

Office of Sustainability Greenhouse Gas Emissions Inventory FY15 Update

Introduction

In fiscal year (FY) 2015, the College of Charleston emitted 53,970 metric tons of carbon dioxide equivalents (mtCO₂e) from six major categories. These categories include energy, air travel, other transportation, commuting, wastewater, solid waste and other related emissions. The College's largest source of emissions is from the consumption of energy (Figure 1). Energy includes purchased electricity, natural gas, propane and distillate oil (generator fuel). The second largest source of emissions for the College is air travel, including all study abroad as well as faculty, staff and student travel on behalf of the College. Commuting is the third largest source of emissions, followed by "other" emissions and "other" transportation related emissions.

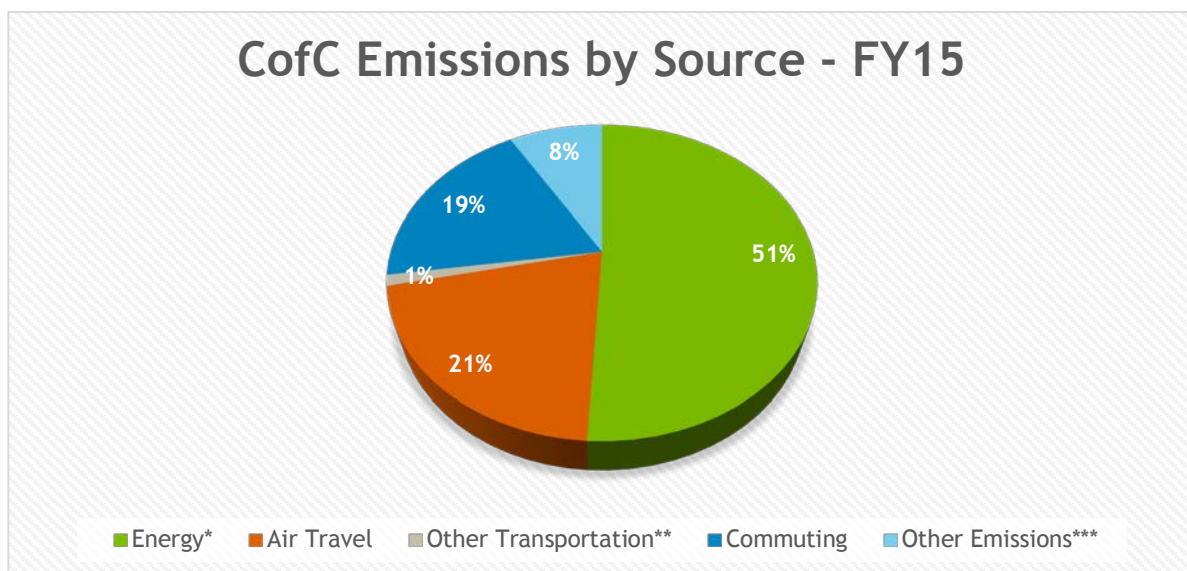


Figure 1: Breakdown of emissions produced by the College of Charleston in FY2015.

*Energy includes scope 2 electricity and scope 1 natural gas, propane and fuel oil for generators.

**Other Emissions includes scope 2 T&D losses and scope 3 paper purchasing, refrigerants, wastewater, solid waste and fertilizer / animal husbandry operations.

***Other transportation includes scope 3 directly financed ground transportation (rental cars and personal mileage reimbursement) and scope 1 campus fleet fuel consumption.

Overall emissions decreased slightly from FY2013 by approximately 1,249 mtCO₂e. The largest decrease over the two years was from purchased electricity. These emissions decreased by approximately 1,782 mtCO₂e. This is attributable to cleaner energy sources in the region, not to a decrease in actual electricity consumption by the campus. Additional decreases occurred

in solid waste production and directly financed travel. Solid waste production has seen a steady decline since FY11, while directly financed travel was positively impacted through a reduction in personal mileage reimbursement. While these decreases are significant, much of those gains were offset through increases in air travel, study abroad and stationary source (natural gas and generator fuel) emissions. The largest increase between FY13 and FY15 was in air travel emissions (Table 1). Both study abroad and directly financed air travel by staff, faculty and students increased significantly. The second largest increase was due to on-campus stationary fuel sources. FY15 saw a large spike in natural gas curtailment requests to the College’s Central Energy Plant compared to FY13. This is discussed in more detail in Section 2.3.

Table 1: FY2013 & FY2015 Emission Comparison

	2013 GHG MTCDE	2015 GHG MTCDE	Difference
<i>Other On-Campus Stationary</i>	2,331.33	2,983.38	+652.1
<i>Direct Transportation</i>	243.11	123.56	-119.6
<i>Refrigerants & Chemicals</i>	589.99	189.46	-400.5
<i>Fertilizer & Animals</i>	20.17	22	+1.8
<i>Purchased Electricity</i>	26,272.02	24,489.53	-1,782.5
<i>Directly Financed Air Travel</i>	4,635.68	7,029.67	+2,394
<i>Other Directly Financed Travel</i>	997.31	469.22	-528.1
<i>Study Abroad Travel</i>	3,258.13	4,109.27	+851.14
<i>Solid Waste</i>	3,711.57	2,867.87	-843.7
<i>Wastewater</i>	50.55	45.82	-4.7
<i>Paper Purchasing</i>	150.25	160.53	+10.28
<i>T&D Losses</i>	2,652.47	1,280.78	-1,371.7
<i>Staff / Faculty Commuting</i>	2,903.35	2,734.55	-168.8
<i>Student Commuting</i>	7,403.18	7,464.11	+60.9

Compared to other higher education institutions across the southeastern United States, the College of Charleston falls within the middle range for mtCO₂e per capita (full-time equivalent students) and within the higher range for mtCO₂e per 1,000 square feet of building space. However, the College continues to have one of the smallest Scope 1 total emissions of any comparable schools.

As signatories of the Second Nature President’s Climate Commitment, the College of Charleston has committed to developing and implementing a Climate Action Plan addressing how to focus efforts to reduce emissions. The College has addressed this through the Office of Sustainability’s Sustainability Action Plan with the goal of becoming carbon neutral by 2050. This Plan assists in creating a sustainable pathway for greater efficiency and effectiveness while taking responsibility for the College’s impact on the world around us. This FY15 greenhouse gas emissions report is an important stepping stone in moving us towards our goal and offering a snapshot of where the College stands today.

Methods

1.1 SIMAP

This GHG inventory covers emissions from July 2014 through June 2015. Once data was collected for this fiscal year, it was input into the University of New Hampshire's Sustainability Indicator Management & Analysis Platform (SIMAP). SIMAP is the platform used dependably by the vast majority of colleges and universities across the United States. SIMAP is the next iteration of the Clean Air - Cool Planet (CACP) Campus Carbon Calculator used in previous inventories. The College has converted all previous GHG inventory data from the CACP into SIMAP and is now using the most up to date emissions factors available. There may be discrepancies noticed between previous Office of Sustainability reports and this report based on this new calculator and the updated emissions factors.

1.2 Scope of Analysis and Inventory Methods

GHG emissions are divided into three different scopes based on the categories of the emissions. Scope 1 emissions are direct emissions owned and controlled by the College of Charleston. These include emissions related to the College's fleet vehicles, stationary campus energy sources (natural gas), refrigerants, chemicals and fertilizers used on the campus and any livestock animals owned by the College.

Scope 2 and 3 emissions are both indirect emissions, meaning the College does not have direct control of the source of the emissions. Scope 2 emissions include purchased electricity used to power the campus. While the College can control how *much* electricity we use, we cannot control *what type of* purchased electricity is produced through our energy provider, whether it be coal fired power plants or solar panels. Scope 3 emissions include air travel, ground travel, solid waste and wastewater generation, paper purchasing and the commuting practices of students, faculty and staff. These emissions account for the services needed in order to operate a college campus - water and waste disposal, paper purchasing, travel and more.

Results

2.1 Emissions by Scope

Scope 1 emissions are the smallest scope of emissions at 3,318 mtCO₂e in FY2015 (Figure 2). This is approximately six percent of the College's total annual emissions, meaning only a small portion of total emissions are directly controlled by the institution. The vast majority (78%) of these direct emissions come from the combustion of natural gas used for heating. The remaining emissions include propane (0.3%), distillate/generator fuel (11%), fuel for College-owned vehicles (4%), fertilizer application (0.2%), refrigerant usage (6%) and the equestrian team horses (0.4%).

Scope 2 emissions are the second largest *scope* of total emissions, and the single largest *category or source* of emissions at 24,489 mtCO₂e. The only emissions included in this scope

are a result of purchased electricity. The College used 62.5 million kilowatt hours (kWh) of electricity in FY2015, the equivalent to the annual electricity consumption of 5,700 homes (EIA).

Scope 3 emissions are the largest scope of the College's emissions equating to 26,162 mtCO₂e. The largest contributor to scope 3 emissions is air travel stemming from College-financed flights for faculty, staff and students as well as student study abroad. Total air travel accounts for 43% of scope 3 emissions. The second largest source of scope 3 emissions is staff, faculty and student commuting which accounts for 39% of total scope 3 emissions. Solid waste production is the third largest source of scope 3 emissions and accounts for 11%. The remaining scope 3 emissions include other directly financed travel (personal mileage reimbursement, charter buses and rental cars), wastewater production, paper purchasing and losses from the transmission and distribution of purchased electricity.

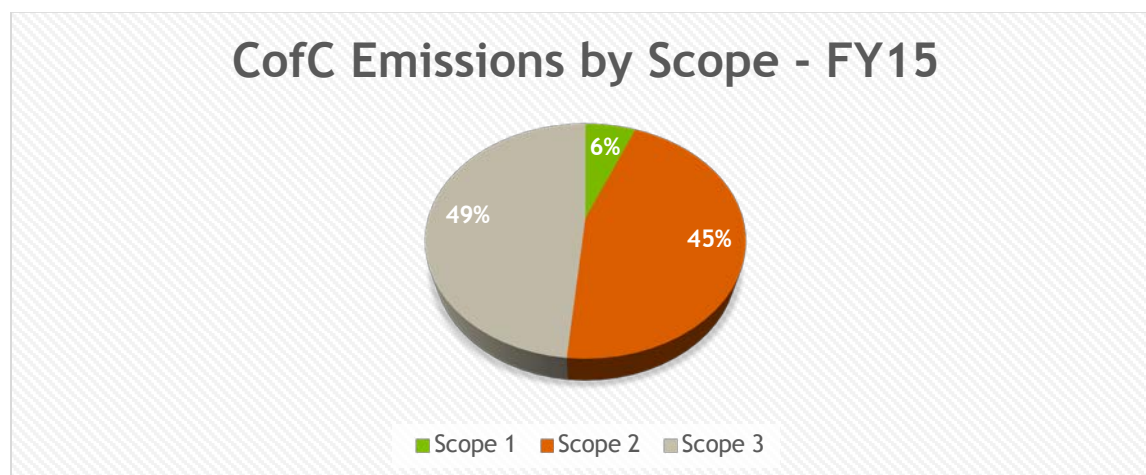


Figure 2: CofC emissions by scope

2.2 Normalizing GHG Emissions

In FY15, the College produced GHG emissions at a rate of 14.4 mtCO₂e / 1,000 square feet and 5.2 mtCO₂e / FTE student. Comparing the College to other institutions across the southeastern United States, emissions are in the mid-range for mtCO₂e / FTE student (Table 2). Appalachian State University in Boone, North Carolina and Radford University in Radford, Virginia both have lower emissions per student while South Carolina's Clemson University and Furman University have higher emissions per student. Furman University has a significantly smaller student population that still supplies all the same amenities as a school with 10,000+ students, which may result in a higher mtCO₂e / student overall.

When calculating total emissions per 1,000 sq. ft., the College is the second highest following Clemson University. However, this is not necessarily due to less energy efficiency. When comparing only scope 2 emissions (purchased electricity) per 1,000 sq. ft., the College falls back to the mid-range position. This metric indicates the College is not any more or less energy efficient when compared to these four peers. The College does rank higher when comparing scope 3 emissions / 1,000 sq. ft. and scope 3 emissions / FTE student. This

indicates the indirect emissions footprint of the College is on the high-end compared to these other institutions.

Table 2: University and College comparisons

	MT CO ₂ e / FTE student	MT CO ₂ e / 1,000 sq. ft.	Building Space (sq. ft)	Student Population	Total Emissions (mtCO ₂ e)
<i>College of Charleston (2015)</i>	5.2	14.4	3,758,084	10,364	53,970
<i>Appalachian State University (2015)</i>	4.1	13.5	5,240,610	17,021	70,594
<i>Clemson University (2014)</i>	7.8	23.1	6,841,818	20,260	158,110
<i>Furman University (2015)</i>	9.1	10.6	2,441,935	2,837	25,808
<i>Radford University (2014)</i>	4.0	13.8	2,827,370	9,702	38,951

Comparing the College with peer institutions is valuable, however it is also important to recognize there are vast structural differences between campuses. Therefore, it is also valuable to internally compare these ratios year-to-year. Between FY13 and FY15, the College reduced emissions per 1,000 sq. ft. and remained steady at 5.2 mtCO₂e per FTE student supporting the downward trend seen in overall emissions.

2.3 Changes over time

Emissions decreased slightly between FY2013 and FY2015 by approximately 1,249 mtCO₂e. The largest decrease occurred in the College’s Scope 2 purchased electricity emissions. However, during these same two years, College-wide electricity consumption increased by about 800,000 kWh (Table 3). The decrease in emissions can be attributed to an increase in a “cleaner” regional energy portfolio. The College’s energy provider, Dominion Energy, decreased their net generation of coal powered electricity by 3 million megawatt hours between 2014 and 2015. At the same time, natural gas increased by 7 million megawatt hours and solar increased by 650,000 megawatt hours ([Dominion](#)). Mass electricity production is getting cleaner, and this is seen in the overall reduction in purchased electricity emissions.

Table 3: Electricity Consumption and mtCO₂e Trends

	Electricity Consumption (kWh)	Emissions (mtCO ₂ e)
<i>FY2011</i>	60,158,957	29,441.51
<i>FY2013</i>	61,786,938	26,272.02
<i>FY2015</i>	62,567,318	24,489.53

Solid Waste emissions also decreased by 844 mtCO₂e in FY15. This is a direct result of a reduction in solid waste tonnage disposal by the College. Through the work of the Office of Sustainability and the Physical Plant, the number of dumpsters on campus was reduced, there

was an increase in recycling infrastructure and improved methods of data collection were created and implemented. The Office of Sustainability’s Sustainability Action Plan also laid out a plan for zero waste and introduced a zero waste events program helping to significantly reduce waste between these two years (Table 4).

Table 4: Solid Waste Disposal and mtCO2e Trends

	Solid Waste Disposal (tons)	Emissions (mtCO2e)
<i>FY2011</i>	1,531	5,315.63
<i>FY2013</i>	1,069	3,711.57
<i>FY2015</i>	826	2,867.87

These reductions in electricity and solid waste emissions were met with similar increases in other emissions sources. The largest increase between FY13 and FY15 occurred in air travel which increased 3,245 mtCO2e. Flights for faculty, staff and students grew significantly between FY13 and FY15 with an increase of \$459,000 spent on airline travel. Study abroad saw a similar jump with an increase of 2 million passenger miles traveled between FY13 and FY15.

The second largest emissions increase was a result of on-campus stationary sources, namely generator fuel. This increase was a direct result of natural gas curtailment requests received from the College’s natural gas provider. These curtailment requests occur during the winter months to assist the provider in normalizing pressure on the gas distribution system. When the College receives a curtailment request, it supplements its natural gas with distillate oil to power generators. In FY15, the College used 37,079 gallons of distillate oil, while in FY13 the College only used 2,263 gallons of distillate oil because there were no curtailment requests.

Recommendations

The following recommendations are intended to help the College of Charleston further align itself with the GHG reduction goals promoted by the Second Nature President’s Climate Commitment and to create accurate and comprehensive emission inventories. These recommendations are abbreviated and echo many of the recommendations borne out of the FY13 GHG report.

Operational

The single largest emissions source of the College is purchased electricity. And, while the College’s emissions footprint has decreased between FY13 and FY15 from 15.5 mtCO2e / 1,000 sq. ft. to 14.4 mtCO2e / 1,000 sq. ft., the College continues to see increases in annual electricity and natural gas consumption. Energy and building efficiency should be at the top of the list for reducing emissions moving forward and as a fiscal priority for the College. Echoing the FY13 report, the College should hire a full-time energy manager to fully understand the complexity of energy usage on campus.

Behavioral

Behavior plays a significant role in many of the emission sources on campus including commuting, electricity consumption, solid waste disposal and paper usage. Implementing behavior change campaigns to complement the structural changes needed to reduce emissions is critical. An updated commuter survey should be administered to gather current insights into changing the behavior of the thousands of commuters to and from campus. The last commuter survey was administered in 2011. In addition, continuing to grow campus waste aversion and diversion programs will be necessary to continue the downward trajectory of solid waste generation and disposal. The zero waste program provides a perfect platform for these messages to carry forward.

Institutional

The Sustainability Action Plan has now laid out the framework for how to move the campus towards its goal of carbon neutrality, and beyond. This Plan also offers a pathway for the proactive integration of sustainability into the curriculum at the College. Bridging the academic and operational aspects of sustainability at an institutional level offers unique learning and experiential education opportunities for students, while simultaneously moving the College towards its goals. Continued efforts should be made to institutionalize and to use sustainability as a lens in which to plan for the College's future growth.