Fall 2009

Greenhouse gas inventory report

Ilonka Zlatar
University of Nevada, Las Vegas

Cassidee Shinn
University of Nevada, Las Vegas

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Compiled and Authored by:
Ilonka Zlatar and Cassidee Shinn
Undergraduate Interns, UNLV Urban Sustainability Initiative

Introduction

National and international organizations and programs like the United States Global Change Research Project and the Intergovernmental Panel on Climate Change agree, and scientific evidence indicates, that anthropogenic greenhouse gas emissions are resulting in global climate change. Unless actions are taken to reverse and reduce the effects of these emissions, future generations will need to either adapt to or bear the burden of the changed environment. Individuals, companies, institutions, municipalities and countries are being called upon during this urgent world crisis. Universities, which support research and education, have a unique opportunity to become leaders in sustainability.

In October 2007, the UNLV President appointed 11 members to the President's Advisory Task Force on Sustainability. The purpose of the task force was to promote environmental management and sustainable development by recommending specific activities to the president that will allow UNLV to appropriately address future sustainability issues. One specific recommendation was that a carbon footprint analysis, also known as a greenhouse gas inventory (GHGI), be completed within a year. Another important recommendation was that the American College & University Presidents Climate Commitment (ACUPCC) be signed by the president. The task force submitted a report to UNLV's President on June 30, 2008.

As described in the ACUPCC, each signatory institution must complete and report an inventory of all greenhouse gas emissions within one year of signing and then update the inventory every two years. In preparation for the signing of this commitment, UNLV took the initiative of completing a GHGI in the summer of 2008. The effort was headed by two undergraduate interns with UNLV's Urban Sustainability Initiative. The inventory was nearly complete by the time the president signed the ACUPCC on August 18, 2008.

Originally the inventory was to provide greenhouse gas data from Fiscal Year (FY) 2001 to 2008. Completing the inventory back to 2001 would highlight the successes in energy use reductions and other sustainability initiatives already accomplished at UNLV. As data collection progressed, some data were found to be inadequate or unavailable for the study period previously selected, thus in 2009 the period was re-adjusted to better reflect accurate record-keeping. At the same time, the Regional Greenhouse Gas Emissions Working Group of the Southern Nevada Regional Planning Coalition was drafting the GHGIs for cities of Southern Nevada and decided that its records were only reliable to 2005. As such, they set 2005 as their baseline year. UNLV decided to adopt this baseline as well.

During the summer of 2009, the greenhouse gas inventory was updated to include FY09, starting with data from FY05 and disregarding previous years. The most current version of the software by Clean Air-Cool Planet does not allow for the input of FY09 data. All FY09 data were collected and saved, except for budget data which were not yet available. When the new version of the software is released, the inventory will be updated.

Methodology

Tools

There are many factors that must be accounted for when compiling information for a greenhouse gas inventory. Using a standardized protocol for these calculations is helpful in eliminating some of the subjective decision-making regarding what should or should not be included. Available software was researched that would help the team manage this daunting task. An overwhelming majority of other universities use a software program developed and maintained by Clean Air-Cool Planet (CA-CP), a nonprofit organization that provides resources for reporting, analyzing, and summarizing greenhouse gas emissions to communities, companies and schools. The American College and University Presidents Climate Commitment recommends the use of CA-CP's Campus Carbon Calculator. According to the CA-CP website, the calculator has been used by more than 1,000 North American campuses. It is a reliable choice because it takes into account emissions from CO_2 and other important greenhouse gases including CH_4, N_2O, HFCs, PFCs, and SF_4. The program is comprehensive and efficient: it automatically produces charts and graphs once data are entered. It also allows institutions to report historical data so that they can track their emission trends over time and make projections for the future, and it is compatible with current standards used to craft carbon cap-and-trade policy. It also includes a project module, which can determine the emissions created or reduced by a future project.

Boundaries

This study and report reflect, unless otherwise noted, emissions produced by the following entities:

- Main UNLV campus (Maryland Parkway), Thomas & Mack Center, and Cox Pavilion
- Paradise Campus
- Shadow Lane Campus
- Sam Boyd Stadium.

Scopes

This greenhouse gas inventory attempts to identify and record emissions from three scopes used by the CA-CP calculator. Scope 1 includes all direct emissions from sources owned or directly controlled by the subject organization. The categories in this scope which are applicable to UNLV and included in this inventory are:

- On-Campus Stationary Sources, (for UNLV Natural Gas combustion);
- Direct Transportation Sources by UNLV fleet and related vehicles;
- Refrigerants; and
- Agriculture in Fertilizer Application and Animal Husbandry.

Scope 2 sources cover GHG emissions that result from importing or buying electricity, steam, heat or chilled water. The only category applicable to UNLV is Purchased Electricity.

Scope 3 includes all other indirect sources of GHG emissions that result from activities from sources not owned or controlled by the organization. The categories in this scope which are applicable to UNLV and included in this inventory are:

- Directly Financed Outsourced Travel (only Personal Mileage Reimbursement);
- Landfill Waste with CH4 Recovery and Flaring, and;
- Purchased Paper.

Omissions

In some cases, necessary data were not available in a usable format. Some categories of the inventory were intentionally omitted because record-keeping practices of some UNLV departments were not compatible with greenhouse gas reporting and would require unavailable time and resources to complete. Other data were unavailable from the source and were outside of UNLV's control. These omitted categories, their potential impacts on UNLVs total emissions, and ways to acquire data in the future are described below.

Air Travel

Currently, travel records do not include direct mileage counts for the trip, which would be the ideal situation. The records provide only destination cities, of which there are several thousand worldwide. The information needed for the calculator software would require the manual calculation of mileage for each individual destination, which is outside of the team's time capabilities.

Discussions have begun to make a new category in the records held by the office of Accounts Payable that would allow future calculations to be simplified. The recommended category would contain the mileage of each flight taken. This number can easily be found either on the flight information or by searching distances between airports. This extra field would not require much additional time or effort.

Records of the Athletic Department's travel were compiled and converted to miles, but they were only available for Fiscal Year 2009. This was not included in the calculation because it would add a field that was not present in previous years, skewing results for annual comparisons. It will be discussed in the Directly Funded Outsourced Travel section of this report.

Air Travel, while not included in this inventory, could be a significant source of emissions. Inspection of other institutions' inventories reveals that it could constitute a range of total emissions anywhere from 2% as reported at Carleton College, to 31% as reported at Oregon State University. Considering the amount of flights sponsored by UNLV, it is likely a significant source of emissions.

Water Treatment and Distribution

Version 6.1 of the CA-CP calculator has the new addition of a field for waste water treatment as an emissions source. At this time, data on UNLV's waste water are not available. Neither UNLV nor the Clark County Water Reclamation District, the local waste water services

provider, has any meters or monitoring system in place. In the future, there could be a way to estimate this field, but there are no current estimating procedures.

In the desert Southwest, water is a scarce resource that must be actively pumped to and from UNLV from Lake Mead. Along with sewage, the movement of clean water takes large amounts of energy, but the CA-CP calculator does not currently include this emissions source. The fresh water consumption records are available from the Las Vegas Valley Water District, but since it was not an active field in the calculator, it was not included in this inventory. However, it should be included in the future, as water treatment and distribution are likely a significant source of emissions.

At this time, it is difficult to estimate UNLV's waste water production. The Clark County Water Reclamation District bills UNLV on the basis of campus population and plumbing fixtures. They do not have a way to estimate the university's sewage use. Fresh water input differs from outgoing sewage water, because an unknown percentage of the water consumed by UNLV is for irrigation and outdoor watering. Due to evaporation and absorption by the ground, this water does not go back to the sewage system. Because currently UNLV is not monitoring what percentage of the water is being used for landscaping, it proves difficult to produce an estimate of waste water.

In the future, waste water could be determined if the amount of water used outdoors could be quantified. This would probably require installation of meters by watering pipes, or knowledge and regulation of the water flow through the watering systems. If UNLV had to install meters, it would likely be a pricey endeavor. Since the waste water field of the calculator is so new (less than 1 year old), other higher education institutions have not included it in their inventories. Because of this lack of information, it is difficult to assess the extent of emissions from this source. Infrastructure to assess waste water is not in place, and since it is unlikely that it would be a major source of emissions, it will not be included at this time.

Summary of Findings

The numbers reported below are the values generated using the CA-CP calculator. They are most likely underestimates, since several potentially important categories were omitted, while we are aware of no potential overestimated data or parameters. However, since they capture most of the major sources, the calculations should reasonably reflect actual emissions. Furthermore, the FY05 to FY08 data have the same uncertainties, meaning omitted data is consistent in all four years. This allows the comparisons to reasonably reflect actual changes over that time.

For FY08, we calculate total emissions of 91,282.8 metric tons (mt) CO_2 equivalents (eCO_2). This is a 0.032% increase over FY05, although this difference is far below the certainty level of the calculations for either year.

We calculated a 0.1 % increase in electricity usage between FY05 and FY08, mainly due to the addition of new buildings. Purchased electricity accounts for approximately 60% of UNLV's eCO_2.

Energy use per full time equivalent student resulted in net emissions of 4.2 mt eCO_2, a 0.05% increase from FY05. The number of full time equivalent students (FTE) attending UNLV decreased slightly, by 0.005%, from FY05 to FY08.

On average, there were 486.5 kg eCO_2 emitted per 1000 square feet of building and research space, a 0.698% decrease from FY05. During these years the campus has increased building and research space by 0.053%. A decrease in emissions, despite an increase in square footage, reflects the university's sustainable initiatives.

On average, 199.0 grams of eCO_2 are emitted per dollar spent on the operating budget. This is a 0.876% decrease from FY05 and demonstrates that the university is spending less money on emissions-causing factors like purchased electricity.

Figure 1 shows Total Campus Emissions in CO_2 equivalent by study sector. Refrigerants, ground travel reimbursements, paper purchases, and agriculture were less than 0.1%, so they are not included in this figure.

Figure 1. Total Campus Emissions (eCO2)

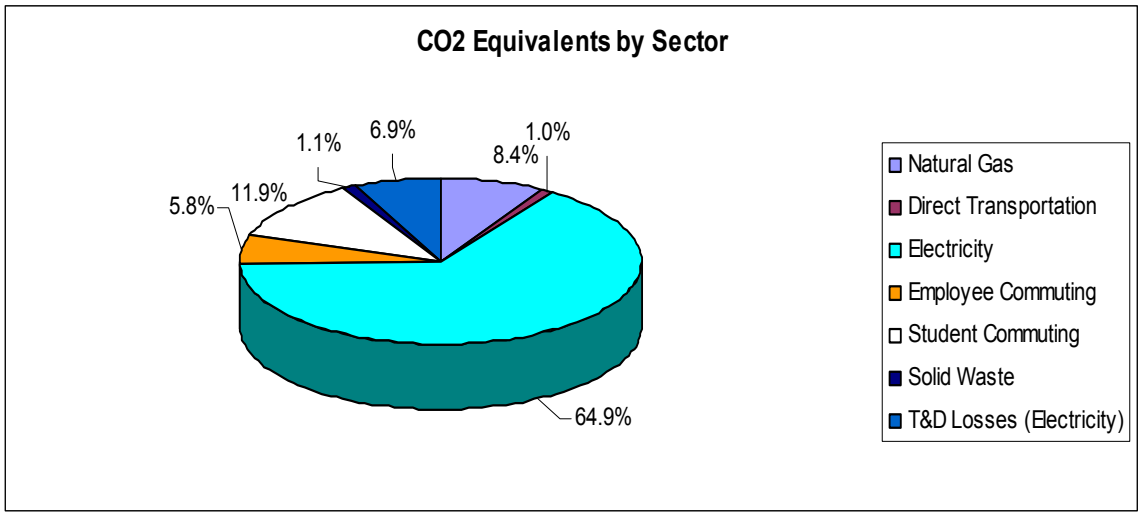


Table 1 was produced by the Campus Carbon Calculator and lists a summary of all emissions by sector for FY08. Emissions summaries for all study years are included at the end of this document.

Table 1. Emissions Summary

MODULE	Summary					
WORKSHEET	Overview of Annual Emissions					
UNIVERSITY	University of Nevada, Las Vegas					
Select Year -->	2008	Energy Consumption	CO_2	CH_4	N_2O	eCO_2
		MMBtu	kg	kg	kg	Metric Tonnes
Scope 1	Co-gen Electricity	-	-	-	-	-
	Co-gen Steam	-	-	-	-	-
	Other On-Campus Stationary	133,199.8	7,027,054.0	702.6	14.1	7,047.4
	Direct Transportation	11,724.3	818,654.4	138.6	48.9	836.3
	Refrigerants & Chemicals	-	-	-	-	112.1
	Agriculture	-	-	47.3	48.1	15.3
Scope 2	Purchased Electricity	898,849.0	54,310,794.0	860.3	554.9	54,494.8
	Purchased Steam / Chilled Water	-	-	-	-	-
Scope 3	Faculty / Staff Commuting	67,319.8	4,720,501.4	944.2	325.0	4,838.4
	Student Commuting	243,615.4	17,094,742.6	3,362.7	1,159.9	17,515.4
	Directly Financed Air Travel	-	-	-	-	-
	Other Directly Financed Travel	1,027.9	72,073.8	14.4	5.0	73.9
	Study Abroad Air Travel	-	-	-	-	-
	Solid Waste	-	-	39,717.9	-	913.5
	Wastewater	-	-	-	-	-
	Paper	-	-	-	-	46.0
	Scope 2 T&D Losses	88,897.2	5,371,397.2	85.1	54.9	5,389.6
Offsets	Additional					-
	Non-Additional					-
Totals	Scope 1	144,924.1	7,845,708.4	888.5	111.1	8,011.1
	Scope 2	898,849.0	54,310,794.0	860.3	554.9	54,494.8
	Scope 3	400,860.2	27,258,715.0	44,124.4	1,544.7	28,776.8
	All Scopes	1,444,633.4	89,415,217.5	45,873.3	2,210.6	91,282.8
	All Offsets					-
					Net Emissions:	**91,282.8**

Figure 2 shows emissions by scope. Based on the three scopes, the emissions for FY08 are:

- Scope 1 sources contributed 8,011.1 mt eCO_2 (9% of mt eCO_2), mainly from natural gas combustion and UNLV's fleet and transportation. Figure 3 displays scope 1 emissions by field.
- Scope 2 sources contributed 54,494.8 mt eCO_2 (59% of total mt eCO_2), due only to purchased electricity.
- Scope 3 sources contributed 28,776.8 mt eCO_2 (32% of total mt eCO_2), largely because of commuting and transmission and distribution of electricity from scope 2. Figure 4 offers a breakdown of emissions by field.

Figure 2. Emissions by Scope (eCO2)

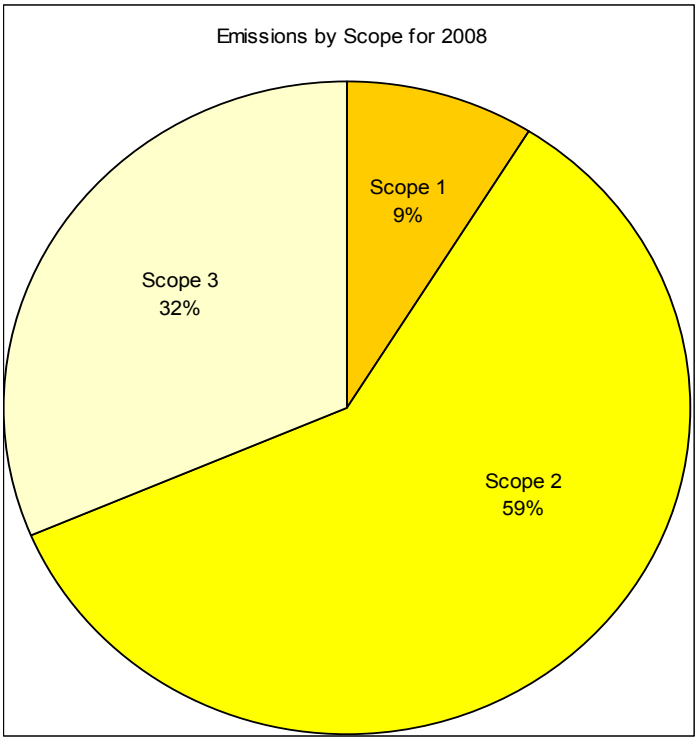


Figure 3. Scope 1 Emissions by Sector

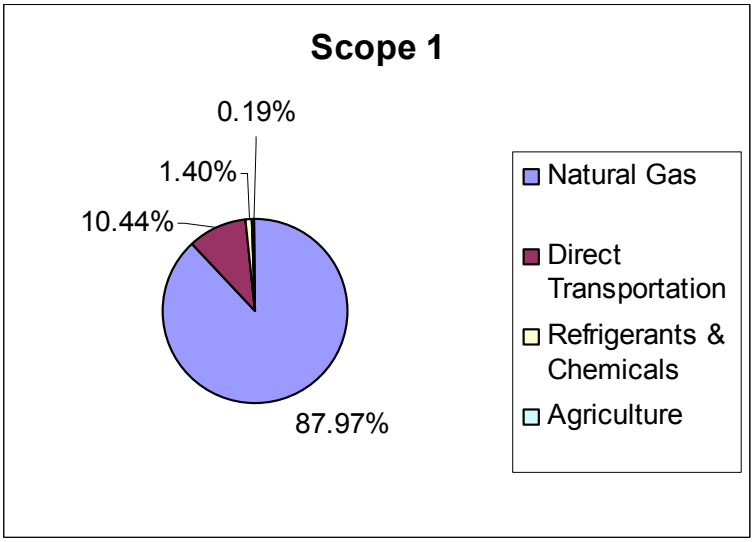
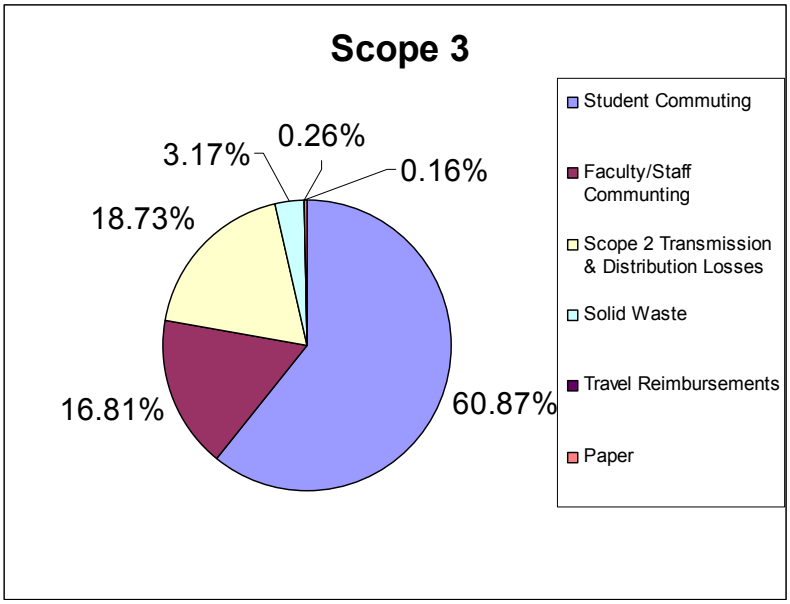


Figure 4. Scope 3 Emissions by Sector



Data Collection and Analysis

Financial Data

For the purposes of this study, it is more appropriate to use expenditures rather than budgets for the Operating Budget and Research Dollars fields, since expenditures are a more accurate depiction of money spent. Expenditure data were obtained from UNLV Controller's Office. UNLV's Energy Budget was calculated from total expenditures for natural gas and electricity from the Controller's Financial Report. All budget data were deflated to 2005 dollars using the Inflation Adjustment tool of the Campus Carbon Calculator.

Figure 5 displays grams of eCO_2 per Operating Dollar and the overall trend of fewer emissions per dollar.

Figure 5. Emissions per Operating Dollar

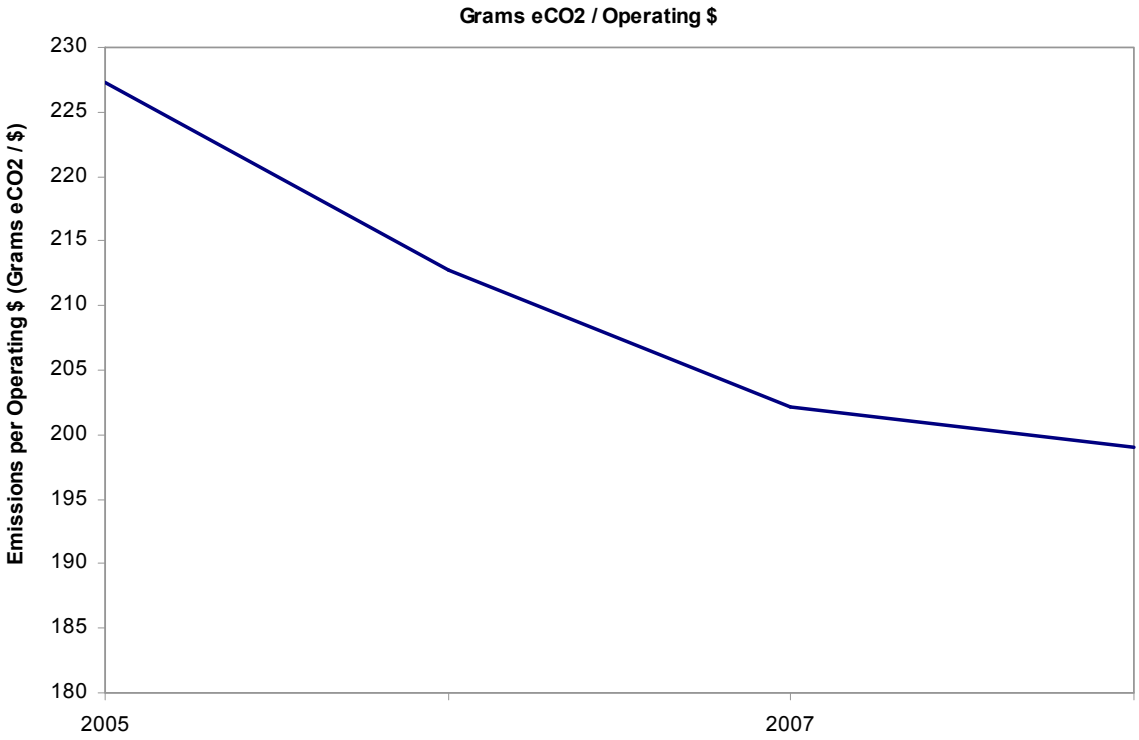
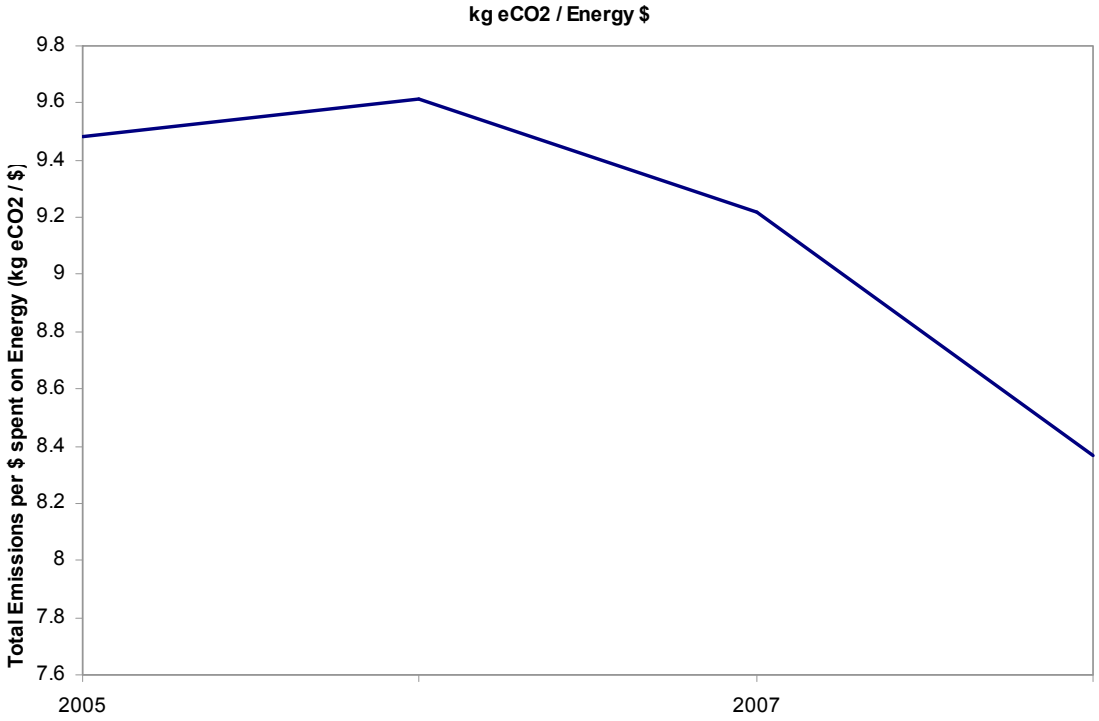


Figure 6 shows emissions per dollar of the energy expenditures. The trend here is also fewer emissions per dollar.

Figure 6. Emissions per Energy Dollar

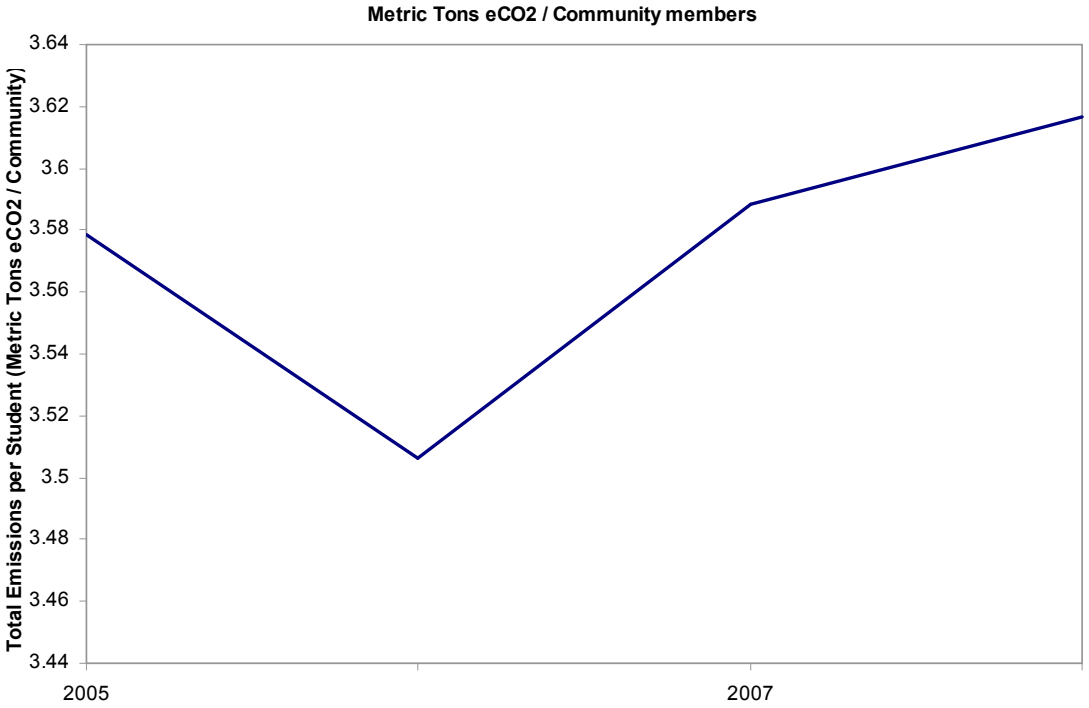


Population

Student population figures were obtained from UNLV Institutional Analysis and Planning. Student population figures were an average of the number of enrollments for Fall and Spring semesters. Faculty and Staff numbers were obtained from UNLV Human Resources. The CA-CP software specified that employee numbers should be stated in Full Time Equivalents (FTEs). Numbers from the previous version were changed to FTEs.

Figure 7 shows the total emissions per students and employees (Community Members) increased in 2007 and 2008 due to the decrease in university population and simultaneous increase of electrical use due to construction of new buildings, resulting in a substantial rise of emissions from FY06 to FY08. The overall change from FY05 to FY08, however, is slight.

Figure 7. Emissions per Community Member

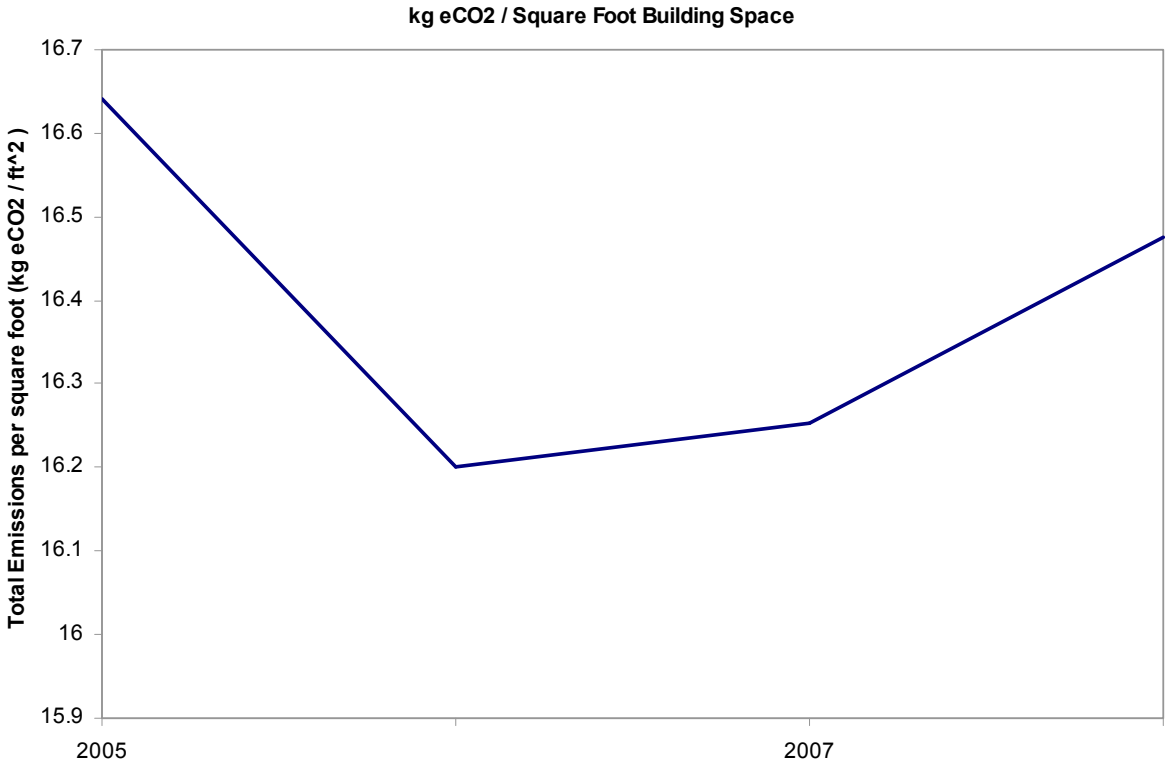


Physical Size

Building space for the main campus was obtained from UNLV Academic and Research Space Director. The Thomas and Mack Center (TMC) and Cox Pavilion space were provided by TMC. The Sam Boyd Stadium size was provided by the Stadium Manager. Research space is evaluated every two years by the Department of Institutional Analysis and Planning; therefore, research space for 2006 is an average of 2005 and 2007.

Figure 8 displays emissions per square foot of building space. The overall trend of emissions per square foot reflects UNLV's efforts to incorporate energy efficient building practices and fixtures. It is UNLV's goal to see this trend continue in the future.

Figure 8. Emissions per Square Foot



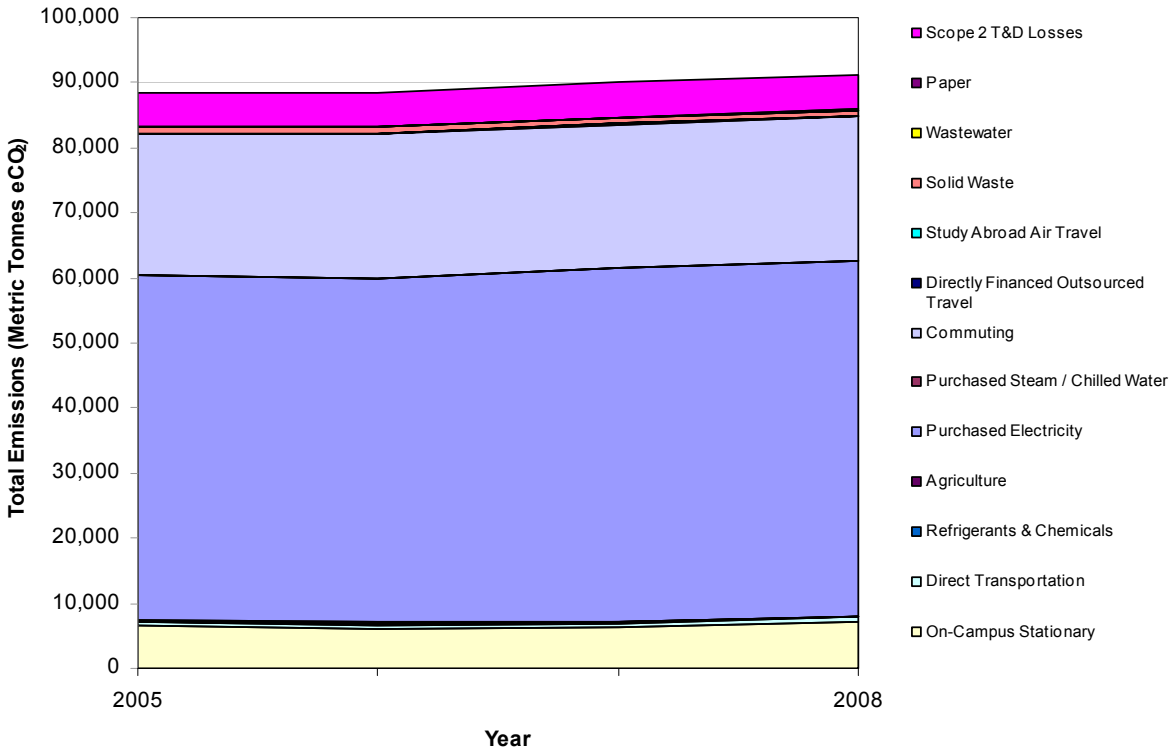
Electricity

The entire campus electric use is divided into three fields: Facilities Management (FAC), Housing Administration (HAB), and Thomas and Mack (TMC) and Sam Boyd Stadium (SBS). Total electric consumption for the 2008 Inventory was calculated using data provided by UNLV Facilities Management Energy Manager. The Energy Manager provided the total electricity used by facilities for all study years. He also provided TMC data for FY07-09, and all entities information in FY09. Campus Housing and SBS compiled their records, but the data contained gaps. TMC kept no records of its electric consumption, so these were manually input from archival accounting records. There were also gaps in the archival records. All gaps were filled based on energy expenditures for the missing period, taken from the Controller's report, and multiplying that by the rate of nearby months in the same account with similar expenditures.

After all electricity and expenditures were added, the expenditures were compared to the total amount paid to NV Energy (formerly Nevada Power Company) from the Controller's report. The differences were recorded. They ranged from 0.08% to 6.61% annually, with the average difference for all years being 3.51%. The differences can be explained by either gaps in the information provided in the KWh, or more likely due to fees and charges on the part of NV Energy for infrastructure and meters in new construction and major renovations. The numbers inputted to the calculator are those kWh that were reported directly from invoices or indirectly for gap estimates, not the estimates derived from the Controller's report, which was only used as a check for accuracy.

Figure 9 shows total campus emissions. Purchased electricity contributes the largest source of emissions. Total emissions have increased in the study period.

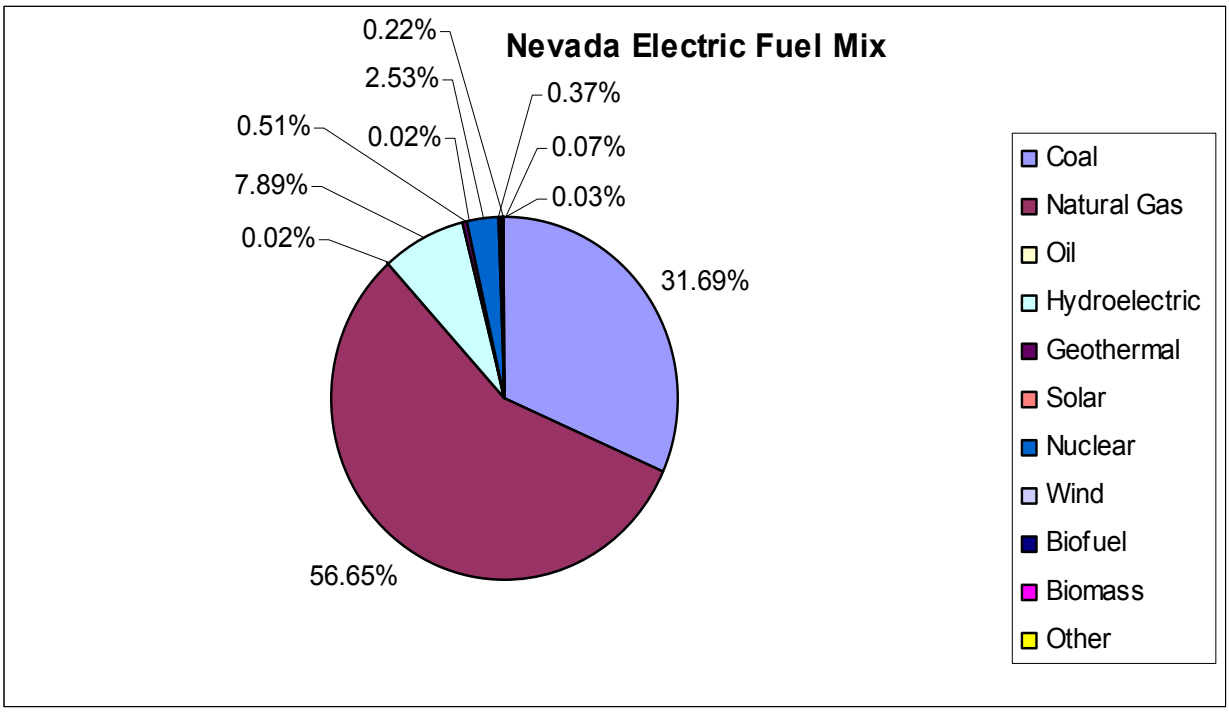
Figure 9. Total Emissions



For FY08, electricity usage accounts for approximately 60% of emitted eCO_2 (54,494.8 mt eCO_2). UNLV has proactively reducing energy usage through different sustainable initiatives like replacing inefficient light bulbs. Despite these initiatives, the new buildings, even LEED certified, require energy which has led to the slightly increased emissions since FY05.

UNLV's fuel mix was acquired from the Nevada Power annual reports on their webpage http://www.nvenergy.com/bill_inserts/ , from Power Content bill inserts. Figure 10 displays the composition of the fuel mix for FY08.

Figure 10. Electric Fuel Mix



Steam and Chilled Water

UNLV does not purchase any steam or chilled water.

On-Campus Cogeneration plant

UNLV does not have a cogeneration plant.

Stationary Sources

On campus stationary sources include all fuel used on campus, excluding vehicle fuel use. Because natural gas is combusted throughout campus for varied uses, it is considered a stationary source, per definition in the calculator. It is the only stationary source at UNLV. The records for Facilities Management and Housing Administration were provided by the Energy Manager for all years and records for all entities only for FY07-09. Thomas and Mack usages for FY05-06 were compiled from archival data, and any gaps in reports were filled according to the same method outlined above in electricity.

University Fleet—Direct Transportation

Fleet fuel was purchased from three sources: Western Energetix, Chevron and Texaco gasoline cards, and Enterprise rental cars. Fuel types used by the UNLV Motor Pool Department included regular unleaded gasoline, biodiesel (B5), compressed natural gas (CNG), and ethanol (E85).

Western Energetix provided complete records for FY08. The rest of the fuel provided by the company was compiled from archival invoices for FY05 to FY07. These were the records kept by the Motor Pool and could not be inclusive of other departments' use. Motor Pool and Western Energetix information was provided by Facilities Management.

Chevron and Texaco gasoline cards and Enterprise Rental Cars only kept dollar figures, so these were converted to gallons using the Department of Energy (DOE) website (http://www.eia.doe.gov/oil_gas/petroleum/data_publications/wrgp/mogas_history.html) and acquiring average prices of regular unleaded gasoline for each fiscal year for the West Coast. Chevron and Texaco gasoline cards for FY07 to FY09 were compiled by the UNLV Purchasing Department. FY05 archives had Chevron invoice records, but there were no records for FY06.

Enterprise submitted a summary for all years, but these only reflect the difference in gasoline after the rental vehicle was returned and does not account for any fuel that was purchased by the user of the vehicle; however, it was assumed that the user paid with a Chevron gasoline card, so the fuel would be accounted for in the travel reimbursement field of the calculator.

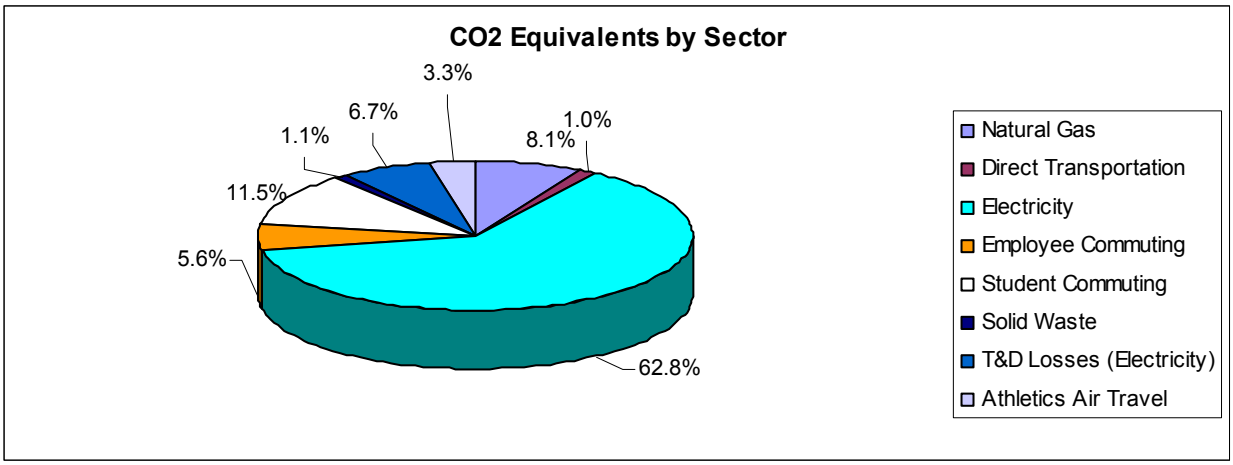
Many departments and programs on the UNLV campus operate electric carts, which are charged from regular electrical outlets throughout the university. The electrical usage of the vehicles cannot be distinguished from the rest of the buildings' usage, but since they are included in total electric use, they are accounted for in the purchased electricity field of the calculator.

Directly Financed Outsourced Travel

The Accounts Payable office does not currently keep records of mileage of flights. The data available are not compatible with GHG reporting. Changes in the travel documents will be made in the future to allow these data to be calculated.

The Athletic Department manages its own flights. Total mileage was tabulated by using the distance between the airport code and McCarran International Airport (LAS) by using the website www.world-airport-codes.com. Travel by the Athletic Department is less than one fourth of the total air travel for UNLV on the basis of number of travel records. When emissions were calculated from this source, it constituted about 3.3% of total campus emissions as seen in Figure 11. This suggests that air travel is a very important part of the total emissions for the entire campus. Assuming that travel by the Athletic Department is similar to all UNLV travel, and that travel remains relatively constant through the years in the study period, an estimated four times the Athletic emissions, or about 12.7% of total campus emissions come from UNLV's air travel.

Figure 11. Total Emissions including Athletic Air Travel



Car travel by employees on university business was reimbursed by the Accounts Payable Office, so the records were provided by that department. They reimburse on a per mile basis and kept records of the amount paid. This dollar total was divided by the reimbursement rate of $0.585 per mile up to January of 2009, after which it was reduced to $0.55 per mile. Car Travel reimbursements were a negligible source of emissions, accounting for less than 0.1% of total campus emissions.

Commuters

A survey was posted on www.unlv.edu containing questions on commuter habits such as distance from an individual's residence to UNLV, number of days commuting, number of days missed, and frequency of usage of bus, biking/walking, and carpooling. All answers were divided according to whether the survey taker was a student, faculty member, or staff personnel. Averages of the mileage to campus were taken for the three categories (excluding three surveys that indicated the individual travels more than 100 miles, because these responses were assumed to be inaccurate). Values less than 1 mile were approximated to 0.5 miles. Percentages of commuter habits other than single passenger vehicles were calculated by assigning each answer a percentage according to the following table:

Option	Rarely/ Never	1-3 times per semester	1-3 times per month	1-3 times per week	Mostly/ Always
% of commuter trips	0	Insignificant	15%	50%	100%

The number of trips per week for students was calculated by taking 16 weeks of class for both Fall and Spring semesters, then multiplied by the average number of trips per week according to student answers for the survey, then multiplied by two to account for the trips to and from campus.

For faculty, the weeks per year was calculated for Fall and Spring semesters plus 13 weeks of Summer sessions. Staff weeks per year were based on 52 weeks, minus 6 weeks

allotted for holidays, sick days and vacation time. The percentage of people driving personal vehicles is the percentage of the student population that purchased parking passes in FY08. Since the team had access only to survey and parking pass data for FY08, these numbers were used for all study years.

UNLV is largely a commuter campus, with less than 1% of the student population living on campus. As such, commuter emissions represent a large portion of total campus emissions, at about 17.7%. UNLV does not have Light Rail or Commuter Rail options at this time.

Agriculture

Fertilizer information was obtained from UNLV Grounds Department and the UNLV Athletic Fields Supervisor. The average nitrogen content for all types of fertilizer applied was used for all quantities. The UNLV Police have two horses on staff, although they are not housed on UNLV property. They are cared for at the Metropolitan Police Department's corral. UNLV does not have a farm or community garden. Agriculture emissions are considered insignificant because they account for less than 0.1% of total university emissions.

Solid Waste

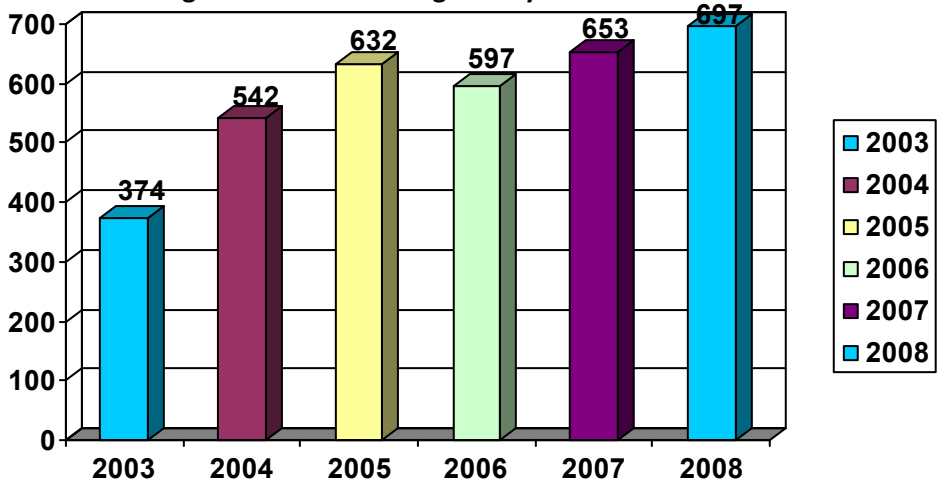
All non-recycled waste goes to a landfill with methane recovery for flaming. The waste is collected in both large compactors, small three to eight cubic yard dumpsters, and one 28 cubic yard open-top container. There are three compactors for the campus. The exact weights of the compactors for Thomas and Mack, Sam Boyd Stadium, and Grounds were provided by Matt Wood from Republic Services. The 28 cubic yard open top is emptied one time per week. There are no weight records for the open top. There are also no weight records for the 62 small dumpsters on campus. There are 55 three cubic yard dumpsters and 7 eight cubic yard dumpsters.

The dumpsters are emptied six times per week by Republic Services in what is referred to as a community collection route. This type of collection route makes it difficult for the garbage company to provide UNLV with their weights. The individual three to eight cubic yard dumpsters are on average half full according to a Waste Assessment Study and Custodial surveys. Grounds took a sample weight of a full dumpster, which weighed 445 lbs. Since these dumpsters are linked to activities related to the people on campus, both students and employees, as opposed to events or construction, we assumed that weight fluctuated with the campus population. The weight was multiplied by the number of dumpsters and the total was divided by the amount of people on campus. This ratio was used for previous years to estimate the contribution due to the buildings' dumpsters. Grounds information was provided by the Grounds and Landscape Manager.

It is important to mention that several hundreds of tons of materials are diverted from the landfill at the Rebel Recycling Center each year. The center accepts all grades of paper, cardboard, aluminum, plastic #1 (PETE) and #2 (HDPE), steel, tin, scrap metal, toner and ink jet cartridges, and wood pallets, among other objects. From FY05-08, Rebel Recycling processed a total of 2,579 tons of materials. Figure 12 shows total tons per year. The Grounds Department also recycles landscape waste via composting at another facility, including tree and grass trimmings, soil, and turf. In FY08, the department recycled 229 cubic yards of waste.

Information for the Recycling Center was produced by the UNLV Solid Waste and Recycling Manager. Yard waste figures were provided by the UNLV Grounds Department.

Figure 12. Total Tonnages Recycled from 2003 to 2008



Paper Purchasing

A UNLV Purchasing Analyst provided records of paper purchases for FY08. The report was divided between reams, packs, and boxes of paper. The data were converted to weights by multiplying each ream by the average weight of a ream of paper, which is 4.5lbs. Weights for packs and boxes were obtained from Office Max Representative Janet Daniels. Office Max is the contracted office supply company for UNLV. The Campus Copy Center and Reprographics have different contracted vendors, and their purchasing information is currently unavailable. As of now, the emissions produced by paper purchases are negligible, considering it only accounts for less than 0.1% of total campus emissions.

Refrigerants

Exact numbers of refrigeration emissions were available for Housing Administration and Facilities Management for all study years. Sam Boyd Stadium had data only for FY08 to FY09, so an average of the two was applied to previous years. Thomas and Mack had a total amount for the study period, but there were no distinctions as to when the leaks happened within that time period, so the total was divided by five years. Refrigeration emissions are considered negligible, as they only contribute less than 1% of total emissions.

Conclusion

The purpose of this inventory is to establish UNLV's baseline eCO2 emissions and current trends. As mentioned in the introduction, the UNLV Sustainability Task Force drafted a report that included numerous recommendations relating to sustainability. Some of those recommendations can be quantifiably supported by data in this GHGI report. The inventory will also provide information to the administration and the UNLV Sustainability Council regarding future areas of focus for sustainability. The data are useful in developing action plans best oriented towards UNLV, the Las Vegas Valley, and the local environment. By completing the

inventory every subsequent year, the positive changes (like lower emissions) from sustainability initiatives can be documented.

Appendix 1: CA-CP Carbon Calculator Input Sheet

Fiscal Year	Institutional Data					
	Budget - Click here to enter data			Population		
	Operating Budget	Research Budget	Energy Budget	Full Time Students	Part-Time Students	Summer School Students
	$ (2005)	$ (2005)	$ (2005)	#	#	#
2005	389,038,000	35,839,000	9,329,316	17,211	9,460	15,381
2006	415,670,897	39,538,356	9,196,078	17,146	10,198	16,242
2007	445,501,336	43,927,017	9,770,191	16,711	10,273	17,068
2008	458,679,062	39,294,205	10,909,944	16,980	9,721	16,623
2009			10,909,944	17,626	10,006	16,441

				Other On-Campus Stationary Sources
		Physical Size		
Faculty	Staff	Total Building Space	Total Research Building Space	Natural Gas
#	#	Square feet	Square feet	MMBtu
1,746	1,027	5,314,383	133,287	124,362
1,902	1,076	5,458,508	130,958	115,972
2,093	1,154	5,540,591	128,629	119,467
2,163	1,235	5,540,591	194,145	133,200
2,006	1,181	5,569,379	200,903	134,709

Direct Transportation Sources					Refrigerants & Chemicals					
University Fleet					Refrigerants & Chemicals					
Gasoline Fleet	Diesel Fleet	Natural Gas Fleet	E85 Fleet	B5 Fleet	HFC-134a	HFC-404a	HCFC-22	12	407C	414-B
Gallons	Gallons	MMBtu	Gallons	Gallons	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
30,866	0	3,053	-	10,875	20	4	137	3	-	5
27,300	0	1,263	-	18,821	395	4	125	-	-	5
38,272	31	392	2,056	11,679	20	6	247	-	-	5
73,389	237	0	-	18,769	20	4	118	-	-	5
59,976	2,021	-	-	16,011	36	1	1,448	1	1	-

Appendix 1: CA-CP Carbon Calculator Input Sheet, *continued*

Agriculture Sources					Purchased Electricity, Steam, and Chilled Water
Fertilizer Application				Animal Husbandry	Electricity
Synthetic	% Nitrogen	Organic	% Nitrogen	Horses	CLICK TO SET eGRID SUBREGION
Pounds	%	Pounds	%	#	kWh
39,200	21.00%	-	0.00%	2	87,056,830
49,075	20.00%	-	0.00%	2	89,853,220
63,092	24.00%	3,000	6%	2	95,591,687
14,805	23.00%	-	0.00%	2	96,513,111
23,538	30.50%	-	0.00%	2	102,405,528

Commuting - click here to enter data			Directly Financed Outsourced Travel	Solid Waste
Faculty / Staff Commuting	Student Commuting		Other	Landfilled Waste
Automobile	Automobile	Bus	Personal Mileage Reimbursement	CH4 Recovery and Flaring
Miles	Miles	Miles	Miles	Short Tons
9,765,521	42,652,124	1,579,752	343,339	3,277
10,504,232	43,171,672	1,601,640	336,432	3,414
11,466,266	42,400,230	1,573,020	213,051	3,374
11,982,025	42,386,645	1,572,516	182,945	3,250
12,832,397	42,295,915	1,569,150	90,225	3,327

Paper			
Uncoated Freesheet	Uncoated Freesheet	Uncoated Freesheet	Uncoated Freesheet
15% Recycled	30% Recycled	50% Recycled	100% Recycled
lbs	lbs	lbs	lbs
158	38,114	1,175	1,026
36	20,843	2,342	2,943

Appendix 2: Emissions Summary Tables

FY05

MODULE	Summary					
WORKSHEET	Overview of Annual Emissions					
UNIVERSITY	University of Nevada, Las Vegas					
Select Year -->	2005	Energy Consumption	CO_2	CH_4	N_2O	eCO_2
		MMBtu	kg	kg	kg	Metric Tonnes
Scope 1	Co-gen Electricity	-	-	-	-	-
	Co-gen Steam	-	-	-	-	-
	Other On-Campus Stationary	124,361.7	6,560,793.6	656.0	13.1	6,579.8
	Direct Transportation	8,379.5	532,521.7	102.7	22.6	541.6
	Refrigerants & Chemicals	-	-	-	-	139.3
	Agriculture	-	-	47.3	116.1	35.4
Scope 2	Purchased Electricity	827,476.1	53,038,118.5	796.5	661.8	53,252.3
	Purchased Steam / Chilled Water	-	-	-	-	-
Scope 3	Faculty / Staff Commuting	54,866.6	3,847,276.0	769.6	264.9	3,943.4
	Student Commuting	245,132.1	17,201,154.1	3,383.7	1,167.1	17,624.5
	Directly Financed Air Travel	-	-	-	-	-
	Other Directly Financed Travel	1,929.0	135,263.5	27.1	9.3	138.6
	Study Abroad Air Travel	-	-	-	-	-
	Solid Waste	-	-	40,052.0	-	921.2
	Wastewater	-	-	-	-	-
	Paper	-	-	-	-	-
	Scope 2 T&D Losses	81,838.3	5,245,528.2	78.8	65.5	5,266.7
Offsets	Additional					-
	Non-Additional					-
Totals	Scope 1	132,741.2	7,093,315.3	806.0	151.7	7,296.0
	Scope 2	827,476.1	53,038,118.5	796.5	661.8	53,252.3
	Scope 3	383,766.1	26,429,221.8	44,311.1	1,506.8	27,894.4
	All Scopes	1,343,983.4	86,560,655.6	45,913.6	2,320.3	88,442.7
	All Offsets					-
					Net Emissions:	**88,442.7**

Appendix 2: Emissions Summary Tables, *continued*

FY06

MODULE	Summary					
WORKSHEET	Overview of Annual Emissions					
UNIVERSITY	University of Nevada, Las Vegas					
Select Year -->	2006	Energy Consumption	CO_2	CH_4	N_2O	eCO_2
		MMBtu	kg	kg	kg	Metric Tonnes
Scope 1	Co-gen Electricity	-	-	-	-	-
	Co-gen Steam	-	-	-	-	-
	Other On-Campus Stationary	115,971.5	6,118,162.4	611.7	12.2	6,135.9
	Direct Transportation	7,239.3	482,141.2	75.9	21.7	490.3
	Refrigerants & Chemicals	-	-	-	-	339.1
	Agriculture	-	-	47.3	138.3	42.0
Scope 2	Purchased Electricity	844,735.1	52,813,004.3	922.6	582.9	53,006.8
	Purchased Steam / Chilled Water	-	-	-	-	-
Scope 3	Faculty / Staff Commuting	59,017.0	4,138,302.3	827.8	284.9	4,241.7
	Student Commuting	248,127.3	17,411,348.2	3,425.0	1,181.4	17,839.8
	Directly Financed Air Travel	-	-	-	-	-
	Other Directly Financed Travel	1,890.2	132,542.7	26.5	9.1	135.9
	Study Abroad Air Travel	-	-	-	-	-
	Solid Waste	-	-	41,724.3	-	959.7
	Wastewater	-	-	-	-	-
	Paper	-	-	-	-	-
	Scope 2 T&D Losses	83,545.2	5,223,264.2	91.2	57.6	5,242.4
Offsets	Additional					-
	Non-Additional					-
Totals	Scope 1	123,210.8	6,600,303.6	735.0	172.3	7,007.3
	Scope 2	844,735.1	52,813,004.3	922.6	582.9	53,006.8
	Scope 3	392,579.7	26,905,457.4	46,094.8	1,533.1	28,419.4
	All Scopes	1,360,525.6	86,318,765.2	47,752.4	2,288.3	88,433.5
	All Offsets					-
					Net Emissions:	**88,433.5**

Appendix 2: Emissions Summary Tables, *continued*

FY07

MODULE	**Summary**
WORKSHEET	**Overview of Annual Emissions**
UNIVERSITY	**University of Nevada, Las Vegas**

Select Year -->	**2007**	**Energy Consumption**	**CO_2**	**CH_4**	**N_2O**	**eCO_2**
		MMBtu	kg	kg	kg	Metric Tonnes
Scope 1	Co-gen Electricity	-	-	-	-	-
	Co-gen Steam	-	-	-	-	-
	Other On-Campus Stationary	119,467.2	6,302,580.7	630.2	12.6	6,320.8
	Direct Transportation	6,938.3	466,495.2	82.7	27.4	476.5
	Refrigerants & Chemicals	-	-	-	-	214.1
	Agriculture	-	-	47.3	215.8	65.0
Scope 2	Purchased Electricity	893,406.1	54,221,136.0	902.4	570.1	54,410.6
	Purchased Steam / Chilled Water	-	-	-	-	-
Scope 3	Faculty / Staff Commuting	64,422.1	4,517,310.3	903.6	311.0	4,630.2
	Student Commuting	243,693.5	17,100,221.6	3,363.8	1,160.3	17,521.0
	Directly Financed Air Travel	-	-	-	-	-
	Other Directly Financed Travel	1,197.0	83,934.8	16.8	5.8	86.0
	Study Abroad Air Travel	-	-	-	-	-
	Solid Waste	-	-	41,241.9	-	948.6
	Wastewater	-	-	-	-	-
	Paper	-	-	-	-	-
	Scope 2 T&D Losses	88,358.8	5,362,529.9	89.2	56.4	5,381.3
Offsets	Additional					-
	Non-Additional					-
Totals	Scope 1	126,405.5	6,769,075.9	760.2	255.8	7,076.4
	Scope 2	893,406.1	54,221,136.0	902.4	570.1	54,410.6
	Scope 3	397,671.4	27,063,996.6	45,615.3	1,533.4	28,567.0
	All Scopes	1,417,483.0	88,054,208.4	47,277.9	2,359.4	90,054.1
	All Offsets					-
					Net Emissions:	**90,054.1**

Appendix 2: Emissions Summary Tables, *continued*

FY08

MODULE	Summary					
WORKSHEET	Overview of Annual Emissions					
UNIVERSITY	University of Nevada, Las Vegas					
Select Year -->	2008	Energy Consumption	CO_2	CH_4	N_2O	eCO_2
		MMBtu	kg	kg	kg	Metric Tonnes
Scope 1	Co-gen Electricity	-	-	-	-	-
	Co-gen Steam	-	-	-	-	-
	Other On-Campus Stationary	133,199.8	7,027,054.0	702.6	14.1	7,047.4
	Direct Transportation	11,724.3	818,654.4	138.6	48.9	836.3
	Refrigerants & Chemicals	-	-	-	-	112.1
	Agriculture	-	-	47.3	48.1	15.3
Scope 2	Purchased Electricity	898,849.0	54,310,794.0	860.3	554.9	54,494.8
	Purchased Steam / Chilled Water	-	-	-	-	-
Scope 3	Faculty / Staff Commuting	67,319.8	4,720,501.4	944.2	325.0	4,838.4
	Student Commuting	243,615.4	17,094,742.6	3,362.7	1,159.9	17,515.4
	Directly Financed Air Travel	-	-	-	-	-
	Other Directly Financed Travel	1,027.9	72,073.8	14.4	5.0	73.9
	Study Abroad Air Travel	-	-	-	-	-
	Solid Waste	-	-	39,717.9	-	913.5
	Wastewater	-	-	-	-	-
	Paper	-	-	-	-	46.0
	Scope 2 T&D Losses	88,897.2	5,371,397.2	85.1	54.9	5,389.6
Offsets	Additional					-
	Non-Additional					-
Totals	Scope 1	144,924.1	7,845,708.4	888.5	111.1	8,011.1
	Scope 2	898,849.0	54,310,794.0	860.3	554.9	54,494.8
	Scope 3	400,860.2	27,258,715.0	44,124.4	1,544.7	28,776.8
	All Scopes	1,444,633.4	89,415,217.5	45,873.3	2,210.6	91,282.8
	All Offsets					-
					Net Emissions:	**91,282.8**