

ENVS 301  
Spring 2015

# Western State Colorado University's Ecological Footprint 2014



## Buildings & Materials:

**Methods:**  
We will look at the embodied energy (tonnage co2) that goes into expanding and maintaining the Western campus. Our study focuses on the three most recent construction projects at Western that have all received some sort of LEED certification: The University Center, Taylor Hall, and The Field House. We converted the dollar signs into co2 emissions. We explored Concrete, Masonry, Metals and Lumber. In analyzing such information our studies provide insight as to the tonnage of co2 each of these building "emits".

**Findings:**  
We found that these projects resulted in 13,090 tonnes of co2 being emitted. With The Fieldhouse emitting 42% total co2 emissions, The University center stood at 33% while Taylor Hall stands at 25%. Building materials emissions are as follows; Concrete 82%, Metals 12%, Masonry 5% and Lumber 1%.

**Conclusion:**  
As a University one of our primary administrative goals is to continue to grow the student body. In order to gain and retain a student body future construction will continue to be an issue. Practicing building patterns that not only receive LEED certifications, but go above and beyond to ensure that local and sustainable materials are used that will remain energy efficient into the future. We conclude the harsh reality that mitigation can only go so far as maintaining the objective to more thoroughly analyze future construction endeavors so as to take accountability for all different types of "emissions".

## Introduction:

Our goal with this project was to collect the total carbon emission data from the 2013-2014 calendar year at Western State Colorado University. We are investigating Western's carbon footprint as it pertains to the President's Climate Commitment Action Plan (ACUPCC). This plan was adopted by Jay Helman in June of 2007 stating the obligation that Western maintains sustainable obligations to the environment. Specifically stating that Western will commit to a 50% reduction of total carbon emissions by 2035 and a 100% reduction in total carbon emissions by 2050. The baseline data from 2006 measures air travel, the school vehicle fleet, natural gas, and electricity use. We have expanded our measurement of Western's carbon footprint to include waste, food, and commuting. This has given a more complete picture of Western's carbon footprint and a clear idea of where Western stands among their commitment to the ACUPCC.

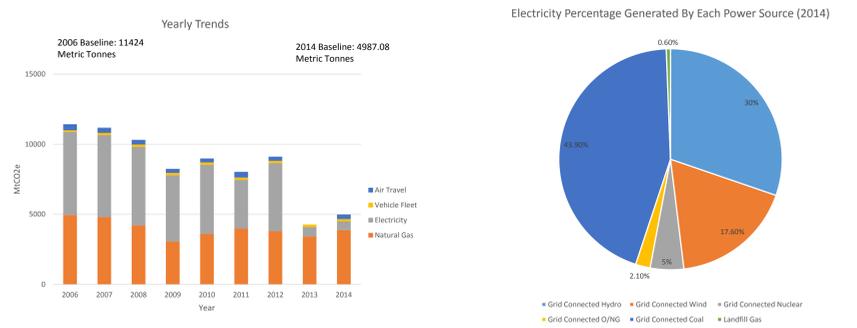


Figure 1: Displays the early trend in MtCO2e emissions from air travel, the vehicle fleet, electricity, and natural gas.

Figure 4: Percentage of Western's electricity generated by each power source in 2014

## Electric:

**Methods:**  
We received data from Sam Kozel, Adam Huisman, and Tex Bradford regarding Western's campus electricity usage for 2013 and 2014. We then calculated the total amount of electricity used in megawatts. Western used 8,200,800 kWh of electricity in 2013 and 8,553,600 kWh in 2014. Then we converted the electricity used into CO2 emissions.

**Findings:**  
Western's combined emissions factor for 2013 was 0.18 pounds of CO2 per kWh. For 2014 the combined emissions factor was 0.16 pounds of CO2 per kWh.

**Conclusion:**  
Overall Western has a major environmental impact due to large energy consumption rates. Through the purchasing of Green-E Certified Recs Western has been able to offset its CO2 emissions over the years. Looking further into the future, Western must continue to increase its active role at reducing its emissions in order to meet the overall future goal of becoming a carbon neutral university. Focusing on efficiency, new technologies (e.g. solar), and increasing awareness within the student body (especially with those who live on campus) Western has the ability to further reduce its emissions. With the continued growth of the student body, Western will have to begin taking larger steps focusing mainly on mitigation strategies.

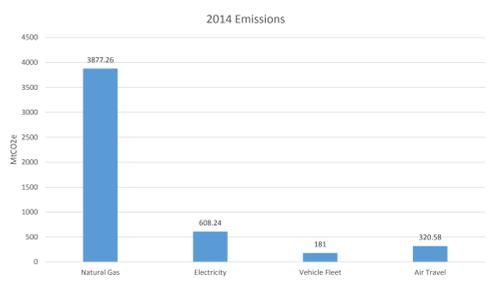


Figure 2: Displays the CO2 emissions from 2014 for natural gas, electricity, vehicle fleet and air travel.

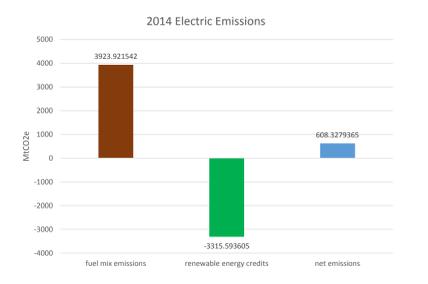


Figure 5: The total Electric emissions for 2014 combined with the renewable energy credits reveal the net 2014 electric emissions.

## Commuting:

**Methods:**  
In order to calculate CO2 emissions from commuting a voluntary survey was sent to the students, faculty, and staff of WSCU. The survey aimed to gather information regarding commuting patterns, methods of commuting, vehicles driven, and alternatives to conventional commuting. Approximately 10% of the Western population participated in the survey and the information gathered was evaluated and a total emissions from commuting was calculated at 0 metric tons of CO2.

**Findings:**  
Total emissions of 2014 from commuting: 730.37 metric tons of CO2  
Individual emissions of 2014 from commuting: .23 metric tons of CO2 per person

**Conclusion:**  
Aside from gathering information to calculate CO2 emissions from commuting our survey also aimed to collect opinions about mitigation strategies. By far the most popular suggestion was to incorporate a Gunnison town bus during the winter months. Most students, faculty, and staff of WSCU prefer to commute to and from campus via bicycle, however winter weather conditions impact this and by implementing a bus system during the winter months could potentially reduce emissions.

## Waste:

**Methods:**  
Waste management practices can impact greenhouse gas emissions by significantly increasing the amount of greenhouse gasses already present in the atmosphere. This paper examines GHG emissions for paper, glass, metal, and plastic materials, as well as municipal solid waste. Our group had the task of calculating the CO2 emissions that Western State Colorado University produces from waste on campus

**Findings:**  
Western emits 1147.31 metric tons of CO2

**Conclusion:**  
We have found that we produce much more CO2 emissions from waste than we reduce from recycling. This means that we need to find mitigation strategies that increase the amount of material recycled, and reduce the amount of municipal solid waste discarded.



## Conclusion:

Our campus assessment for 2014 revealed that Western State Colorado University's total CO2 emissions equated to approximately 9471 metric tons. While this number is much smaller than that of some comparable institutions (Middlebury College reported a total emissions of 12,729 metric tons of CO2 for 2014), it is still an approximation. This is the most comprehensive CO2 emissions assessment yet conducted for WSCU, incorporating some scope 3 emissions. Future assessments may fluctuate as we strive to adopt more accurate and standardized evaluation methods.

## Natural Gas:

**Methods:**  
Data was acquired from the Western database via Dez Pennartz and compiled to give an approximate figure for CCF for the 2013 and 2014 calendar years. From there it was plugged into Figure 1 to calculate metric tons of CO2 emitted.

**Findings:**  
(CCF) x (0.0544 kg CO2 / cubic foot) x (0.001 kg / metric ton) = **3877.26** Metric Tons CO2 (2014)  
**3,427.5** Metric Tons CO2 (2013)

Figure 1.: Conversion for CCF's of natural gas to metric tons CO2 [2]

**Conclusion:**  
Curbing the consumption of natural gas to heat buildings in an extremely cold winter climate such as Gunnison is a difficult task to complete, but I believe that with the upgrade of heating systems as well as added insulation to buildings around campus, the consumption of natural gas can decrease across the entire university.



## Air Travel:

**Methods:**  
Our goal was to determine the carbon emissions of WSCU that are directly related to air travel for both faculty and students. We contacted the Accounting office and obtained records of all the purchase orders for flights taken during 2014 calendar year. After logging data and calculating total air miles, we were able to use a web based tool to calculate our campus carbon emissions for air travel. With the information provided we were also able to break it down further by department.

**Findings:**  
WSCU's total air travel carbon emissions for 2014 were: 320.58 Metric Tons.

**Conclusion:**  
We found that there were a number of flights with many segments that could have been eliminated, as well as large groups of people flying long distances which contribute to a larger footprint. However recent studies from the FAA show that energy consumption of automobiles is significantly more than that of air travel. Air travel energy consumption is currently at 2,654 BTU/passenger mile, compared to automobile travel which consumes 3,193 BTU/passenger mile. As air travel becomes more reliable and efficient, it will grow, allowing emissions to lower significantly. To address this development in transportation, WSCU should continue using air travel as a primary form of travel. Mitigation strategies include assessing mileage flown b

## Food:

**Methods:**  
To gain food data, we interviewed, Supervising Chef Aaron Chester and John Cody. We then found data on the internet that correlated indirect food emissions based on lbs/ kgs. Once we found the total emissions in kilograms for each product, we converted kilograms to total metric tons of CO2 emitted for the academic year and summer.

**Findings:**

	Metric Tonnes of CO2
Academic Year total Kg CO2/ Kg of Food	264748.1
Food	2
Summer total Kg CO2/ Kg of Food	44472.41
Total CO2 emissions	2692.32

**Conclusions:**  
The Agricultural processes in the US account for 700 Million metric tons of CO2 or 10% of the total emissions. Western contributes 2692.32 metric tons of CO2 to the United States total. Our contribution is minuscule compared to the total agricultural emissions.

## Fleet:

**Methods:**  
Data was provided by Nickie Thompson, Administrative Assistant and Transportation Service Specialist for Western State. The total amount of fuel consumed was multiplied by the pounds of CO2 released by one gallon of gasoline or diesel; 19.6 lbs./CO2 and 22.38 lbs./CO2 respectively. These totals were then converted into kilograms, to be consistent with data from previous years.

**Findings:**  
· In 2013 Western's fleet produced 167 metric tons of carbon dioxide.  
· In 2014 Western's fleet produced 181 metric tons of carbon dioxide.  
· The carbon dioxide produced by Western's fleet increased 55% from 2013 to 2014.

**Conclusion:**  
Converting Western's fleet to compressed natural gas (CNG) vehicles and electric-hybrid vehicles is a logical first step in working to reduce carbon emissions produced by the Universities' fleet. Most of Western's fleet could be converted to run on CNG and their original fuel type. CNG vehicles emit 6-11% less greenhouse gases than traditional gasoline vehicles. Western could also phase out old vehicles with electric-hybrid vehicles or install electric-hybrid kits on the current vehicles. This can reduced fuel consumption from 15-20%.