Carbon Neutrality And UBC
A First Glance

Students: Liz Ferris, Jordan Best.
Staff Support: Heather Scholefield, Jorge Marques, Brenda Sawada.
Faculty Support: Peter Nemetz.
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INTRODUCTION

Climate Change is an issue that has gained increasing and unprecedented media coverage throughout the past year. The rate at which we are altering our planet coupled with the urgent need for solutions, however, means that we can no longer wait for governments to adopt and act upon the issue of climate change: we must instead begin look toward unique, innovative, and collaborative solutions to climate change throughout the many facets of society. Our goal with this paper is to begin conducting the research necessary to assist the UBC Sustainability Office in developing relevant strategies to ensure that the University of British Columbia can curb its harmful effects on the climate. The following research explores what 'carbon neutrality' could mean in the context of the University of British Columbia with specific relevance to the UBC Vancouver campus. Companion Research conducted by the UBC Trek Centre Program and the SEEDS program will be published throughout the summer of 2007.

ACKNOWLEDGMENTS

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BACKGROUND

THE CLIMATE CRISIS

Climate change, and its subsequent effects on the planet's ecosystems, has been a monumental issue in 2007, both politically and morally. This year has seen unprecedented media coverage on the 'climate crisis'. For the first time, the international community, led by the Intergovernmental Panel on Climate Change (IPCC, 2007), has agreed that climate change is caused by human effect on the planet (Walker 2007). To ensure our community's continued success and the survival of our species, we must alter our actions (Pollution Probe 2004). Indeed, we are not alone in the belief that the 'climate crisis' may well be the defining issue of our time. As the late Carl Sagan, a well known astronomer and astrobiologist has stated, "we are by accident of fate alive at an absolutely critical moment in the history of our planet"(Sagan 1994).

In 2005, James Hansen, director of NASA's Goddard Space Flight Center and the widely recognized chief climate scientist in the U.S. argued that we have *at most* a decade to dramatically alter the trajectory of our GHG emissions, or it will be too late (Vernon 2006).

CONTEXT- UBC AND SUSTAINABILITY

For over a decade, UBC has been considered a leader in Campus Sustainability. In 1990, UBC was among the forward-thinking group of universities to sign the Talloiries Declaration. Since then, UBC has become Canada's first university to implement a sustainable development policy (see UBC Policy # 5) and, in 1998, UBC opened Canada's first campus Sustainability Office. Recent projects include completing Canada's largest university energy and water retrofit(UBC Sustainability Office, 2007), and producing North America's first comprehensive sustainability strategy for a University. TREK 2010, UBC's vision calls for UBC to "prepare

students to become exceptional global citizens, promote the values of a civil and sustainable society"(University of British Columbia, Trek 2010).

OPPORTUNITIES AT UBC

Though UBC has shown clear leadership on issues of sustainability, the university has not yet managed to engage the campus community on the issue of climate change. This is an area where UBC could show leadership in the future. Universities such as UBC offer a unique opportunity to see innovative and dynamic solutions to problems such as the 'climate crisis'. At no other place in society can such diverse combinations of expertise, research, student action, and the economic capital represented by the University's large endowment collaborate to create pathways for change.

In the book *Planet U*, M'Gonigle and Starke highlight the potential that academic institutions have in catalyzing social change. Indeed, "around the world, universities have long been centers for political discourse and catalysts for political action"(M'Gonigle and Starke 7, 2006); universities are both a place of innovation and resistance (M'Gonigle and Starke 2006).

UBC is an excellent example of a concentration of resources that could be capitalized upon in the face of the 'climate crisis'. The UBC Vancouver Campus currently is 'home base' to over 60 000 students, researchers, faculty, staff and administrative personnel (UBC, About UBC 2007). Additionally, UBC has an annual operating budget of over one billion dollars (UBC Public Affairs 2007), and invests its 700 million dollar endowment annually (UBC University Town 2007). The campus also houses a big urban land base, large pieces of ecologically significant lands, diverse expertise and research power, unmatched capacity to solve problems, and a dedicated body of students eager to promote change.

David Orr, chair of the Environmental Studies program at Oberlin College, further highlights the unique role that universities and other academic institutions can play in catalyzing

change in his book *Ecological Literacy*. According to Orr, academic campuses allow people to "begin to see and envision things that otherwise are just giant global problems". Indeed Orr believes that the campus can be a microcosm for the challenges of the 'real world'; this is because the campus is "big enough to be interesting and small enough to be manageable" (Orr 1992).

INTER-INSTITUTIONAL NETWORKING

In the face of the severe impacts of increasing emissions on our climate, many academic institutions have looked to climate neutral strategies to lesson their own institutionally-generated emissions and to mitigate the effect of these emissions. Though each institution faces unique challenges and brings to the climate crisis individual opportunities, for the most part, climate neutral plans include a combination of both emission reduction and emission offsetting strategies. This section of the report will examine a variety of schools currently undertaking climate-neutral strategies as well as programs such as the President's Climate Commitment, a U.S. based inter-institutional effort to address global warming through collective commitment and action to neutralize GHGs and accelerate research and education focused on climate change. By answering questions such as what are Universities and Colleges currently doing to claim climate neutrality, what emissions are being included in quantification inventories, and how are emissions currently being measured, it is hoped that this section of the report will be useful in helping the University of British Columbia develop its own climate neutral strategy.

FRAMING THE PROBLEM

Across North America, currently 325 universities and colleges have committed to Climate Neutrality through the American University and College President's Climate

Commitment (ACUPCC). Although many institutions have committed to achieving climate-neutrality, at the time of research, no universities or colleges have a completed a climate action plan approved for implementation. Nevertheless, many institutions of higher learning are planning for climate action. Additionally, several institutions have created useful planning tools that can be used to develop and evaluate institutional emission reduction and offsetting strategies. A discussion of these tools can be found below.

Currently, it is possible to say that the campus sustainability movement is planning to plan. This has been the major contribution of the American University and College Presidents Climate Commitment (ACUPCC, 2007). Once signed by a college or university, this commitment immediately requires the initiation of a planning process. According to Dedee DeLongpree, the Director of the Office of Sustainability at the University of Florida, the ACUPCC has catalyzed a much more rapid, focused, and integrated approach to achieving carbon neutrality amongst its rapidly growing list of signatories. As this large network of universities and colleges plans to achieve carbon neutrality in their campus operations, they are behaving as an extremely large distributed research network working to address the greatest challenge of our time.

This situation reflects the broader context of the human struggle against the problem of climate change: We have a sense of the scale and the urgency of the challenge that faces us. We are largely able to agree on the scale and the timeline of required deep emission reductions (80-90% reductions in developed countries by 2050). However, we do not yet know how we are going to achieve that kind of change.

This is, of course, where our leading institutions of research and learning have a particular opportunity to contribute. The approach of the University of Florida, described below, is typical of the approach of the ACUPCC. It is a strategy for sparking change best described by this statement from page 5 of the PCC call for climate leadership:

"Colleges and universities are also ideal settings to develop workable new strategies, systems, behaviors and technologies that can be scaled up to the community and state levels. By involving students, faculty and staff, these institutions can become effective models for achieving climate neutrality and sustainability. We need academia to take the lead on cutting-edge research, action and demonstration projects that will speed the path to climate neutrality across all society's sectors - catalyzing investment and driving the development of new markets" (A Call For Leadership, ACUPCC 2007).

PRESIDENTS CLIMATE COMMITMENT CHALLENGE

The American University and College Presidents Climate Commitment (ACUPCC) has, to date, been signed by over 325 higher education institutions (ACUPCC, 2007). The signatories have broad geographic coverage and represent a wide range of higher education institutions.

The commitment outlines a road map for carbon neutrality. Institutions that have signed the strategy are expected to first have top-level commitment toward action on climate change. The ACUPCC then offers member institutions strategies for buy-in from the university community. This buy-in is then followed by the creation and implementation of a plan, and the concurrent reporting of progress to the ACUPCC governing body.

By signing the commitment, American university and college presidents agree to:

1. Initiate the development of a comprehensive plan to achieve climate neutrality as soon as possible.
2. Initiate in-term tangible actions to reduce greenhouse gases while the more comprehensive plan is being developed.
3. Make the action plan, inventory, and periodic progress reports publicly available by providing them to the Association for the Advancement of Sustainability in Higher Education (AASHE) for posting and dissemination[1].

[1] For a complete listing of ACUPCC regulations, please visit http://www.presidentsclimatecommitment.org/pdf/commitment.pdf or Appendix 1 of this report.

For a comprehensive list of actions required of ACUPCC signatories please refer to appendix 1**.**

Signatories of the commitment are expected to inventory all institutionally created emissions inclusive of emissions from electricity, heating, commuting, and air travel (ACUPCC, 2007). Though this is commendable, the commitment fails to define a scope of Climate Neutrality. This has the potential to lead to bench-mark inequity, and provides an incentive for academic institutions to avoid calculating institutionally created GHG emissions simply to maintain their Climate-Neutral status. For example, many institutional GHG emissions are created during construction of buildings, or are a result of the embodied energy found in construction materials. As the ACUPCC does not require institutions count these emissions in GHG inventory reports, schools can claim to be climate-neutral when in reality many emissions associated with institutional operations have been neither reduced, offset nor accounted for.

In July, 2007, the ACUPCC released a draft implementation guide, outlining guidelines for GHG inventory calculations. This document appears to address some of the uncertainty associated with boundary and scope of calculable GHG emissions.

Judy Walton, director of the Association for the Advancement of Sustainability in Higher Education has stated that there is interest in launching a Canadian version of the ACUPCC. As UBC is widely recognized as Canada's leader in sustainability, an opportunity exists for UBC to show leadership on the issue of climate change through the creation of a Canadian-made University Commitment. At the time of research, UBC President Stephen Toope had requested an initial study into the interest and feasibility of a Canadian Climate Campaign. Currently Common Energy, an organization at the University of Victoria and the Sustainable Concordia Project, a group at Concordia University are also exploring the possibility of a Canadian Commitment. Areas for further future research directions include assessing the potential for a Canadian plan, and exploring the opportunity of expanding the program from academic

institutions toward businesses and industry.

Schools Going Climate-Neutral

Currently there are 325 signatories of the PCC. This list is growing rapidly (ACUPCC, 2007), with approximately 200 institutions having signed onto the commitment since January. The following institutions are all early adopters of the PCC and have undertaken some initial climate action planning.

College of the Atlantic, Bar Harbor, Maine

The College of the Atlantic's Carbon Net-Zero Proclamation sets out impressive targets for achieving 100% reliance on energy from renewable sources by 2015 (COA, 2007). They will then purchase offsets for the remaining GHG emissions. To plan efforts for emissions-neutrality, COA is integrating all major components of the emissions-reductions strategy into the curriculum. Student-researchers will quantify emissions, write an emissions-reductions strategy and investigate opportunities to shift endowment investment into renewable energy investment projects. As of 2007, COA is powered by renewable energy projects including wind and bio-diesel (A Call For Leadership, 9).

Arizona State University, Phoenix, Arizona.

ASU president Michael Crow signed the PCC in March of 2007 (ASU Insight, 2007) and is part of the ACUPCC leadership circle that promotes the agreement. ASU have committed to putting together an inventory of their greenhouse gas emissions and developing a plan within two years to become carbon neutral. The Office of Sustainability Issues is helping to put the carbon neutral plan together. ASU's commitment is particularly impressive given the very large size of the institution.

UNIVERSITY OF CALIFORNIA, SANTA BARBARA

The University of California system has emerged as a major leader in the campus sustainability movement. The Bren School of Environmental Science and Management at UCSB completed a Campus Carbon Neutral Project last year which explored possible strategies for meeting California's 80% GHG emissions reductions by 2050 goal (Bren School, 2007). In their investigation, researchers at the Bren School found that should the university adopt an energy-reduction strategy, energy savings would save the university $5 million by 2020.

They are currently working on Campus Carbon Neutral II, a plan which builds upon the initial report and examines further energy reduction and carbon neutral strategies for the campus[2].

UNIVERSITY OF FLORIDA, GAINESVILLE, FLORIDA

The University of Florida has received considerable press for their climate neutral declaration. Published in 2004, the University of Florida Carbon Neutral Assessment Report laid the groundwork for the 2006 announcement that the university sign make the President's Climate Commitment and begin a planning process to achieve carbon neutrality (University of Florida, 2004). Currently, the university is working on a detailed greenhouse gas inventory using an upgraded version of the software that was employed to create the 2004 report[3]. This assessment will quantify the impact of commuter transportation and plane travel. The 2004 report indicates the University could become carbon neutral by 2020 in an "aggressive" scenario or by 2030 in a "moderate" scenario. Furthermore, the report found that existing energy efficiency initiatives routinely saved money and that a 40% reduction in energy demand would positively improve the University's operational budget. The study concludes that achieving carbon neutrality is possible at no net cost, and, if desired, attainable within two decades (University of Florida, 2004).

[2] The details of this project can be found at http://fiesta.bren.ucsb.edu/%7Eccn2/
[3] This software, developed in-house is being replicated for use in other campuses.

LANE COMMUNITY COLLEGE, EUGENE, OREGON

Lane Community College is committed to Climate Action. President Mary Spilled is on the Leadership Circle of the PCC, and the campus won a Campus Sustainability Leadership Award in October 2006 from AASHE, for, among other things, declaring a target of climate-neutrality by 2050 (Lane Community College, 2006). The college established Sustainability Group in 2004 whose membership includes students, faculty, staff and managers. Initiatives already underway that implement sustainability include an environmental curriculum, a comprehensive recycling and waste reduction program, energy conservation and a waste reduction plan[4]

OBERLIN COLLEGE, OBERLIN, OHIO

As the site of the Lewis Center for Environmental Studies and well-known university sustainability expert, David Orr, Oberlin College was an early signer of the ACUPCC. Like all of the other universities and colleges that have signed this commitment they are currently in the planning stages.

The report: *Oberlin College: Climate Neutral by 2020* was written in 2002 by the Rocky Mountain Institute to chart a possible path to climate neutrality and is an extremely comprehensive assessment of the challenges and opportunities faced by institutions going climate neutral (Rocky Mountain Institute, 2002).

LOCAL CONTEXT

UNIVERSITY OF VICTORIA

The University of Victoria has demonstrated leadership on the issue of climate change. In response to the threat of climate change, students at UVic have launched Common Energy (www.commonenergy.org), an emerging network of students, staff, faculty, and regional partners

[4] For more details regarding Lane's sustainability policies and further details of their ene rgy conservation and reduction program, visit http://www.lanecc.edu/sustainability/vision.html and http://www.lanecc.edu/sustainability/resources.html

working to find local solutions to climate change. Common Energy seeks to answer a critical question faced by institutions of higher learning: ‘ how can we do more to solve the problem of climate change than we do to cause it? ‘ The network coined the term *beyond* climate-neutral, an idea which emphasizes the capacity of educational institutions such as universities to contribute to the solutions of climate change, as well as mitigate their own impact on the climate. Universities can create the solutions to climate change through research, technological innovation and educating graduates to understand the impacts of climate change. An institution is *beyond* climate-neutral when they are both acting to reduce GHG emissions associated with university operations, and additionally mobilizing around climate-change solutions.

At UVic, the goal of *beyond* climate-neutral is being targeted through a series of working groups supporting 3 campaigns: a climate trust funding climate-related initiatives, a university challenge, supporting community members to move beyond climate neutral, and a strategy document, outlining how UVic can move *beyond* climate-neutral. In June, 2007, the University of Victoria launched its first Progress Report on Climate Change, a 61-page document outlining ways in which the greater Victoria region can move *beyond* climate-neutral[5]. Students at UBC are following this model and have worked closely with the Common Energy Network to launch Common Energy UBC. The authors of this report believe that any plan to move UBC toward Climate-neutrality should work closely with both the University of Victoria, and the UBC Common Energy Network.

UNIVERSITY OF BRITISH COLUMBIA

Since the authors first began this report, the context at the University of British Columbia has changed dramatically. As mentioned previously, Common Energy UBC, an emerging network of students, staff and faculty at the University of British Columbia has begun a number

[5] For a copy of the progress report, and to learn more about the common energy network, please visit commonenergy.org

of campaigns to bring UBC *beyond* Climate-neutral. Throughout the spring term of 2007, three working groups (projects, research and outreach teams) collaborated with over 100 UBC Campus community members to begin visioning a climate-neutral UBC. Networking with the UBC Sustainability Office created the Climate Action Partnership, a participatory partnership between UBC's three student unions, Common Energy UBC, the Sustainability Office, the UBC Trek Program Centre and other Campus Stakeholders committed to bringing UBC toward climate-neutrality. The University has formalized its commitment to climate-neutrality through the creation of the Climate Action Partnership Coordinator Position, funded through the Sustainability Office. It is hoped that the Green House Gas emissions profile that follows will allow the Climate Action Partnership (CAP) to move UBC toward and *beyond* climate-neutrality.

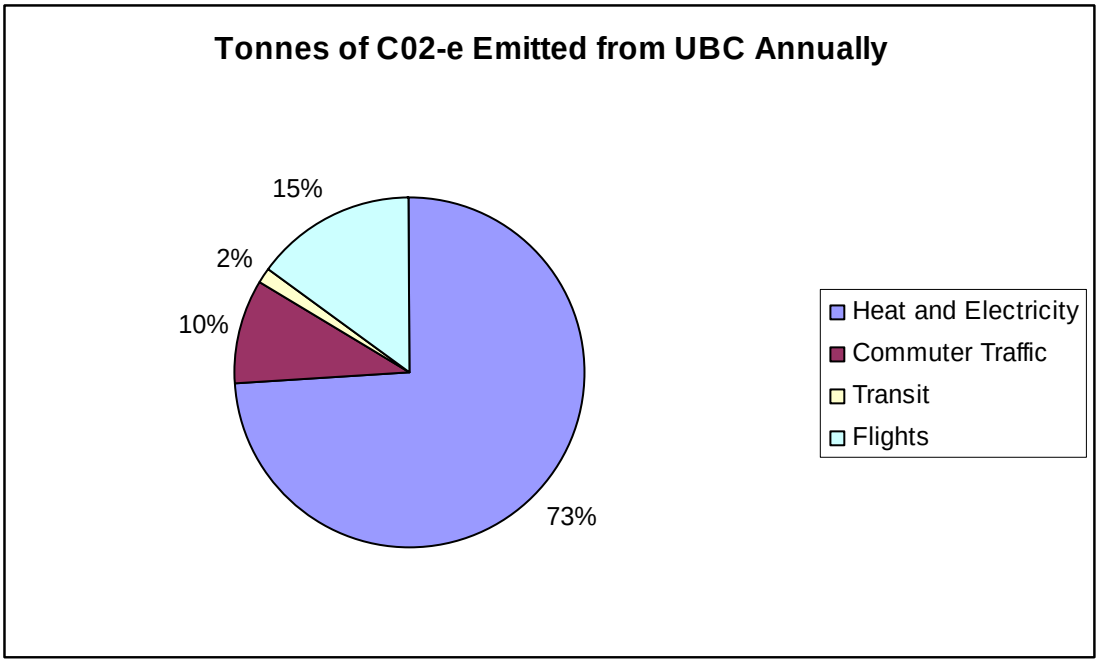
GREENHOUSE GAS QUANTIFICATION

Annually UBC emits 82 750 tonnes of CO_{2-e} [6] through operations (heat and electricity), commuter traffic (transit and vehicle) and flights. A study calculating on-campus fleet vehicles is currently being conducted. The emissions associated with on-campus fleet vehicles will be appended to this report when completed (August, 2007).

Type	Tonnes of C02-e
Heat and Electricity	61056
Commuter Traffic	8072
Transit	1322
Flights	12300
Total	82750

[6] CO_2 and equivelant emissions. For the purposes of this investigation, CO_2, CH_4 and N_2O were calculated with Global Warming Potential (GWP) conversion factors of:

Gas	GWP
CO_2	1
CH_4	21
N_2O	310



GHG QUANTIFICATION METHODOLOGY

When undertaking an emissions profile of an academic institution, it is first necessary to define the boundary of emissions attributable to the institution. A number of methodologies exist for determining emissions boundaries. The World Resources Institute believes that institutions should break down emissions into three scopes (World Resources Institute, 2007):

- Scope 1
  Emissions from fossil fuels under your direct control, i.e. at your premises or in your vehicle fleet, etc.
- Scope 2
  Emissions from electricity that you consume but that is generated elsewhere.
- Scope 3
  Other indirect emissions that you cause but that are not from emission sources that you own, e.g. emissions from your supply chain or from business travel on commercial airlines.

Once calculated, institutions must then act to reduce emissions directly in their own control, and emissions consumed but generated elsewhere (Scopes 1 and 2). Scope 3 emissions may or may be offset at the discretion of the institution.

The ACUPCC also offers guidelines for GHG emissions calculation. The ACUPCC recommends that institutions of higher learning account for all GHG emissions associated with Heat and Electricity, Commuter Travel and University-related flights. As noted earlier, in July, 2007, The ACUPCC released a draft implementation guide, outlining GHG quantification methodology. As this guide was not available at the beginning of UBC's GHG quantification project, researchers were unable to make use of its recommendations.

Following from the recommendations of the ACUPCC, this project will account for UBC's GHG emissions associated with:

- Heat and Electricity
- Commuter Travel (transit and vehicle use)
- Flights
- Fleets

Other GHG emissions associated with UBC include but are not limited to emissions from food consumed on campus (production and distribution), construction of on-campus buildings (embodied energy in materials and building-related emissions) fertilizer and agricultural practices, and emissions from ancillary businesses operated by UBC. Additionally, as UBC is developing the endowment lands and leasing the land for profit, the emissions from the construction and operation of these new neighborhoods could be attributed to UBC's GHG emissions profile. Finally, this report only accounts for emissions associated with UBC's Point Grey Campus. For a complete university GHG profile, GHG quantification must be done for all three of UBC's campuses (Point Grey, Robson Square and Okanagan), the Hope and Agazzi research sights, the Finning Lands and the 2 research forests owned and operated by UBC. Additional opportunities for GHG calculation include a quantification of the CO_2 impact produced by UBC's forested endowment lands.

We recommend that future GHG emission quantification projects account for all university associated emissions, including those associated with food, and construction. Clean Air, Cool Planet (http://www.cleanair-coolplanet.org/) has created a GHG emissions profile tool-kit for Universities and academic institutions that could be used as a reference tool in future GHG quantification projects.

HEAT AND ELECTRICITY

UBC has started to reduce its energy emissions through ECOTrek, Canada's largest energy and water retrofit. Over the past 9 years, through retrofitting 120 buildings on the Point Grey Campus, the ECOTrek program has reduced core campus energy use by over 20%. This translates into absolute $CO_{2\text{-}e}$ emissions reductions to 2% below 1990 levels for UBC buildings, despite a 46% increase in building area over the same period.

Though the Campus has achieved GHG emissions reductions, the UBC Point Grey Campus still emits a significant amount of $CO_{2\text{-}e}$ through heat, lighting and other energy uses. The Core campus of UBC has 1,221,132 square metres of core and ancillary buildings (UBC Sustainability Office, 2006). Through the aforementioned ECOtrek program, in 1998, UBC has begun tracking the energy use of its academic core buildings. In 2006, the Sustainability Office created an annual report describing energy use for academic core buildings. In the report, it was determined that each square metre of building space on the UBC Vancouver Campus emits 0.05 tonnes of CO_2 and equivalent for heating, light, and electricity (UBC Sustainability Office, 2006).

Multiplying floor space by $CO_{2\text{-}e}$ / metre^2 yields a figure of **61,056.6 tonnes of $C0_{2\text{-}e}$.** This figure represents the emissions associated with heat and electricity for the UBC Point Grey Campus.

COMMUTER TRAFFIC AND CLIMATE CHANGE

It is widely recognized that the emissions created by the burning of fossil fuels to power vehicles makes a significant contribution to climate change. In May, 2007, the Intergovernmental Panel on Climate Change (IPCC), a working group established by the WMO and UNEP to "assess scientific, technical and socio- economic information relevant for the understanding of climate change, its potential impacts and options for adaptation and mitigation" released its preliminary findings from its fourth Assessment Report 'Climate Change 2007' (IPCC, 2007). In this report, the panel confirmed that the increasing atmospheric GHG emissions and their associated effects on the planet's climate are unequivocally caused by human impact on the environment. Additionally, in this working paper, it was noted that global greenhouse gas emissions have increased 70% between 1970 and 2004, with the rate of atmospheric CO2 emissions increasing by 80% during the same time period (IPCC, 2007). In the U.S., the burning of fossil fuels account for 80% of all GHG emissions (Energy Information Administration, 2007). As fossil fueled transport vehicles and their associated emissions contribute to climate change, it is necessary to include the emissions associated with commuter traffic in all comprehensive GHG quantification strategies. This section of the report will examine commuting trends to and from the UBC Vancouver Campus and estimate the associated GHG emissions with both Personal Use Vehicle (PUV) traffic and transit traffic.

COMMUTER TRAFFIC AND UBC

Currently the UBC Vancouver Campus has many community members traveling to and from campus each day. Although UBC Housing and Conferences provides on-campus accommodation for almost 7,000 community members (UBC Housing and Conferences, 2007),

and the Official Campus Plan aims to house 18,000 residents on campus by 2021 (Campus and Community Planning, 2007), currently approximately 45,000 students, staff and faculty commute to the UBC Vancouver Campus each day of the winter academic term (UBC Planning and Institutional Research, 2007). Indeed, in 2006, the average fall weekday saw 102,900 trips to the Campus (see table 1.1)(UBC Trek Program Centre, 2007) , each averaging 17.3 km in length(Hoffman and Chisholm, 2001).

Table 1.1 **– Weekday Person Trips Across UBC/UEL Screenline**

Person Trips	1997	2006	Change from 1997 to 2006	
Single occupant vehicle (SOV)	46,000	40,600	-5,400	-12%
Carpool and vanpool	36,100	17,600	-18,500	-51% [7]
Transit	19,000	41,500	+22,500	+118%
Bicycle	2,700	1,200	-1,500	-56%
Pedestrian	1,400	700	–700	–50%
Truck and motorcycle	900	1,300	+400	+44%
Totals	**106,100**	**102,900**	**-3,200**	**-3%**

Source: UBC Trek Program

Though this number is staggeringly high, it is important to note that in the years between 1996 and 2007, the number of trips to UBC actually decreased by 3% with Single Occupancy Vehicle (SOV) trips decreasing by a total of 12% (UBC Trek Program Centre, 2006) and Transit rider ship increasing by 118%. The Trek Program, UBC's Transportation Management Department, is dedicated to providing a variety of sustainable transportation alternatives and, since 1996, has been working to reduce the numbers of vehicles traveling out to UBC campus. Much of this decrease in SOV traffic commuting each day to campus can be credited to the TREK program and its initiatives such as the emergency ride home, and campus shuttle

[7] This decrease is most likely due to the implementation of the U-Pass program.

programs and the U-Pass program. Additionally, UBC has taken a leadership role in many aspects of sustainability including commuter traffic. Since 1997, UBC parking has eliminated over 25% of parking stalls equating to about 3000 stalls eliminated (UBC Trek Program, 2006).

VEHICLE TRAFFIC

Although there are a variety of transportation options to the UBC campus, in fall 2006, the average day saw 48,800 automobile trips with 40,600 of those trips SOV trips (see table **1.2**).

Table 1.2 Traffic Across UBC/UEL Screenline[8]

Vehicle Type	Fall 2006 Person Trips
SOV vehicles	40,600
Carpool and vanpool vehicles	8,200
Total automobiles *(SOV + carpool/vanpool)*	48,800

Source: UBC Trek Program

RESEARCH METHODOLOGY

When quantifying commuter traffic-associated greenhouse gas emissions, there are several ways to calculate the emissions created. In 2004, Jonathan Frantz under the supervision of Gord Lovegrove and Bill Rees undertook the monumental task of creating a GHG Emissions baseline of the associated Student, Staff and Faculty Commuter Emissions. For simplicity sake, this report will build on the Research of the 2004 project and adjust for current conditions at the UBC Vancouver Campus. In 2006, the TREK program undertook a postal code survey determining the daily distance that students, staff and faculty travel each day to get to the campus. This 2006 data has not yet been published; however the researchers believe that when the data becomes available, a more accurate GHG emission profile from commuter-associated emissions can be calculated.

[8] The UBC Screenline was set up at all campus entry points to record vehicles entering and exciting campus.

To calculate the emissions created by automobile traffic commuting to the UBC Point Grey campus, Frantz *et al.* began by creating a formula to determine total kilometers traveled to UBC and then used a conversion factor supplied by the GVRD transportation department to calculate the GHG emissions associated with the distances traveled.

Commuting Population x Commuting Days x Trip Distance = Kilometres Traveled

Figure 1.1

Source: GHG Emissions Baseline: Students, Faculty and Staff Commuting to UBC, Frantz, Lovegrove and Rees, 2004.

On the average weekday in fall 2006, 40,600 commuters traveled to campus in a Single Occupancy Vehicles, and an additional 8,200 Car/Van pool trips were recorded crossing the Screenline[9]. Although these numbers represent the average fall day at the UBC Point Grey Campus, student classes run on a semester schedule and thus varying student populations throughout the year must be adjusted for. In the 2004 study, researchers calculated the number of days commuted to campus by adjusting days on campus by the length of academic term, exam periods and the reading week. Researchers found the number of days students were on campus to be 169.6, which was rounded up to 170 for ease of calculation[10] (See table 1.3).

[9] UBC Trek Program, See table 1.2
[10] For a complete methodology, please refer to the 2004 UBC GHG Emissions Baseline Study, available on line at http://www.sustain.ubc.ca/pdfs/seedreport04/UBC%20GHG%20Emissions.pdf

Table 1.3

Total Days at UBC per Student per Year				
Temporal Division	**Time Frame (weeks)**	**Adjustment Factor**	**Days per week**	**Days at UBC**
Full Classes	26	1	5	130
Summer Session	18	0.22	5	19.8
Exams	6	0.61	5	18.3
Reading Week	1	0.3	5	1.5
Vacation	1	0	5	0
Total	52		169.6	

Source: GHG Emissions Baseline: Students, Faculty and Staff Commuting to UBC, Frantz, Lovegrove and Rees, 2004.

In 2001, researchers Hoffman and Chisholm used postal code information from a transportation survey to calculate the distance commuted to the UBC campus. Using GIS software, Hoffman and Chisholm found the average round-trip distance to be 34.6 km (Hoffman and Chisholm, 2001).

As noted in the beginning of this section, in 2006 the TREK program conducted a second transportation survey with postal code information. When this information is available, the average trip distance to UBC should again be calculated to correct for the change in population at UBC between the years 2001 and 2006.

When calculated, it is found that in 2006, SOV commuters traveled 238,809,200 km and Car Pool Commuters traveled 103,523,200km. For vehicles in the Greater Vancouver Regional District, average fuel consumption is found to be approximately 10.1 liters/100 kilometers used **(Need Citation**). This is found to be true for vehicles dating back to 1986. $CO_{2\text{-}e}$ emissions from gasoline are found to be 19.4 pounds/gallon (U.S.**) (Need Citation)**

Upon using these conversion factors GHG emissions for Traffic Commuting are found to be:

Type	**Emissions (in tones)**
Single Occupancy Vehicles	5642
Car-Pool	2430
Total:	**8072**

TRANSIT EMISSIONS

Over the spring of 2007, the UBC Trek Program Center conducted a thorough GHG quantification of Emissions created by transit vehicles traveling to the UBC Vancouver Campus. The researchers found that that between **1322 and 2644 tonnes** of CO_2 -equivalent emissions can be attributed to UBC in terms of transit emissions. For a complete copy of the report, please contact the UBC Trek Program Centre (http://www.trek.ubc.ca/).

VEHICLE FLEETS

Currently Researchers are working on quantifying GHG emissions associated with Vehicle Fleets at UBC Campus. UBC's vehicle fleet includes all vehicles owned and operated by the university, such as maintenance vehicles and vehicles owned by faculties. This research is set to be published in August, 2007, and will act as a companion document to this report when finished.

PASSENGER FLIGHTS GHG QUANTIFICATION

PASSENGER FLIGHTS AND CLIMATE CHANGE

The GHG emissions associated with passenger flights are usually not included in university climate neutral schemes. Passenger flights, however, represent an extremely large and growing source of global emissions. Global aviation contributes to climate change by causing large scale emissions of GHGs like carbon dioxide and methane, by triggering the formation of condensation trails (contrails) and by increasing cirrus cloudiness (Lister et al. 1999). The Intergovernmental Panel on Climate Change (IPCC) estimates that aircraft caused about two percent of anthropogenic carbon dioxide emissions in 1992, or about thirteen percent of the emissions from the global transportation sector (Ibid). The IPCC also predicts that these emissions will, by 2050, increase to between 1.6-10 times the value of 1992 levels (Ibid). Any

serious climate neutral strategy, therefore, cannot ignore this important source of emissions.

PASSENGER FLIGHTS AND UBC

The number of passenger flights taken by UBC staff and faculty for UBC business and academic purposes is enormous. In general, these flights fall into one of two categories. Around twenty percent of UBC-related flights are paid for by the university's general operating funds, and involve UBC staff traveling for purposes concerning enrolment, fundraising and alumni affairs. These flights are covered by Policy 83 of the Board of Governors. The vast majority of flights, around eighty percent, are paid for by portions of research grants. These flights are made by UBC faculty taking academic-related trips for purposes such as conference attendance.

The amount of money spent on UBC flights each year is tracked by the travel department of Supply Management and the Accounts Payable department of UBC Finance. As each flight is paid for by the individual staff or faculty member, and later reimbursed by Accounts Payable, the total amount reimbursed in a year can be determined. In the 2006/7 financial year (April to March), around $14.5 million worth of flights were booked by UBC staff and faculty. The amount of money spent annually on flights has been increasing substantially each year for the past few years. In 2003/4, $10.7 million worth of flights were booked. In 2004/5 this number jumped to $12 million, and in 2005/6 it rose to $13.9 million.[11] While some of this increase can be attributed to the rising cost of flights, there is obviously a clear trend of increased air travel at UBC.

While around sixty percent of these flights are booked through Supply Management, the rest are booked by individual faculties and departments. This makes it extremely difficult to determine exactly where UBC staff and faculty are flying to each year. Supply Management uses

[11] Year End Report from Connie Fabro, Travel Manager at UBC Supply Management.

two main travel agencies, North South Travel & Tours and Vision 2000 Travel Group. Although Supply Management does track fight information, the reports quickly grow large, and are discarded. It is impossible to obtain destination information for the remaining forty percent of the flights. Accounts Payable does not collect this information, and only keeps track of the dollar figures that are being reimbursed.

METHODOLOGY FOR QUANTIFICATION

There are many assumptions involved in determining the GHG emissions associated with UBC flights. Since it is impossible to study all of the flights in a given year, as mentioned above, it was first necessary to select a representative sample. The top fifty destinations booked through North South Travel & Tours during a nine-month period of the 2006/7 year were selected, since this information was available through Supply Management. The total cost of these flights was around $2.3 million.[12] As $14.5 million worth of flights were booked during this year, this sample represents about fifteen percent of the total.

These flights next had to be translated into GHG emissions. There are many different calculators to translate kilometers traveled by aircraft into per-passenger emissions. Each method gives a different estimate for the total GHG emissions from any one flight, based on the different assumptions of their calculations. The calculator available through the UBC-based organization *Offsetters* was ultimately chosen, since these calculations were developed at UBC[13]. It should be noted that the *Offsetters* calculator had been criticized for calculating low emissions levels in comparison to other calculators (Bowell et al, 2006). The company *Atmosfair*'s calculator, for instance, calculates emissions at more than twice the rate of *Ofsetters* for a flight of equal

[12] Note: Approximate numbers are given for the reader's convenience. Exact numbers were used in all calculations.
[13] For more information on the assumptions behind these calculations, see:
Jardine, Christian. Calculating the Environmental Impacts of Aviation Emissions. Oxford: Environmental Change Institute, 2005.

distance.

For each of these top fifty destinations, the *Offsetters* calculator was used to determine the GHG emissions associated with one flight segment. This number was then multiplied by the number of segments booked for this destination in the given time frame. For example, according to the *Offsetters* calculator, one flight from Vancouver to Ottawa causes 0.388 tons of emissions. Since there were 272 flight segments booked between Vancouver and Ottawa during this nine-month period, the total emissions for this one destination was 271.6 tons. The totals for each of the fifty destinations were then added to determine the total emissions from this representative sample. The total emissions associated with these fifty destinations were determined to be about 1,900 tons.

As mentioned above, the total cost of the flights booked in this representative sample was about $2.3 million while the total cost of all flights booked during the 2006/7 year was $14.5 million. The simplifying assumption was made that the remaining eighty-five percent of flights shared the same cost to emissions ratio as the representative sample. The emissions from the sample were, therefore, multiplied by 6.3 ($14.5/$2.3)[14] to determine the total emissions of UBC flights. The potential inaccuracy of this assumption must be highlighted since there is not always a clear relationship between the cost of a flight and the emissions from that flight (as determined by total mileage).

QUANTIFICATION

According to the calculations using the above mentioned methodology, the total estimated GHG emissions from UBC related flights were about **12,300 tons** during the 2006/7 financial year.

[14] Again, exact numbers were used in the actual calculations.

This number must be considered an estimate only, since the calculations that derived it are based on several critical assumptions. A more accurate calculation would measure the emissions from every flight booked on campus, but this would take an enormous amount of time and the information is not currently available. As previously noted, the *Offsetters* calculator is considered conservative in the amount of emissions it assigns to each flight. If another calculator, such as the company *Atmosfair*'s, had been used, this number would be almost twice as large. The given number is useful, however, as a general estimate for comparison purposes with other sources of emissions and to begin to understand the total emissions of UBC.

EMISSIONS OFFSETTING

BACKGROUND

While the primary focus of a climate neutrality scheme should be emission reductions, carbon offsets can also play an important role. Carbon offsets can be used to neutralize remaining emissions once an aggressive reduction strategy has already been implemented, or to temporarily offset emissions while reduction strategies are being considered. Carbon offsets should not be seen as a way to "buy" the institution out of the problem of climate change, but as a valuable piece of a comprehensive climate change plan. Offsets should not allow the university to become complacent in their emissions reduction strategies, since offsets do not fundamentally change the conditions that perpetuate our carbon-intensive economy. Offsetting should be seen as a temporary option, not a final solution to UBC's climate change responsibilities.

Carbon offsets are purchases meant to offset a certain amount of GHG emissions by paying another body to implement projects that either avoid, reduce or absorb an equal amount of emissions. These offsets are usually managed and implemented by offsetting companies who

typically invest in renewable energy, energy efficiency or bio-sequestration projects.

PROJECT CRITERIA

When selecting a project to support through offsetting, there are numerous conditions that the project must meet to be considered a legitimate and high quality offset. The following section will outline some of the most important conditions that the researchers believe any project should adhere to before it is considered for offsetting by UBC.

1.) The project is "additional." This means that the project would not have gone ahead if it was not for the funding provided by the offset. If the project would have existed, and reduced emissions anyway, the offset can be considered a waste of money. A common method of testing whether a project can be considered additional is to study whether the difference in available revenue provided by the offset was a decisive reason for going forward with a project. Another method is to consider whether the offset was successful in reducing a barrier (such as lack of know-how) that was previously stopping the project from being implemented.

2.) It provides a proven environmental benefit. There is much debate surrounding the legitimacy of carbon-sequestration projects such as tree-planting. For this reason, sequestration projects are not recommended. At this point it is not clear whether such projects actually take carbon out of the atmosphere and to what extent this removal is permanent. At the same time, these projects do not help transition our society towards a less carbon-intensive future. Projects focusing on energy efficiency and renewable energy can provide this lasting environmental benefit.

3.) The project is not double counted. In other words, emission reductions should not be claimed by more than one stakeholder. This gives multiple buyers the false pretext that they caused the reduction in emissions. This problem can be addressed if offsetting companies retire each offset after selling them. There remains a problem, however, in the double counting of emissions reductions that fall under the regulatory regimes of different levels of government. Offsets should not be claimed for reductions spurred by legislative policies as this is a form of double counting. This problem also relates to that of additionality[15] if the policy framework would have caused the reductions in the absence of the offsetting revenue.

4.) The project has a demonstrated social and economic benefit to local communities. This point is particularly important for projects in "developing" countries. Examples of ill-planned projects abound that, with our without good environmental intentions, have displaced local peoples and negatively affected their welfare.

5.) Emissions reductions must be permanent. The project must ensure that the emissions reductions will not be "undone" in the future. This is one of the reasons that bio-sequestration projects are so controversial. If trees are planted, it is hard to guarantee that they will not be cut down in the future.

MARKET RESEARCH

For a climate neutrality strategy to be effective, it must have the support and buy-in of the student body. An extensive survey was therefore conducted to gauge student interest and support

[15] Refers to a situation where a project results in emissions reductions additional to those that would have taken place in the absence of the project activity

in the goal of climate neutrality at UBC.

SURVEY BACKGROUND

Over the months of March and April of 2007, four hundred UBC students were surveyed and asked a variety of questions concerning climate change and carbon neutrality. These surveys were done orally by the authors of this report. Students were approached completely at random in an effort to make the survey population as reflective of the general student body as possible. Students were surveyed at many different locations on campus so that no one faculty would be overrepresented. As a result, the survey population is comprised of a wide range of ages, academic backgrounds and is representative of the ethnic diversity and gender distribution at the UBC Point Grey Campus. The survey used a 5-point hedonic scale and at gives participants the option to answer that they don't know the answer to questions where appropriate. The following section outlines the most important findings of this survey. For a complete listing of all the questions and responses, please refer to Appendix #**2**.

STUDENT CONCERN REGARDING CLIMATE CHANGE

Based on the findings of this survey, the majority of UBC students are concerned about the issue of climate change. Twenty nine percent of those surveyed responded that the issue is important, while thirty percent consider the issue very important and twelve percent consider the issue extremely important. Taken as a whole, over seventy percent of those surveyed consider the issue of climate change to be of importance.

Importance of Climate Change:

Not at all important	4%
Somewhat important	24%
Important	29%

Very Important	30%
Extremely Important	12%
Total: Important or greater:	**71%**

Even higher numbers of students feel that the threat of climate change is serious. Twenty-eight percent of those surveyed think that the threat of climate change is serious, twenty-nine percent think it is very serious and twenty-three percent consider the threat extremely serious. This means that eighty percent of the representative student population considers the threat of climate change, at the very least, serious.

These numbers support the conclusion that the vast majority of students feel that the issue of climate change is important and worthy of serious attention.

CLIMATE CHANGE AND UBC

When asked to consider how much UBC has already done to reduce its impact on climate change, a small majority of those surveyed feel that UBC has only done a moderate amount. Fifty one percent responded that UBC has done a moderate amount, while sixteen percent thought that UBC has done a small amount and eight percent thought UBC has already done a large amount to combat climate change. A significant number of students, at twenty three percent, did not know at all how much UBC has already done. Very few students, therefore, consider UBC to have already done a large amount to reduce its impact on climate change.

The surveyed students' opinions were extremely varied when asked whether UBC has shown leadership on the issue of climate change. Twenty-two percent thought that UBC has shown a somewhat large amount, twenty-five percent felt that UBC has an average amount, and nineteen percent thought that UBC has shown a large amount of leadership on the issue. At the

same time, a significant number of students, at twenty-two percent, did not know if UBC has shown leadership or not on the issue of climate change. According to this survey, it seems that the number of students who consider UBC to be leading the campus climate change movement are extremely small.

A vast majority of the surveyed students feel that UBC can and should do much more to reduce its impact on climate change in the future. Sixty-percent of the respondents thought that UBC should do a large amount more in the future and twenty-four percent thought UBC should do an extremely large amount more in the future to combat climate change. The student population, according to the results of this survey, would be solidly behind strong action on climate change in the future.

Climate-Neutrality and UBC

The majority of students surveyed (64%) were not familiar with the term carbon neutral or climate neutral. To ensure that all of the students' opinions on climate neutrality at UBC would be based on the same basic understanding of the concept, after answering the above question, students were provided with the following definition of the term:

"Being carbon neutral involves calculating your total climate damaging emissions, reducing them where possible, and then balancing your remaining emissions, often by purchasing a carbon offset (such as investing in wind and solar power or planting tress), so your net impact on climate change is zero."

After being given a definition of carbon neutrality, a large majority of students feel that carbon neutrality should be a serious goal for UBC to strive towards. While forty percent of surveyed students thought that climate neutrality should be a serious goal, thirty-three percent

thought it should be a very serious goal and seven percent thought that it should be an extremely serious goal. Taken as a whole, eighty percent of the respondents felt that UBC should take carbon neutrality seriously in the future.

The majority of the respondents felt that the task of making the university climate neutral was the combined responsibility of students, the university administration and the government. While five percent thought it was the students' responsibility, twenty-three percent thought it was the university administration's responsibility and six percent felt it was the government's responsibility; the majority at sixty-four percent thought this responsibility should be shared.

Almost all of the students who were surveyed were willing to make some financial contribution to the goal of making UBC climate neutral. Students were asked how much they would be willing to pay annually in increased student fees to assist UBC in going climate neutral. Two percent were willing to pay less than $1, eleven percent were willing to pay under $5, eleven percent were willing to pay between $5 and $10, twenty nine percent were willing to pay between $10 and $20, and thirty five percent were willing to pay between $20 and $30 annually. A contribution of $30 represents approximately a 1.6% increase in student fees. This means that seventy five percent of the surveyed students were, at the very least, willing to contribute between $5 and $10 a year to assist in the goal of carbon neutrality. According to the findings of this survey, students not only want to see UBC move towards climate neutrality, they are willing to back up this support with increased student fees.

MARKET RESEARCH CONCLUSIONS

According to the findings of this survey, the student population would be solidly behind a climate neutrality plan for UBC. They feel climate change is important, serious, and worthy of much more attention in the future. In their opinion, UBC has not done enough to tackle the problem, and should be doing much more in the future. They do not consider UBC to be leading

the university movement on the issue. Therefore, a large opportunity exists to move forward with the support of the student body. While the majority of students were not familiar with the term "climate-neutrality", once given a basic definition and understanding of the concept, most believed that carbon neutrality should be a serious goal of the university. Student buy-in to a carbon neutrality scheme will, therefore, require an education campaign that clearly explains and demonstrates its purpose. If students understand the plan, they will support it, as demonstrated by this survey. As they are also willing to contribute financially, albeit modestly, to the goal of carbon neutrality, and believe the responsibility needs to be shared between the university administration and the student body, students must be involved in all stages of the plan. This will increase student support and the educational potential of the plan. A student referendum on increased student fees to support the goal should also be considered, considering the willingness of students to contribute money to the scheme. It is important to note that the researchers put a cap of $30 when asking students for their willingness to contribute financially to carbon-offsetting. Future studies should remove this ceiling to determine students' true willingness to pay for carbon offsetting.

Assuming the average cost of carbon-offsetting at $15/tonne, it would cost approximately $1.25 million to offset the GHG emissions calculated by this study. Were students to shoulder this cost, this would translate to a fee levy of approximately $27.50/ student.

Future Research Directions

Other Sources Of GHG Emissions

There are several sources of UBC's GHG emissions that were outside of the scope of this project. While most other institutions and businesses attempting to achieve climate-neutrality do not usually include such sources, they remain important, and should be studied and addressed

further in the future.

Food Miles

Almost all of the food consumed on campus has traveled a large distance in GHG-intensive trucks, planes and ships. Further attempts to localize UBC's food supply and ensure the future of the UBC farm should be seen as an important component of climate change planning. In the future, an attempt should be made to quantify the emissions from this source.

Landfills

Landfills are a significant source of GHG emissions. While UBC currently has a large and extremely successful composting program, there is no doubt that a large amount of organic waste still ends up in regional landfills. As this waste breaks down anaerobically, it produces methane, a common GHG. While quantifying these emissions would be extremely difficult, a further expansion of the composting program would continue to address the problem.

Ongoing Construction

The constant construction and renovation on campus produces a significant amount of emissions. Increased traffic from trucks, the production of construction supplies such as concrete and the use of heavy machinery all contribute to UBC's total emissions. Future development plans must take these anticipated emissions into account as UBC strives to become climate neutral. Incremental $CO_{2\text{-}e}$ emissions must be counted in UBC's GHG emissions profile. This means that for every new building on-campus, the building will add to UBC's net GHG emissions, both through construction and operating costs.

Everyday Consumption and Use

A large amount of different products are consumed and used by staff, faculty and students

on campus every day. The list of these products is endless. They range from paper to computers, disposable cups, office equipment, laboratory equipment, chemicals, packaging and physical infrastructure. While there are little to no on-site GHG emissions from the use of these products, it should be recognized that there were emissions associated with their production. A life-cycle analysis of these products would reveal the GHG emissions associated with such products.

Removal of Trees

While the relationship between planting trees and the sequestration of GHG emissions is complicated and contested, there is no doubt that existing, healthy trees absorb carbon dioxide. Therefore, the removal of trees on campus for future development must be seen as within the framework of UBC's total emissions.

Recommendations for Implementation

Heat and Electricity Recommendations

As noted earlier in this report, UBC has had significant success in reducing its GHG emissions associated with heat and electricity. The ECOtrek retrofit has managed to reduce energy use by 20% since 1998, and initiatives such as the sustainability coordinator program, housed out of the UBC Sustainability Office have managed to further reduce energy use by encouraging energy-saving practices.

Further Reducing Heat and Electricity GHG Emissions

Although UBC has had considerable success with energy reduction programs, as highlighted above, annually heat and electricity account for 61,056.6 tonnes of GHG emissions, by far UBC's largest source of GHG emissions. GHG emissions associated with electricity and heat could be further reduced by one of two ways: reducing overall heat and energy use, and making heat and energy cleaner.

Reducing Heat and Energy Use at UBC

UBC has managed to reduce its heat and energy use by 20% over the past 9 years, an amount that deserves recognition. However, through further building retrofits, and a stringent green building policy, UBC could continue to make large reductions in overall heat and energy use on campus. Additionally, the ECOtrek project only focused on core academic buildings on the campus. To further reduce emissions associated with campus operations, the University could help ancillary businesses such as UBC food services, UBC housing, and other operations conduct their own energy and water retrofits. This support could come in the form of low-interest, or interest free loans to help fund the cost of energy and water retrofits, or through the creation of a 'community energy manager' housed in the Sustainability Office. This energy manager, funded by the University could work as a 'consultant' working with the UBC community to help ancillary businesses reduce their energy use.

Reducing Emissions Associated with Energy and Heat Use

A second way to reduce emissions created through energy and heat use is to use cleaner forms of heating and electricity. Further research is required to determine appropriate electricity alternatives, however several organizations including Green-E have created certification granting programs allowing individuals and institutions to purchase certified green or emission-free energy [16].

Commuter Traffic Recommendations

UBC has reduced its emissions profile substantially though the creation of the U-Pass program. The U-pass currently requires UBC students to purchase a mandatory bus pass at substantially reduced rates. This program has been very successful with an overall increase in

[16] See http://www.green-e.org/

transit rider ship at UBC by a full 118% since 2003(UBC Trek Program Centre, 2006). The U-pass is not currently offered to faculty and staff at UBC. We recommend an expansion of the U-pass program to the UBC staff and faculty communities, coupled with continued reduction of single-stalled parking at UBC.

Flight Recommendations

As of yet, there has not been any effort to address the number of annual UBC flights. If anything, the trend has been to make the process simpler for staff and faculty to purchase and be reimbursed for university related flights. A large opportunity, therefore, exists to commence a coordinated campaign to reduce flights where possible, and offset the remaining flights until further reductions are achieved.

Reducing GHG Emissions from Flights

The university should set a goal to reduce the number of flights booked annually, and the total emissions from flights, by a realistic percentage. This goal could be met by:

- Encouraging staff and faculty to take an inter-city bus on UBC related trips where appropriate such as Seattle, Victoria, Kamloops, Kelowna and Cranbrook. The per-kilometre emissions from this mode of transportation are much lower in comparison to flights. As these tickets are often cheaper than airfare, this could be made mandatory for trips to certain destinations that are coming out of the general operating budget.
- Incorporate an education campaign surrounding flight reductions (and offsets) into the Sustainability Coordinator program to educate staff and faculty about the issue.
- Encourage the inclusion of tele-conferencing facilities in new academic and operational buildings being constructed on campus, where appropriate.
- Further encourage the use of existing tele-conferencing facilities, such as those in the Life Sciences Centre and the Liu Institute for Global Issues. These facilities are currently

underutilized and increased collaboration between departments is necessary to ensure they are used by a wide range of departments and disciplines, not just those who are housed in the same building.

- The travel agencies UBC books through should be encouraged to place a greater emphasis on direct flights. As a large percentage of the fuel for a flight is burnt at take-off and landing, flights with stopovers are much less fuel-efficient than direct flights (Jardine, C, 2005).

Offsetting Remaining Flights

While the emphasis should be placed on reducing flights, offsetting should be encouraged for the remaining flights. The university should first move to adopt an official policy on the offsetting of flights. This could be done in a couple of different ways.

One option is to attempt to quantify the total emissions from flights each year. These emissions could then be neutralized by purchasing the required amount of offsets from one or more companies. This option would be relatively simple and would require only one lump-sum payment annually.

Another option is create a university policy requiring the offsetting of each flight as it is booked. The offsetting could either be done by the individual staff or faculty member and the price could be included in the amount of money they are reimbursed for, or by someone else on their behalf, such as a travel manager. Such a policy could be passed by the Board of Governors, perhaps as an amendment to the current Policy #83: Travel and Related Expenses. This would, at the very least, commit the university to paying for the offsetting cost of every flight that is reimbursed with money from the general operating fund. This option becomes much more difficult for the majority of flights that are reimbursed through research grants. Those entities who give the grants, such as the federal and provincial governments, may not agree to their

money being spent on this purpose. According to personal testimonials from staff and faculty who have tried this option, they have not been given permission by their grant donors. It is unclear at this point whether, after passing an official policy on the matter, UBC could hold enough sway amongst research grant donors to move beyond this initial resistance. If UBC was successful in convincing at least the largest granting agencies, such as the government, to allow their travels funds to include the cost of offsetting, this could have a major influence in pushing change on these large entities.

Until such policies can be implemented, the existing relationship between the domestic airline carrier *Westjet* and the local organization *Offsetters* should be exploited. For every *Westjet* flight booked through this *Offsetters*- website, Westjet pays *Offsetters* the price of the offset. This fact needs to be advertised to staff and faculty, and the agencies (such as Supply Management) that are booking large portions of UBC flights need to be brought on board with this option. Until an official offsetting policy is put in place, this form of voluntary offsetting can play an important role.

All of the above options will require a large amount of collaboration between entities such as the UBC Sustainability Office, Supply Management (especially the travel manager), UBC's main grant donors, the Board of Governors, UBC's principle travel agencies and various faculties and departments. A Flights Reductions and Offsetting Committee should be struck that could include these stakeholders to begin moving forward with some of these options. Together, a coordinated education campaign and strong policies from the UBC administration could move the university towards a climate neutral travel scheme.

REPORT CONCLUSIONS

As noted earlier, climate change is a pressing issue that requires immediate and decisive action by all facets of society. The unique advantages of the university to show leadership in

society while at the same time developing the solutions necessary to curb the effects of climate change, create an opportunity for UBC to have great impact in addressing the challenge of climate change, within both our local and the broader global community. The research results of this report are only the very beginnings of what is required to see UBC move toward, and beyond, climate-neutrality. It is the hope of the researchers that the information found in this report will be further expanded upon in the future and aid UBC in achieving a goal of climate-neutrality.

Appendix 1: Signatory requirements of The President's Climate Commitment:

Signatories of the Presidents Climate Commitment Agree to:

1. Initiate the development of a comprehensive plan to achieve climate neutrality as soon as possible.

a. Within two months of signing this document, create institutional structures to guide the development and implementation of the plan.

b. Within one year of signing this document, complete a comprehensive inventory of all greenhouse gas emissions (including emissions from electricity, heating, commuting, and air travel) and update the inventory every other year thereafter.

2. Within two years of signing this document, develop an institutional action plan for becoming climate-neutral, which will include:

- A target date for achieving climate neutrality as soon as possible.
- Interim targets for goals and actions that will lead to climate neutrality.
- Actions to make climate neutrality and sustainability a part of the curriculum and other educational experience for all students.
- Actions to expand research or other efforts necessary to achieve climate neutrality
- Mechanisms for tracking progress on goals and actions.

3. Initiate two or more of the following tangible actions to reduce greenhouse gases while the more comprehensive plan is being developed.

- Establish a policy that all new campus construction will be built to at least the U.S. Green Building Council's LEED Silver standard or equivalent.
- Adopt an energy-efficient appliance purchasing policy requiring purchase of ENERGY STAR certified products in all areas for which such ratings exist.
- Establish a policy of offsetting all greenhouse gas emissions generated by air travel paid for by our institution.
- Encourage use of and provide access to public transportation for all faculty, staff, students and visitors at our institution
- Within one year of signing this document, begin purchasing or producing at least 15% of institution's electricity consumption from renewable sources
- Establish a policy or a committee that supports climate and sustainability shareholder proposals at companies where our institution's endowment is invested.

4. Make the action plan, inventory, and periodic progress reports publicly available by providing them to the Association for the Advancement of Sustainability in Higher Education (AASHE) for posting and dissemination.

Appendix 2 – Survey Responses

How important is the issue of climate change to you? Not at all important: 16 (4%) Somewhat important: 96 (24%) Important: 116 (29%) Very important: 120 (30%) Extremely important: 48 (12%)	**How serious is the threat of climate change?** Not at all serious: 20 (5%) Somewhat serious: 60 (15%) Serious: 112 (28%) Very serious: 116 (29%) Extremely serious: 92 (23%)
How knowledgeable do you consider yourself on the issue of climate change? Not at all knowledgeable: 14 (4%) Somewhat knowledgeable: 88 (22%) Average: 192 (48%) Very knowledgeable: 96 (24%) Extremely knowledgeable: 8 (2%)	**How much of an effort do you make to reduce your personal impact on climate change?** No effort: 8 (2%) Minimal effort: 64 (16%) Moderate effort: 188 (47%) Large effort: 128 (32%) Extremely large effort: 12 (3%)
How often do you hear about climate change while at UBC (class, conversations, events etc.)? Never: 8 (2%) Rarely: 92 (23%) Somewhat often: 176 (44%) Very often: 92 (23%) Extremely often: 32 (8%)	**How much do you think UBC has already done to reduce its impact on climate change?** Nothing: 8 (2%) Small amount: 64 (16%) Moderate amount: 204 (51%) Large amount: 32 (8%) Extremely large amount: 0 (0%) Don't know: 92 (23%)
Do you think UBC has shown leadership on the issue of climate change? Not at all: 36 (9%) Somewhat: 88 (22%) Average amount: 100 (25%) Large amount: 76 (19%) Extremely large amount: 12 (3%) Don't know: 88 (22%)	**In the future, how much more should UBC do to reduce its impact on climate change?** Nothing: 0 (0%) Small amount: 4 (1%) Moderate amount: 56 (14%) Large amount: 240 (60%) Extremely large amount: 96 (24%) Don't know: 4 (1%)
What percent of a reduction in GHG emissions do you think is attainable for UBC in a 25 year time frame? 0% Reduction: 4 (1%) 20% Reduction: 80 (20%) 40% Reduction: 104 (26%) 60% Reduction: 64 (16%) 80% Reduction: 24 (6%) 100% Reduction: 120 (30%)	**Are you familiar with the term carbon neutral or climate neutral?** Yes: 144 (36%) No: 256 (64%) **Students were then given this definition**: Being carbon neutral involves calculating your total climate damaging emissions, reducing them where possible, and then balancing your remaining emissions, often by purchasing a carbon offset (such as

	investing in wind and solar power or planting tress), so your net impact on climate change is zero.
How serious of a goal should climate neutrality be for UBC? Not at all serious: 0 (0%) Somewhat serious: 68 (17%) Serious: 160 (40%) Very serious: 132 (33%) Extremely serious: 28 (7%) Don't know: 12 (3%)	**Whose primary responsibility is it to make the university climate neutral?** Students: 20 (5%) The university administration: 92 (23%) The government: 24 (6%) Combination of all three: 256 (64%) Don't know: 8 (2%)
How much would you be willing to pay annually in increased student fees to assist UBC in going carbon neutral? Nothing: 20 (5%) Less than $1: 8 (2%) Under $5: 44 (11%) $5 - $10: 44 (11%) $10 - $20: 116 (29%) $20 - $30: 28 (7%)	

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