Creighton UNIVERSITY

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Greenhouse Gas Inventory

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Prepared for Creighton University by

brendle GROUP

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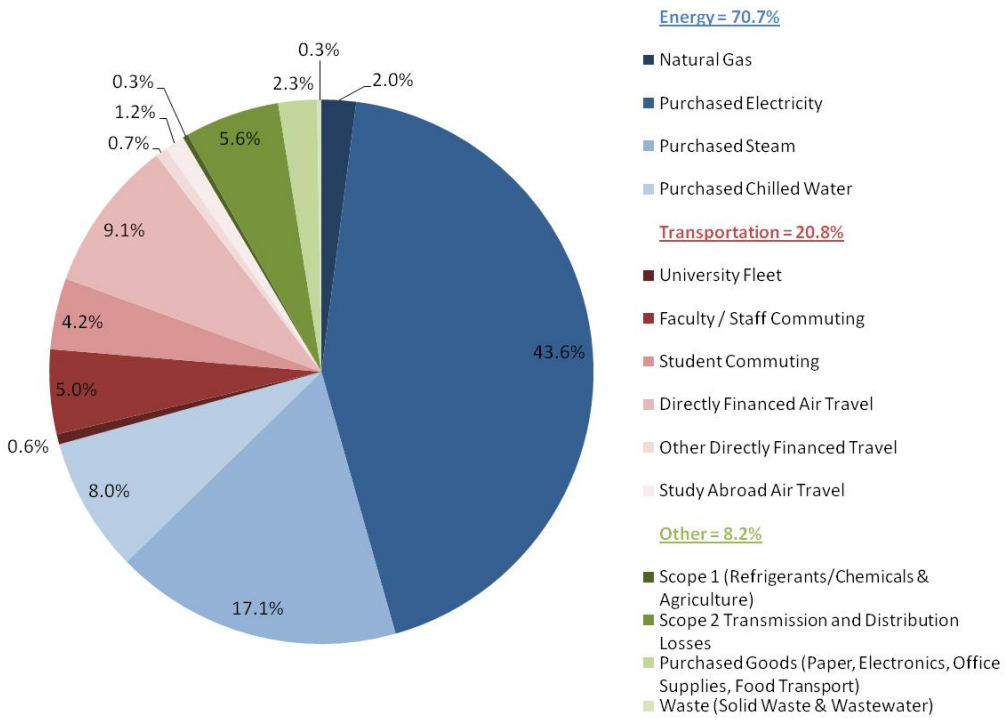
EXECUTIVE SUMMARY

Over the last 150 years, greenhouse gas emissions have been increasing and impacting social, economic, and ecological health worldwide. This greenhouse gas inventory represents an important piece of Creighton University's efforts to be a leader in higher education climate change and sustainability issues. In early 2010, Creighton's Father Schlegel signed the American College and University President's Climate Commitment and this inventory is the first requirement of the commitment. Results from this inventory will be used to develop an action plan for reducing emissions and becoming climate neutral.

Outcomes of the inventory indicate that in fiscal year 2010 (July 2009-June 2010), Creighton University was responsible for 88,534 metric tons of carbon dioxide equivalent (CO_2e) emissions. Electricity consumption, the single largest source of emissions, accounted for 44 percent and steam/chilled water consumption, the second largest source, accounted for 25 percent. Both sources are primarily consumed in buildings and together account for almost three quarters of all emissions at the university. Understanding the sources and scale of the university's emissions is the foundation upon which informed strategies can be developed to move forward.



1 INTRODUCTION AND BACKGROUND

1.1 Climate Change and Greenhouse Gases

Climate change refers to the wide range of impacts resulting from the increase in accumulated concentrations of greenhouse gases (GHGs) in the atmosphere as a result of human activity, primarily the combustion of fossil fuels and deforestation. Globally, these impacts include changes in temperature, precipitation, sea level, ice melt, frequency and severity of storms, and changes to species and habitats, which ultimately affect human health and economies. Specifically, Nebraska and the Omaha region are expected to see increases in temperature, particularly during summer months, as well as moderate increases in spring and winter precipitation as a result of global climate change.

Some GHG Reduction Co-Benefits

- Support local businesses and stimulate economic development
- Reduce government, home and business energy and operational costs
- Reduce dependence on foreign fuel sources
- Reduce vulnerability to energy price increases and supply volatility
- Diversify energy supply and reduce loads on transmission system
- Reduce air pollution emissions, including ozone precursors and fine particles
- Improve public health through increased exercise and nutritious foods
- Reduce waste and increase landfill diversion rates
- Reduce vehicle miles traveled and traffic congestion
- Reduce water consumption in the community and impacts on water bodies and riparian habitats
- Provide opportunities for regional, state and national leadership and recognition
- Improve quality of life through preservation of urban forest, reduced commuting times and increased access to nature and open space
- Improve educational opportunities

In addition to minimizing the impact of climate change, reducing carbon emissions has many additional benefits. These include, but are not limited to, improved air quality, lower rates of respiratory disorders such as asthma, less susceptibility to volatile energy costs, reduced vulnerability to federal and state energy regulations, and water security. Protecting the climate also minimizes a range of potential impacts, such as extreme weather events, insect outbreaks, climate-sensitive diseases, and agricultural impacts to which response or adaptation could be very costly.

1.2 Creighton University Sustainability Initiatives

Creighton University is a Jesuit University located in Omaha, Nebraska. Creighton has multiple undergraduate, graduate, and professional schools, including Arts & Sciences, Business, International Programs, Law, Pharmacy and Health Professions, Nursing, Dentistry, and Medicine. 2010 there were 759 faculty and 2,242 staff members at Creighton. The most recent school term (Fall 2010) also recorded 6,640 full-time and 1,022 part-time students.

1.2.1 American College and University President's Climate Commitment

To show its commitment to sustainability and climate change in early 2010, Creighton's Fr Schlegel signed the American College and University President's Climate Commitment (ACUPCC) along with 20% of the nation's university and college presidents. As part of this commitment, Creighton has agreed to:

1. Complete an emissions inventory.
2. Within 2 years, set a target date and interim milestones for becoming climate neutral.
3. Take immediate steps to reduce GHG emissions by choosing from a list of short-term actions.
4. Integrate sustainability into the curriculum and make it part of the educational experience.
5. Make the action plan, inventory, and progress reports publicly available.

This report is intended to serve as Creighton's deliverable for the first action item in the list above. Creighton will be able to use the data presented in this GHG emission inventory to identify critical areas for improvement, develop an action plan to reduce its GHG emissions, and achieve climate neutrality.

1.2.2 Other Sustainability Initiatives

In addition to ACUPCC, which has driven the development of this report, Creighton is involved in many other efforts that have showcased its commitment to being a national leader in sustainability:

- Midlands Council on Sustainability host, involving several colleges and universities in the region
- Energy conservation initiatives by the Facilities Management Department
- Expansion of the single stream recycling program on campus
- Green Jays Student Group, which is organized into four committees: Fall Sustainability Fair, Bike Program, Community Garden, and 'Ban the Bottle' (bottled water reduction program)
- National recognition in Green Business Quarterly and Guide to 286 Green Colleges

2 GREENHOUSE GAS INVENTORY

The following section provides Creighton's GHG inventory for the fiscal year 2010[1] (FY'10) baseline year. It discusses the overall objectives of the inventory and the methodology used to compile the inventory, and shares the individual components and overall conclusions of the inventory.

As mentioned in the previous section, the results of this inventory present the current situation at Creighton with respect to GHG emissions, including a breakdown by sector so that Creighton can identify where to focus its reduction efforts. The inventory also provides a baseline to which Creighton can compare future inventories and measure its progress towards climate neutrality. The objective of this inventory is to be as complete, consistent, accurate, and transparent as possible while achieving the intended purpose and goals for the inventory.

2.1 Approach

2.1.1 Methodology and Tools

This inventory was assembled through the collection and analysis of utility data, compiling of University records, discussions with facility/staff, and an online campus commuting survey. Figure 1 presents a visual outline and description of the methodology used to organize the inventory process.

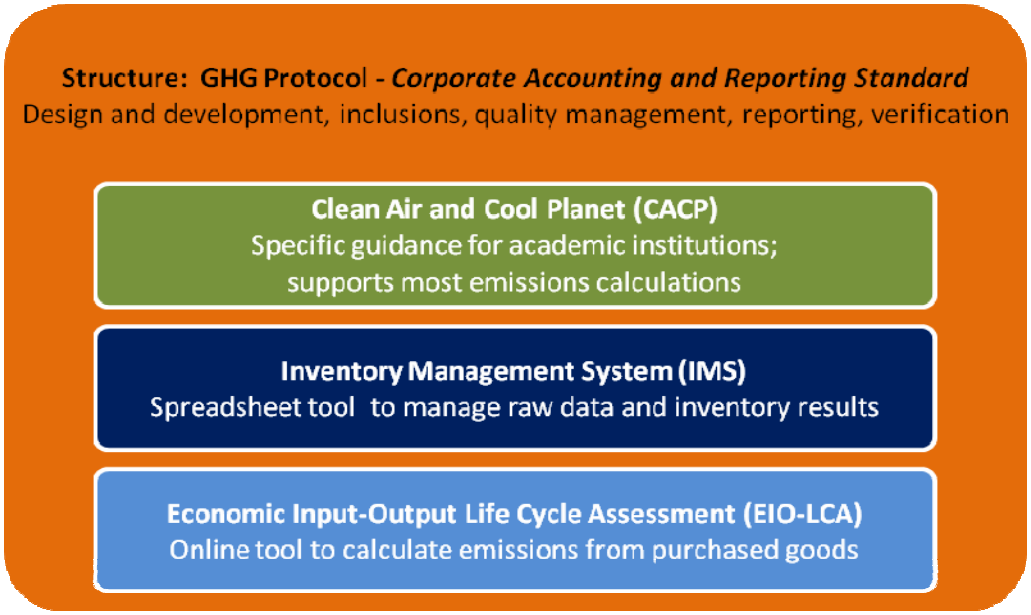


Figure 1. GHG Inventory Protocol and Tools

[1] July 2009 – June 2010

This inventory was developed in accordance with the GHG Protocol – Corporate Accounting and Reporting Standard as recommended by ACUPCC. The GHG Protocol provides guidance on what emissions sources to include in a GHG inventory and how to address situations such as partial ownership, leases, etc. ACUPCC also provides some direct guidance on issues specific to conducting university and college inventories. Table 1 describes the key requirements of the GHG Protocol and the alignment of this inventory's approach.

Table 1. Alignment with Key GHG Protocol Requirements

GHG Protocol Requirement	Alignment
Organizational Boundary GHG emissions shall be consolidated based on an organization's equity share, operational control, or financial control of the source.	Creighton has decided to define its organizational boundary based on operational control, including leased space (i.e., Creighton Medical Association clinics). This decision was based on the assumption that Creighton will be able to best influence those facilities/ resources that it directly operates. Any spaces Creighton owns but does not operate or occupy space (i.e., Burt Street plant and Boystown) have *not* been included.
Operational Boundary GHG emission sources shall be identified and categorized as direct or indirect and the scope for indirect emissions defined.	Section 0 identifies the GHG emission sources included in this inventory and their respective scopes.
Choosing a Base Year The organization shall select and quantify emissions for a base year for which data are available and specify reasons for choosing that year.	The Creighton inventory base year is fiscal year 2010 (July 2009 – June 2010), the most recent timeframe for which complete data were available at the time the inventory was prepared. The fiscal year was selected as it is the format in which many activities at Creighton are reported and evaluated. Data that were not provided in fiscal year format were adjusted as necessary.
Calculating GHG emissions The organization shall identify emission sources, select a calculation approach, collect activity data and choose emission factors, apply calculation tools, and roll-up emissions data to the organization level.	**Error! Reference source not found.** provides a narrative for each emission source in Creighton's inventory, including a discussion of the selected methodologies and activity data.

To translate the baseline inventory data to GHG emissions, the Clean Air Cool Planet (CACP) Campus Carbon Calculator, Version 6.5 was used. This tool is based on well-reviewed methodologies from the Intergovernmental Panel on Climate Change and provides an accessible and well-documented platform for maintaining a GHG inventory. The CACP tool was developed specifically to provide higher education institutions with a consistent approach to calculating campus GHG emissions and is recognized as an acceptable tool by the ACUPCC.

To help manage all of the raw data from the many emission sources at Creighton, an Inventory Management System (IMS) was developed. The IMS is a Microsoft Excel-based spreadsheet that collects the original data and performs the calculations necessary to prepare the data for input into the CACP tool. The IMS also provides a platform for exporting results from the CACP tool and creating an array of summary tables and figures of the emissions inventory results.

Additionally, the Economic Input-Output Life Cycle Assessment (EIO-LCA) tool, developed by Carnegie Mellon, was used to calculate the embodied emissions in various goods purchased by Creighton.[2]

The purpose of this report is to convey the approaches used and the results of the inventory. Therefore, it is not burdened with excessive details of methodology. Full documentation of data sources, emission factors, methodologies, assumptions, and results can be found in the IMS. **Error! Reference source not found.** is targeted at the audience that will be maintaining the inventory and describes the general structure of the inventory, including directory structure, data sources, spreadsheets, and how they are coordinated into a cohesive inventory.

2.1.2 Greenhouse Gases

The GHG Protocol requires the reporting of six different GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and sulfur hexafluoride (SF6). The majority of Creighton's climate change impact is a result of emissions of the first three gases, as documented in the following sections. PFCs and HFCs are primarily released as the result of normal operation and maintenance of refrigeration, air conditioning, and fire suppression systems, and though they are a minimal contributor to the overall Creighton inventory, they are documented here to align with ACUPCC requirements. Sulfur-hexafluoride is found primarily in large electrical equipment, such as transformers, and was determined to be a minimal source at Creighton.

2.1.3 Global Warming Potential and Carbon Dioxide Equivalent

Each of the greenhouse gases reported in this inventory has a different level of impact on global warming. For example, the emission of 1 ton of N_2O has a global warming potential (GWP) 310 times larger than that of the emission of 1 ton of CO_2. Similarly, the emission of

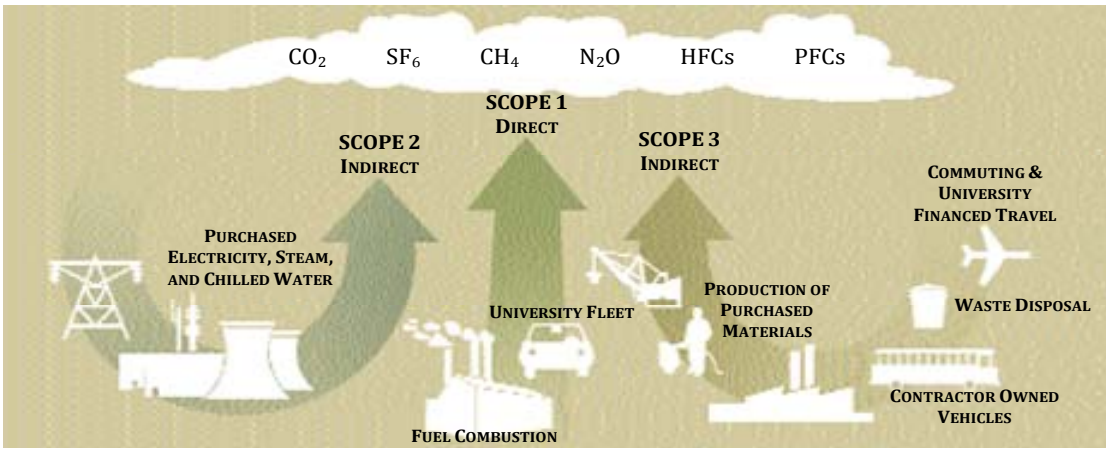
[2] Carnegie Mellon University Green Design Institute. (2008) Economic Input-Output Life Cycle Assessment (EIO-LCA), US 1997 Industry Benchmark model [Internet], Available from:<http://www.eiolca.net> Accessed 20 December 2010.

1 ton of CH4 has a GWP 21 times that of CO_2. To avoid confusion between emissions of the different types of gases and their respective GWPs, all emissions are reduced to the common unit of CO_2e, or carbon dioxide equivalent. Thus, the emission of 1 ton of N_2O is expressed as the emission of 310 tons of CO_2e. All results in this report will be presented in units of metric tons of CO_2e unless otherwise noted and will be labeled as $MTCO_2e$.

2.1.4 Scopes and Emission Sources

All emissions are categorized into three scopes as defined in the GHG Protocol. The purpose of scopes is to prevent double counting emissions between reporting entities. For example, a power plant would report emissions from generating electricity as Scope 1 and consumers using that electricity would report their responsibility to those emissions as Scope 2. By segregating these emissions, they are allocated accurately and not added together.

In general, Scope 1 emissions are direct emissions occurring at the university, Scope 2 emissions are those resulting from energy that is purchased by the university but generated elsewhere (primarily electricity), and Scope 3 emissions are other indirect emissions that occur outside of the university as a result of the activities or demand generated by the university. These scopes are outlined graphically in Figure 2.



Modified from WRI GHG Protocol

Figure 2. Emission Scopes
(Modified from RWI GHG Protocol)

ACUPCC requires signatories to inventory all Direct (Scope 1) and Energy Indirect (Scope 2) GHG emissions, as well as Scope 3 emissions from commuting and directly financed air travel "to the extent that data is available." All other Indirect (Scope 3) emissions are reported at the discretion of the entity but reporting is encouraged by ACUPCC, especially from sources that are large or "can be meaningfully influenced." Creighton has elected to include all university financed travel; solid waste disposal; wastewater treatment; embodied emissions from paper, electronic, and office supply purchases; and contractor owned vehicles.

2.2 Results

The total emissions in the Creighton inventory in FY'10 were 88,534 $MTCO_2e$ (

Table 2). Over 95% of the emissions generated at Creighton are indirect, with the majority from consuming purchased energy (Figure 3). When considered by sector, energy consumption and transportation are the primary sources of GHG emissions at the university, with small portions contributed by other sources, such as the embodied emissions in purchased goods (Figure 4). A detailed summary of each emission source can be found in Appendix A.

Table 2. FY'10 GHG Emissions

		Scope	eCO_2 *Metric Tons*	Percent
Energy	Natural Gas	1	1,813	2.0%
	Purchased Electricity	2	38,562	43.6%
	Purchased Steam	2	15,138	17.1%
	Purchased Chilled Water	2	7,084	8.0%
Transportation	University Fleet	1	537	0.6%
	Faculty / Staff Commuting	3	4,439	5.0%
	Student Commuting	3	3,751	4.2%
	Directly Financed Air Travel	3	8,018	9.1%
	Other Directly Financed Travel	3	618	0.7%
	Study Abroad Air Travel	3	1,050	1.2%
Other	Refrigerants & Chemicals	1	270	0.3%
	Agriculture	1	18	0.02%
	Solid Waste	3	190	0.2%
	Wastewater	3	36	0.04%
	Paper Purchasing	3	324	0.4%
	Contractor Owned Vehicles	3	12	0.0%
	Electronics Purchases	3	1,477	1.7%
	Office Supply Purchases	3	214	0.2%
	Scope 2 Transmission and Distribution Losses	3	4,983	5.6%
TOTAL			**88,534**	**100.0%**

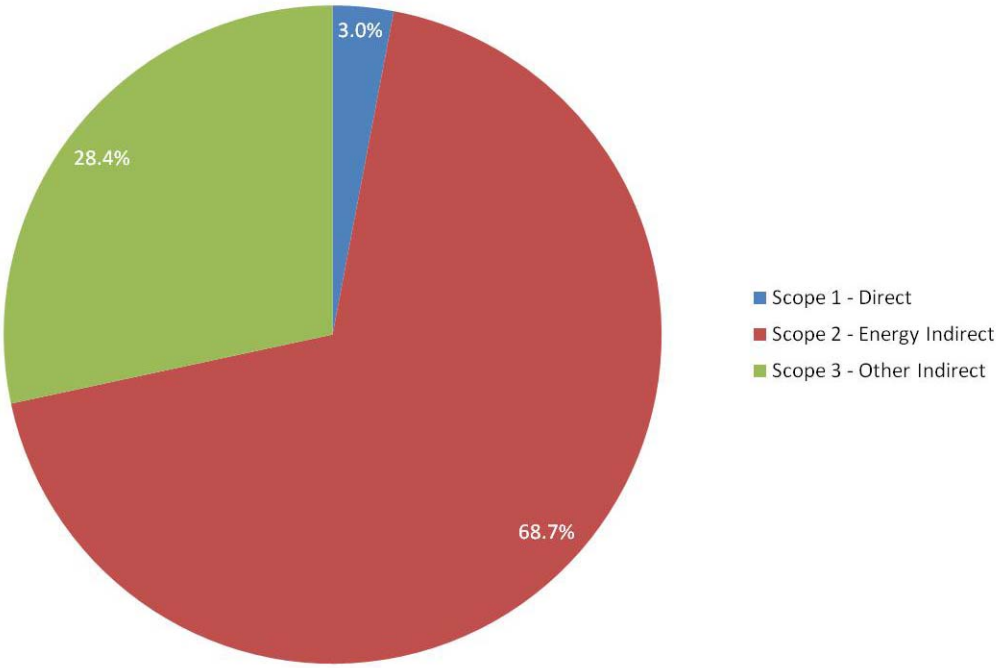


Figure 3. FY'10 GHG Emissions by Scope

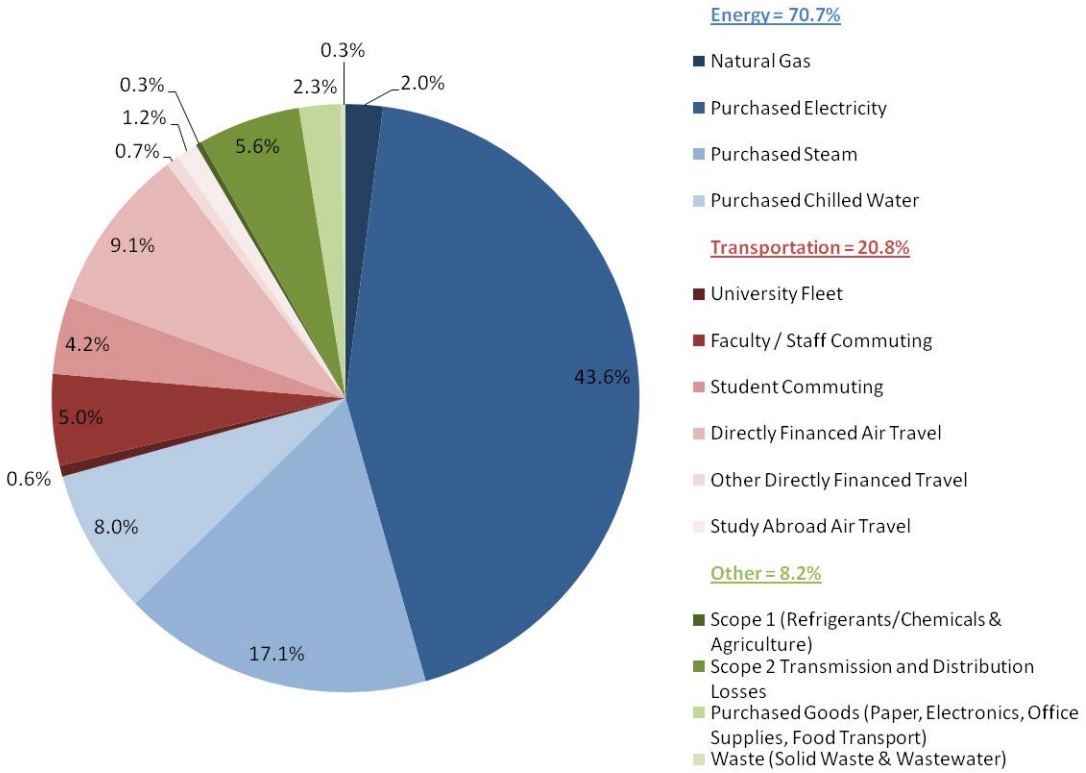


Figure 4. FY'10 GHG Emissions by Sector