**Richland Community College Climate Assessment (RCCCA)**

**June 2012**

**To: Dr. Douglas Brauer**

**From: Benjamin Newton**

**Executive Summary**

This study provides the results of the Richland Community College Climate Assessment from fiscal years 2010-2011. The annual greenhouse gas emissions for Richland Community College were calculated to be between 19,517 and 19,270 metric tons of CO2e during fiscal years 2010-2011. There is a 1.2% decrease in GHG emissions from 2010 to 2011. This is due to decreased enrollment in 2011, resulting in less commuting emissions and retrofitting of the RCC campus with efficient lighting and HVAC upgrades. They also removed bulbs where the lighting was excessive.

 Commuting, wastewater, paper use, and electricity use were consistent for the last two years. This is due to using a single commuter averages and paper use applied to both years. Purchased electricity emissions decreased 6%, purchased steam emissions increased 13%, and natural gas emissions decreased 84% in fiscal year 2011. Natural gas was not utilized when the steam line from Archer Daniels Midland (ADM) was being utilized. This is also due to a decrease in student enrollment from 2010 to 2011 and renewable electricity generation by the Richland wind turbine and energy efficiency upgrades.

 Student, faculty, staff commuting at Richland Community College resulted in an average of 25% of the overall greenhouse gas emissions. Currently approximately 87% of students drive alone to campus, 10% carpool, and 3% take the bus. Strategies such as more students utilizing Decatur Public Transit and carpooling could reduce the overall emissions from commuting. Students, faculty, and staff travelled 12,566,911 miles in 2011. Assuming an average of $4.00 per gallon of gasoline and an upper average of 30 miles per gallon, commuting in 2011 resulted in a cost of $1,675,588.

**Figure 1: Summary of Richland Community College greenhouse gas emissions**

**2010-2011 (metric tons carbon dioxide equivalents)**

|  |  |  |
| --- | --- | --- |
|  | 2010 | 2011 |
| ***Scope 1*** |  |  |
| Natural Gas | 733 | 118 |
| Refrigerants and Chemicals | 990.6 | 990.6 |
| Campus Fleet | 33.1 | 45.4 |
| Agriculture |  | .1 |
| ***Scope 2*** |  |  |
| Purchased Electricity | 3,663.4 | 3,441.6 |
| Purchased Steam | 8056 | 9180 |
| ***Scope 3*** |  |  |
| Faculty/Staff Commuting | 699 | 573 |
| Student Commuting | 4848.7 | 4491.1 |
| Wastewater | 83.8 | 91.3 |
|  Paper | 5.9 | 6.0 |
|  Scope 2  T&D losses | 417.5 | 349.3 |
| **Totals** |  |  |
|  **Scope 1** | **1756.7** | **1154.1** |
|  **Scope 2** | **11719.4** | **12621.6** |
|  **Scope 3** | **6054.9** | **5510.6** |
|  Biogenic |  | 2.8 |
|  Compost  Offsets | 13.1 | 13.1 |
|  **All Scopes** | **19516.9** | **19270.4** |

**(T&D) Transmission and Distribution**

**I. Climate Change Impact**

 Human activities are changing the climate, and the consequent impacts on humans

and ecosystems are becoming increasingly serious. It has been recognized that adapting to and mitigating anthropogenic climate change is a matter of immediate action for the world. To inform adaptation and mitigation policies, it is essential to assess the impact of climatic changes under a wide range of scenarios for the stabilization of emissions of anthropogenic greenhouse gases (GHGs) and aerosols.

**II. Higher Education’s Role in Greenhouse Gas Reductions**

 Global climate change is one of the most difficult environmental challenges as it spans across the world. As a stakeholder, higher education is a large economic force that can alter current energy policy strategies by changing to alternative energy sources. Currently over 17 million students are enrolled and over 1 million faculty are employed by higher education (National Educational Center for Statistics, 2010). This huge industry is spending billions on fuel and energy. If higher education can prove successful in reducing energy costs and reducing greenhouse gas emissions, many industries will follow their strategy. Higher education can be a proactive leader in transforming energy strategies.

 Being resilient to climate change through the advancement of renewable energy technologies and adaptation strategies will emerge out of higher education dedicated to an energy transition. Academic institutions benefit from tax free status, academic freedom, and billions in endowment donations.

**III. Climate Assessment**

 A climate assessment is an inventory of all the greenhouse gas emissions associated with the everyday operations of a university or industry. A climate assessment inventory involves estimating the greenhouse gases emitted by Richland Community College into the atmosphere. Emissions by source and sector was calculated using existing data in the Clean Air Cool Planet Calculator for three major greenhouse gases including carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O) from available data from the fiscal years 2010-2011. Conducting our own greenhouse gas inventory will help us become more energy efficient, which will reduce the total amount of budget spent on energy. Energy efficiency is the cheapest, cleanest, smartest and most readily available source of American energy. For Richland Community College, greenhouse gas emissions are generated from purchased electricity, purchased steam/chilled water, natural gas, transportation (including student/staff commuting), and paper use on campus.

 By committing to a climate assessment, Richland Community College acknowledges the tremendous consequences of global climate change. Many other universities already have climate action plans. A commitment to the global climate change challenges will attract students, faculty, and funding to Richland Community College. A climate assessment will give us a better understanding of the challenges we are facing to reducing our emissions. It will provide a framework that outlines the goals, strategies, and plans for future action. We can set target goals that measure our progress in achieving emission reductions. Finally, reducing our greenhouse gas emissions will also reduce energy costs through efficiency and new technology.

 A climate assessment involves identifying wasteful energy practices and is a first step in reducing energy costs. The initial assessment requires an active engagement of faculty and students and adaptive management of the goals. It requires a commitment of engaging and seeking input from key stakeholders, complementing educational goals, recruiting campus participation and strategic community partnerships, as well as exploring innovative technical solutions.

 Electricity, natural gas, and transportation emissions data was collected in collaboration with Richland Community College facilities staff. The climate assessment focuses on measuring overall emissions, throughout the university, and considers purchasing offsets as a last resort for unavoidable greenhouse gas emissions. With a completed climate assessment inventory, Richland Community College has the option of joining the American College & University Presidents’ Climate Commitment. By signing the commitment, Richland Community College will be nationally recognized as a leader in sustainability.

 The goal of the initial greenhouse gas assessment is to calculate a baseline level of GHG emissions for Richland Community College for the 4 buildings and 155 acres on the main campus. An average of 33% of RCC’s CO2 emissions is from buildings (electricity, heating, and cooling). Faculty, staff, and student commuting account for annual CO2 emissions average of 48% and wastewater accounts for 0.8% of the annual average. Transmission and distribution lost from purchased electricity results in 3.5% of the annual CO2 emissions.

**Methods**

Richland Community College is located in Decatur, Illinois, the heart of Central Illinois. Richland serves its district with the main campus, in Decatur, and three extension centers. The College’s main campus resides on a site of 155 acres of land. Following substantial growth and expansion, Richland currently contains 293,590 square feet. With a commitment to serving the community, the College added three new wings to the main campus: the Industrial Technology Center in 2002, the Schrodt Health Education Center in 2003, and the Dwayne O. Andreas Agribusiness Education Center in 2007. In 2008, the College completed construction on the Adele P. Glenn Academy for Early Childhood Education (opened in Spring 2009) and the new Fitness Center. The Industrial Technology Center was renamed the Scherer Industrial Technology Center in April 2009. The Center for Sustainability and Innovation opened in July 2009, with the University of Illinois Extension Office located on the first floor. The Innovations lab on the second floor opened in Spring 2010. The Center for Sustainability and Innovation received the designation of LEED Platinum in December 2010.

**Institutional Data**

 This assessment was performed in collaboration with numerous faculty and staff on campus to collect all the information required for the climate assessment. The Institutional Databook provided enrollment and number of faculty and staff from 2008-2011. Operations and Technical Services David Holtfreter provided total building square footage and energy, water, and Richland Community College vehicles fuel usage. Vice President of Operations Greg Florian provided the average commuter travel distances. Paul Mcchancey of Decatur Public transit provided a bus survey to determine Richland Community College riders from 2/13/2012-2/24/2012. Marilyn Settles-Clark in Purchasing and Midland Paper Company provided the amount of paper purchased by Richland Community College.

 Professor of Horticulture David McLaughlin provided information regarding animal husbandry and composting on campus. The Budget Office provided detailed operating, research, and energy budgets for the fiscal years 2010-2011. In future years the Richland Community College Climate Assessment will revise strategies for data acquisition and management to achieve a more complete assessment to include faculty and staff travel.

**Boundaries and Scope**

 A baseline year of measuring emissions must be established to determine annual differences in emissions. Based on available reliable energy data at Richland Community College 2010 is the baseline year for the Richland Community College Climate Assessment. Using 2010 as a baseline year, Richland reduced its GHG emissions by 1.2% in 2011.

 There are three main types or scopes of emission sources in the initial Richland Climate Assessment (RCA). These scopes define a set of accounting standards to classify the emissions by source (World Resource Institute, 2001). Standards are important in verifying accuracy and comparison with other institutions. Scope 1 emissions involve all on campus emissions that are a direct result of the universities operations. Scope 2 includes all emission sources indirectly resulting from the universities consumption of purchased utilities and occurring off-site. Scope 3 emissions are all remaining emissions that are indirect and not under university control.

**Scope 1** includes greenhouse gas sources directly controlled by Richland Community College. These emissions include mobile combustion from university fleet service vehicles.

**Scope 2**: Indirect includes purchasing of electricity, heat, or steam from utility providers. Richland Community College currently purchases electricity from AmerenCIPS and previously purchased steam from Archer Daniels Midland (ADM).

**Scope 3**: Includes indirect sources of greenhouse gas emissions as a result of Richland Community College activities such as commuting, paper use, and wastewater generated by the university.

 The boundary of the Richland Community College Climate Assessment only included the main campus in Decatur due to the energy data available from Plant Services and Operations. Archer Daniels Midland produces steam, which previously was used to heat campus buildings, produce chilled water for cooling, and to generate electricity. Steam and chilled water were distributed through underground tunnels to the main campus.



**Figure 2** Map of Decatur, IL and location of Richland Community College and Extensions

Scope 1 and 2 calculations: Emissions by source and sector was calculated using existing data in the Clean Air Cool Planet Calculator for three major greenhouse gases including carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O) from available data from the fiscal years 2010-2011. Each atmospheric gas captures different amounts of reflected heat and has different atmospheric lifetimes. All of them contribute to the global warming effect, which is known as global warming potential. Carbon dioxide, the least efficient of these gases in capturing radiation, serves as the reference gas with a global warming potential of 1 (WBCSD/WRI, 2001).

The Campus Carbon Calculator calculates emissions using this formula.

A x Fg=Eg

Where A is the quantification of an activity in units that can be combined with emission factor of GHG *g* (F*g*) to obtain the resulting emissions for that gas ~E*g*!. Examples of activity units include MMBtu of natural gas, gallons of heating oil, kilowatt-hours of electricity, and miles traveled (Banai, 2010). Total GHG emissions can be expressed as the sum of the emissions for each gas multiplied by its global warming potential. GHG emissions are reported here in metric tons of carbon dioxide equivalents.

GHG=Σg Eg x GWPg

The Campus Carbon Calculator estimates E*g* from the quantity of fuel burned using national and regional average emissions factors, such as those provided by the US Department of Energy’s Energy Information Administration (2009).

The Campus Carbon Calculator included Richland Community College in the electricity grid SERC Midwest electricity grid subregion. The subregion is provided in the Campus Carbon Calculator determines the proper electricity mixture of power sources (e.g. nuclear, coal, natural gas, wind) instead of just using a regional average (Illinois Commerce Commission, 2009).

Scope 3 emission calculations for the Richland Community College Climate Assessment include commuting for faculty, staff, and students. It was estimated that 87% of students use drive alone in personnel vehicles, 10% carpool an average of 19 miles roundtrip per 3 trips per week to campus. From a bus survey done by Decatur Public Transit, it was determined an average of 3% of the students/faculty/staff travel 25 miles roundtrip per 5 trips per week to campus.

Richland Community College currently does not track its municipal solid waste. In the future we will determine how to better track solid waste sent annually to the landfill in the future and monitor our single stream recycling capacity.

The Campus Carbon Calculator generated emission factors. These factors were based on government documents and software from the US Department of Transportation, the U.S. Environmental Protection Agency, and the US Department of Energy (Hough et al., 2008). Bus and automobile transportation factors were the only modes of transportation included in the Richland Community College Climate Assessment. The vehicle emission factors in the Campus Carbon Calculator were derived using normalized fuel efficiency for bus transit was 39.67 miles per gallon per passenger and automobile fuel efficiency used an average fuel economy of 22.1 miles per gallon.

**Directly Financed Travel-** A list of the faculty/staff travel destinations is not included in the initial Richland Community College Climate Assessment, due to a lack of information tracking travel destinations by different departments. Beginning in 2012, Richland Community College may begin tracking travel destinations and mileage through the budget office.

**Paper Results** The overall paper usage by recycled content is shown in **figure 2**. All greenhouse gas values were calculated by using the Environmental Defense Fund Paper Calculator to determine the eCO2 emissions (in lbs) for paper of each paper type containing 0%, 10%, and 30% recycled content.

|  |  |  |
| --- | --- | --- |
| Virgin paper | 10% Post Consumer | 30% Post Consumer |
|  pounds |  pounds |  pounds |
| 3650 | 190 | 960 |

**Figure 3** Total number of pounds of paper used by Richland Community College in 2011.

**Animal Sources** The emission factors for chickens were derived from national data by dividing total emissions by total population of animals determine greenhouse gas emissions from animal husbandry (EPA, 2003). All of the chicken manure is composted, which results in an offset of the emissions.

**Results**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Fiscal Year** | **Full time students** | **Part time students** | **Faculty** | **Staff** | **Total Building Space (sq. feet)** |
| **2010** | **2,745** | **5,099** | **249** | **231** | **294,186** |
| **2011** | **2,644**  | **4,955**  | **231**  | **189** | **302,001** |

**Figure 4** Number of full time/part time students, faculty, staff and total building space (sq. feet).

**Figure 5: Summary of Richland Community College greenhouse gas emissions**

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|  |  |  |
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