Updated Carbon Footprint Analysis for Trinity College, Hartford, CT

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This semester in Environmental Science Internship, I revised Trinity College's energy usages for individual building up to date. I mainly focused on the electricity (in KWH) and compressed natural gas (CNG in CCF) whose monthly readings and costs were obtained from the bills that the school received. Upon updating, I wanted to look at previous years' records to see if there was any trend in energy usages on campus in the past five years. I hoped to find an area or a specific building that has been using a lot of energy, make a note of that, and subsequently derive an alternative method that is more energy efficient and cost beneficial.

At first, I also wanted to look at the fuel records that correspond to heating not for fueling automobiles. However, it became irrelevant since Trinity converted from fuel to CNG for spatial heating back in 2009 and I am only looking at the data dating back to 2010. Thus the energy used for space heating has already been a part of the CNG data. Moreover, I wanted to look at the total energy used per building, so I used a conversion factor of 0.935 for electricity and 11.7 for CNG to convert them to carbon dioxide emission levels (CO^2e) and added them together. Since there are numerous buildings with different functions on campus, I grouped them into 7 categories for simplification: Cultural Houses, Gym, Library, Multiple (buildings with a multiple functions), Office, Residential, and Lecture/Laboratory. I generated bar graphs to illustrate which category of buildings read the highest CO^2e.

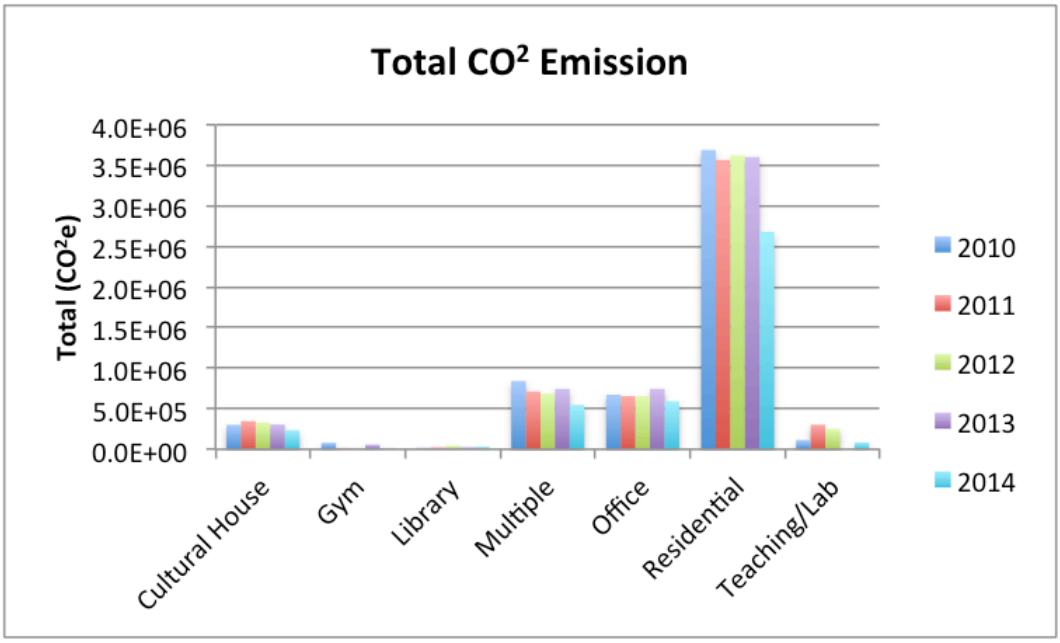


Figure 1. Total CO^2 Emissions for the 7 categories of buildings over the last 5 years.

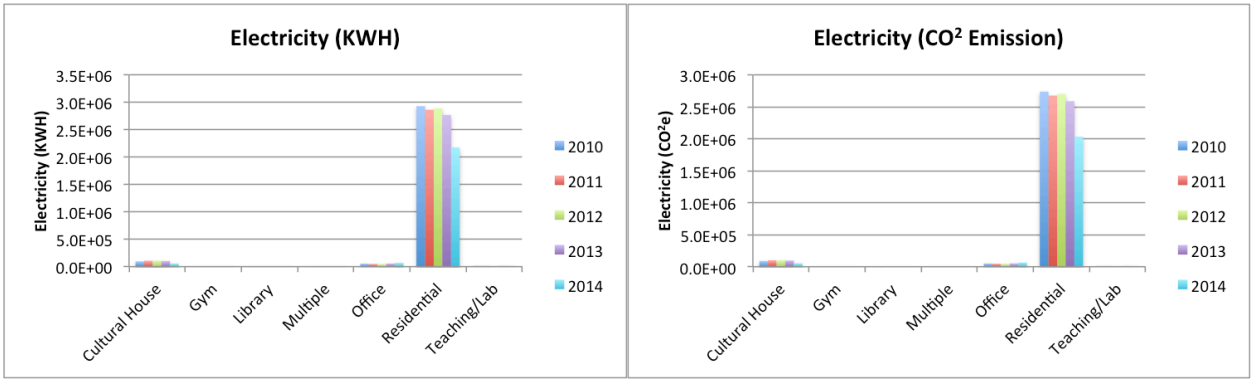


Figure 2. Electricity (KWH and CO^2e) for the 7 categories of buildings over the last 5 years.

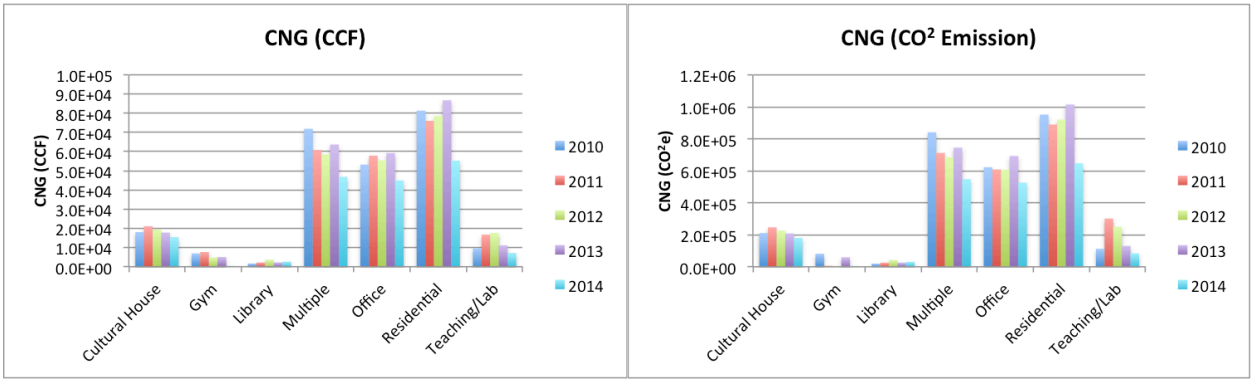


Figure 3. Compressed natural gas (CNG in CCF and CO^2e) for the 7 categories of buildings over the last 5 years.

One of the biggest issues that I faced this semester was availability of the data. While I was able to obtain CNG data for most of the buildings (not all), I had a hard time finding the electricity data. Thus there were a lot of unknowns, which is why Figure 1 cannot be reliable. The graph shows that the Residential buildings emit the most CO^2, however, looking at Figure 2 and 3, it is clear that only Residential buildings have both readings for electricity and CNG while others are missing the electricity data. Moreover, it was discovered that there are fewer electrical meters than the number of buildings on campus, meaning that one meter can cover more than one building. Thus, the electrical data was deemed even less reliable. However, what can be said about these graphs is that the energy usage seems to experience a slow decline over the past 5 years. However, to support this observation, more data from the past will be required.

The graphs do show that the residential buildings have the highest readings for CO^2, so I generated another set of graphs just focusing on the residential buildings. They are Stowe, Clemens, Ogilby, Doonesbury, North, Jones, Summit East, Summit West, and Summit South. In order to take into account the size of each residential building and the number of occupants, I normalized the total CO^2 emission and CNG (both CCF and CO^2e) of each dormitory by the number of residents obtained from Trinity's Housing website. Figure 4 showed that the North Campus read the highest total CO^2 emission level on campus. However, a staff member from Buildings & Grounds, Matt, told me that North Campus' electrical meter covers not just North Campus but also several other buildings in the vicinity. Therefore, Figure 4 became unreliable and inaccurate.

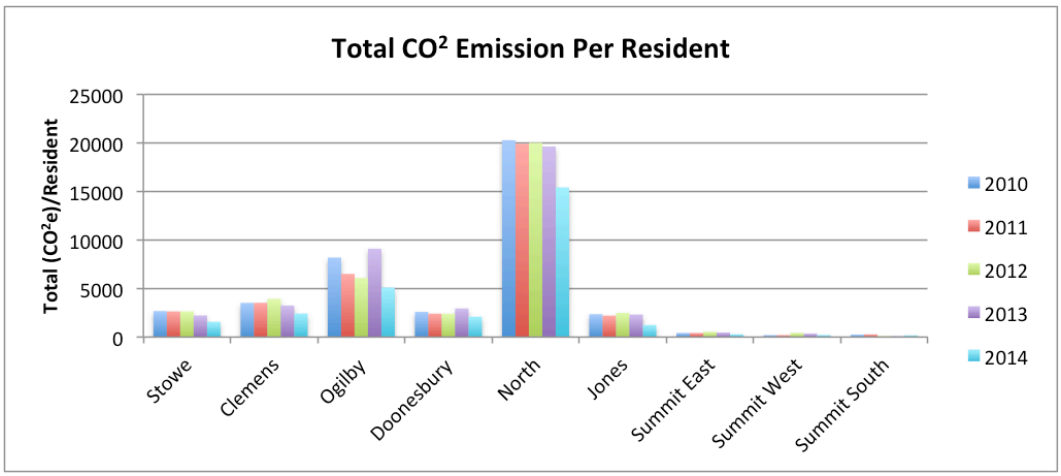
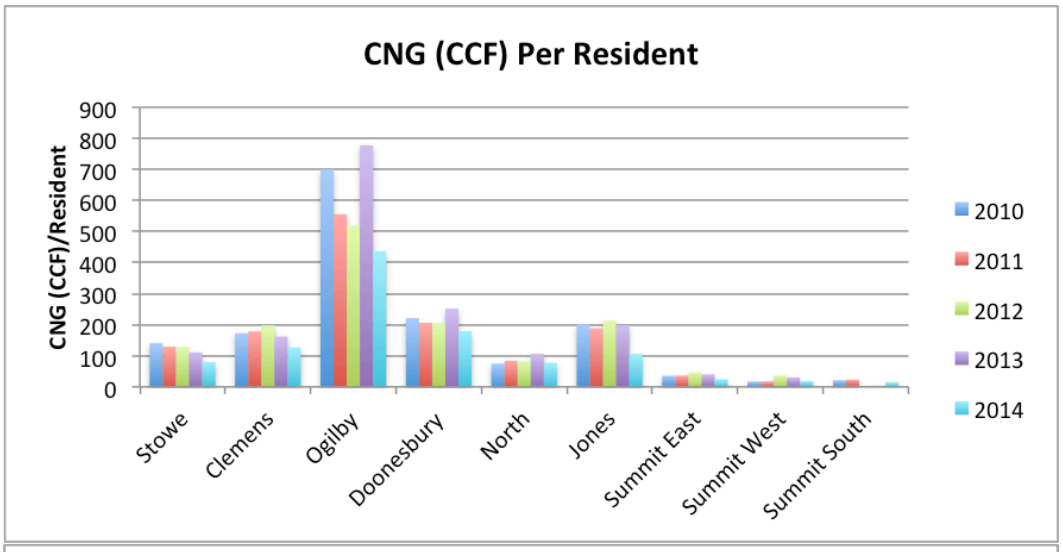


Figure 4. Total CO^2 Emissions for all the residential buildings over the last 5 years.



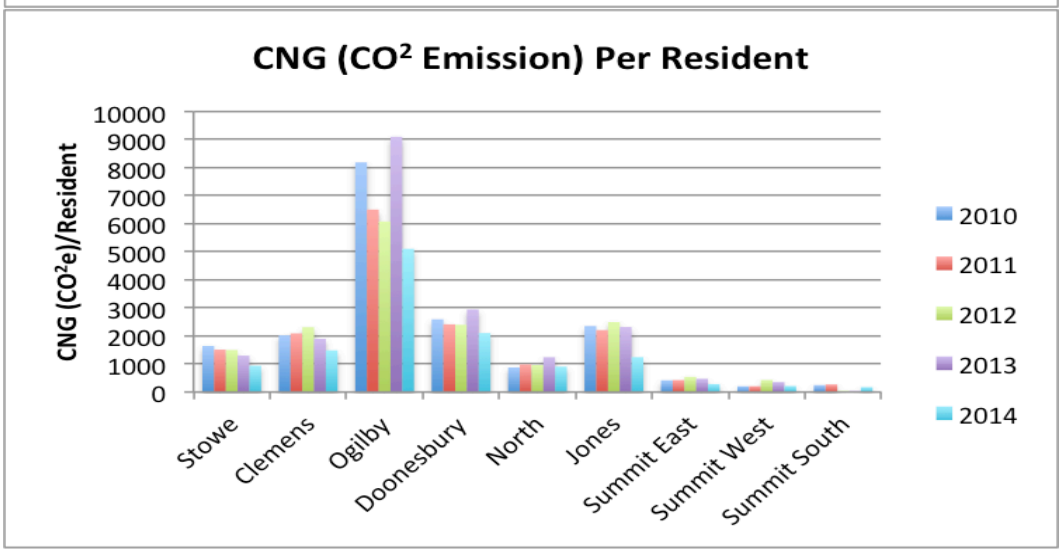


Figure 5. Compressed natural gas (CNG in CCF and CO^2e) for all the residential buildings over the last 5 years.

I generated two more graphs with CNG data, which are more complete and reliable than the electrical data. Based on Figure 5, Ogilby read the highest CNG per resident followed by Doonesbury. Ogilby is a residential building exclusive for the members of St. Anthony Hall that also holds social events. There is no evident trend in the usages of energy from year 2010 to 2014.

For future work, what I would like to suggest is having a more comprehensive data for electricity and CNG. Although CNG date covered more buildings than the electricity data on campus, there were still a lot of buildings missing. It shocked me that the school does not have these data handy or recorded electronically already because these data could be very helpful to find ways to minimize the energy usages and spend less money as well. Yale University, on the other hand, embarked on an initiative to provide reliable and cost effective energy services. In 2005, Richard Levin, Yale President at the time, committed the University to reduce its greenhouse gas emissions 43% below 2005 levels by 2020. They own and operate two power plants (Central Power Plant and Sterling Power Plant) of their own, implement energy efficiency measures and onsite renewable energy technologies, and engage the campus community in energy conservation efforts. Their program is something that Trinity College should look into and adapt in order to become greener, more sustainable and environmentally aware.