

University of Idaho Greenhouse Gas Inventory Guide

The University of Idaho (UI) conducts an annual GHG (greenhouse gas) inventory in accordance with the requirements of the institution's commitment to ACUPCC (the American College and University Presidents' Climate Commitment). This guide is meant to supplement the procedural protocol summarized in the 2011 GHG-inventory report. The raw data from previous annual inventories are filed at the University of Idaho Sustainability Center (UISC). For access to data contact Darin Saul, University of Idaho Office of Community Partnerships Associate Director at dsaul@uidaho.edu.

The UI's GHG emissions are categorized under Scopes 1, 2, and 3. Scope 1 accounts for direct emissions caused by on-site activities: stationary combustion (e.g. natural gas and oil for heating), vehicle emissions, and fugitive emissions (escaped GHG's from refrigeration systems). Scope 2 accounts for emissions caused indirectly by the combustion of fossil fuel for the generation of electrical power. Scope 3 accounts for any GHG emissions not captured by Scope 1 and 2, such as university-funded air travel, waste disposal, and emissions generated from livestock. Research for this project began in 2005, which is considered the baseline for our data. Project data span from 2005 to 2011, with 2008 being the peak year for emissions on the UI campus during the study period.

This report was prepared by Spencer Batt, Research Assistant in the UISC, under the supervision of Darin Saul, Associate Director, OCP.

Scope 1 Emissions

Stationary Combustion – Natural Gas

Natural gas usage data were collected from a database of general UI accounts provided by Richard Nagy, Resource Conservation Manager (UI Facilities Maintenance and Operations) and Timothy Haight (UI Facilities Web Developer). Auxiliary account files (i.e., accounts within the UI organizational boundary that are not tracked by Facilities) were provided by Jayson Hunnel (Regional Account Executive) at Avista Utilities. Based on fiscal year data and billing dates, total usage was calculated per calendar year through a prorating process as described below.

The UI fiscal year runs from July first to June 30th. Billing periods are not based on calendar months. The calendar-year usage was estimated using data from the 11 whole billing periods plus two “partial” billing periods, which overlap the beginning and end of the calendar year. The usage for these two partial months is estimated by dividing the usage for the given billing period by the number of days in that period, then multiplying that result by the number of days in the period that coincided with that calendar year. For example, if the meter was read on January 7, that date was included in the number of days for the December-January period; January 8 was counted as the first day in the following period. Accounts may open and close due to extenuating circumstances at the UI, and these changes are tracked annually to assure data consistency. Notable account changes from 2010 to 2011 are described below.

490087391 – Closed. The fraternity Alpha Gamma Rho was closed.

770123215 – Closed. This was only a temporary account that was used in previous reports.

Using the prorating method, the total therms are calculated for general education and auxiliary accounts at UI for the 2011 calendar year. This data were entered into the clean air-cool planet online calculator (<http://cleanair-coolplanet.org/campus-carbon-calculator/>). Clean air – cool planet is a reliable source used by universities nationwide to calculate their carbon footprint, which operates in accordance with the ACUPCC standards. The clean air-cool planet output indicates that that 4,566 metric tons of CO₂ were produced. The calculator operates this function by using an emissions factor of 53.02 kg/mmbtu. See Figure 1 for the annual natural gas emissions profile.

Scope 1 Emissions

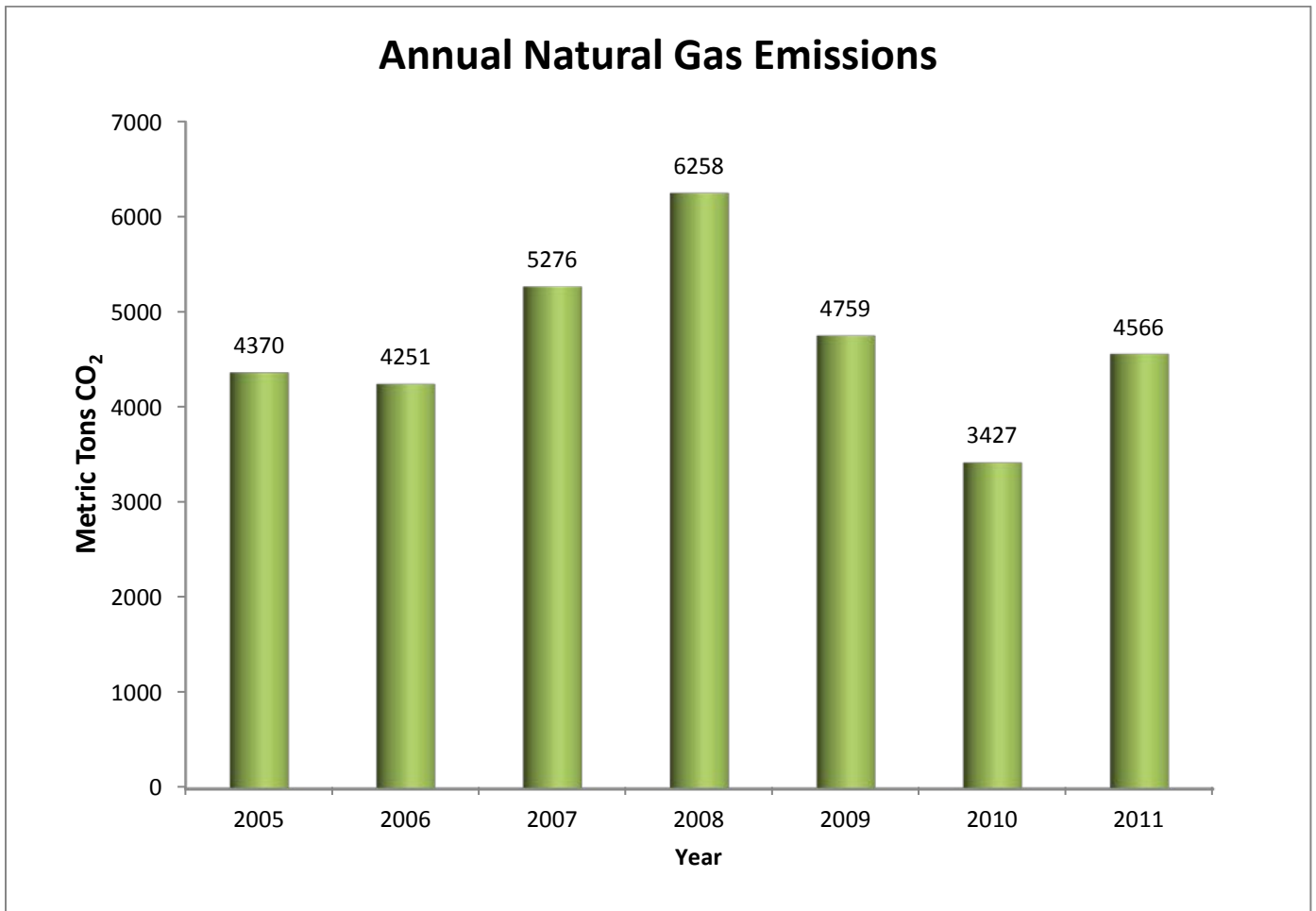


Figure 1. Annual natural gas emissions. While natural gas emissions fluctuated from 2005 to 2011, there was a 4.3 percent increase in 2011 compared to the baseline in 2005.

Scope 1 Emissions

Fleet Emissions

Emissions from campus-owned vehicles are estimated using the protocol described in the 2011 GHG inventory report provided by Darin Saul and from fuel bills obtained from Busch Fuel Distributors (Crete Davis). The total amounts of gas and diesel were then entered into the clean air-cool planet online calculator, which determined that 736 metric tons of CO₂ were produced in the 2011 calendar year. The emissions factors for gas and diesel are 8.86 kg/Gal and 10.26 kg/Gal respectively. See *Figure 2* for the annual fleet emissions profile.

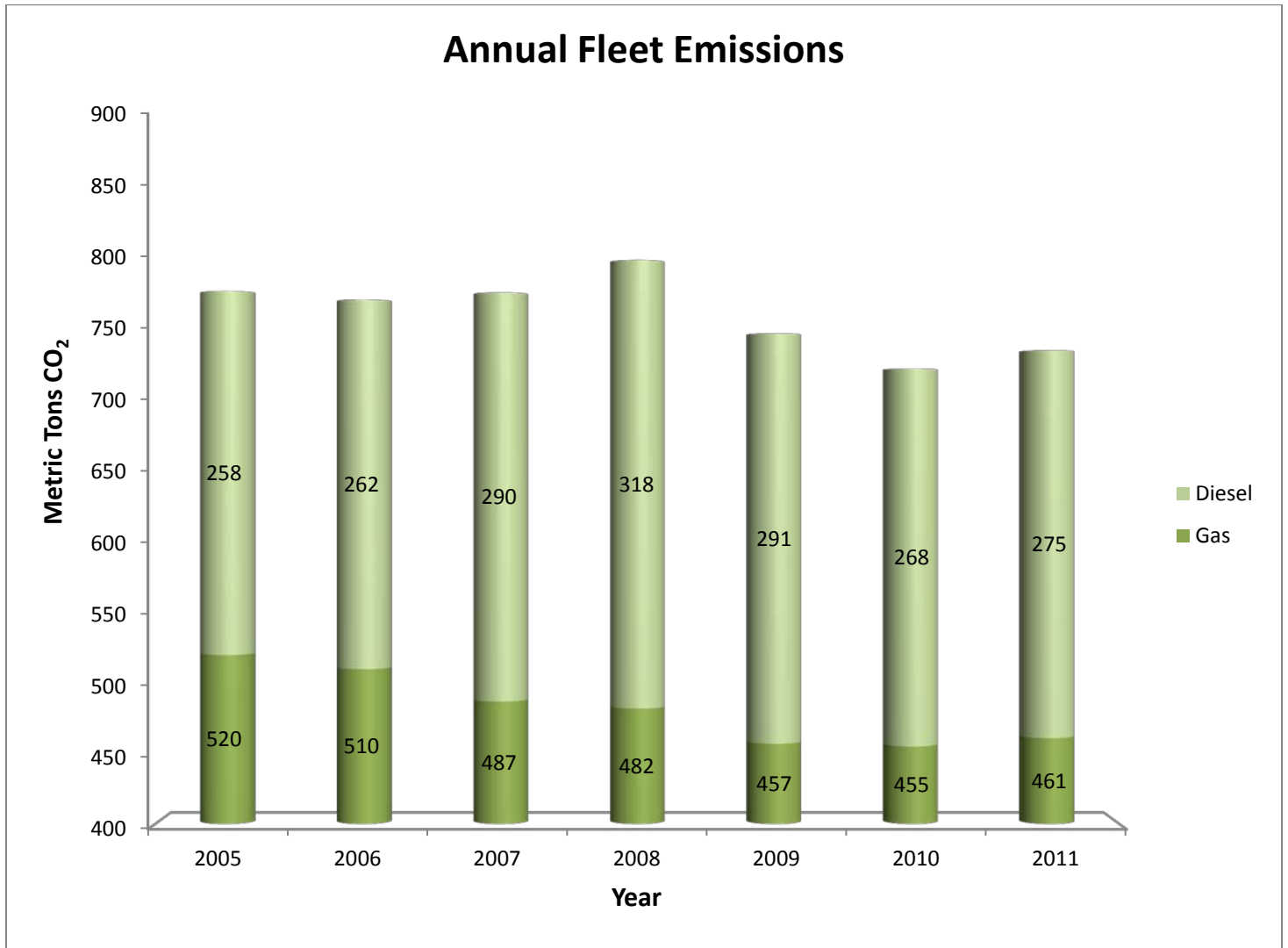


Figure 2. UI campus fleet emissions by relative amounts of gas and diesel consumed. Although fuel consumption remained fairly constant from 2005 to 2011, fleet emissions decreased by 5.4 percent in that time period.

Cumulative Scope 1 Emissions

As seen in *Figure 3*, gas and diesel had relatively little effect on cumulative emissions compared to natural gas, which constitutes the majority of the Scope 1 emissions profile.

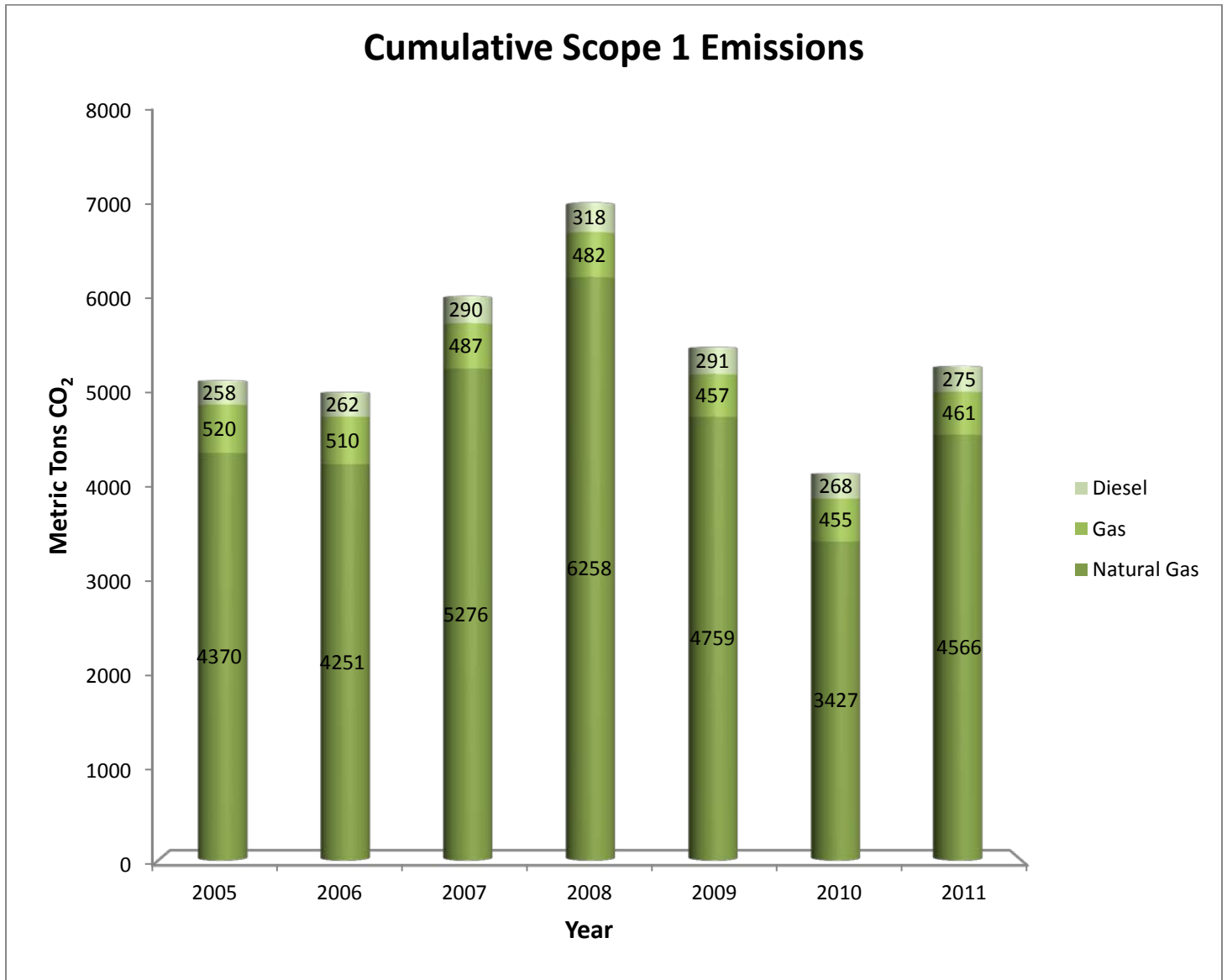


Figure 3. Cumulative Scope 1 emissions in units of diesel, gas, and natural gas. From 2005 to 2011, Scope 1 emissions increased by 2.9 percent. However, from the peak year of 2008 to 2011, Scope 1 emissions decreased roughly 25 percent.

Scope 2 Emissions

Electricity

Electricity usage data were collected from a database of general UI accounts provided by Richard Nagy, Resource Conservation Manager (UI Facilities Maintenance and Operations) and Timothy Haight (UI Facilities Web Developer). Auxiliary account information was provided by Jayson Hunnel (Regional Account Executive) at Avista Utilities. The only notable account change was the closure of E1624247-118, which closed because it was assigned to a building that UI sold during the study period. Using the same prorating process described above, the total electricity usage in kilowatt hours (kWh) was calculated. These data were entered into the clean air-cool planet online calculator, which determined that 21,959 metric tons of CO₂ were produced in the 2011 calendar year. The emissions factor for electricity usage is .37 kg/kWh. See *Figure 4* for the annual electricity emissions profile.

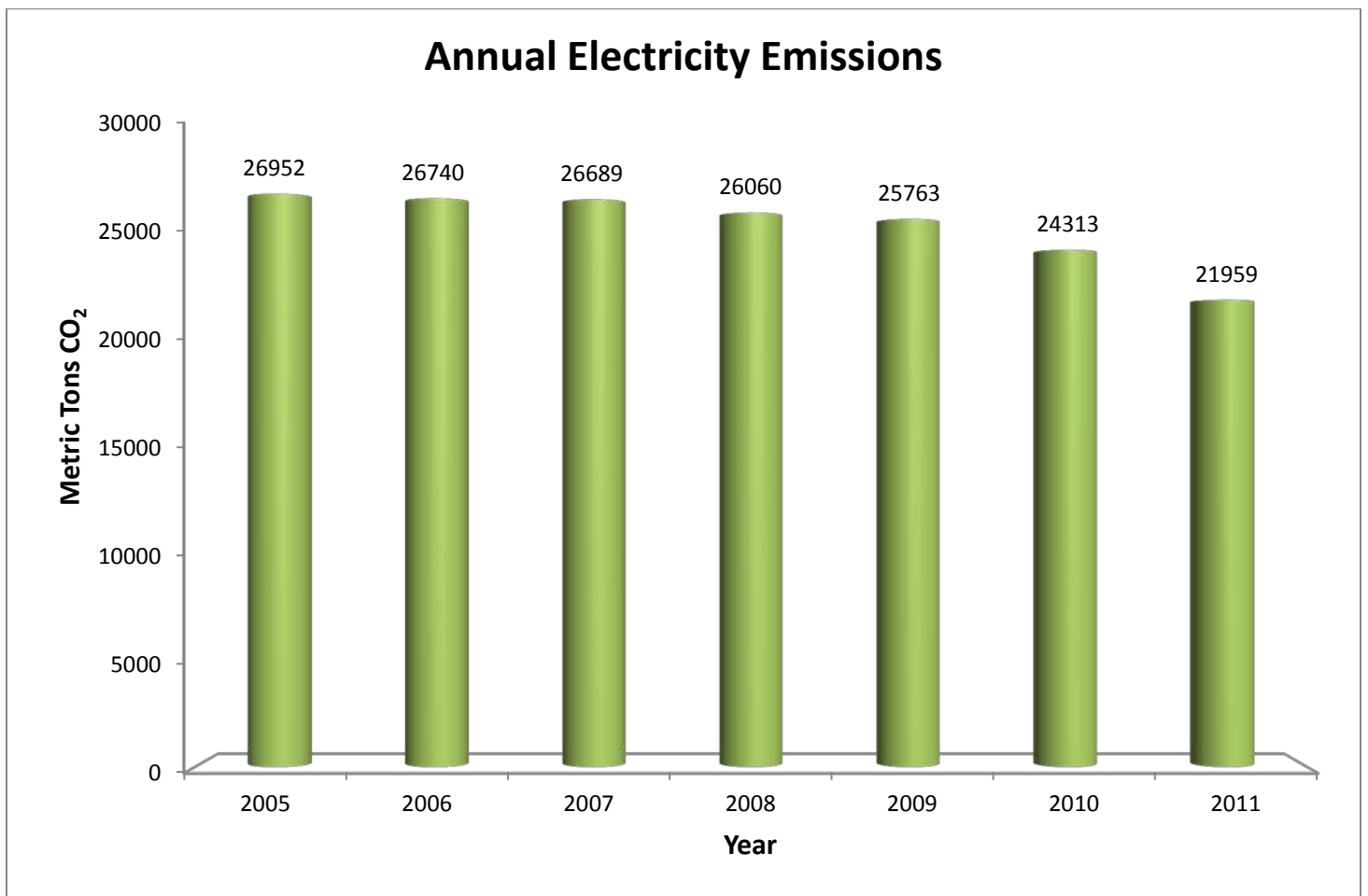


Figure 4. UI electricity usage. Annual electricity emissions comprise the majority of overall emissions, and from 2005 to 2011 Scope 2 emissions decreased 18.5 percent.

Scope 3 Emissions

University Funded Air Travel

Air travel data for UI were provided by Doug Hall, manager of Enterprise Development at ITS Management Information Services at the University of Idaho. Air travel data were tracked in three categories: in-state (short haul trips), out-of-state (medium haul trips), and international (long haul trips). Fiscal year data were converted into miles traveled using a conversion factor of 1 air mile per \$0.25 as recommended by the ACUPCC Implementation Guide. The relevant accounts had the following designations:

E5380 – Airfare in-state (short haul trips)

E5381 – Airfare out-of-state (medium haul trips)

E5379 – Airfare international (long haul trips)

The mileage for fiscal-year data were converted into calendar-year data by dividing it by 12 for a monthly average for each fiscal year. The monthly averages were multiplied by 6 to develop 6-month averages. The 6-month averages from two sequential fiscal years were combined to create a calendar year total. Thus, the number of miles for each category (short, medium, and long haul trips) was multiplied by their respective conversion factors to determine that 1,772 metric tons of CO₂ were produced in the calendar year of 2011. The conversion factors for each category are as follows: *short haul* .28 kg/mi, *medium haul* .16 kg/mi, and *long haul* .18 kg/mi. Note that the conversion factor decreases with increased mileage due to greater fuel efficiency of longer flights. See *Figure 5* for the air travel emissions profile.

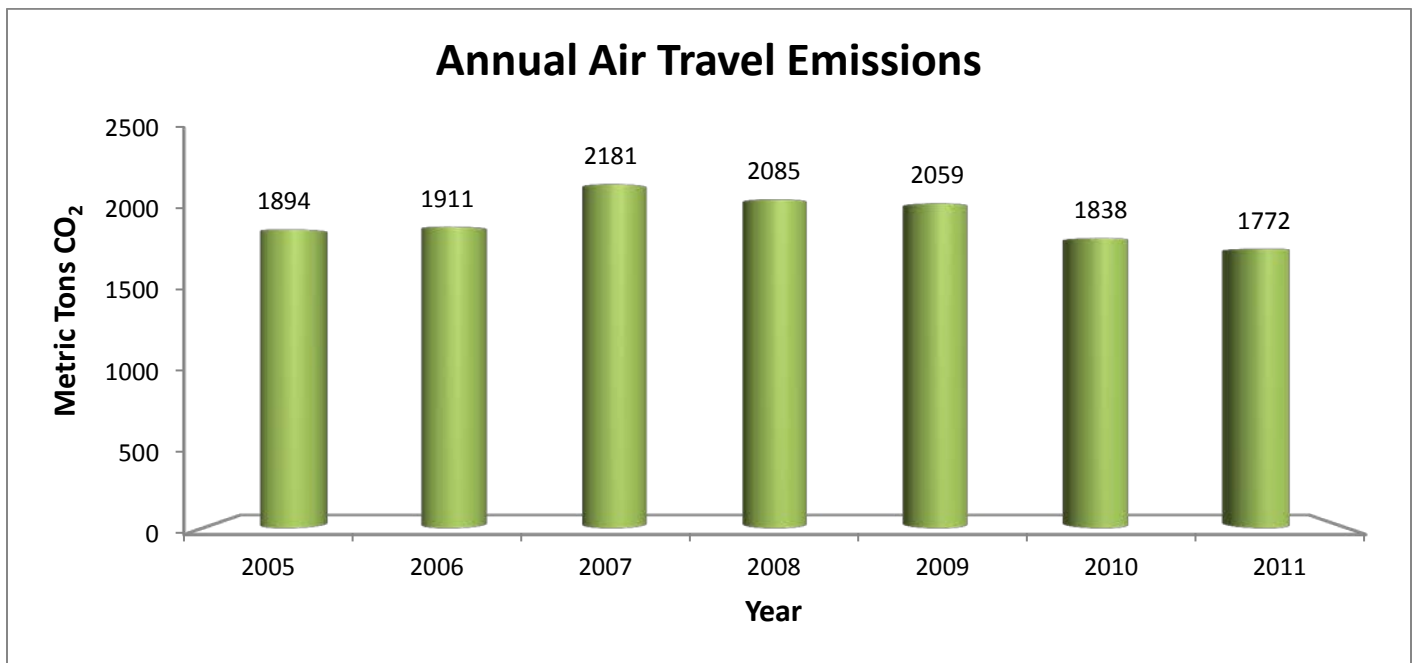


Figure 5. Annual air travel emissions. Compared to 2005, air travel emissions in 2011 declined 6.4 percent.

Scope 3 Emissions

Commuter Emissions

In previous years commuter emissions were based on an on-campus survey. A commuter emissions survey for calendar year 2011 was unavailable; therefore, we assume the percentage of student and faculty commuters remains roughly the same from 2010 to 2011. Thus, commuter emissions were scaled to current student admission numbers using a per-student emission rate based on the last student commuter survey, which was conducted in 2010.

In other words, the amount of CO₂ (metric tons) estimated from the last commuter survey in 2010 was multiplied by the percent increase in student population, which was slight. This increase was then added to the number of metric tons of CO₂ calculated using the 2010 survey. Using this method, an estimated 2,285 metric tons of CO₂ were produced in the 2011 calendar year. See *Figure 6* for the annual commuter emissions profile.

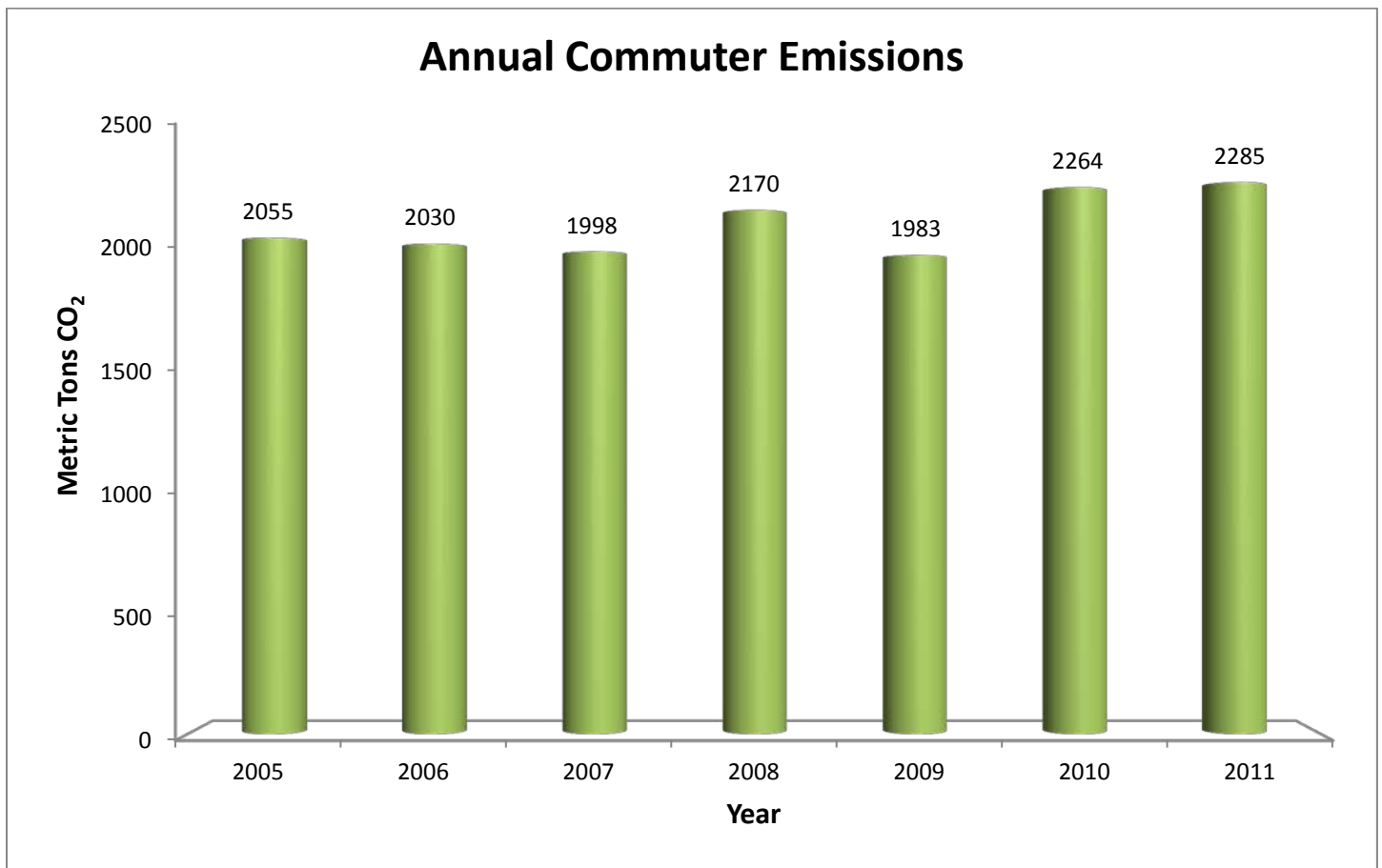


Figure 6. Campus commuter emissions. 2011 commuter emissions are estimated to be 10.1 percent higher than in 2005.

Scope 3 Emissions

Waste Disposal Data

Cumulative waste data for UI were provided by Charles Zillinger, UI Facilities. Fiscal year data were converted to calendar year data by averaging two consecutive years (i.e. (FY 11 + FY 12)/2). This data were then put into the Clean Air-Cool Planet online calculator to determine the amount of methane emitted due to waste decomposition at the landfill site. The emissions factor for this calculation is 12.4kg CH₄/ton.

Waste transportation also composes a sizeable proportion of emissions in this category. The amount of waste calculated for the calendar year 2011, 1,124 tons, was divided by the average weight of waste transported in one trip: 20 metric tons. This resulted in the number of trips per year it takes to transport the waste generated at the UI to the landfill in Arlington, Oregon: 56.2. By multiplying the number of trips by the distance to Arlington, 225 miles, the annual mileage traveled for one leg of the trip was determined: 12,641 miles. This mileage was divided by the fuel efficiency of a full semi-truck, 3 mpg, to obtain the amount of diesel used annually for one leg of the trip: 4,214 gallons. For the return trip from the landfill, the truck travels the same distance, 225 miles, but it is empty and therefore gets better gas mileage: 4 mpg. By multiplying the annual miles traveled for one leg determined above by the gas mileage of an empty semi-truck, the yearly fuel usage for the second leg of the trip was determined: 3,160 gallons. The total annual fuel usage of 7,374 gallons was entered into the clean air-cool planet online calculator to determine that 76 metric tons of CO₂ were produced transporting UI's waste to the landfill in 2011. It is important to note that waste disposal data for the period of 2005 to 2007 are based on estimates from UI facilities. See *Figure 7* for the annual waste disposal emissions profile.

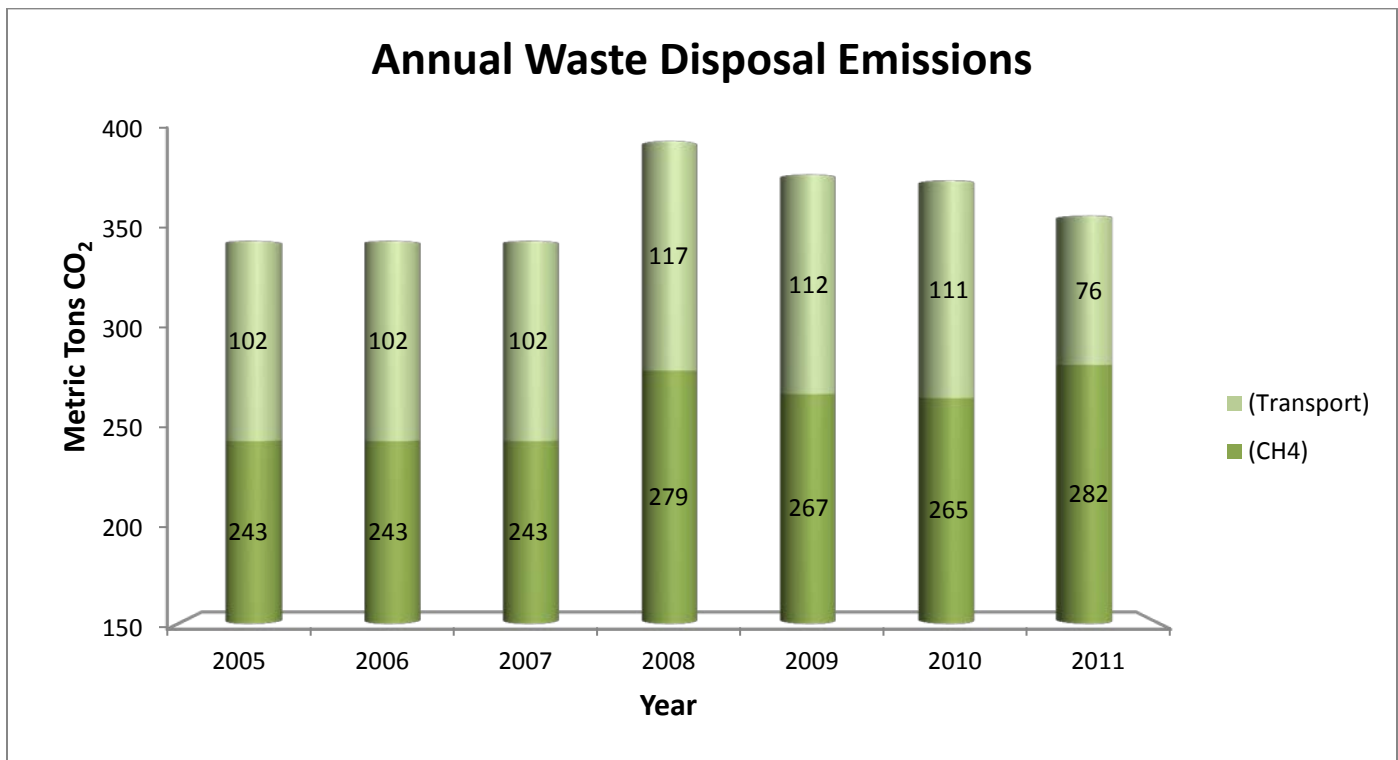


Figure 7. Total waste emissions in units of transporting waste to the landfill, and methane emitted from the source. Waste emissions in 2011 were 3.6 percent greater than in 2005.

Scope 3 Emissions

Livestock

Data regarding UI livestock was provided by Dave Casebolt, UI livestock manager. Emissions data in this category are difficult to estimate due to variable herd sizes throughout the year. According to Casebolt, herd sizes have been relatively stable from 2005 to 2011, and therefore we assume the livestock emissions in 2011 are consistent with previous years.

As seen in *Figure 8*, the individual components of Scope 3 emissions have been relatively consistent over time, resulting in little variance in the annual Scope 3 emissions profile.

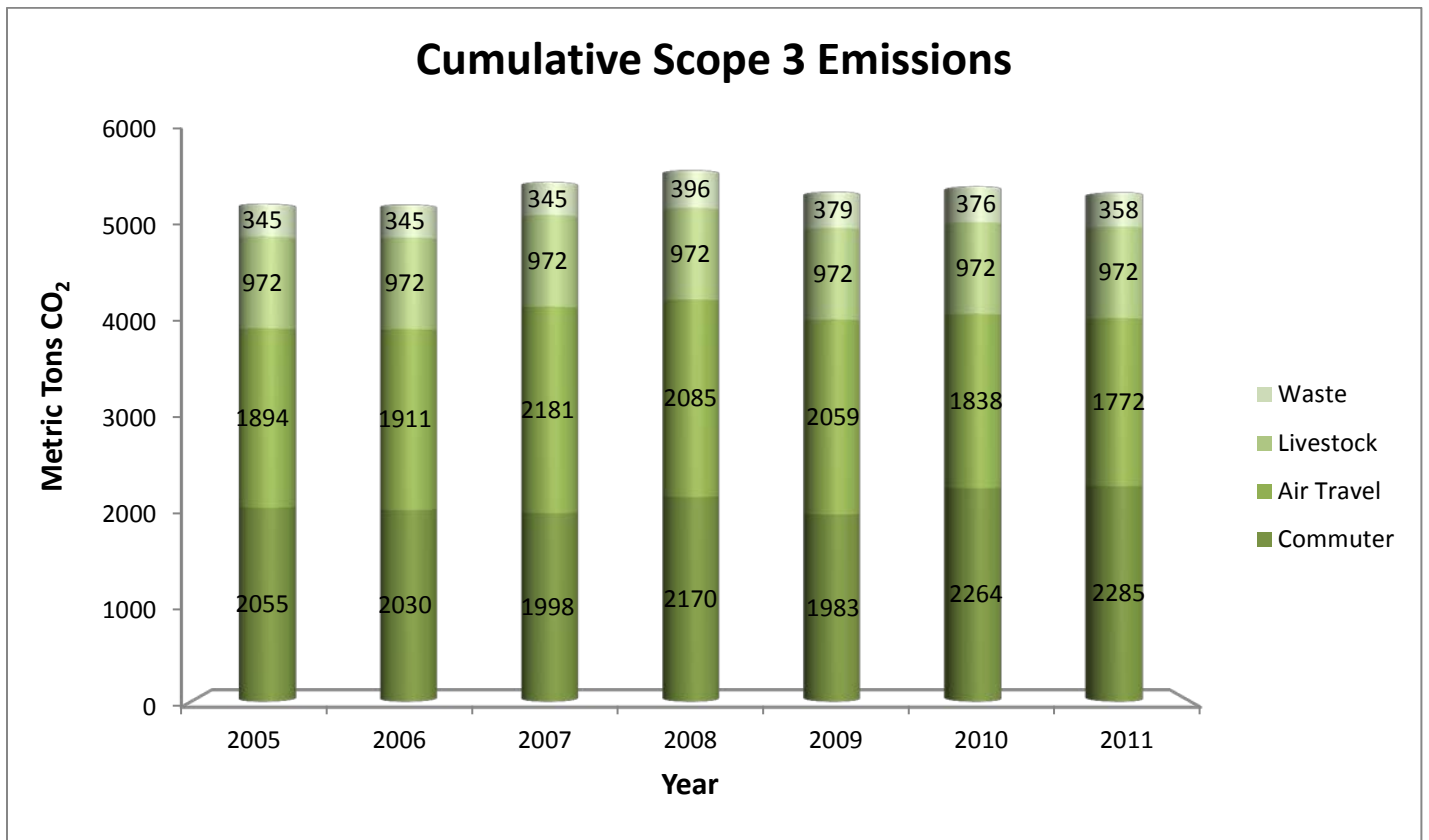


Figure 8. Cumulative Scope 3 emissions in terms of waste, livestock, air travel, and commuter emissions. This profile has been relatively consistent over the past seven years with a 2.25 percent increase from the baseline year of 2005, and a 4 percent decrease since the peak year of 2008.

Annual Emissions Profile

UI cumulative annual emissions have been declining since 2008. As seen in figure 9 below, Scope 2 (electricity) generates the largest portion of emissions on the UI campus.

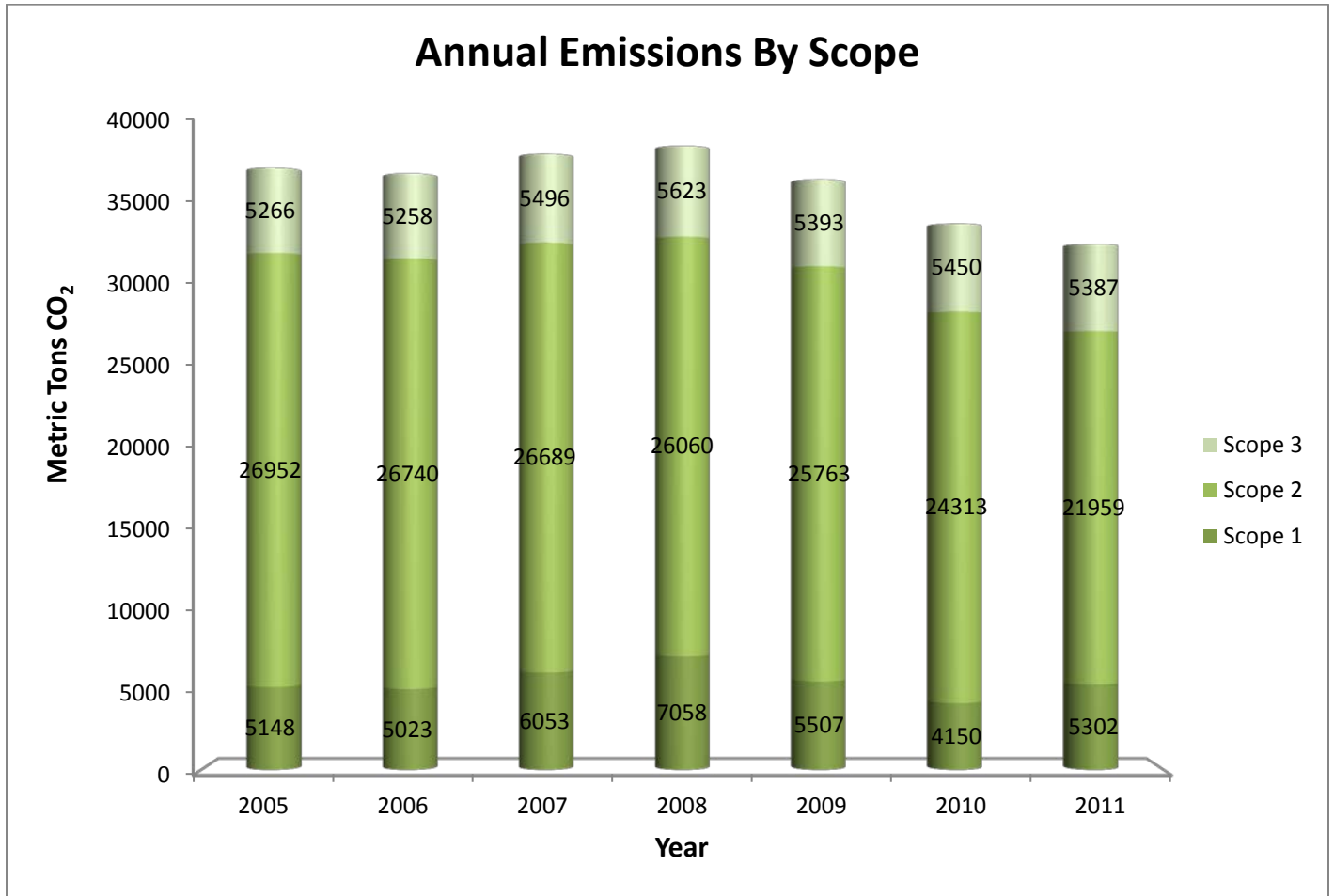


Figure 9. Cumulative annual emissions by category. As mentioned above, Scope 2 (electricity) composes the majority of annual emissions.

Annual Emissions Profile

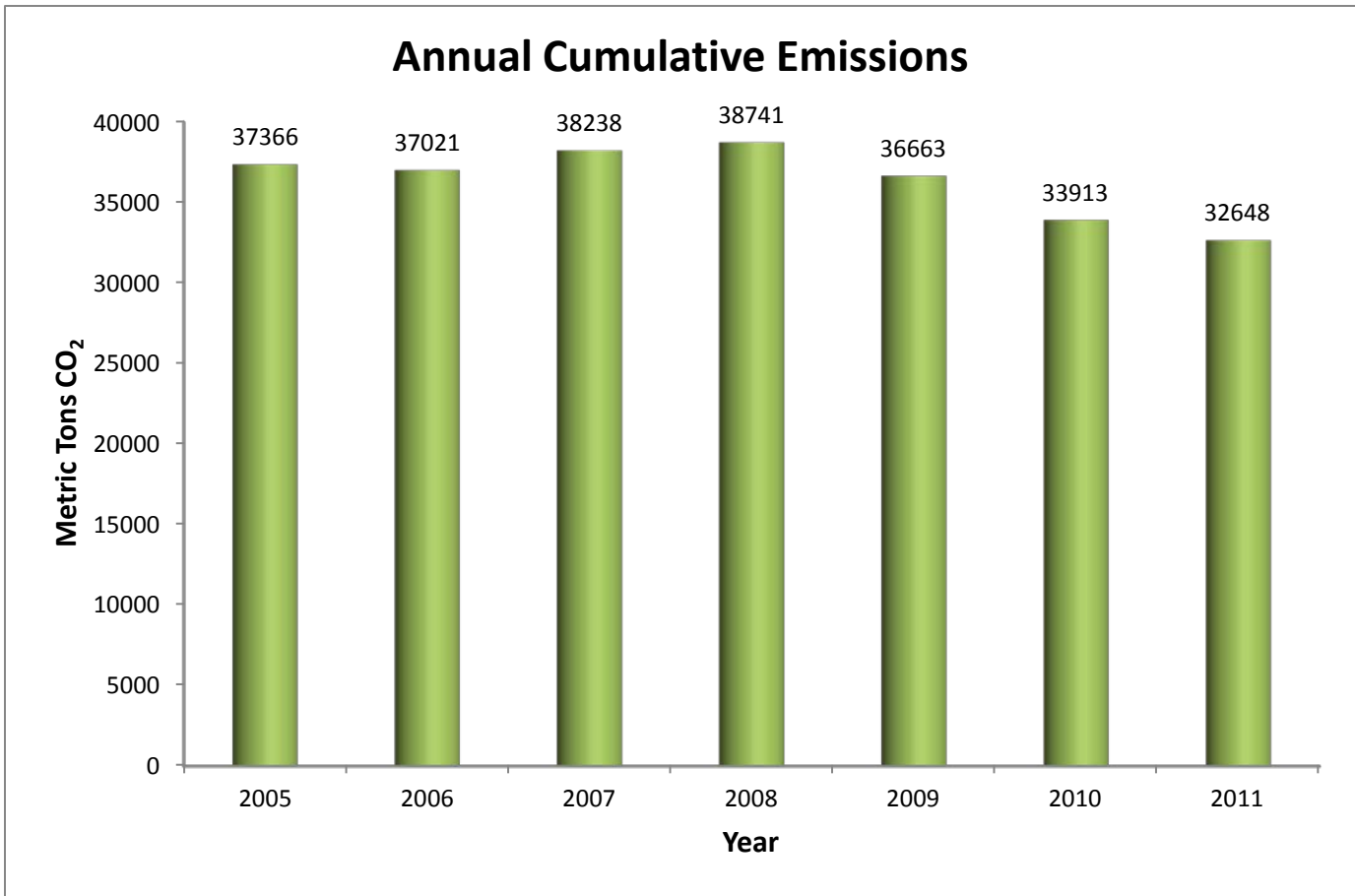


Figure 10. Overall annual emissions. There was a 12.5 percent decrease in emissions from UI in 2011 compared to 2005, and a 15.7 percent decrease in emissions since the peak year of 2008.

Annual Emissions Profile

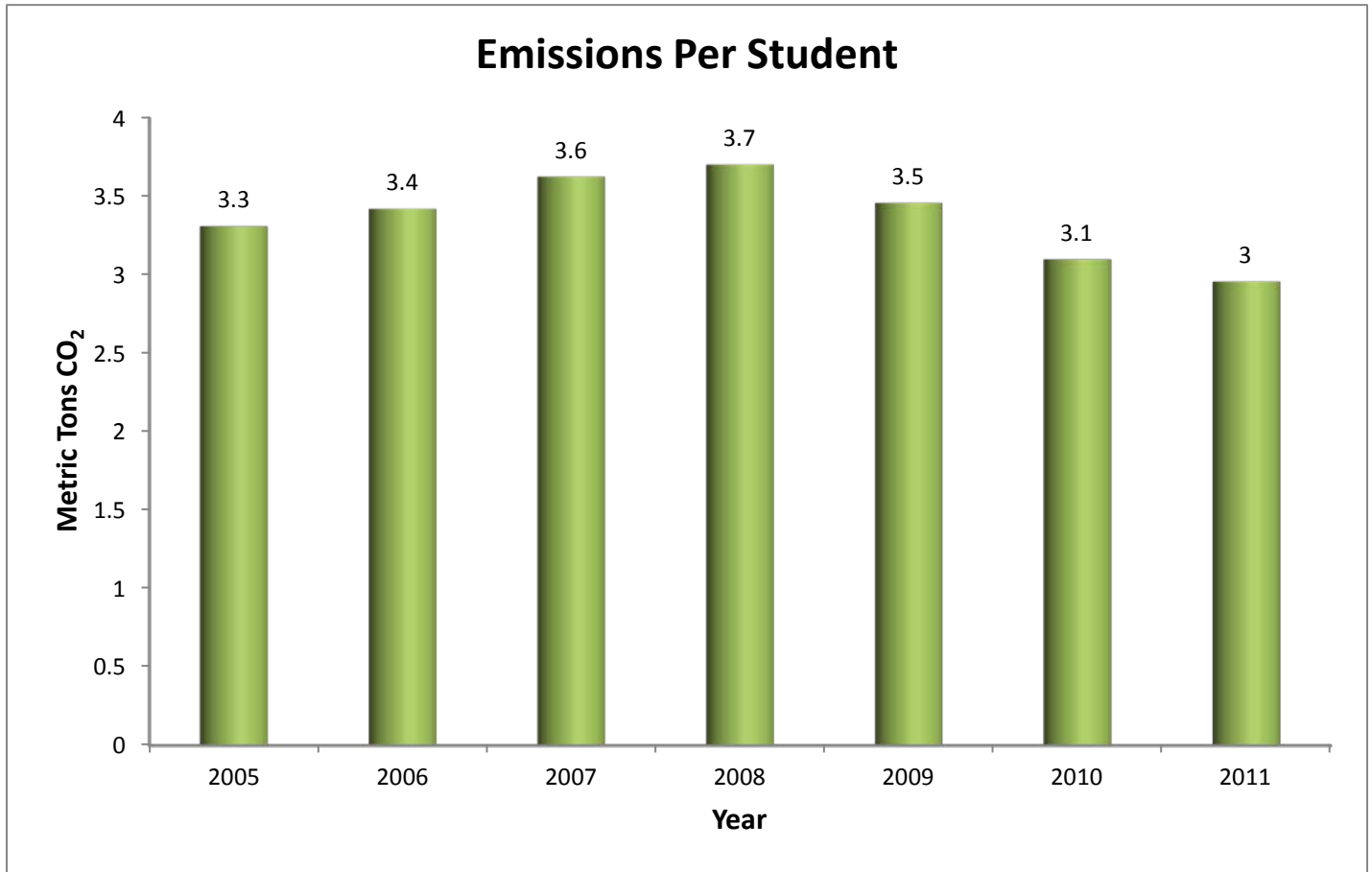


Figure 11. Emissions per student. There was a 9 percent reduction in emissions per student in 2011 compared to 2005. From the peak year of 2008 to 2011, there was a 19 percent reduction in emissions.

Annual Emissions Profile

Conclusions

Data collection for this project began in 2005, which is considered the baseline year of study. Over the course of the seven year study period, 2008 is the peak year in which annual emissions on the UI campus reached an all-time high.

As illustrated in *Figure 10*, annual cumulative emissions declined from the peak year of 2008 to 2011, culminating in a 12.5 percent reduction in carbon dioxide production since the baseline year of 2005. As *Figure 9* illustrates, this is largely due to a decrease in Scope 2 emissions, (electricity usage) which composes the largest portion of emissions on the UI campus. 'Emissions per student' is a common metric for comparing ACUPCC participating universities' emissions. UI's emissions per student decreased 9 percent in 2011 compared to 2005 (see *Figure 11*).

For more information on this project please contact Spencer Batt at spencerbatt@vandals.uidaho.edu if before May of 2014. If you request information after May of 2014, please contact Jeannie Matheson at jeanniem@uidaho.edu.