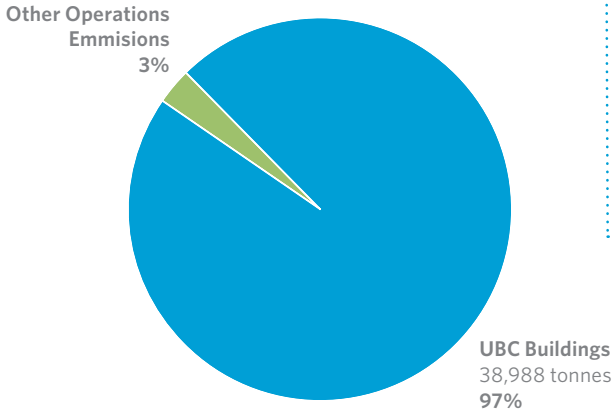

Figure 16: Campus Operations Emissions: UBC Campus Buildings

[Note: This graphic includes all emissions at the building level, and includes direct natural gas use by buildings as well as by the ADES described above]

[9] As a low-carbon non-fossil fuel, renewable natural gas (RNG) can replace natural gas in buildings that are not connected to the district energy system. However, historically the available supply of RNG has been limited.

MARINE DRIVE RESIDENCE HEAT PUMP PROJECT STUDY

Electrification of building heating equipment is a key opportunity to reduce UBC's GHG emissions. UBC Student Housing and Community Services (SHCS) commissioned a study to assess replacement of natural gas fired make up air units (MUA), which provide heating and ventilation, with air source heat pumps (ASHP) at the Marine Drive student residence.

Heat pumps work by using electricity to transfer heat from the outside environment to inside the building. As such, they can be extraordinarily efficient, with the units assessed for Marine Drive about four times more efficient than existing equipment. When considering available incentives and energy savings over the project lifespan, ASHP lifecycle costs are competitive and help to significantly reduce GHG emissions.

5.1.3 FLEET

Target:	UBC will only procure new vehicles and equipment that are zero emissions where feasible solutions exist.
Rationale:	While UBC's fleet of vehicles and motorized equipment has a relatively small impact on overall GHG emissions, vehicles are a highly visible part of UBC's operations.

Between 2007 and 2018, UBC Building Operations reduced UBC fleet GHG emissions by 52% and achieved the only E3 Fleet Platinum rating in Canada. Transitioning to Zero Emissions Vehicles (ZEV) and enabling vehicle sharing among departments can realize significant co-benefits in addition to improving community wellbeing through reduced community harming GHG emissions, including greater overall financial performance and improved quality of fleet services for end users.

Figure 17: UBC Electric Vehicle and Charging Station

FLEET

Actions: Immediate (Start F2021-22)

- Explore the expansion of fleet management programs across all UBC vehicles, including additional funding, in order to continue to pursue fleet optimization and increased efficiency.
- Develop a comprehensive ZEV Charging, Fueling, and Maintenance Strategy to guide ZEV transitions on campus.

FLEET

Actions: Short Term (By 2023)

- Incorporate a Zero Emissions Vehicle and Equipment First (ZEV First) requirement into existing fleet policy for all new vehicles and equipment, where feasible operational solutions exist.

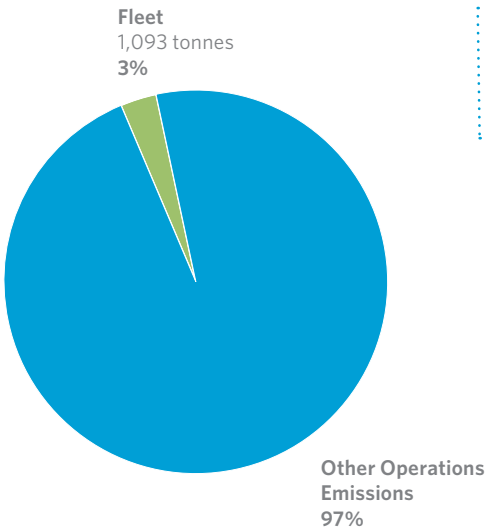

Figure 18: Campus Operations Emissions - Fleet

5.1.4 FINANCIAL MECHANISMS: INTERNAL CARBON PRICING

Target: Implement an internal carbon price to better align financial decision-making criteria with UBC's climate goals.

Rationale: Carbon pricing is seen as a key policy tool and a financial mechanism to address climate change. It works by incorporating the true costs of carbon pollution into the decision-making process. So far, external climate policy has lagged behind providing an actual representation of the costs of damages associated with climate change. To address these challenges, CAP 2030 introduces an Internal Carbon Price (ICP) to better align financial decision-making criteria with UBC's climate goals and provide certainty, predictability, consistency and rigor for decision making. Unlike a carbon charge, the internal carbon price does not result in the exchange of money; it is simply used to inform decisions. The application of an internal carbon price can result in more money being invested initially in climate-friendly systems that reduce carbon dioxide emissions; however, it often saves money when factoring in the life cycle cost-benefits of the solution.

UBC's internal carbon price represents an overall price ceiling, inclusive of all external pricing instruments, such as carbon offsets and fuel taxes. With the introduction of an internal carbon price, UBC will join the City of Vancouver and Metro Vancouver to create a local cluster of global leadership on carbon pricing. Refer to Appendix C for UBC's Internal Carbon Pricing Policy Guideline .

FINANCIAL

Actions: Immediate (Start F2021-22)

- An internal carbon price level of $\$250/tCO_2e$ has been selected based upon carbon price escalation seen at the provincial and federal levels, which will reduce risks by ensuring that carbon costs are fully accounted for during decision making.
- Pilot the internal carbon price approach in lifecycle cost analysis for several energy supply, equipment renewal and energy conservation projects.

FINANCIAL

Actions: Short Term (By 2024)

- Implement the internal carbon price and use life cycle cost analysis to inform decision-making for energy projects (energy supply, energy equipment, energy conservation projects), as well as to fleet purchases and programs.
- Pilot and implement the internal carbon price and use life cycle cost analysis to inform decision-making on capital and infrastructure planning.

5.2 EXTENDED IMPACTS EMISSIONS

5.2.1 COMMUTING

Target: By 2030, achieve a 45% reduction in commuting emissions from 2010 levels.

Rationale: Accounting for approximately 36,000 tCO_2e emissions per year, commuting by students, faculty and staff to the Vancouver campus is the highest extended impact emissions category accounting for nearly the same GHG emissions of buildings and energy supply combined. UBC has been very successful at increasing the transit mode share from 18% in 1997 to 54% in 2019 as a result of the introduction of the U-Pass program for students in 2003. However, substantial growth in the transit mode share is constrained until there is a rapid transit connection to UBC, which isn't anticipated until around 2030. This risks an increase to the single occupant vehicle mode share above the current 32% and therefore an increase in commuting emissions and public health impacts. There are opportunities for significant emissions reductions by decreasing commuting trips, shifting choices of transportation modes and vehicle types, and increasing transit capacity in the longer term. Climate justice factors into the development of transportation policies and programs to ensure that equity across the UBC community is considered.

COMMUTING

Actions: Immediate (Start F2021-22)

- Develop policies, targets and tools that enable and support departments in incorporating remote work / teleworking, flex days and online learning on an ongoing basis.
- Explore funding via a "Sustainable Transportation Levy" as part of parking permit fees (e.g., $0.25 / trip) to fund sustainable transportation initiatives, including a Sustainable Transportation Program, that will support increased use of sustainable modes of transportation and reductions in commuting emissions.
- Establish an ongoing Sustainable Transportation Program to deliver infrastructure, programs and initiatives that enable sustainable transportation choices and drive behavioural change to reduce commuting emissions.
- Continue to pursue a SkyTrain connection to campus by 2032 (existing action).
- Identify a suite of improvements including infrastructure, procedural, and policy changes to improve the Electric Vehicle (EV) charging user experience and increase capacity to support transition towards electrical vehicle ownership in the UBC community.

COMMUTING

Actions: Short Term (By 2024)

- Transition parking permit fee structure to daily permits only (eliminating monthly, term, and annual permits), and offer a discount/subsidy for monthly transit passes for all staff and faculty.
- Improve cycling experience to support increased cycling trips to and from campus, such as improved secure bike storage, working with government partners to provide dedicated bike lanes to/from campus and an integrated e-bike and bike share program with the City of Vancouver.

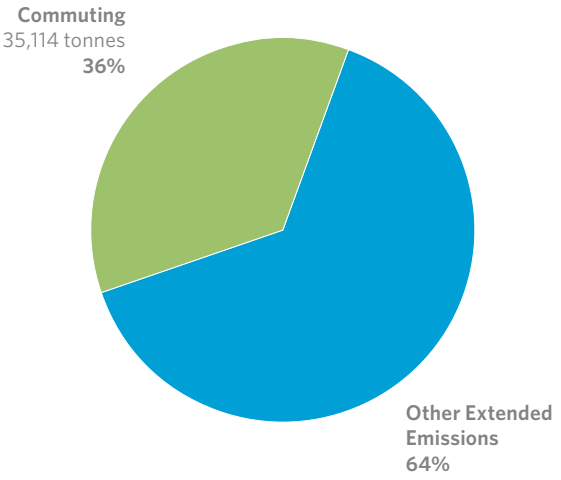

Figure 19: Extended Emissions - Commuting

5.2.2 BUSINESS AIR TRAVEL

Target: By 2030, reduce business air travel emissions by 50% from 2019 pre-COVID-19 levels.

Rationale: Business air travel is a significant source of extended impact emissions, accounting for approximately 17,500 tCO_2e/yr. This is equivalent to about 50% of total campus operations emissions. Much of this travel is undertaken by UBC faculty and staff to attend academic and professional conferences. By leveraging the availability of better communication technology solutions, greater social awareness, and recent learnings from the COVID-19 pandemic, air travel and associated emissions can be reduced while providing an opportunity to maintain or improve UBC's education and research objectives, and is a key opportunity to increase access to educational opportunities for students and departments lacking means for engaging in extensive travel. This acknowledges the dependence upon air travel for researchers to carry out certain types of research and scholarly projects. Generally speaking the UBC Okanagan Campus often bears a somewhat disproportionate amount of "UBC system" travel. Identification and removal of barriers to choosing travel alternatives will be integral to shifting cultural norms, while ensuring an equitable approach.

BUSINESS AIR TRAVEL

Actions: Immediate (Start F2021-22)

- Initiate a Sustainable Travel Program to develop behavioural change programming and awareness campaigns that shift behavior and create awareness around travel impacts and the increasing number of virtual alternatives available.
- Implement a study across both campuses to understand inter-campus air travel patterns, barriers and opportunities to reduce inter air-travel emissions. This action will enable UBC to better understand travel between the two campuses and how our travel behaviours should ideally shift as we start to emerge from Covid-19 travel restrictions.

BUSINESS AIR TRAVEL

Actions: Short Term (By 2024)

- Track and report GHG emissions and other key parameters for all UBC business air travel.
- Lead a coordinated approach to reduce air travel across the University ecosystem by leveraging UBC's leadership role across peer networks (e.g., UC3, U7+).

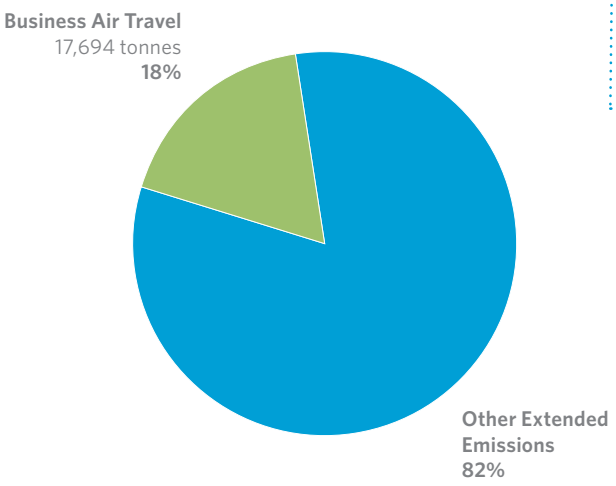

Figure 20: Extended Emissions – Business Air Travel

5.2.3 FOOD SYSTEMS

Target: By 2030, achieve a 50% GHG emission reduction of food systems.

Rationale: UBC campus food systems account for over 29,000 tCO_2e per year and is the second highest category in extended impact emissions after commuting. From a global perspective, food systems are an enormous driver of climate change and contribute between 21 - 50% of global GHG emissions. After commuting, food is the second highest emissions category in the extended impact emissions area.

Over 60% of food produced, equivalent to 35 million tonnes of food are wasted in Canada each year, generating about 56.5 million tonnes of CO_2-equivalent emissions. Approximately 32% – equaling 11.2 million metric tonnes of lost food – is avoidable and is edible food that could be redirected to support people in our communities[10].

UBC is well positioned to lead an integrated approach in creating a just and resilient campus-wide food system – access to sustainable, safe, affordable, healthy foods increases mental health, physical health, and sense of wellbeing benefits. Through partnerships with communities both on and off campus, a Climate-Friendly Food System at UBC will use science-based targets to reduce food system-related GHG emissions. The creation of a campus-wide food system strategy will address all components of UBC's food system, including food production, procurement, provision, consumption to waste and recovery.

[10] https://secondharvest.ca/research/the-avoidable-crisis-of-food-waste/, *accessed 13th August 2021*

Figure 21: UBC Farm Centre for Sustainable Food Systems

FOOD SYSTEMS

Actions: Short Term (By 2024)

- Develop campus-wide Climate-Friendly Food System (CFFS) definition, mandatory CFFS labelling, and a toolkit to increase sustainable dietary choices and habits.
- Develop and implement mandatory campus-wide Climate-Friendly Food System Procurement Guidelines applicable to all food providers. Develop a Food Waste Reduction and Recovery Strategy (including food-related waste).
- Amend the UBC Supplier Code of Conduct to reflect UBC's climate commitments.
- Develop a Food System Resilience and Climate Action Strategy that holistically advances climate-friendly foods at UBC including climate mitigation and adaptation.
- Leverage and expand established interdisciplinary research initiatives, student and faculty-led research to advance climate-friendly food systems, spanning climate mitigation and adaptation.

FOOD SYSTEMS

Actions: Medium Term (2024-2030)

- Enhance the measurement and reporting of the campus food system's environmental footprint, and coordinate with other food sustainability tracking priorities.

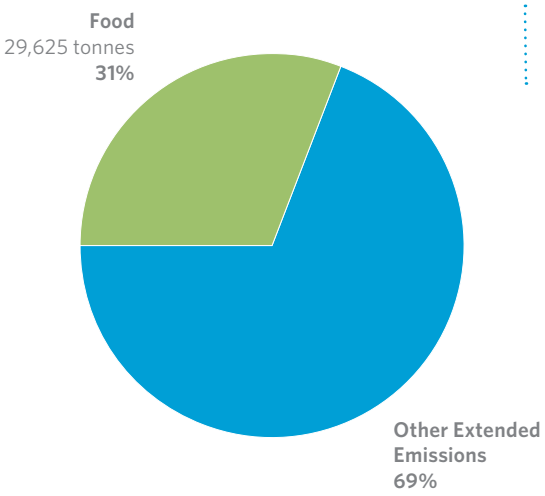

Figure 22: Extended Emissions - Food

5.2.4 WASTE AND MATERIALS

Target:	By 2030, UBC will apply a circular economy lens[11] to enable a 50% reduction in waste, progressing toward a zero-waste community.
Rationale:	While UBC's reported GHG emissions from waste disposal are a very small fraction of overall emissions, waste-related emissions are much higher when considering life cycle emissions that include production of goods and materials – analogous to what is included in embodied carbon calculations for construction. In 2019, the Ellen MacArthur Foundation reported that 45% of 2050 global emissions reductions will need to address production of goods and materials, and circular economy strategies could eliminate almost half of these emissions. A Zero Waste Action Plan update planned for 2022 will more strongly prioritize emissions reductions opportunities such as reuse, apply a circular economy lens, and address barriers that have limited progress toward UBC's zero waste goals to date.

[11] In contrast to a conventional linear economy ("take, make and dispose"), a circular economy lens increases the focus on reuse and recycling of goods and materials back into the economy to avoid and eliminate waste and generate economic value.

WASTE AND MATERIALS

Actions: Immediate (Start F2021-22)

- Initiate a process for updating the Zero Waste Action Plan, which will include refining and integrating the actions below.
- Complete the planning and resourcing for launch of a scalable reuse program that includes furniture, residence items, and scientific equipment.

WASTE AND MATERIALS

Actions: Short Term (By 2024)

- Fund, develop, and implement the Waste Operations Strategy (implemented through Building Operations), which will provide critical waste management infrastructure and business process updates needed to reach our zero waste goals.
- Scope and develop a central sustainable procurement program that could include vendor and product sustainability criteria, packaging requirements, updated procurement guidelines and processes, and integration with the Integrated Renewal Plan (UBC's enterprise level IT systems upgrade).

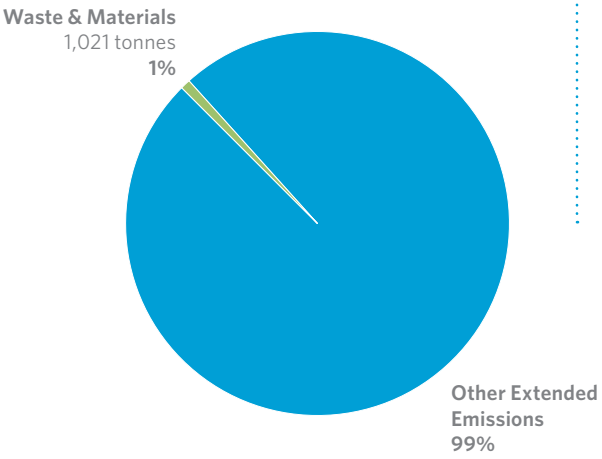

Figure 23: Extended Emissions – Waste and Materials

[Note: Waste emissions shown only include those from disposal and do not include life cycle emissions, which are much larger]

5.2.5 ENGAGEMENT AND OUTREACH PROGRAMS

Target:	By 2030, three quarters (75%) of UBC faculty, staff and students will be aware of UBC's climate action goals and participating in UBC's evolving and expanding culture of sustainability.
Rationale:	UBC's climate-related engagement and outreach programs have demonstrated successes in reducing energy and emissions from UBC operations through energy conservation initiatives and campaigns delivered by programs including Green Labs, Sustainability Coordinators and Sustainability in Residence. With the inclusion of extended emissions targets in CAP 2030, new and expanded communications and engagement capacity will be critical to underpin the community climate action and behaviour and social changes needed to reach the Paris Agreement target-aligned goals for business air travel, commuting, food, and waste.

ENGAGEMENT AND OUTREACH PROGRAMS

Actions: Immediate (Start F2021-22)

- Create a comprehensive plan to track, support, and (where needed) coordinate the implementation of CAP-related engagement and outreach communications, campaigns, and programming, in alignment with institutional action on the Climate Emergency Task Force priorities, Sustainability & Climate Action Integrated Communications & Engagement (ICE) Plan, and CAP 2030 scope 1, 2 and 3 emissions reduction actions.

ENGAGEMENT AND OUTREACH PROGRAMS

Actions: Short Term (By 2024)

- Establish a climate action communications, engagement and outreach model (supporting awareness-building and education as well as social and behavioural change) for both targeted and campus-wide audiences.
- Develop new and expanded sustainability engagement and outreach programs, tools and resources, ensuring adequate and ongoing resourcing to amplify engagement on climate action.
- Standardize a university-wide process for portfolios, faculties and/or departments to track, measure and report out on UBC CAP participation and progress.

ENGAGEMENT AND OUTREACH PROGRAMS

Actions: Medium Term (By 2030)

- Identify, create and promote (existing and additional) funding opportunities to support innovative sustainability initiatives driven by faculty, students and staff (i.e. AMS Fund, Workplace Sustainability Fund, Green Labs Fund, Sustainability Revolving Fund, and building-based energy-savings projects to benefit lab environments).
- Develop ways to ensure that climate action is an important aspect of every employee's work, where relevant – such as integration within performance metrics, job descriptions, etc.
- Identify and utilize price signals to incentivize GHG reduction behaviors (i.e. transportation, business air travel, waste, etc.).

5.2.6 EMBODIED CARBON

Target:	By 2030, establish an embodied carbon baseline and align new building and renewal designs with a 50% reduction target.
Rationale:	As UBC continues to drive down operational emissions from buildings, it is becoming more important take a life cycle approach and address embodied emissions that arise from materials used to construct these buildings, in addition to the energy emissions from operating the building. Even when averaged over the life of the building, these emissions represent a significant share of all UBC's extended impact emissions, hence limiting new construction as far as possible represents the first step in limiting GHG emissions. The embodied energy of new buildings can be reduced by using materials which use less energy to produce and are made from natural materials and recycled materials.

There has been significant progress made in initial research and scoping of this area; UBC is already a recognized innovator and leader in building projects that use low carbon materials and innovative construction techniques, as demonstrated by UBC's Brock Commons Tallwood Project (Figure 24), which was world's tallest contemporary wood building at the time of completion. Research will need to continue into developing more accurate and streamlined assessment methods for embodied carbon, reliable regional supply chains for low carbon materials, as well as design and construction strategies to further reduce embodied carbon across the campus.

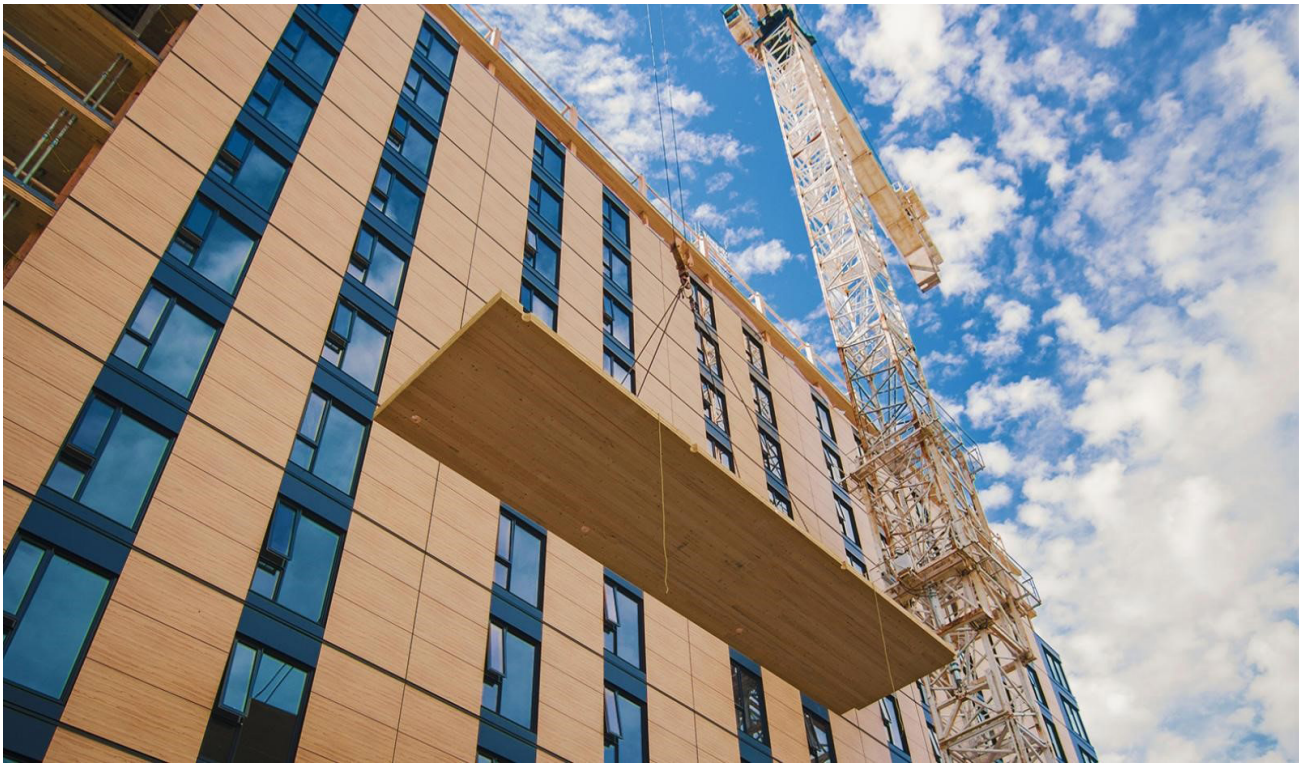

Figure 24: UBC's Tallwood Building

EMBODIED CARBON

Actions: Immediate (Start F2021-22)

- Develop clear guidance for embodied carbon Life Cycle Assessment (LCA) studies for new buildings and renewals, and introduce a pilot target of 20% reduction over a baseline building.
- Develop guidance for reducing embodied carbon in buildings to discourage, reduce or potentially eliminate materials with the highest embodied carbon impacts
- Update the method for campus level reporting on embodied carbon emissions in UBC's GHG inventory and carbon reporting.

EMBODIED CARBON

Actions: Short Term (By 2024)

- Create an operational and academic research collaboration or hub for UBC building performance/embodied carbon.
- Develop embodied carbon reduction targets for UBC buildings by type and for campus as a whole, for application on projects in 2025-2030.

EMBODIED CARBON

Actions: Medium/Long Term (By 2031+)

- In addition to embodied carbon, consider healthy and equitably-sourced materials as part of a holistic approach to building material choices.

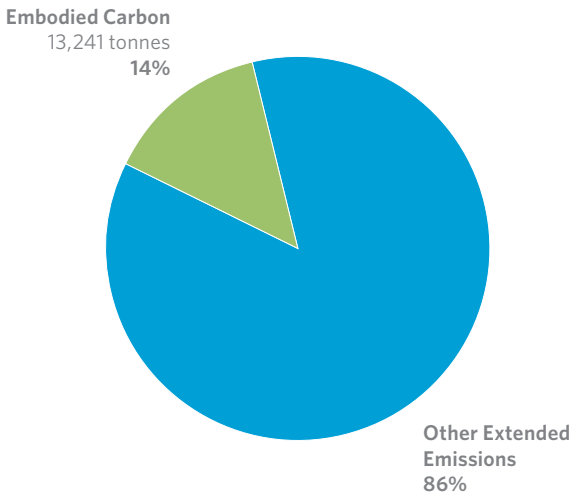

Figure 25: Extended Emissions – Embodied Carbon

5.3 COMPLEMENTARY ACTION AREAS

The following actions are tied to other planning initiatives that are not specifically part of CAP 2030, but contribute to important CAP 2030 objectives

5.3.1 ADAPTATION, RESILIENCE AND BIODIVERSITY

CAP 2030 is focused on the mitigation of greenhouse gas emissions to meet UBC's and Paris Agreement targets. However, adaptation and resiliency in the face of a changing climate, notably that our biodiversity and ecosystems are a key issue as evidence of a changing climate.

British Columbia is already experiencing the impacts of climate change on our population and unique biodiversity. Average temperatures are increasing, sea levels are rising, and more variable and extreme weather is becoming more frequent, including increased rainfall and extreme rainfall events. It is also important to note, that though all of BC faces challenging climate change impacts, Indigenous communities continue to experience a disproportionate share of historical and magnifying climate impacts. These impacts directly affect the province and require government and public sector organizations to re-think how they will deal with their own infrastructure and operational needs, and their ability to provide services to the public. Failing to adequately consider and manage risks from climate change will cost significantly more than implementing proactive management of these risks. In response, the Province of BC is drafting a Climate Readiness and Adaptation Strategy that UBC has helped inform. The Province is also developing Minimum Climate Resilient Design standards and guidelines that will influence our future actions.

In recent years, the Province has required public sector organizations including UBC to complete an Annual Climate Risk Survey to understand current public sector capacity to report on climate risk management. In the near future UBC will be required to report and track progress against key climate risk categories, in the same way we report on and offset carbon emissions and mitigation actions. Increasingly UBC will need to incorporate climate resiliency and adaptation considerations into campus planning and operations. For example, designing stormwater management systems that can accommodate more intense rainfall events, modelled for future climate conditions.

Addressing climate and ecological crises simultaneously is critical in developing a resilient campus. In addition, natural assets are also part of a holistic suite of solutions that can contribute to mitigating GHG emissions - e.g., urban forests and shading buildings to reduce cooling energy loads, using green space to mitigate heat island effects, and carbon sequestration via trees and vegetation.

Given the devastating local impacts of climate change, there will be a continued immediate campus response to recent heat wave and climate fires with a focus on building retrofits, addressing indoor air quality measures for wildfire smoke, and exploring ways to enhance the UBC Vancouver Climate Ready Building Requirements for new construction. The campus will be developing an Adaptation, Resiliency and Biodiversity Strategy as a subsequent CAP 2030 planning phase.

ADAPTATION, RESILIENCE AND BIODIVERSITY

Actions: Immediate (Start F2021-22)

- Increase understanding of the biodiverse ecosystems on campus and the climate adaptation benefits they provide by developing foundational research around biodiversity and climate resilience on the UBC campus. This will include:
    - A community-driven process to develop a set of campus biodiversity and climate principles to advance climate change mitigation and adaptation, ecological health, and human health and wellbeing.
    - A campus natural asset baseline that quantifies the contributions of UBC's natural assets to the range of ecological and socio-cultural services.
- Continue UBC's immediate response to recent heat wave and climate fires with a focus on building retrofits, addressing indoor air quality measures for wildfire smoke, and updating and expanding the UBC Vancouver Climate Ready Building Requirements for new construction.
- Provide technical and advisory contributions to the drafting Provincial Climate Preparedness and Adaptation Strategy.
- Develop procedures and protocols for building occupants and facility managers – i.e. UBC to take proactive steps to introduce new maintenance and operation protocols to improve air quality through ventilation systems by implementing MERV 13 filters.

ADAPTATION, RESILIENCE AND BIODIVERSITY

Actions: Short Term (By 2024)

- Develop a Climate Adaptation, Resiliency and Biodiversity Strategy that is an "umbrella" strategy that incorporates other UBC plans, policies and initiatives, with specific actions to maintain and enhance urban biodiversity as a tool for climate action through nature-based solutions.
- Adopt biodiversity metrics as a key indicator of climate resilience on campus.
- Leverage and expand established interdisciplinary research initiatives, student and faculty-led research to advance climate mitigation, adaptation and biodiversity solutions, in service of community health and wellbeing (e.g. reducing climate anxiety, addressing health impacts from forest fire smoke, etc.).

ADAPTATION, RESILIENCE AND BIODIVERSITY

Actions: Medium Term (By 2030)

- Incorporate and codify UBC biodiversity enhancements as a strategy to advance towards the target of 85% GHG emission reductions by 2030.

5.3.2 HOUSING AT UBC

A strategy supporting affordable housing at or near UBC for students, faculty and staff to reduce commuting emissions was identified as an important issue, while it is important to simultaneously recognize that significant embodied carbon emissions arise before and during new construction that have major climate impacts and will take many decades to balance with reduced commuting emissions.

HOUSING AT UBC

Actions: Immediate to Medium Term

- Continue to implement UBC's Housing Action Plan to address housing affordability challenges for UBC faculty, staff, and students by increasing housing opportunities on campus.
- Explore additional opportunities for affordable on-campus housing through the upcoming Campus Vision 2050 land use process.
- Conduct a study to model the impacts on commuting emissions and embodied carbon emissions for various on-campus housing scenarios to help inform future land use planning and Campus Vision 2050.

6. Plan Implementation

6.1 DISTRIBUTED LEADERSHIP APPROACH

The CAP 2030 is a UBC wide effort across both the Vancouver and the Okanagan campuses, and will require leadership and resourcing from many units across both campuses. The breadth and scope of the Plan necessitates that it reaches every corner of the institution, requiring a distributed approach to implementation. A CAP Accountability framework has been developed that outlines responsibilities for implementation of actions, monitoring progress, governance over decisions and processes – See Appendix B.

The distributed leadership model integrates concurrent work into this Plan, enhances mobilized resources across campuses, and embeds ownership and accountability for delivering on this Plan across the organization. This approach builds the cross-organizational capacity required for systems change. UBC Campus and Community Planning will serve as a support and/or lead for several discrete actions, and support the monitoring and reporting on progress led by units over time, ensuring all units are held accountable and recognized for advancing their respective actions. The distributed leadership approach will continue through implementation to ensure successful execution of this Plan.

6.2 RESOURCING CAP 2030

6.2.1 APPROACH AND RESOURCING – CAMPUS OPERATIONS

CAP 2030 has identified bold targets and key actions that can accelerate UBC towards its net zero target for Campus Operations. Technically there are solutions that can support deep emission reductions through more aggressive performance requirements at building and site scales, as well as low carbon energy at the campus scale. However, the final decarbonization approach for UBC's current context requires further development. Therefore, a top priority is to continue key studies to identify the best approach to decarbonize UBC's core operations, progressively refine the costing, and ensure that limited resources are spent in the most effective manner to reduce GHG emissions.

As UBC advances towards deeper GHG reductions, increasing levels of capital investment will be required in the short term, to help reduce UBC's carbon liability in the medium and longer term. While it is too early to provide a detailed estimate of investment needed for achieving the overall GHG reductions identified by CAP 2030, a sense of the scale of investment can be given when considering future carbon liabilities. Translating the recent update of the federal carbon price to UBC's remaining carbon emissions gives carbon liabilities of approximately $100 million over a 20 year project period (provincial offset requirements and implicit carbon costs from regulations will further add to this)[12]. Investments in clean solutions will be needed to avoid having to pay this liability.

[12] *Estimate based on multiplying UBC's remaining emissions by the announced federal carbon price ($170/t CO_2e) and by an assumed average project life of 20 years.*

The timing of investments will vary widely. Generally, building scale decarbonization projects will be ongoing throughout the decade to 2030. Investments in district energy decarbonization projects are forecasted to commence earlier following detailed studies and analysis.

6.2.2 APPROACH AND RESOURCING – EXTENDED IMPACTS

In contrast to campus operations emissions which are generally addressed through capital investments, reductions in extended impact areas will be driven by policy, procedures, processes, and programs aimed at achieving behaviour change across the UBC community. This, in combination with the fact that many emission reduction opportunities of 'low-hanging fruit' are still available in the extended impact categories, means that relative to campus operations emissions, its resourcing needs are lower and will be in the form of human resources, administrative, or program funding. Addressing extended impact emissions is something the University can commence quickly, to drive action and to show leadership and commitment to the Climate Emergency Declaration.

6.2.3 SHORT-TERM RESOURCING PRIORITIES

There are several short-term priorities that will require immediate resourcing to ensure that the CAP 2030 process continues to advance.

Academic District Energy System and building decarbonization plans:

These technical and financial studies currently underway will continue into 2022 and lead to the recommended technical solutions and projects that will provide the "heavy lift" emissions reductions for campus operations.

Low carbon equipment replacements:

There are several hundred pieces of fossil fuel (natural gas) equipment in buildings, responsible for about half of Campus Operations emissions. This equipment periodically needs to be replaced, with new equipment often staying in operation for 15-20 years. Avoiding locking in of new fossil fuel equipment is critical to achieve the CAP 2030 targets. It will require extra funds to cover the higher upfront capital costs of low carbon alternatives (many of which will have lifecycle savings when including the cost of energy and carbon). Importantly, this will protect against the risk of having to replace gas-using equipment well before its end of life at a later date, which would come at considerable extra cost.

Low carbon design for new and renewal green buildings:

Similar to equipment replacements, it is critical to avoid locking in new fossil fuel equipment going forward wherever possible. As new and renewal buildings are designed, low carbon features may necessitate incremental capital costs. UBC must find ways to address these costs in budgeting and funding.

Extended impacts program development and implementation:

Quick-start actions have been initiated to reduce emissions from food systems and business air travel. These programs and others will need to continue and expand to support achievement of our aggressive 2030 targets.

This short-term resourcing will help build the foundations for success of CAP 2030, ensure that the long-term costs of climate action are minimized, and demonstrate early leadership on priorities identified in the Climate Emergency Declaration.

6.2.3 RESOURCING STRATEGY

Resourcing and funding of the CAP 2030 will help achieve multiple objectives across the institution, including avoiding future costs and reducing UBC's carbon liability. CAP 2030 will help position UBC at the vanguard of climate action leadership and will help to advance a core pillar of UBC's Strategic Plan. CAP 2030 will continue to elevate UBC's brand and reputation on sustainability. UBC's investment in CAP 2030 is not just an investment in improving operational excellence through higher performance buildings, low carbon infrastructure and behavioral change programs and community climate action. Resourcing CAP 2030 will also provide innovative platforms for Campus as a Living Laboratory projects whereby the operational and academic communities of students and faculty partner together to foster innovation, ingenuity and position UBC as a progressive change-agent that advances applied research to demonstrate climate action(s), practices and policies.

The CAP 2030 project management team collaborated with UBC's Strategy and Decision Support (SDS) to develop an overall Resourcing Strategy for CAP 2030 (Appendix A), which identifies opportunities, efficiencies and innovative resourcing approaches for the many actions and the resulting future projects and programs identified in the Plan. It also defines the selection process for major projects, with project implementation considerations, financial planning considerations, and a preliminary overview of the types of funding needs and opportunities to support CAP 2030 actions.

Realizing the bold vision and aggressive GHG reduction targets in CAP 2030 will require significant effort from across the university, and significant investments in innovative low carbon projects, student and faculty-led research and programs. These necessary investments will challenge UBC's current resourcing abilities. Innovative solutions will be needed not only in technology, but also in processes for planning and resourcing projects and programs.

Achieving our emissions targets will not only help protect the climate, our biodiversity, and public health and wellbeing, but will also mitigate UBC's carbon liability, while maintaining UBC's sustainability leadership role at this critical time for our planet.

Figure 26: UBC Climate Strike in front of Musqueam Welcome Post, Sept 2019
[Photo: Joachim Zens]

7. Glossary

Academic District Energy System (ADES): UBC's district energy systems that produces hot water and distributes it to buildings to provide space and water heating. UBC's ADES is the main source of heating to campus buildings.

Air Source Heat Pump (ASHP): An air source heat pump is a system that transfers heat from outside the building to inside the building for heating (or vice versa for cooling). As it transfers heat and doesn't create heat, ASHPs can be extraordinarily energy efficient, with heat generated up to 400% of the initial electrical energy input.

Alliance of World Universities (U7+): An international alliance of university presidents to engage in discussions and concrete action and commitments to address the most pressing global challenges in a multilateral context.

Biodiversity: A characteristic of an ecosystem that describes the diversity of life it contains, and directly correlates to the function and resilience of that ecosystem. Biodiversity is manifested at all levels of the organization and functioning of biological life, from the micro to the macro level, including genetic diversity, diversity of species, ecosystems and biomes, and cultural diversity

Bioenergy Research and Demonstration Facility (BRDF): UBC's plant that produces heat and electricity from biomass fuel, renewable natural gas, and conventional natural gas. The biomass fuel is gasified to create syngas that is burned to produce steam. The heat produced by the BRDF is distributed by the ADES to buildings in the form of hot water.

Business As Usual (BAU): Refers to a situational context or scenario that does not undergo any change; a scenario where no climate action is taken.

Campus Operations Emissions: Emissions generated through campus operations are defined as emissions from sources directly controlled and operated by UBC, including combustion of natural gas on campus (scope 1), and from upstream emissions from electricity consumed on campus (scope 2).

Carbon Dioxide (CO_2): A naturally occurring gas that is also a by-product of the combustion of fossil fuels and biomass, land-use changes, and other industrial processes. It is the principal anthropogenic greenhouse gas. It is the reference gas against which other greenhouse gases are measured and therefore has a Global Warming Potential (GWP) of 1.

CleanBC: A plan developed by the British Columbia provincial government that sets 2030 climate goals through energy and industry emission reduction innovations and initiatives.

Climate Action Plan (CAP): A framework that provides a pathway to net zero emissions for the Vancouver campus. This was first initiated in 2010, and has been subsequently updated for 2020, and now 2030.

Climate Adaptation: An approach aimed to mitigate the suffering and destruction of climate change through adapting ecological, social, economic and physical environments to withstand threats such as rising sea levels, severe storms, higher temperatures and changes in rainfall patterns.

Climate Justice: A holistic approach to climate action that acknowledges the ways in which climate change and its consequences differently affect underprivileged and marginalized populations, compounding and exacerbating the existing inequalities they experience.

Climate Justice Lens: Recognizes responsibility and accountability for causes of climate change, the inequitable burdens of climate change impacts and an awareness of intersecting vulnerabilities, systemic and structural injustices. Climate justice might generally be thought of as advocating for what is right, fair, appropriate or deserved in relation to climate change drivers and impacts, including thinking about climate justice as forms and processes of distributive justice, procedural justice and restorative justice.

Climate Mitigation: A human intervention to reduce the sources or enhance the sinks of greenhouse gases (GHGs).

Climate Resilience: The degree to which a socio-ecological system can withstand and adapt to the adverse effects of a changing climate.

E3 Fleet Rating (E3): A unique made-in-Canada rating program that evaluates and recognizes excellence in the green performance of vehicle fleets.

Extended Impact Emissions: Emissions occuring from activities that are not always fully controlled by UBC, but that the institution impacts and influences through purchasing decisions, plans, policies, guidelines, behavioral change programs, and others. These emissions are generally referred to as scope 3 emissions and include sources such as commuting to and from campus, business air travel, food consumed on campus, waste, and the embodied carbon associated with the construction of new buildings and retrofits.

Global Warming Potential (GWP): GWPs are particularly important within the context of emissions reporting since international protocols require the reporting of both individual GHGs and their carbon dioxide equivalents (CO_2e). For this reason, the calculation of GHG emissions generally involves multiplying the emission factor for a GHG by an appropriate measure of consumption (activity) to produce the corresponding emissions for that GHG and then multiplying those emissions by its GWP to produce the corresponding CO_2e emissions.

Greenhouse Gas (GHG) Emissions: Gases emitted from fuel combustion and other sources, that contribute to the greenhouse effect and global warming. This includes carbon dioxide, methane, nitrous oxide, ozone, and chlorofluorocarbons.

Heating, Ventilation and Air Conditioning (HVAC): The system and technology of heating and cooling of buildings through heating, ventilation and air conditioning.

International Sustainable Campus Network (ISCN): An International forum that support higher education institutions in the exchange of information, ideas, and best practices for achieving sustainable campus operations and integrating sustainability into research and teaching.

Renewable Natural Gas (RNG): A biogas (or biomethane) that results from bacteria breaking down organic waste from sources such as landfills, agriculture and wastewater treatment facilities, and is upgraded to a quality similar to fossil natural gas. Because of its biological source, it is considered a carbon neutral energy source.

Resilience: An ongoing process of diverse, interconnected relationships and processes that activate and build up resilience-enhancing capacities within and across a community for short, medium and long term sustainability and wellbeing.

Tonnes of Carbon Dioxide Equivalent (tCO_2e): The universal unit of measurement to indicate the global warming potential (GWP) of each of the six greenhouse gases, expressed in terms of the GWP of one unit of carbon dioxide. Expressing all

GHGs in terms of tonnes of CO_2e allows the different gases to be aggregated. The GWP of CO_2 equals one. Methane or CH4 has a GWP of 25, indicating that its radiative forcing is 25 times that of CO_2. In other words, releasing one tonne of CH4 will have the same warming impact as releasing 25 tonnes of CO_2. This impact is often expressed using the concept of carbon dioxide equivalent, or CO_2e: that is, one tonne of CH4 can also be expressed as 25 tonnes of CO_2e.

University Alliance for Sustainability (UAS): An alliance between Freie Universität Berlin, the Hebrew University of Jerusalem (Israel), the Peking University (China), St. Petersburg State University (Russia), and UBC to focus on sustainability as a comprehensive topic for collaborating in research, teaching, and campus management.

University Climate Change Coalition (UC3): A coalition of North American research universities committed to climate action and cross-sector collaboration to accelerate local climate solutions and build community resilience.

Zero Emissions Vehicle (ZEV): A vehicle that has the potential to produce no tailpipe emissions. These can still have conventional internal combustion engines but must be able to operate without it. Some types of ZEVs are battery-electric, plug-in hybrid electric, and hydrogen fuel cell.

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