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2010 ISU ACUPCC GHG Inventory

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For further information about ISU's ongoing sustainability efforts,
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Introduction

As part of the American College and University Presidents' Climate Commitment (ACUPCC), which Illinois State University (ISU) President Al Bowman signed September 15, 2008, the school performs an annual inventory of greenhouse gas (GHG) emissions. This year is only the second for which this inventory has been performed, and as such, some of our methodologies and information gathering methods have yet to become standardized. This narrative is intended to describe the process that created this year's inventory, explain the sources of the data used in the inventory, and provide a reference to make future inventories easier. This inventory covers the fiscal year of 2009.

Project Description

The purpose of the annual greenhouse gas emission inventory is twofold. Not only does it provide a standardized way to evaluate the environmental impact of the university, it also provides a baseline for attempts to create a Climate Action Plan in the near future. As with most universities, ISU opted to use the Clean Air – Cool Planet (CA-CP) Campus Carbon Calculator, version 6.5. This calculator was chosen as it provides a user-friendly method to input data from a wide variety of sources into one spreadsheet, it can output data in a format that is the same as that required by the ACUPCC, and it is designed specifically for use by colleges. This narrative will closely follow the order of data entry in the CA-CP Calculator.

All emissions are reported in metric tons of carbon dioxide equivalent (mt CO₂e). This is a standard weighted value based on the Intergovernmental Panel on Climate Change's Fourth Assessment Report. Each greenhouse gas is given a weighted value, with carbon dioxide being the baseline, based upon their contribution to climate change; these values are referred to as global warming potential (GWP) and are based on their effect over 100 years. For example, methane (CH₄) has a GWP of 25. The mt CO₂e values in this inventory reflect the sum of all the different greenhouse gases created in a given category.

Data Sources

The following sections will provide a description of where various data came from, as well as information regarding assumptions made when using this data.

Institutional Data

To provide a means of comparing different colleges, as well as to calculate per student and per square foot emissions, the ACUPCC requires some institutional data. Budget data is broken down into three categories: operating budget, research budget, and energy budget.



Operating and research budget information is publicly available from ISU's Office of Planning and Institutional Research, in the form of an annually released Factbook. The energy budget was obtained by contacting the Office of Energy Management.

Population data was also available from the Factbook, although the number of summer school students had to be acquired from a summer session data file, which the Office of Planning and Institutional Research makes available through their website.

Gross square feet (GSF) of all buildings under the purview of ISU had been estimated in previous years; fortunately, a space survey requested by the Illinois Board of Higher Education (IBHE) provided exact numbers for GSF. While the total GSF estimated was quite close to the actual, estimated space for research was over 2 million square feet, where in fact the actual value is just over 55,000 square feet. This survey also provided data for net assignable laboratory space, net assignable health care space, and net assignable residential space; these values were not available for last year's inventory.

Scopes of GHG Emissions

The ACUPCC requires that carbon inventories are broken down into three scopes, as defined by the Greenhouse Gas Protocol, which is a partnership between the World Business Council for Sustainable Development and the World Resource Institute. These three scopes, as explained in the ACUPCC Implementation Guide, are:

Scope 1:

This scope covers direct GHG emissions occurring from sources that are owned or controlled by ISU, including on-campus stationary combustion of fossil fuels, mobile combustion of fossil fuels by fleet vehicles, and fugitive emissions.

Scope 2:

This scope contains only indirect emissions generated in the production of electricity consumed by ISU.

Scope 3:

This scope includes all other indirect emissions - those that are a consequence of the activities of ISU, but occur from sources not owned or controlled by ISU.

This section will cover the data which went into each scope, how that data was obtained, and any assumptions made in the use of that data.



Scope 1: Direct Emissions

On-Campus Combustion of Natural Gas

ISU has four stationary boilers on campus with a total rated capacity of 674.01 MMBtu/hr. The school uses these boilers to create steam, which is then sent throughout the campus to provide heat. This is a significant contribution to the school's GHG emissions, at 32,358.9 mt CO₂e. The value used in this calculation is based on metered natural gas purchased from Nicor Gas.

Direct Transportation

Direct transportation covers fleet vehicles which are filled using gasoline, ethanol, diesel, and biodiesel that ISU purchases directly in bulk. We were able to determine the amount of fuel purchased by reviewing fuel purchase invoices from 2009; however, some data appears to be missing. Because of this, it is suspected that the amount of gasoline with ethanol used is actually four times higher than what is available and what is contained in the inventory. It would appear that 2010 will be the first year wherein ISU is able to make an accurate assessment of greenhouse gas emissions from fleet vehicles, as 2010 data has already been collected in preparation for next year's inventory and is believed to be a much better representation of this category of emissions. The calculated value of emissions from fleet vehicles is 296.2 mt CO₂e.

Fugitive Emissions of Refrigerants

Refrigerants used on campus include HFC-134a, HFC-404a, and HCFC-22. These refrigerants are used primarily in the chillers which provide cool air to buildings throughout the campus. Refrigerants are tracked by the ACUPCC because some volume of them inevitably escapes from refrigeration system; hence the term, fugitive emissions. We have estimated that fugitive emissions of refrigerants generate 1,820.5 mt CO₂e. This value is based on approximations made by personnel working with the refrigeration system. No other chemical or refrigerant is known to be used at ISU that would fall under this category.

Animal Husbandry

ISU's farm in Lexington, IL has 1,818 animals under their purview. The CA-CP Calculator estimates the net emissions from these animals is 1,619.2 mt CO₂e. The data for this category was provided by the farm manager.



Scope 2: Purchased Electricity

Scope 2 is intended to cover emissions from purchased electricity, steam, or chilled water. However, the only applicable purchase in this category is purchased electricity, as steam and chilled water are generated on-campus. In 2009, ISU purchased 87,187,000 kWh of electricity. The CA-CP Calculator comes pre-programmed with data from the EPA's eGRID, which tracks data on the emission factors of each region of the United States electrical grid. Using this data, the CA-CP Calculator estimates that ISU's electricity purchases account for 72,612.1 mt CO₂e.

Scope 3: Indirect Emissions

Commuter Travel

Unfortunately, commuter travel data was unavailable for this GHG inventory. Rather than generate an arbitrary guess as to commuter habits, ISU has opted to wait until a formal survey of commuter habits can be performed. This will be done via an optional survey offered through the ISU website to faculty, staff, and students.

Faculty and Staff Air Travel

Faculty and staff air travel is done through a local travel agency. After last year's inventory, they volunteered to track total air miles and were able to provide this data for this year. Faculty and staff air travel accounts for 11,908.1 mt CO₂e of emissions.

Athletic Bus Mileage

Given that the only available data on athletic team bus travel is destination cities, distance from ISU to each destination city was assumed and summed to give this value. This mileage was input into the CA-CP Calculator, which provided a value for this category of emissions of 5.5 mt CO₂e.

Study Abroad Air Travel

The interim Study Abroad Coordinator at the Office of International Studies was able to provide the number of students going to each destination of the study abroad program. Unfortunately, without flight numbers or detailed itineraries, some assumptions had to be made. Firstly, it was assumed that most students would depart from the Central Illinois Regional Airport, which is less than five miles from ISU. Secondly, it was assumed that students would



fly into the international airport nearest their host city. Thirdly, it was assumed that most students would use a discount air travel website to get their flights. Fourth, it was assumed that the straight-line distance between airports would be a sufficient way to approximate the air-miles traveled by each flight; the downside is that this does not account for specific flight paths, changes in flight path due to weather, or time spent waiting for clearance to land. Finally, it was assumed that students would share a single flight to their destination, and take separate flights back. Although our methodology is subject to many assumptions, it was felt that this was an accurate way to account for mileage flown by students studying abroad until more accurate methods are enacted starting with the fall semester of 2010. Using this method, we estimate our emissions from students traveling to study abroad to be 1,851.1 mt CO₂e.

Landfill Waste

Landfill waste data was retrieved from a submittal to the state of Illinois from ISU which gives projections for future landfill use. All waste at ISU which is not composted is sent to a landfill which does not collect methane or generate electricity from burning waste. This landfill waste accounts for 2,905.8 mt CO₂e of emissions.

On-Campus Composting

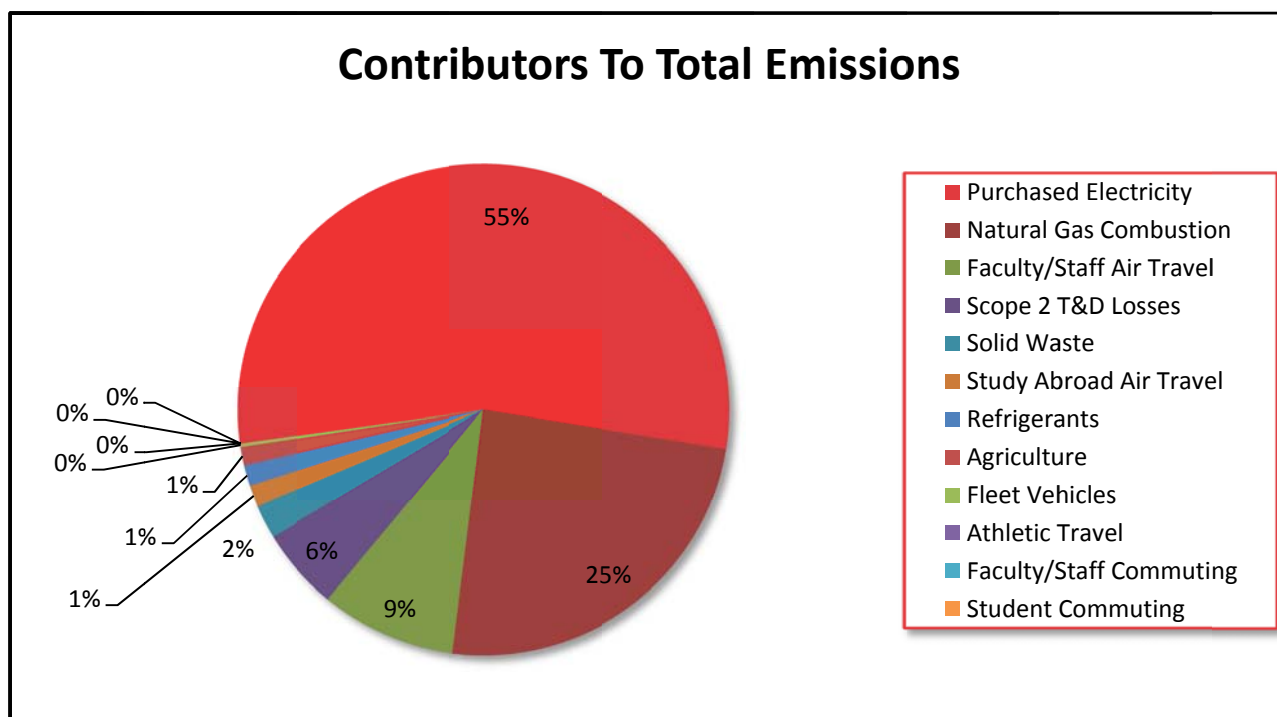
Composting data was available in a variety of measurements which had to be converted to short tons in order to be used with the CA-CP Calculator. In order to do this, references from the internet had to be utilized. On-campus composting turns out to be a significant carbon sink for the university at -3,620.8 mt CO₂e. In the future, ISU will be accepting food waste to be composted from non-residential sources near the university, and this number is expect to increase greatly in the coming years.

Summary and Conclusion

As one can readily see in the pie chart on the next page, the largest single contributor to ISU's GHG emissions is the use of electricity purchased from the grid. This is followed by the use of natural gas to generate steam for building heat, then faculty and staff air travel. All other emissions sources account for less than 12% of ISU's total emissions.

ISU is currently in the planning process for the Climate Action Plan (CAP), as required by the ACUPCC. This is the first CAP to be done by the university. It is likely that any comprehensive attempt at mitigating emissions will focus primarily on Scope 2 emissions from the purchasing of electricity. This can be accomplished by efficiency or purchasing electricity from renewable sources. Already, ISU has taken strides in efficiency, and almost all light bulbs on campus have been upgraded to Compact Fluorescent Bulbs.





The only carbon sink at ISU is the on-campus composting process, which takes food scrap from campus dining centers and converts it to fertilizer for use on the ISU farm, use on campus, and purchase. In the coming semester, ISU will take food from non-residential sources in the community, allowing this to become an even greater factor in reducing ISU's net emissions.

ISU has made great progress and is committed to becoming a truly sustainable university. ISU was named in [The Princeton Review's 2010-2011 Guide to 286 Green Colleges](#). ISU was highlighted because of our car sharing program, bike sharing program, dedicated sustainability coordinator, and active sustainability committee. Look forward to many developments as ISU continues its tradition of sustainably-minded decision making.

Source	Emissions	
Scope 1	36,094.86	mt CO ₂ e
Natural Gas Combustion	32,358.94	mt CO ₂ e
Fleet Vehicles	296.25	mt CO ₂ e
Refrigerants	1,820.47	mt CO ₂ e
Agriculture	1,619.20	mt CO ₂ e
Scope 2	72,612.07	mt CO ₂ e
Purchased Electricity	72,612.07	mt CO ₂ e
Scope 3	20,231.12	mt CO ₂ e
Faculty/Staff Commuting	0.00	mt CO ₂ e
Student Commuting	0.00	mt CO ₂ e
Faculty/Staff Air Travel	11,908.09	mt CO ₂ e
Athletic Travel	5.51	mt CO ₂ e
Study Abroad Air Travel	1,851.09	mt CO ₂ e
Solid Waste	2,905.79	mt CO ₂ e
Scope 2 T&D Losses	7,181.41	mt CO ₂ e
On-Campus Composting	-3,620.77	mt CO ₂ e
Total	128,938.06	mt CO₂e

