



The University of North Carolina at Chapel Hill

2018 Greenhouse Gas Inventory Report

Executive Summary

In 2007, the University of North Carolina at Chapel Hill (Carolina) became a signatory of the American College and University President’s Climate Commitment (ACUPCC), pledging to achieve carbon neutrality by 2050. As part of that commitment, the University conducts an annual greenhouse gas inventory to track its progress.

Historically, Carolina’s annual greenhouse gas inventories were completed using a customized spreadsheet. While this tool was designed to fit the University’s needs, it was not standardized with other universities, was difficult to share, and increased the risk of calculation errors. Carolina began using the Sustainability Indicator Management & Analysis Platform (SIMAP) tool created by the University of New Hampshire for the 2017 inventory. The tool is widely used by universities, enables data sharing, and makes the inventory more reliable.

In 2018, Carolina emitted 489,524 metric tons of carbon dioxide equivalents. This marks a 2% decrease from 2017, an 19% decrease from the University’s 2007 baseline, and the lowest annual emissions since signing the climate commitment. (Figure 1) shows Carolina’s greenhouse gas emissions since 2007, and (Figure 2) illustrates Carolina’s 2018 greenhouse gas emissions by category.

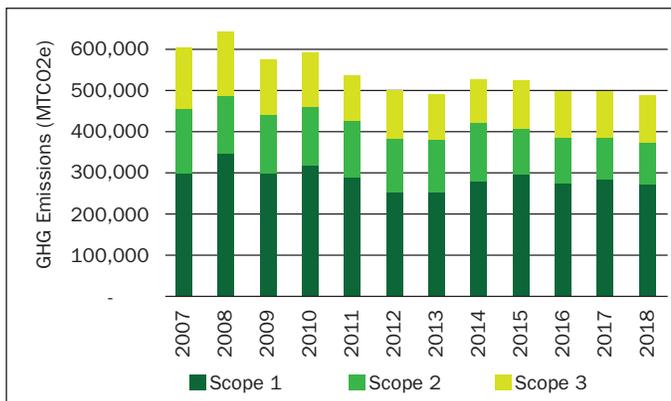


Figure 1. Carolina’s GHG Emissions since 2007

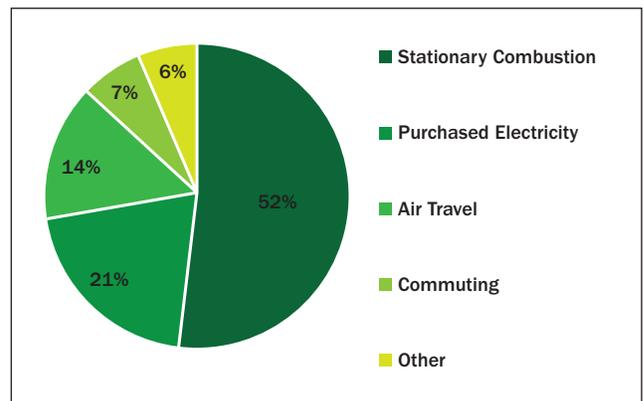


Figure 2. Carolina’s 2018 GHG Emissions by Category

Stationary Combustion

Stationary combustion accounts for the fuel burned on campus for heating or electricity generation purposes. Since 2007, Carolina has reduced stationary combustion emissions by 9%. This has been accomplished through steam system efficiency improvements, campus energy efficiency projects, and a 30% reduction in coal combustion.

Purchased Electricity

Despite a 26% increase in campus square footage since 2007, Carolina’s electricity use has remained unchanged. This is largely due to campus energy efficiency improvements. Paired with Duke Energy’s cleaner grid, this increase in efficiency has resulted in a 35% decrease in purchased electricity emissions.

Air Travel

In 2018, members of the University community flew over 117 million passenger miles for University business. Although the number of miles flown has increased by 10% since 2007, the associated GHG emissions have risen less than 1% due to improvements in airplane efficiency.

Food Emissions

Since 2014, Carolina has reduced food related emissions by 29%. While this decrease is partly due to a 10% reduction in food purchases, the largest reduction came from a 42% decrease in meat related emissions.

Introduction

In 2007, The University of North Carolina at Chapel Hill (Carolina) signed the American College and University President’s Climate Commitment (ACUPCC). In signing this, Carolina committed to carbon neutrality by 2050 and agreed to conduct annual greenhouse gas (GHG) inventories. These inventories are designed to help identify hot spots, design emission reduction strategies, and track progress. The University’s first inventory was performed for the 2007 calendar year with a result of 601,212 metric tons of carbon dioxide equivalents (MTCO₂e). Since then, Carolina has reduced its annual GHG emissions by over 100,000 MTCO₂e.

Results

In 2018, Carolina emitted 489,524 MTCO₂e. This represents a 2% decrease from 2017, an 19% decrease from the 2007 baseline, and the lowest recorded emissions since 2007. The full trend can be seen in (Figure 3). As can be seen in (Figure 4), stationary combustion, purchased electricity, and transportation (air travel and commuting) together account for 94% of GHG emissions. The remaining 6% is split between upstream energy losses, refrigerant use, food purchases, vehicle fleet fuel consumption, paper purchases, fertilizer use, and waste (in that order).

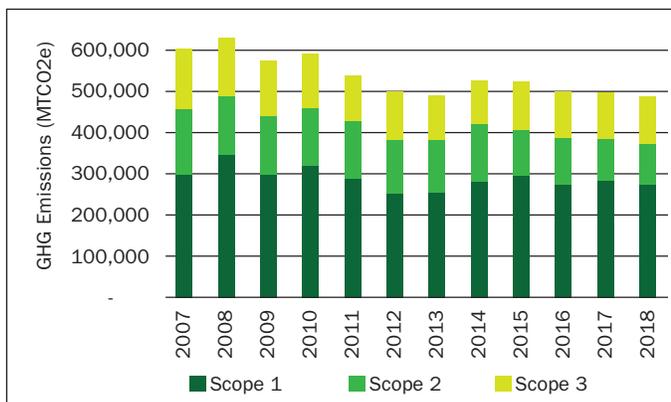


Figure 3. Carolina's GHG Emissions since 2007

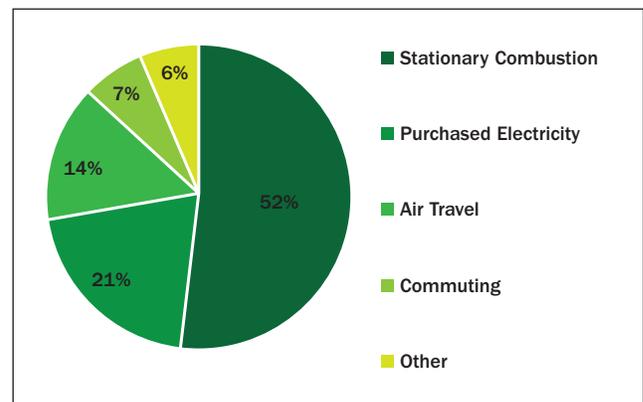


Figure 4. Carolina's 2018 GHG Emissions by Category

Stationary Combustion

At a glance: 254,284 MTCO₂e, 52% of emissions, 9% decrease since 2007

Carolina’s stationary combustion sources include the Cameron Cogeneration Facility, Manning Drive Steam Plant, individual building steam boilers, emergency generators, and miscellaneous campus natural gas and propane use. Because the primary mission of these assets is to provide steam and electricity to campus and the hospital, their emissions are tied closely to campus energy use (Figure 5). Outside of energy demand, the main drivers of emission changes are system efficiency and fuel type. The 9% decrease in emissions since 2007 is due to campus energy efficiency improvements, system efficiency upgrades, and a 30% decrease in coal combustion.

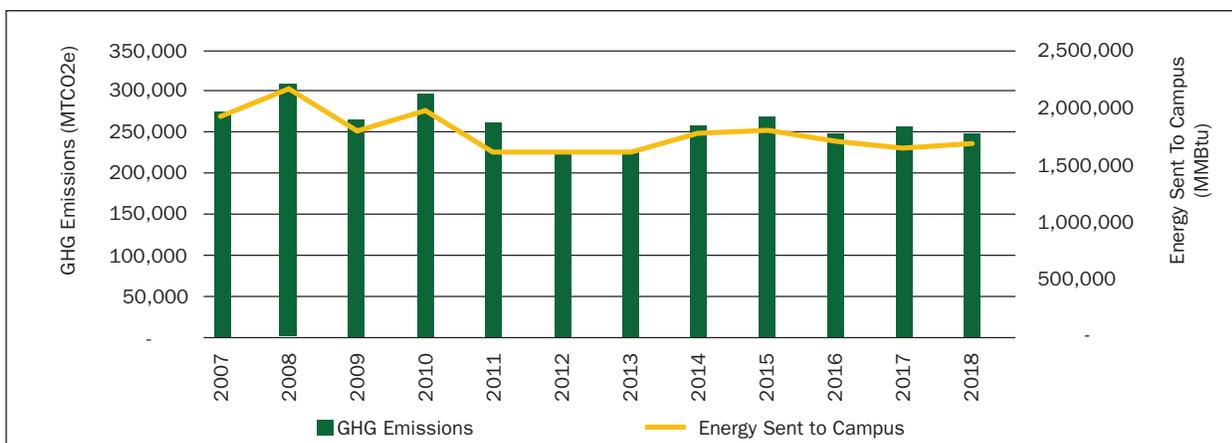


Figure 5. Cogeneration greenhouse gas emissions compared to the combined energy (steam and electricity) sent to campus

Purchased Electricity

At a glance: 101,675 MTCO₂e, 21% of emissions, 35% decrease since 2007

Purchased electricity is the University's second largest source of emissions. While it is a large contributor, purchased electricity also accounts for the largest reduction in GHG emissions since 2007 (Figure 6). This reduction is due to campus energy efficiency projects, increases in chilled water plant efficiency, on-site renewable energy additions, and Duke Energy's transition to cleaner electricity sources. Due to energy efficiency efforts, Carolina's electricity use has fallen by 0.2% since 2007 despite a 26% increase in campus gross square footage and an 8% increase in campus population. The other emission source associated with electricity use is the leaking of sulfur hexafluoride (SF₆) to the atmosphere. SF₆ is a gas used in large electric distribution equipment due to its stability and insulation abilities. Although SF₆ has many desirable traits, it has the highest global warming potential of all known greenhouse gases (~23,900 times higher than CO₂). The University's historic SF₆ purchases can be seen in (Figure 7). The variability in (Figure 7) is likely due to this data being based on purchases instead of use. Electric Distribution Systems accounts for roughly half of the annual SF₆ purchases on campus.

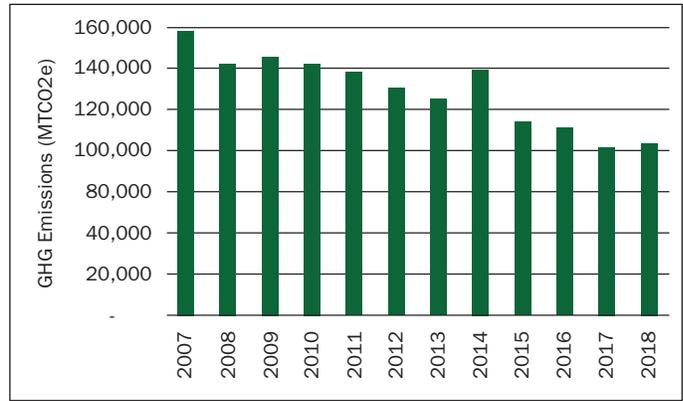


Figure 6. Carolina's Purchased Electricity Emissions Since 2007

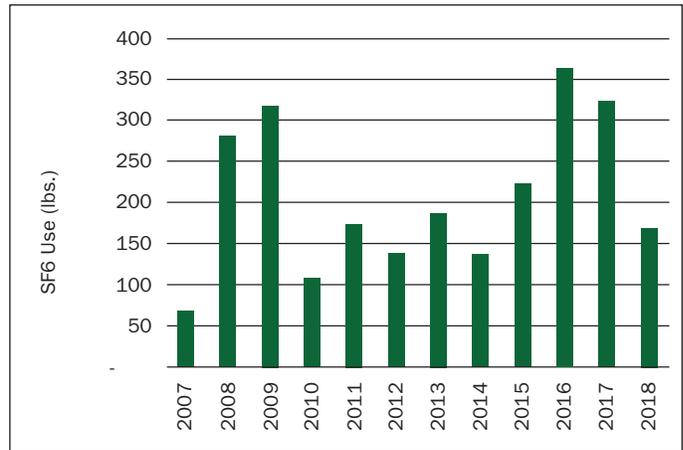


Figure 7. Carolina's SF₆ purchases since 2007

Transportation

Air Travel

At a glance: 70,555 MTCO₂e, 14% of emissions, less than 1% increase since 2007

In 2018, members of the Carolina community flew over 117 million passenger miles for University functions. This is a 10% increase since 2007. Of these miles, 87% were directly financed, 13% were from study abroad travel, and <0.1% were due to Area Health Education Centers (AHEC) flights. While the number of miles traveled has increased by 10%, emissions have by less than 1%. This is largely due to more efficient airplanes. The trends in emissions can be seen in Figure 8 below.

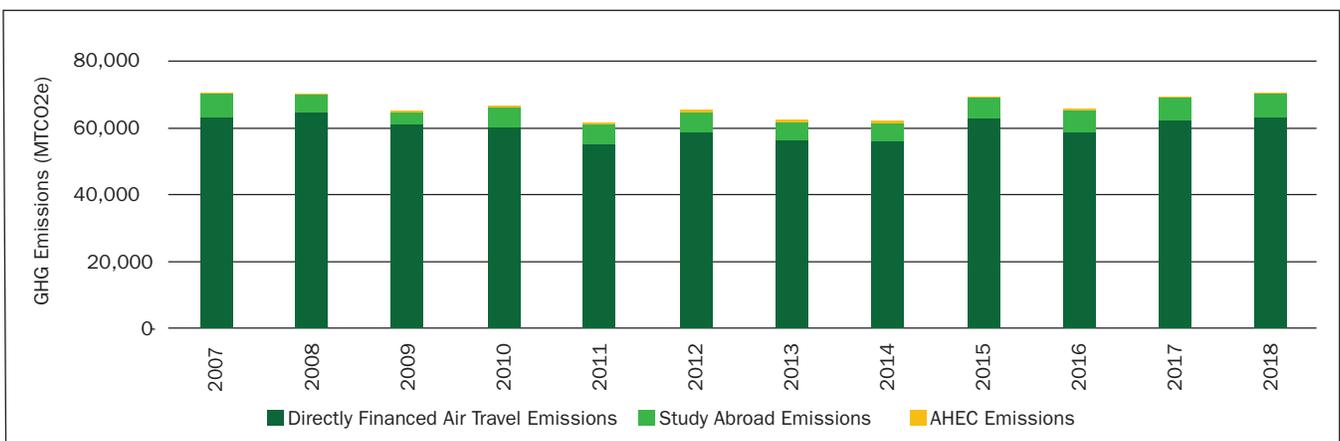


Figure 8. Carolina's Air Travel GHG Emissions Since 2007

University-Financed Ground Travel

In 2018, University employees drove personal vehicles 10.7 million miles for University functions. This travel was responsible for 4,024 MTCO₂e. This represents a 171% increase from 2007.

Commuting

At a glance: 32,701 MTCO₂e, 7% of emissions, 4% decrease since 2007

Commuting emissions depend on the number of commuters, the commuting methods used, and the distance traveled. Despite an 8% increase in the total campus population since 2007 and an increasing number of commuters driving to campus, Carolina's commuting emissions have fallen by 4%. This is mostly due to commuters living closer to campus. On average, employees and students are living 19% and 24% closer to campus, respectively, than they did in 2007. Because Carolina claims a percentage of Chapel Hill Transit's emissions, regardless of University ridership, Carolina's associated emissions have remained relatively constant.

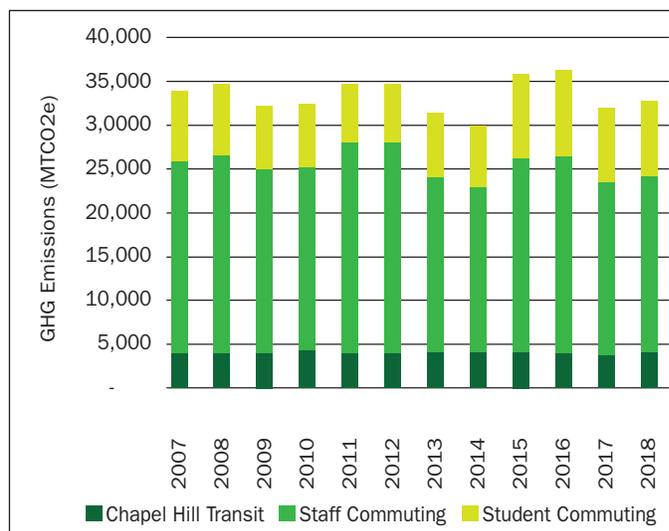


Figure 9. Carolina's Commuting Emissions Since 2007

Food

At a glance: 4,571 MTCO₂e, 1% of emissions

Accurate food purchasing data before 2014 could not be accessed. Due to this, Carolina's food emissions trend cannot be shown back to the 2007 baseline. Since 2014, Carolina's food emissions have fallen by 29%. This decrease is partially due to a 10% reduction in overall food purchases but also largely due to a decrease in meat purchases (Figure 10). Between 2014 and 2018, meat related GHG emissions fell by 42%. Because animal products have significantly higher related GHG emissions than plant-based foods, reductions in meat and dairy consumption can drive significant emission reductions. Even with recent reductions in meat and dairy consumption, animal product purchases still account for 78% of Carolina's food related emissions.

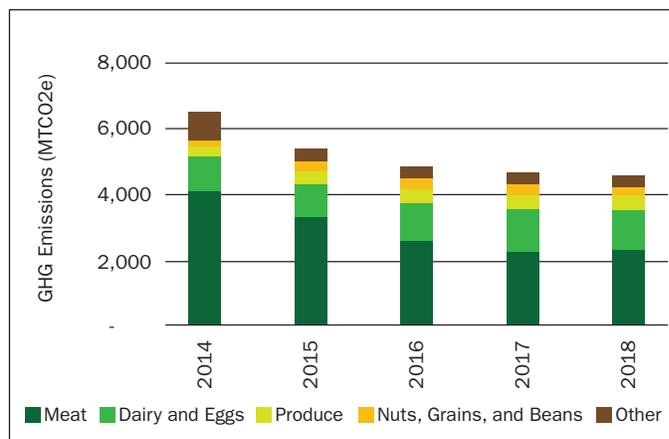


Figure 10. Carolina's Food-Related Emissions Since 2014

Other

Other emission sources not mentioned include upstream energy losses (2.3%), refrigerant and gas use (1.7%), vehicle fleet fuel use (0.4%), paper purchases (0.1%), fertilizer use (<0.1%), and waste/wastewater (<0.1%). Upstream energy losses include energy losses from the transmission and distribution of electricity and the drilling and transportation of natural gas. Refrigerant and gas emissions occur when refrigerants or other gases used by the University leak into the atmosphere. Refrigerants are used in equipment such as chillers, vehicles, and HVAC units. Gases are used for laboratory research and as electric insulators.

Conclusion

The University of North Carolina at Chapel Hill's 2018 greenhouse gas emissions are the lowest recorded since the signing of the ACUPCC. Since the 2007 baseline year, Carolina has reduced annual emissions by 111,688 MTCO_{2e} (19%) despite a 26% increase in campus square footage and an 8% increase in campus population. The reduction in emissions is primarily due to decreased stationary combustion and purchased electricity emissions. Of the total GHG reduction since 2007, stationary combustion accounted for 25% and electricity purchases accounted for 52%. The only emission sources that increased were air travel and upstream natural gas emissions.

Methodology

System Boundary

Carolina uses an “operational control” approach to set a system boundary. This means emissions from entities under the authority of the University are claimed. The most notable exclusion is the UNC Hospitals. Although the University and UNC Hospitals share space and infrastructure, they are funded and operated separately. Carolina, however, claims all emissions from steam production despite UNC Hospitals' steam use.

Emission Sources

For greenhouse gas inventories, emission sources are separated into three scopes. Scope 1 emissions are any emissions for which the party is directly responsible. The University's Scope 1 emissions consist of stationary combustion, vehicle fleet, refrigerant use and fertilizer use. Scope 2 emissions are any emissions from utilities such as electricity or chilled water purchased by the party. Carolina's Scope 2 emissions consist solely of electricity purchases. Lastly, Scope 3 emissions include all other emissions. These are typically referred to as supply chain emissions and include emissions from upstream sources. The University's Scope 3 emissions consist of commuting, air travel, food purchasing, paper purchasing, waste, wastewater and energy losses.

Data Collection

To complete this inventory and the previous restatements, data was collected from 19 different University departments. To find a complete list of data sources and contributors, see Acknowledgments.

Calculation Tool

Historically, Carolina's GHG inventory calculations were completed using a customized spreadsheet based on World Resources Institute's GHG Protocol. While the spreadsheet precisely fit the University's needs, it was not standardized with other universities, enabled calculation errors, and was difficult to share. For the 2017 inventory, Carolina switched to the Sustainability Indicator Management and Analysis Platform (SIMAP) tool created by the University of New Hampshire. This tool is widely used, makes the inventory more reliable, and easily enables data sharing.

Restatements

In addition to changing the tools used to calculate GHG emissions, the University increased the number of emission sources included in the 2017 inventory. Due to this, all past inventories were restated. These restatements ensure consistency in the inventories and allow accurate year-over-year comparisons.

Verification

After the inventory and restatements were complete, the new methods, data and results were presented to several key stakeholders for internal validation and approval.

Acknowledgements

This inventory and the past restatements would not have been possible without the assistance of several departments. Data was gathered from Energy Services, Environmental Health and Safety, Facilities Services, Athletics, Transportation and Parking, Travel Services, Study Abroad, Accounting Services, Logistics, Office of Waste Reduction and Recycling, Carolina Dining Services, Staples, and AirGas. Internal review and data vetting were provided by Energy Services. Cover photo Copyright © 2019 The University of North Carolina at Chapel Hill.



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