



2007-2008 Greenhouse Gas Inventory
Willamette University

Willamette University Sustainability Council
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Abstract:

In April of 2007, Willamette University (WU) President Lee Pelton signed the “American College and University Presidents Climate Commitment,” (ACUPCC) an agreement established by the American Association for Sustainability in Higher Education (AASHE). One key component of this agreement is an institutional commitment to inventorying greenhouse gases (GHGs) every two years. The *2007-2008 Greenhouse Gas Inventory* presents WU’s first iteration of this accounting process. The report includes a snapshot of WU emissions for the fiscal year ending June 1, 2008 along with a detailed discussion the methodology used to obtain these results. Significant findings of this report include:

- Willamette’s total emissions of greenhouses for the 2007-2008 fiscal year were **17,934 metric tons of carbon dioxides equivalent** (MT eCO₂). This translates to:
 - 5.52 MT eCO₂ per person (all faculty, staff, and students)
 - 7.06 MT eCO₂ per student
 - 12.8 MT eCO₂ per 1000 square foot of building space
 - 1.89 MT eCO₂ per \$10,000 of operating expenditure
- The vast majority of emissions come from three sources: electricity consumption (28%); heating (28%); and transportation (41%).
- Local commuting is a significant source of emission (14%) but generates only half the emissions of long-distance travel (27%).
- Air travel to and from off-campus study locations generates 8% of total emissions or about 0.53 MT eCO₂ per student, about the same amount as local commuting by students.

Introduction:

The American Association for Sustainability in Higher Education (AASHE) was established in 2006 “with a mission to promote sustainability in all sectors of higher education¹”. In one of its first national initiatives, AASHE created the American College and University Presidents Climate Commitment (ACUPCC) to bring attention to institutions of higher education as leaders in the effort to re-stabilize the earth’s climate. By signing the agreement an institution commits to becoming climate neutral by a date of its own choosing and to publicly reporting on its progress toward that goal. In April of 2007, President Pelton signed the agreement, making Willamette a charter signatory.

At Willamette the Administrative Council is ultimately responsible for development and implementation of a comprehensive plan to become climate neutral. The Sustainability Council, which serves as an advisory body on sustainability issues to the President and the University Community as a whole, acts as the coordinating body for development of the comprehensive plan, including the determination of target dates and interim targets, actions to be taken in fulfillment of the Commitment’s objectives, and appropriate assessment.

The first step toward reduction is awareness. The *2007-2008 Greenhouse Gas Inventory* presents WU’s first attempt to quantify our GHG emissions. This report provides a baseline that will be used to help shape the comprehensive plan and against which future reductions may be measured.

Acknowledgements:

Completing the inventory would have been impossible without the active involvement of many people and departments on campus. It is heartening to learn how many different people across campus recognize the threat of global climate change and are willing to take action to reduce that risk!

For their help collecting data, we would particularly like to thank: Gary Grimm and Mike Ryan from Facilities; Jim Andersen from Grounds; Kindra Jordan and Mika Yamanaka from the Travel Center; and Stacy West from the Office of International Education.

Methodology:

Boundary and scope

One key step to carrying out a greenhouse gas (GHG) inventory is identifying the appropriate and available information to be included in the analysis and what information either should not be included or could not be reasonably measured at this time. One needs a conceptual aid to identifying different types of sources and avoid double counting.

The World Resources Institute and World Business Council on Sustainable Development identify three scopes² of GHG emission data to be included in inventories. Scope 1 includes

¹ <www.aashe.org/about/about.php>

² “The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard, Revised Edition,” 2004. World Resources Institute and World Business Council on Sustainable Development.

direct GHG emissions from University owned and controlled sources. Scope 2 includes indirect emissions from the purchase of electricity, heat/steam, and chilled water. Scope 3 includes all other indirect sources of emission, eg commuting, air travel, and solid waste transportation and disposal.

Scope of this study:

This inventory seeks to be as comprehensive as possible, reporting emissions of all three scopes. Specifically:

- Scope 1: Fuel consumption by stationary and mobile sources and fugitive emissions, eg from agriculture, chemical processes, and refrigeration;
- Scope 2: Purchased electricity, heating, cooling, and steam;
- Scope 3: Commuting; faculty, staff, and student air travel, including travel to and from off-campus study locations; and transportation and disposal of solid waste.

Omitted emissions sources:

It was not possible to inventory all the emissions that fit within our intended scope. In some cases, emissions are omitted either because the data are not available or because they are too complex to evaluate carefully. Sources that are omitted for these reasons include:

- long distance faculty/staff air travel that was not arranged through the travel center;
- embodied emissions of purchased materials; and
- emissions related to materials recycling.

Also, emissions due to student air travel between their (permanent) homes and Willamette's campus in Salem are not included in the inventory. We exclude these emissions in part because of the complexity of trying to estimate them, but primarily because these emissions would be outside the conventional "boundary" of the institution. If it is deemed desirable, it would be possible to estimate these air travel miles in future inventories by expanding the commuter survey to include queries about long distance travel as well as local commuting travel.

Data Collection

After the scope of the inventory was determined, available data were collected for all sources of emissions. Data were gathered by the Sustainability Council from 6 primary sources:

- 1) The WU facilities department provided information about electricity, natural gas, gasoline and diesel fuel consumption by the campus fleet and rental vehicles as well as releases of PFCs, HFCs, and SF6. The gathering of these data was overseen by Facilities manager Gary Grimm.
- 2) Data on solid waste sent to the landfill were provided by the WU facilities department. The gathering of this data was overseen by Mike Ryan, Manager of Custodial/Facilities Support Services
- 3) The WU grounds department provided information about fertilizer use. These data were collected by Grounds Director Jim Andersen.

- 4) The WU Travel Center provided information about air miles traveled by employees on University business and university sponsored air travel by student groups (eg athletic teams). (Note: These data did not include student air travel to international study destinations.) Collection of this data was overseen by Travel Center Director Kindra Jordan, and executed by Mika Yamanaka.
- 5) Student air travel to and from off-campus study locations was estimated by identifying all off-campus study locations utilized by students during the 2007-2008 academic year, calculating the roundtrip distance between Portland International Airport and the nearest airport to the off-campus location, and multiplying by the number of students studying at that off-campus location during the 2007-2008 academic year. Data on the locations and the number of students utilizing each location were gathered by Stacy West in the Office of International Education.
- 6) Average annual commuting miles from local residences to campus were calculated for students and faculty/staff, using an online survey http://www.willamette.edu/about/sustainability/commute/commuter_survey.htm. The survey was administered by the Sustainability Council and data were analysed by Nathan Sivers Boyce, Council Chair.

Data Analysis

Once the data were collected, the Clean Air–Cool Planet Campus Carbon Calculator tool was used to estimate WU’s total GHG emissions in metric tons of eCO₂. Clean Air-Cool Planet is a nonprofit organization dedicated to finding and promoting solutions to global climate change. Their Campus Carbon Calculator is rapidly becoming the standard tool for climate inventories because it is specifically designed to be used by colleges and university. It provides a framework that greatly simplifies both the data collection and emissions calculation tasks. The calculator estimates campus-wide emission of the six major greenhouse gases based on collected operational data.

Although our inventory estimates the emissions of each greenhouse gas separately, for reporting simplicity the emissions of each gas are translated into their “carbon equivalent,” the amount of carbon dioxide emissions required to produce the same climate disruption risk. This allows us to report the results of the inventory as a single number, expressed in metric tons of carbon equivalent (MT eCO₂). All the results in this report are expressed in these units³.

Willamette’s (or any other institution’s) total emissions in a given year are determined by a variety of factors, including the number of people (faculty, staff, and students) associated with University operations and activities—especially the number of students we are serving, the number and size of buildings to which we are providing heating, cooling and electricity, and the way in which we choose to spend money. To emphasize these connections and provide a useful means of comparing between schools, the results table presents total emissions, emissions per person (faculty, staff, and students), emissions per student, emissions per 10,000 squarefeet of building space, and emissions per dollar of operating expenditure.

³ A more detailed account of the emissions of different gases is available in the CA-CP calculator file: WU_CarbonCalculator.xls.

In order to provide some useful context, results of GHG inventories performed at other schools are presented (where possible) alongside those for Willamette University. The results cited here are taken directly or estimated (italicized entries) from studies that are publicly available on the website of the American Association of Sustainability in Higher Education (AASHE) <http://www.aashe.org/resources/ghg_inventories.php>. Comparison schools were chosen from available reports to offer some variety across different geographical regions and institutional structure. Pomona, Lewis & Clark, and Wellesley are all private, liberal arts institutions of comparable size to Willamette. While Pomona and Lewis & Clark are located on the west coast and share similar climate, Wellesley is located across the country in Massachusetts and enjoys a significantly different climate. Although Oregon State is located in nearby Corvallis, it is a large public university, giving a different structure than the other schools.

Since the estimates from different were produced using different methodology and are not all from the same time period, comparisons should be made with caution. However, we believe the variety of results presented below provides a useful context in which to consider WU’s emissions profile. In future reports, it should be possible to provide even more useful comparisons as more schools will be publishing the results of regular inventories.

Results:

Overall Emissions

Summary results of the inventory are presented in the table below.

GHG Inventory Summary Results

	<i>Willamette 07-08</i>	<i>OSU 06-07</i>	<i>Pomona 05-06</i>	<i>Wellesley 02-03</i>	<i>Lewis & Clark 02-03</i>
Total	17,934	151,287	17,524	42,400	16,703
<i>per person</i>	5.52	6.61	n/a	n/a	n/a
<i>per student</i>	7.06	8.35	<i>11.3</i>	18.4	5.92
<i>per 1000 ft²</i>	12.8	21.5	n/a	n/a	n/a
<i>per \$10,000 exp.</i>	1.89	n/a	<i>1.33</i>	n/a	<i>1.72</i>

As the table illustrates, Willamette’s emissions are significant (more than five and half tonnes per person) but well within the range of what might be considered normal for college campuses across the country. The striking differences between WU and OSU or Wellesley can most likely be attributed to differences in size and type of the institution (OSU) and the climate (Wellesley). Compared to Pomona and Lewis & Clark, WU’s total emissions are very similar.

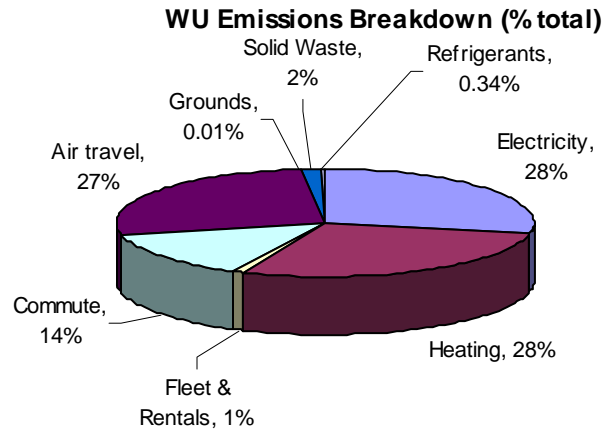
Emission Sources

The chart below illustrates the breakdown of Willamette’s total GHG emissions by source. Several observations are worth making:

- As expected, nearly all of Willamette’s emissions are associated with the consumption of electricity (28%), natural gas for heating purposes (28%), and transportation (42%). If

Willamette is to become climate neutral, these are the primary areas in which consumption must be reduced or the impact from consumption must be offset.

- Although commuting *is* a significant source of emissions, the impact of local commuting (14% of total) is only half that of university-related long distance travel (27% of total).
- The largest source of air travel emissions was travel by faculty and staff (3,058 MT eCO₂ or 17% of total) followed by student travel to and from off-campus study locations (1,352 MT eCO₂ or 8% of total emissions) and other student travel (383 MT eCO₂ or 2% of total).
- The impact of local commuting by students (1,354 MT eCO₂ or 8% of total emissions) exceeded the impact of local commuting by faculty and staff (1,181 MT eCO₂ or 7% of total emissions).
- The impact of local commuting by students is about the same as the impact of student travel to and from off-campus study locations (roughly 8% of total emissions each).



In order to meaningfully compare institutions of different such different size, we need to standardize emissions. Since enrollment figures are readily for all five schools, we report MT eCO₂ per student for each emissions source in the table below.

Emissions per Student by Source

	<i>Willamette</i> <i>07-08</i>	<i>OSU</i> <i>06-07</i>	<i>Pomona</i> <i>05-06</i>	<i>Wellesley</i> <i>02-03</i>	<i>Lewis & Clark</i> <i>02-03</i>
Electricity	2.01	5.14	5.16	8.67	2.28
Heating	1.98	1.67	n/a	6.50	1.08
Commuting	1.00	0.39	n/a	1.08	1.13
Air Travel	1.88	1.25	n/a	n/a	1.31

As the table illustrates, overall Willamette’s emissions are again well within the range of values in this comparison group. In WU is close to the low end of the range values presented for each source, with the lone exception being air travel, where Willamette has the highest value of a narrow range.

There is a lot of similarity between schools. Electricity consumption, heating, and transportation together comprised the more than 90% of total emissions for all the schools. Unsurprisingly, the biggest differences are in emissions from the consumption of electricity and heating. It seems likely that differences electricity-related emissions arise at least in part from differences in the generation portfolio available to different schools. Likewise differences in heating are most probably due to regional differences in climate.

Conclusions:

Over the years many steps have been taken that help reduce Willamette's impact on climate⁴. While these efforts have been laudable and effective, it is clear that additional reductions are needed in order to achieve our goal of climate neutrality. The current inventory indicates that, in particular, we will need to take steps to reduce or offset our impact from energy use and transportation. During the coming year, the Sustainability Council will coordinate development of a Climate Action Plan that lays out a strategic planning reach this goal.

⁴ See <http://www.willamette.edu/councils/sustainability> for more details about some of these initiatives.