Carbon Emissions Report 2010

University of Alaska Anchorage

University of Alaska Anchorage

3890 University Lake Drive

University Lake Building, Suite 110B

Anchorage, AK 99508

Lei Yao, Research Technician
Paula Williams, Ph.D., Sustainability Director
Tel: 907-786-1515
E-mail: anpw@uaa.alaska.edu
January 2011

Table of Contents

List of Figures

List of Tables

Summary

This report is submitted in compliance with the American College & University Presidents' Climate Commitment (ACUPCC) signed by University of Alaska Anchorage's (UAA) Chancellor Elaine Maimon in 2007. The ACUPCC requires signatory institutions to complete a comprehensive inventory of all greenhouse gas emissions (including emissions from electricity, heating, commuting and air travel) biannually. University of Alaska Anchorage's first greenhouse gas (GHG) inventory was completed in 2008 for academic year 2007-2008.

This report calculates GHG emissions for the 2009-2010 academic year. It is the synthesis of two reports: one prepared by a Masters student, in collaboration with the Office of Sustainability at UAA, that calculates emissions from fuel, electricity and natural gas, and one prepared by the Institute of Social and Economic Research (ISER) at UAA that estimates emissions from air travel, commutes to and from work/school and surface travel to conduct UAA business. Two major changes were made from the 2008 report in order to more accurately report CO_2e emissions for the 2010 academic year: the coefficient used to estimate GHG emissions from electricity generation was investigated and a more accurate coefficient is used in this report, and the manner in which commutes were calculated was updated. Changes between the two reports make it difficult to compare emissions between 2008 and 2010 as explained more fully in the conclusion.

During the 2009-2010 academic year, the sources and amounts of UAA's GHG emissions in metric tons of CO_2e included electricity 18,950, natural gas 13,164, fuels 516, electric losses 1,839, commute to and from campus and surface travel for UAA business 9,500, air travel 2,641, for a total of 46,250 metric tons CO_2e emitted.

Introduction

University of Alaska Anchorage (UAA) has a long-standing commitment to sustainability. This is manifest in many ways. In 2004, UAA signed the Talloires Declaration, a statement of principles and practices for using higher education to promote sustainability. University of Alaska Anchorage's Strategic Plan 2017 envisions UAA as "a university of first choice distinguished for its commitment to sustainability and environmental responsibility" and lists sustainability and stewardship as two of its core values.

The ACUPCC, signed by UAA Chancellor Elaine Maimon in 2007, supports the mission of implementing comprehensive plans in the pursuit of carbon neutrality for higher education institutions. The ACUPCC requires signatory institutions to complete a comprehensive inventory of all greenhouse gas emissions (including emissions from electricity, heating, commuting and air travel) biannually. Greenhouse gas emissions are the release of gases to the atmosphere that prevent radiant (infrared) energy from escaping the Earth's atmosphere, causing the Earth to maintain higher surface temperatures than would occur if the gases were absent.

Through the utilization of natural gas, electricity and fuel, carbon dioxide (CO_2) is not the only greenhouse gas emitted. Carbon dioxide equivalent (CO_2e) has become the standard of measurement against which the impacts of releasing different greenhouse gases are evaluated. Carbon dioxide equivalents for various greenhouse gases are measured using the Global Warming Potential (GWP), a measurement of the impact that a particular gas has on the additional heat/energy that is retained in the Earth's biosphere by the addition of this gas to the atmosphere (also called radiative forcing). The GWP of a given gas describes its effect on climate change relative to an equivalent emission of carbon dioxide.

GAS	ATMOSPHERIC LIFETIME	GWP
Carbon dioxide (CO_2)	50-200	1
Methane (CO_4)	12+/-3	21
Nitrous Oxide (N_2O)	120	310
HFC-23	264	11,700
HFC-134a	14.6	1,300
CF_4	50,000	6,500
C_2F_6	10,000	9,200
SF_6	3,200	23,900

Table 1: GWP Equivalents for Selected Greenhouse Gases

Source: U.S. EPA Climate Change: Global Warming Potential

University of Alaska Anchorage's first carbon emission baseline calculation was completed in 2008 for the 2007/2008 academic year (referred to as the 2008 report). This second UAA GHG emissions inventory (referred to as the 2010 report) serves as a continuation of the progress made with the first inventory, establishes an improved methodology for tracking GHG emissions, and provides a preliminary baseline against which to compare future inventories to determine the effectiveness of GHG emissions reduction projects and initiatives.

An inventory of emissions from electricity, heating, commuting and air travel encompasses scope one and two emissions, as well as some scope three emissions. Scope one emissions are defined as direct GHG emissions occurring from sources that are owned or controlled by the institution. Scope two emissions are indirect emissions generated in the production of energy purchased by the institution. Scope three emissions are indirect emissions that are the consequence of the activities of the institution, but are from sources not owned or controlled by the institution. The emissions calculated for scope one included gasoline and diesel purchases by the university to fuel fleet vehicles and for use in back-up generators (sources owned or controlled by the institution), and purchases of natural gas. Scope two calculations are based on purchases of electricity (indirect emissions generated in the production of energy purchased by the institution). Scope three calculations are based on emissions from commutes to and from campus as well as surface and air travel as a consequence of activities of the institution. For the 2010 report, scope three calculations also included emissions caused by losses from electricity generation and transmission.

Two separate studies were generated to complete this report. Scope one and two GHG emissions and electricity losses (scope three) were calculated in a study and report prepared by Lei Yao and Paula Williams using the Clean Air Cool Planet (CACP) model. A separate study prepared by Alejandra Villalobos Meléndez, Sarah Christine Gerd, and Ginny Fay of the Institute for Social and Economic Research (ISER) estimated the levels of three types of scope three GHG emissions: University official air travel, commuting by students and employees, and surface travel for University business (Villalobos-Melendez, A., Gerd, S.C., & Fay, G., 2010).

Differences between the 2010 report and the 2008 report included: the 2008 report utilized the GHG Protocol developed by the World Resources Institute to calculate electricity and natural gas emissions, whereas the 2010 report utilized the CACP model; and the methodology for data collection and calculations used in the 2008 model to estimate GHG emissions for commute and air travel was refined as described more fully below.

Scope of the Report Calculating Natural Gas, Electricity, Fuel and Electricity Loss Emissions

Scope one and two emissions were calculated for UAA main campus, housing and other buildings owned by UAA located in Anchorage (referred to as off campus buildings). Community campus emissions were not included in the calculations. Figure 1 shows the detailed map of the buildings included in the calculation. The map can be found at: http://www.uaa.alaska.edu/map/classicversion.cfm.

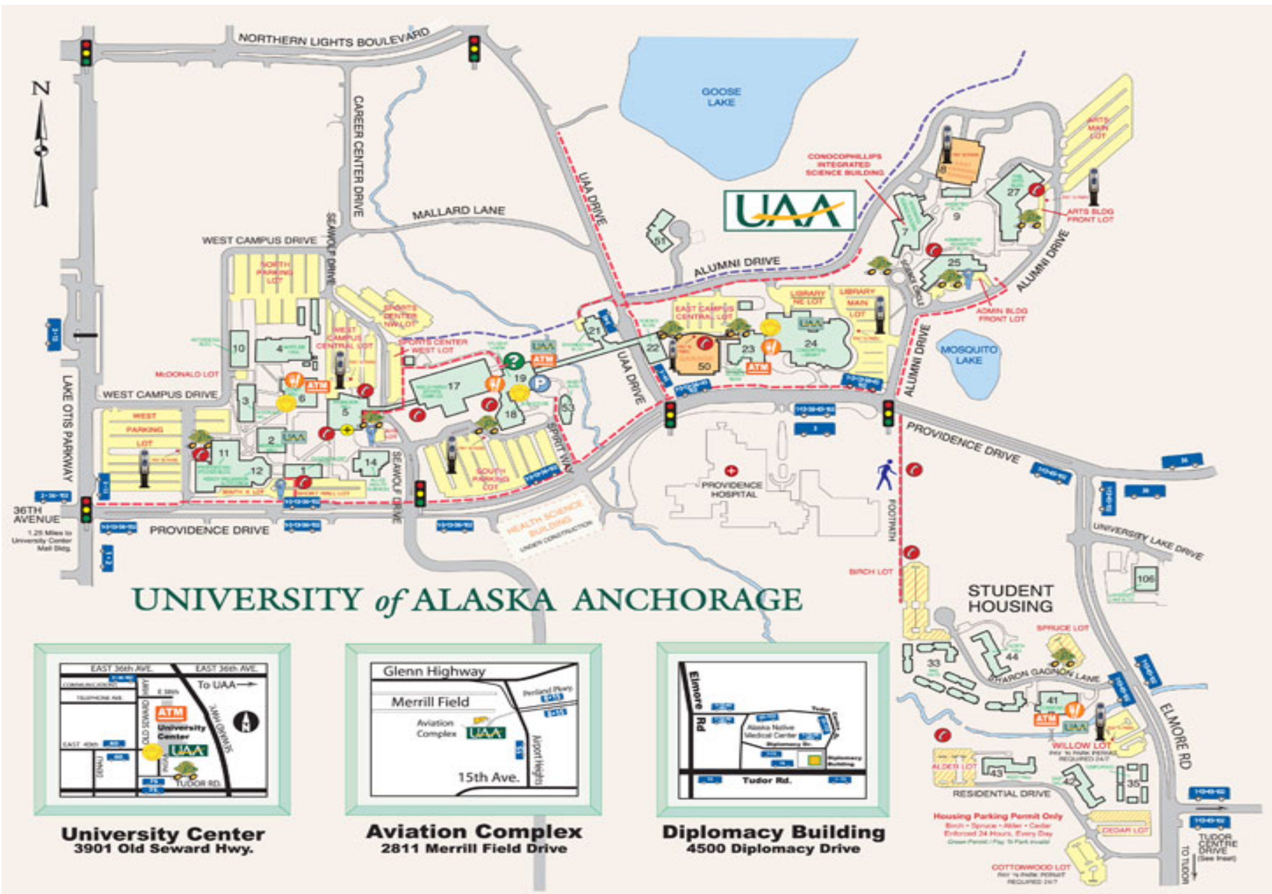

Figure 1. Map of UAA main campus and off-campus buildings.

Engineering Masters student, Lei Yao, served as the project manager for this study. We consider student involvement to be important and solicited volunteers to learn about gathering and entering data and calculating carbon emissions. Three undergraduate students responded to the recruitment announcement. These students, all from engineering and science disciplines, were very interested in green and sustainable development issues. Lei Yao held a seminar each week for the student volunteers to learn how to use the Clean Air Cool Planet software and other green and sustainable development concepts. Figure 2 is a photograph from a seminar session attended by two of the student volunteers.

Figure 2. Photograph of student participants.
(From left to right, Milca Fernando, student volunteer; Paula Williams, UAA Sustainability Director; and Theresa Cho, student volunteer.)

Scope of the Report Calculating Air and Surface Travel and Commute Emissions

Pursuant to the ACUPCC, this study estimates the levels of three types of scope three GHG emissions: University official air travel, official surface travel, and commuting by students and employees. Two models were developed by ISER for the 2008 report: a UAA air travel model and a UAA commuter model. The 2010 report calculated GHG estimates using the 2008 model, with refinements made to the methodology for data collection and calculations (Villalobos-Melendez, A., Gerd, S.C., and Fay, G., 2010).

The modifications made to the air travel model included use of the Haversine formula to calculate spherical rather than planar miles traveled and an improved sampling method described below. The modifications to the commute model are attributable to having survey data available to calculate commute emissions. The 2008 report relied on parameter setting and estimations because data was not available. Data available for the 2010 report included the number of days each week students and employees commuted to campus, addresses from which students and employees commuted to campus (rather than zip codes) to determine number of miles traveled, and refinements of the number of city and road miles traveled by people commuting from outlying areas. Carbon emissions for surface business travel were not included in the 2008 report, but are included in the 2010 report.

Methodology

Data collection

In order to determine campus carbon dioxide equivalent emissions, the following steps were completed during the calculation preparation process:

1. Gather all data to determine scope one emissions. This included fossil fuel consumption of all campus owned equipment and activities: heating fuels, emergency generator fuels, fuels associated with any transportation provided by campus-owned vehicles, and the purchase of natural gas for University heating systems for main campus and off-campus buildings.
2. Gather all data to determine scope two emissions. This requires the collection of the amount of all purchased electricity for main campus and off-campus buildings.
3. Gather data for scope three emissions, including distance and frequency of commutes to and from campus by students and employees, and miles per gallon of vehicles utilized for these commutes; number and range of air and surface miles traveled for UAA business; and electric loss from generation and transmission.

Natural gas use

An Excel spreadsheet detailing natural gas usage from academic years 2003 through 2010 (academic years run from July 1 to June 30) was provided by UAA's Department of Facilities, Maintenance and Operations. Figure 3 shows the annual natural gas purchased (in ccf/100 cubic feet) by UAA, for main campus and off-campus buildings. Natural gas bills for housing are kept separate from other campus utility bills, and those were collected for the 2009/2010 academic year. Figure 3 shows (in green) natural gas usage from 2003 through June 30, 2010, for all on and off-campus buildings except housing. The natural gas usage in purple represents that used by housing in academic year 2009/2010. This data was entered into the CACP model to calculate CO_2e emissions.

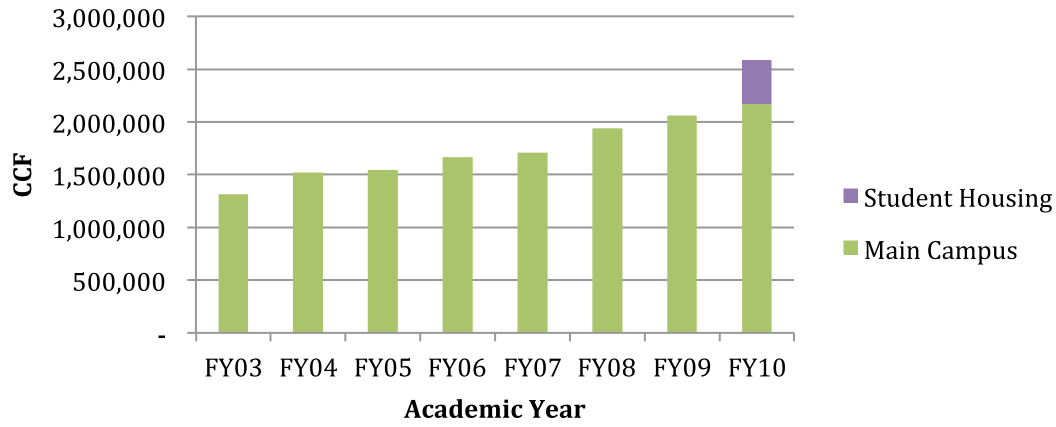

Figure 3. Total ccf natural gas purchased by UAA from 2003- 2010.

Electricity use

The Excel spreadsheet provided by UAA's Department of Facilities, Maintenance and Operations included electricity use by on and off-campus buildings, except for housing, from academic year 2003 through 2010. Figure 4 shows the annual electricity (in kilowatt hours - kWh) purchased by UAA for those buildings. Electricity bills for housing are kept separate from other campus utility bills, and those were collected for the 2009/2010 academic year. Figure 4 shows (in blue) electricity usage from 2003 through June 30, 2010, for main campus and off-campus buildings, exclusive of housing. The electricity usage in red represents that used by housing in academic year 2009/2010. This data was entered into the CACP model to calculate CO_2e emissions.

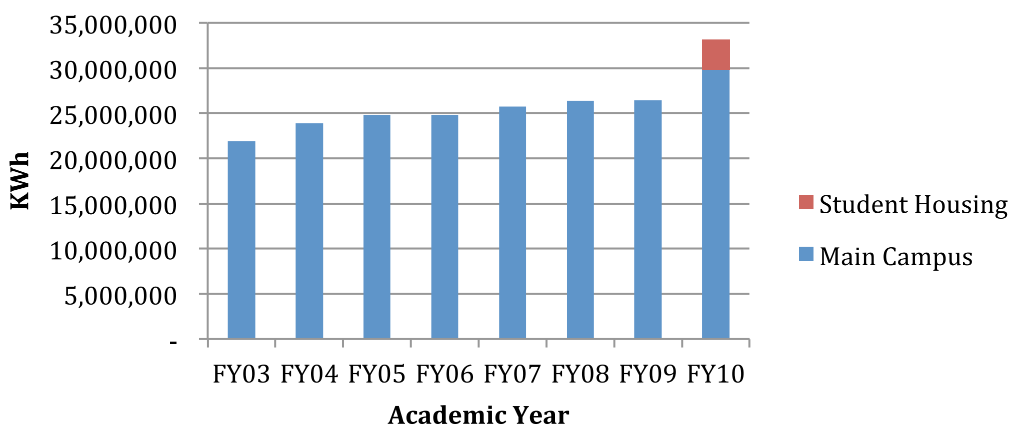

Figure 4. Total kWh purchased by UAA 2003-2010.

Carbon coefficient determination

When determining the amounts of CO_2e emitted from electricity generation, the mix of fuels used to generate the electricity along the entire grid system must be included. The North American Electric Reliability Corporation (NERC) calculates coefficients for use by each region of the United States. These coefficients are commonly used in calculating CO_2e. The 2008 report questioned whether the coefficient calculated by NERC for the South/Central Alaska area was accurate (Hammel, Green & Abrahamson, Inc., 2008). The NERC divides Alaska into two subregions, AKGD, South/Central Alaska (the grid system from Fairbanks to Homer/Seward) and AKMS, the remainder of Alaska. The emission coefficient for the AKGD subregion is approximately 2.5 times larger than the emission coefficient for the AKMS subregion. The authors of the 2008 report adopted 0.0049 as the emission coefficient to calculate tons of CO_2e emitted per kWh of electricity purchased. However, 0.0049 is not the coefficient for AKGD subregion, but for the entire state of Alaska.

eGRID subregion acronym	eGRID subregion name	Nameplate capacity (MW)	Net Generation (MWh)	Generation resource mix (percent)										
				Coal	Oil	Gas	Other fossil	Biomass	Hydro	Nuclear	Wind	Solar	Geo-thermal	Other unknown/ purchased fuel
AKGD	ASCC Alaska Grid	1,469.1	5,298,411.8	11.7607	7.1296	69.3825	0.0000	0.0072	11.7201	0.0000	0.0000	0.0000	0.0000	0.0000
AKMS	ASCC Miscellaneous	540.4	1,278,241.3	0.0000	29.9131	3.7125	0.0000	0.3812	65.9471	0.0000	0.0461	0.0000	0.0000	0.0000

Figure 5. Mix of fuel sources for electricity generation in the AKGD and AKMS subregions

Although the emission coefficient of the AKGD subregion is approximately 2.5 times as large as the emission coefficient for the AKMS subregion, the structure of the resource mix in the AKGD and AKMS subregions, listed in Figure 5, supports this difference. The resource mix for the AKMS subregion includes about 30% of power generated from heating oil, and about 66% from hydro-power. Because the assumption is made that hydro-power generation does not emit any greenhouse gases, it will not contribute to the emission coefficient. In the AKGD region, natural gas accounts for about 69% of power generated and coal about 12%. Hydro and other renewable resources account for about 12% of power generated. This analysis supports the emission coefficient of 1,232.36 lb/MWh in South/Central Alaska, and 498.86 lb/MWh in the remaining areas of Alaska used by NERC. As a result, for this report, the AKGD coefficient calculated by NERC was used.

Transmission and generation losses

Generation and transmission of electricity results in loss of power due to resistance and other factors. Our report utilized the CACP model estimate of 9% electricity losses from generation and transmission.

Fuel use

Fuel use at UAA includes unleaded gasoline and diesel. Figure 5 shows gallons of gasoline and diesel used annually. This data was entered into the CACP model to calculate CO_2e emissions.

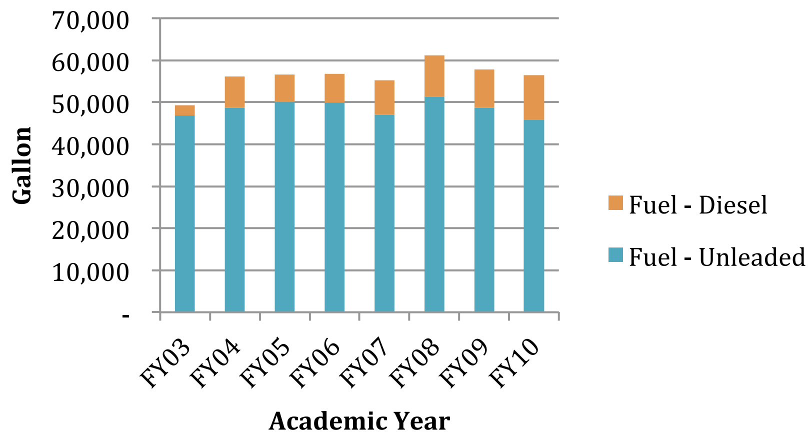

Figure 6. Gallons of fuel purchased by UAA 2003-2010.

Air travel

Non-athletics air travel

Air travel GHG emissions were estimated by ISER using data from Travel Expense Reports (TERs) obtained from UAA's Travel Office. TERs include information on each segment of a trip financed or approved by the University. TERs were separated into two categories: athletics and non-athletics. A total sample size of 21% of all TERs during the fiscal year 2010 (July 1, 2009 to June 30, 2010) was used to estimate total emissions attributed to air travel. The total sample size was 17% of non-athletics TERs and 100% of athletics TERs.

TERs are currently available in hard copy only and are stored by the Travel Office. Mileage reports for car travel are also stored among the TERs. Flight information from every seventh air travel report, not including athletics TERs, was manually entered into a database to estimate the GHG emissions of UAA air travel for a sample total of 492 recorded trips with a statistical mode of two travel segments per trip, approximately 17% of the TERs. This sample size gives the study a 95% confidence interval (with a 4% margin of error) for the accuracy of the results.

Airport codes for each airport associated with a trip were entered into ISER's model. The model then determined the geographic coordinates (latitude and longitude) for each airport listed in the TERs and converted each successive pair of airport codes into a distance in statute miles using the Haversine formula. This formula gives exact results for both short and long spherical distances, and therefore provides more accuracy than the conventional distance formula, which operates on a planar surface.

The number of statute miles for each segment of each trip is then multiplied by a GHG multiplier to determine the carbon emissions for that segment. Before this multiplication, each segment is categorized by its length: short (fewer than 281 statute miles flown), medium (fewer than 994 statute miles flown), or long (994 or more nautical miles flown). Due to the high-energy cost of takeoff relative to additional miles at cruising altitude, different segment lengths are associated with different levels of average GHG emissions per mile traveled.

The categorization determinants and the corresponding emissions multipliers were obtained from Clean Air Conservancy, which based their figures on those calculated by the World Resources Institute. Table 2 shows the category parameters and emissions multipliers used in the model.

	Maximum Distance (statute miles)	**Multiplier (kg of CO_2 per statute mile)**
Short flight	281	0.2897
Medium flight	994	0.2028
Long flight	*none*	*0.1770*

Table 2. Air Travel Emissions Factors
Source: Clean Air Conservancy, Air Travel CO2 Emissions. 2010.

Athletic Department air travel

Athletic travel was modeled separately from other University travel due to sampling concerns related to the fact that a single TER from the Athletic Department often covers a number travelers rather than a single traveler. The Athletic Department provided a list of employees and athletes who traveled in the fiscal year 2011. The TERs categorized as 'Athletics Department' and associated with these names were recorded separately from other University travel with added emphasis on recording the number of travelers participating in each trip; 149 TERs for the Athletics Department recorded the trips of 1,028 passengers. The methodology for calculations proceeded as described in the previous subsection, with the adjustment of multiplying the carbon emissions for each segment by the number of travelers.

Commutes

The scope three emissions from commuting to campus were calculated by ISER with a refined model based on the 2008 model. There were two major data inputs to the commuting inventory: land travel records and parking permit records. Increased data availability allowed ISER to modify the original model to improve the accuracy of the estimates. The data used in the Commuting Model was provided by the UAA Parking Services Director and included parking permit data from July 1st to December 7, 2010. From every parking permit sold, we obtained the following information:

- Permit ID
- Permit type
- Permit status (e.g., active, refunded, cancelled, etc.)
- Vehicle Make, Model and Year
- Permit buyer's address

In addition, per the researchers' request, the Parking Services Office included a few additional questions in the parking permit application.

- How many times per week do you drive to campus?
- Do you drive to campus with someone else (carpool)?
- If yes, how many times a week do you carpool?
- How many people do you carpool with?
- How many times per week do you use non-motorized transportation (walk, bike, ski) to get to campus?
- How many times a week do you ride the People Mover bus to campus?

The emission factor used by ISER calculated only CO_2 emissions and not other greenhouse gases, therefore all reports of commute, surface business travel and air travel emissions are reported in CO_2, not CO_2e. Carbon dioxide emissions from commuting to campus attributable to UAA were estimated using a Commuter Model. ISER used information from parking records about vehicle year, make and model and obtained fuel efficiency records from the U.S. Department of Energy. This data was entered into the commute model. ISER estimated a decrease in fuel efficiency of 10% during winter driving conditions. Distance of commute was more accurately calculated with the use of an address rather than a zip code. Address information also allowed ISER to calculate miles driven in the city and on the road to increase accuracy of estimates of the amount of fuel used for commutes. Finally, the number of commutes to campus by students, staff and faculty could be more accurately calculated from data gathered during the parking permit process.

ISER reported that the model estimated 16,390,400 miles were driven by UAA commuters in a year and 198,500 miles for surface business travel. ISER utilized a CO_2 emissions factor of 8.8 kilograms of CO_2 per gallon of fuel utilized. The model assumed that all fuel used by commuters was gasoline.

Surface business travel

Land travel records that identify miles driven for UAA business were manually collected and input into a database. Included in the database were TER records where the main mode of transportation was driving a university or personal vehicle or a rental car. TER records have origin and destination information, and in many cases they report miles driven. For the cases in which miles driven were not recorded, the origin and destination were entered into Mapquest.com to estimate miles driven; miles for round trips were recorded.

Most of the land travel information was from the mileage reports stored with the TERs. These reports always include the number of miles driven; information from these records was entered in the database for every report during fiscal year 2010.

Results

Natural gas, electricity, and fuel consumption data were input into the Clean-Air Cool Planet model to calculate emissions from these fuel sources. In order of highest to lowest metric tons of CO_2e generated per source, electricity emitted 18,590, natural gas 13,164, electric losses 1839, and fuel use 516. Total emissions from natural gas, electricity, fuel and electricity losses were 32,803 metric tons for 2009/2010.

Commuters emitted an estimated 7,800 metric tons of CO_2 traveling to and from UAA. Of that amount, 4,200 metric tons was emitted by commuters living within Anchorage municipality limits and 3,600 metric tons were emitted by commuters living in areas outside those limits. Land travel for UAA business emitted 1,700 metric tons. Table 4 below provides information on total metric tons emitted from use of vehicles, number of commuters and CO_2 emitted per commuter. Commuting and land travel resulted in an estimated total of 9,500 metric tons of emitted carbon dioxide during fiscal year 2010.

City	Metric Tons CO_2	Miles per Commuter	CO_2 per commuter
Anchorage	4,200	1,200	0.6
Outside Anchorage	3,600	5,800	2.5
Commuting Total	**7,800**	**2,000**	**1.0**
UAA Land Travel	1,700	300	2.7
Total	**9,500**	**1,900**	**1.0**

Table 3. Commuter CO_2 emissions per year
Source: UAA Travel Records, Mileage Reports, Campus Parking Permit Data; ISER Calculations. December 2010.

Emissions attributable to air travel totaled 2,641 metric tons of CO_2. Table 5 below provides data on miles flown, kg and metric tons of CO_2.

	UAA Total	Other Travel Only	Athletics Travel Only
Total miles flown	10,725,800	9,941,300	784,500
Metric tons CO_2	2,641	1,806	834

Table 4. CO_2 Emissions From Air Travel (Total, Other, Athletics)
Source: UAA Travel Office Records, ISER Calculations. January, 2011.

Total metric tons of CO2e emitted by UAA in 2009/2010 was 46,250. Of that, the largest proportion, 40% or 18,950 metric tons, was attributable to electricity generation. If electric losses are included in those figures, CO2e attributable to electricity increases to 44% of the total (20,789 metric tons). The next highest single source of emissions is natural gas totaling 13,164 metric tons and 28% of total emissions. Commutes to campus account for 17% (7,800 metric tons) of emissions, followed by air travel with 6% (2,641 metric tons). Surface travel for UAA business was 4% (1,700 metric tons) of emission totals and fuel use 1% (516 metric tons).

Emission Source	CO_2e (Metric Tons)	Percentage of Total (%)
Natural gas (main campus)	11,191	24%
Natural gas (student housing)	1,973	4%
Natural gas total	13,164	28%
Electricity (main campus)	16,708	36%
Electricity (student housing)	1,882	4%
Electricity total	18,590	40%
Air Travel – Athletics	834	2%
Air Travel - Other	1,806	4%
Total Air Travel	2,641	6%
Electric losses	1839	4%
Fuel (unleaded & diesel)	516	1%
Commuting totals	7,800	17%
Official Surface Business Travel	1,700	4%
Total	**46,250**	**100**

Table 5. CO_2e emission sources and amounts

Figure 7 shows sources of CO_2e emissions by percentage contribution.

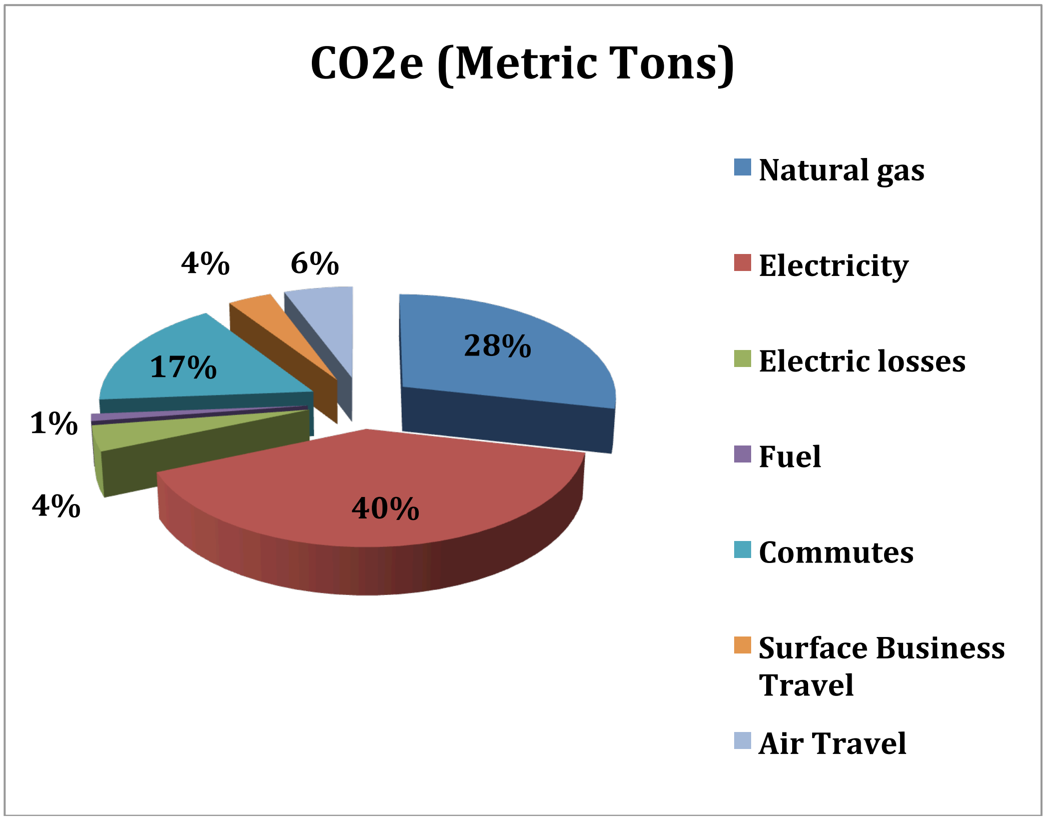

Figure 7: Sources and percentages of CO_2e emissions (metric tons)

Conclusion

As described above, methods of calculating UAA's scope one, two, and three emissions changed significantly enough between our initial report in 2008 and our current report to make comparisons inaccurate. Nonetheless, in 2008 UAA reported a total of 10,753 metric tons of CO_2e emissions from natural gas usage compared to 13,164 in 2010. Calculations between reports were similar and assuming that the coefficient for natural gas did not change between reports (because the 2008 report does not state what coefficient was used), it is fair to say that UAA's carbon emissions from natural gas have increased. Between 2008 and 2010, the Conoco-Phillips Integrated Science Building was constructed and brought on-line. A comparison of CO_2e emissions per square foot of space suggests that UAA has not significantly reduced, or increased, its use of natural gas per square foot (0.0068 in 2008 and 0.0070 in 2010).

Electricity CO_2e emissions in 2008 were reported to be 14,215 metric tons, and we report 18,950 for 2010. As explained above, we believe that the report in 2008 did not use a correct emission coefficient to calculate the amount of emissions from electricity purchased by UAA. The emission coefficient used in 2008 was 0.00049. If the conversion factor used in this report (0.0005602692) had been used in 2008, the CO_2e emissions reported would have been 16,252 metric tons. On a square foot basis, CO_2e emissions in 2008 were 0.0103 per square foot and are 0.0101 in 2010. Since UAA added building space over that time period, based on square footage, we have likely reduced our carbon emissions from electricity.

Comparison of fleet fuel usage is not possible, because that data was not reported in the 2008 report. The 2010 report reflects that fuel usage at UAA accounted for 516 metric tons CO_2e emissions. Emissions from electricity losses also were not calculated in the 2008 report, and they accounted for 1,839 metric tons of CO_2e.

Emissions from air travel were reported to be 3,582 metric tons in 2008, and 2,641 in 2010. However, comparison of the two years' emissions may not be accurate because of the changes in methodology between the two reports. The sampling method was improved, and miles were calculated using the Haversine model, which employs spherical mileage rather than planar mileage. Arguably, this should increase the amount of carbon emissions reported for 2010, not reduce it.

Accurate comparisons of the emissions from commutes between the 2008 report and this report are also not possible. The data for commute emissions provided by ISER in 2008 are contained in the table below. The table is taken directly from ISER's 2008 report (Institute of Social and Economic Research, 2008).

	Metric tons of CO2 for all UAA	**Metric tons of CO2 per commuter**	**Miles driven for all UAA**	**Miles driven per commuter**
High scenario	19.451	1.91	16,318,571	1,600
Medium scenario	14,783	1.45	14,782,958	1,449
Low Scenario	11,203	1.10	11,474,973	1,125

Table 1. Commuter results summary

The 2008 carbon baseline reported that employee and student auto commute generated, respectively, 1,482 metric tons and 14,196 metric tons of CO_2e (Hammel, Green, & Abrahamson, 2008). Although the baseline report cites the report by ISER for its figures, it is unclear how these numbers were derived as the ISER report does not separate faculty and staff commute emissions, and the numbers used in the 2008 report don't add up to any of the scenarios proposed by ISER.

The current report generated by ISER estimates employee auto commute emissions to have been 1,640 metric tons and student auto commute emissions to have been 6,100 metric tons, for a total of almost 7,800 metric tons of emissions from commutes. This report also calculated emissions from surface travel for UAA business purposes to be

1,700 metric tons. Compared to the 2008 report, this represents a significant reduction in the amount of CO_2 emissions. Those differences can largely be explained by refinements to the model used to calculate commute emissions. These refinements include survey data of the number of days each week students and employees commuted to campus, using addresses rather than zip codes to determine number of miles traveled to campus, and refinements of the number of city and road miles traveled by people commuting from outlying areas.

This report represents a significant improvement in accurately calculating and reporting carbon emissions at UAA. It will help us focus our efforts in those areas most likely to result in reductions to our carbon emissions.

Reference List

Hammel, Green & Abrahamson, Inc. (2008). *Energy and the Environment at the University of Alaska, Anchorage*. Minneapolis, MN: author.

Institute of Social and Economic Research. (2008). *UAA Inventory: Greenhouse Gas Emissions From Transportation.* Anchorage Alaska: author.

Institute of Social and Economic Research. (2011). *Greenhouse Gas Emissions Inventory from Transportation, University of Alaska Anchorage*. Anchorage Alaska: author.