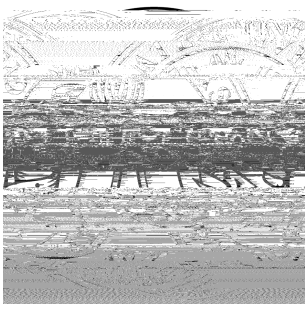

Colgate University's 2013 Greenhouse Gas Inventory

A step-by-step guide to completing a greenhouse gas inventory at Colgate University

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INTRODUCTION

The ACUPCC and Colgate's Commitment to Climate Neutrality

The American College and University Presidents' Climate Commitment (ACUPCC)[1] was officially announced in October 2006 during the AASHE[2] conference at Arizona State University. Signatories make a commitment to "*achieve climate neutrality as soon as possible"* by eliminating or offsetting 100 percent of the institution's greenhouse gas emissions. One mandatory component of the ACUPCC is to complete a greenhouse gas emissions inventory as specified in the pledge[3] under step 1, part b:

> *"Within one year of signing this document, complete a comprehensive inventory of all greenhouse gas emissions (including emissions from electricity, heating, commuting, and air travel) and update the inventory every other year thereafter."*

just society." To meet these ends, Colgate offers over 40 courses per semester related to or focused on sustainability and climate change.

On September 15, 2011, the Sustainability Office published Colgate's Sustainability and Climate Action Plan[5]. The plan details a set of specific, measurable, and tangible goals to achieve climate neutrality by Colgate's bicentennial celebration in 2019–an ambitious target date. Colgate's updated greenhouse gas inventories (including this one) will track our progress towards that goal.

As a result of our climate action planning efforts, Colgate was honored with Second Nature's 2011 Climate Leadership Award[6]. With our wood-fired boiler, low-carbon electricity grid, sustainability-focused academic programming, and a campus culture that promotes sustainability, Colgate is well-positioned to continue as a leader in sustainability in the 21st century.

[5] Accessed online at: https://sites.google.com/a/colgate.edu/2011-2015-sustainability-and-climate-action-plan/

[6]

vehicles nor in their commuting behaviors. The three scopes of greenhouse gas emissions recorded in Colgate's Inventory are as follows:

- Scope 1 Emissions. Scope 1 refers to direct GHG emissions occurring from sources that are owned or controlled by the institution. At Colgate, this includes on-campus stationary combustion of fossil fuels (such as fuel oil #6, fuel oil #2, kerosene, and propane), vehicle fleet emissions, fugitive refrigerant chemicals, and emissions associated with grounds maintenance.
- Scope 2 Emissions. Scope 2 refers to indirect emissions generated in the production of electricity consumed by the institution. To calculate these emissions, we have to determine how our electricity is produced (e.g., hydroelectric, coal, wind, etc.) and calculate the rate of greenhouse gas emissions associated with each source.
- Scope 3 Emissions.

Emissions Factors used to quantify Colgate's 2013 greenhouse gas emissions [10]

DATA COLLECTION

Data collection is the most time consuming part of Colgate's Greenhouse Gas Inventory. Going forward, we recommend that the data collection process commences in August of each year, giving employees the necessary time to finish their end of the fiscal year reporting before the students return for the new academic year.

The annual data collection process has started to become routine, and therefore, much easier if we are consistent in the timing and type of data we request when reaching out to individuals at Colgate. Nevertheless, because of busy schedules and data that are not easily available, Colgate staff members will need time to meet your request. Allow a few weeks for employees to get you the data you are requesting and anticipate that you may have to make multiple requests for the same data.

Once the appropriate data is collected, it should be entered into the *"Colgate Carbon Inventory Workbook"* created by Sustainability Office Intern, Andrew Pettit '11. The Workbook contains data entry fields and performs most of the necessary calculations through the built-in formulas. The Workbook can be obtained through the Administrative Fileshare or by contacting Colgate's Director of Sustainability (John Pumilio).

Overall, we recommend that Colgate's annual greenhouse gas inventory is completed by the target date of of each year. This allows enough time for the report to circulate internally before publishing online to the ACUPCC Reporting System[11] by our annual deadline of January 15.

Tracking institutional data is useful because it establishes a frame of historical reference and facilitates the comparison of Colgate's level of emissions in relation to other colleges and universities. Furtherm ore, significant changes in budget allocations, population, or square-footage of the built environment can have a great influence over the university's activities and energy consumption, and therefore, greenhouse gas emissions. Table 3 provides an overview of Colgate's institutional data for Fiscal Years 2009-2013.

Colgate's institutional data for fiscal Years 2009 through 2013.

Fiscal Year	Budget (dollars)			Population			Physical Size (square-feet)
	Operating Budget	Research Budget	Energy Budget	Full-Time Students	Faculty	Staff	Total Building Space
2009	$147,320,539	$614,403	$4,712,740	2,784	28/Cs1 cs		
2010							
2011							
2012							
2013							

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Data Requested: The operation, research, and energy budgets for FY 2013.
Key Contact(s): Budget Reporting Analyst (Roy Langworthy) or Associate Vice President for Budget and Financial Aid (John Collins)

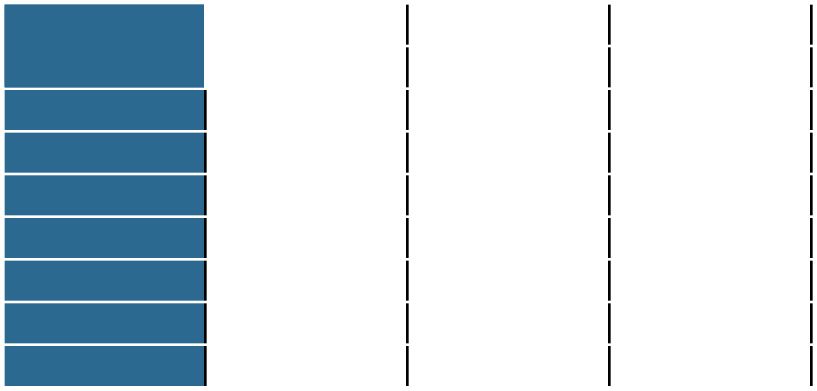
Data Requested: The number of full-time students, faculty members, and staff members for FY 2013.
Key Contact(s): Director of Institutional Planning and Research for student enrollment (Brendt Simpson) and Human Resources for faculty/staff employment (Jill Dinski)

Data Requested: The university's total building space in square-feet for FY 2013.
Key Contact(s): Associate Vice President for Budget and Financial Aid (John Collins)

Tracking energy and water costs is valuable because it establishes a frame of historical reference and allows us to perform useful climate action planning analyses. Moreover, relatively small changes in our energy and water costs per unit can have big impacts on our operating budget. For these reasons, it is necessary to track energy and water costs as part of our inventory data collection process (Table 4).

Colgate's energy and water cost per unit, FY 2009 through FY 2013

Colgate's emissions associated with wood chip combustion, FY 2007 through FY 2013.



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Data Requested: Gallons of gasoline consumed in FY 2013.

Key Contact(s): Campus Safety Administrative Assistant (Sue Marks) tracks Campus Safety gasoline use throughout the year and can provide total gasoline consumption.

Colgate University has an on-campus chiller for space cooling, water fountains, and refrigerators across campus that use HFC-134a refrigerant. Additionally, Starr Hockey Rink and the Dana Arts Center use HCFC-22. These refrigerant hydrocarbons meet all the required standards specified by the U.S. EPA in order to reduce the rate of ozone depletion. Unfortunately, hydrocarbons are powerful greenhouse gases. HFC-134a, for example, has a global warming potential of 1,430 (meaning that it is 1,430 times more potent as a greenhouse gas than carbon dioxide). Therefore, it is important to calculate the amount of refrigerant chemicals Colgate uses on an annual basis. In 2011, refrigerants accounted for more than 592 tons of GHG emissions, but that number has fallen dramatically in recent years. (Table 8).

Greenhouse gas emissions from HFC-134a and HCFC-22 refrigerant chemical use, FY 2011-2013.

	HFC-134a Refrigerant Loss	Emission Factor	GHG Emissions	HCFC-22 Refrigerant Loss	Emission Factor	GHG Emissions	Total GHG Emissions
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Calculations: The Clean Air-Cool Planet Campus Carbon Calculator has a feature that can help you determine the emissions factor for your local electricity mix. Simply enter the percentages of your electricity sources into the custom fuel mix section of the calculator.

Greenhouse gas emissions from purchased electricity, FY 2008 through FY 2013.

	Total	Emissions Factor	GHG Emissions
	(kWh)	(MTeCO2/kWh)	(MTeCO2)
	30,783,478	5.97E-05	1,838
	31,571,030	5.97E-05	1,885
	30,264,128	5.97E-05	1,807
	30,883,211	5.97E-05	1,844
	30,390,822	5.97E-05	1,814
	30,252,750	5.97E-05	1,806

Scope 3 Emissions

Scope 3 emissions are all other indirect emissions attributed to our institution – those that are a consequence of the activities of the institution, but occur from sources not owned or controlled by the institution. Colgate's Scope 3 emissions include faculty and staff commuting, bus commuting, employee business ground travel, air travel paid by or through the university, solid waste, and paper use. As explained earlier in this report, student commuting is considered de minimus emissions and not included in Colgate's greenhouse gas inventory.

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Most Colgate faculty and staff commute to work by driving. In order to calculate the emissions associated with this behavior, we need to determine the amount of gasoline consumed by each employee over the course of the year for commuting. We estimate this by conducting an annual survey (established in FY 2010) using Qualtrics and distributing to the campus community over email (Appendix A). For incentive to complete the survey, we offer prizes (e.g., movie tickets, bookstore gift card, tickets to an athletic game) for a few randomly selected individuals. The survey needs to capture how many days per week and weeks per year each individual drives to campus, the distance traveled, and the average miles per gallon of their vehicle.

2013 Annual Commuter Survey

Data Needed: Gallons of gasoline consumed through faculty and staff commuting in FY 2013.

Key Contact(s): Environmental Studies and Sustainability Program Assistant (Steve Dickinson) created the survey and administered the analysis. Administrative Coordinator, Dean of Faculty (Penny Mintel) emails the survey to the campus

Comments: The Annual Commuter Survey should be distributed to the campus community via email in late September or early October to maintain consistency between years.

Greenhouse gas emissions from faculty and staff commuting, FY 2010 to FY 2013.

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	Total Gasoline (gallons)	Emission Factor (MTeCO2/gallon)	GHG Emissions (MTeCO2)
	157,740	0.008924124	1,408
	153,057	0.008928806	1,367
	154,872	0.009097265	1,409
	145,866	0.008648022	1,261

Colgate University contracts through Birnie Bus Services, Inc. to provide free transportation service around campus and to select locations in the downtown area called the Colgate Cruiser. Birnie Bus also provides service to Colgate's athletic teams for competition away from home.

Bus Commuting (Colgate Cruiser)

Data Requested: Gallons of diesel consumed for each of the buses that make up the Colgate Cruiser bus service in FY 2013.

Key Contact(s): The Birnie Bus terminal in Hamilton, NY (315-824-1260) provides the Cruiser data upon request. Although data was not obtained until visiting the bus terminal and asking for the data in person.

Athletics Travel

Data Requested: Gallons of diesel consumed in FY 2013 for bus service for varsity athletic travel.

Key Contact(s): Administrative Assistant, Athletics (Lori Godshalk).

Data Received: Gallons of diesel consumed for FY 2013 for bus service for varsity athletic travel.

Comments: Sport club outings use the “T” vans that are owned by Colgate, and therefore, included within the ‘Colgate Vehicle Fleet’ data as Scope 1 emissions.

Greenhouse gas emissions from outsourced bus travel, FY 2009 through FY 2013.

	Cruiser	Diesel Emissions Factor	GHG Emissions	Athletics Travel	Diesel Emissions Factor	GHG Emissions	

Air travel plays a vital role in many university functions, a role that is arguably exacerbated by Colgate's rural location and

a potent greenhouse gas (methane) as it decomposes. However, different landfills have different techniques for how they handle methane emissions and these different techniques result in very different levels of greenhouse gas emissions. Therefore, it is necessary to know how the Madison County Landfill handles its methane emissions in order to determine

Colgate's greenhouse gas emissions associated with paper consumption, FY 2010 through FY 2013.

Data Requested: The total amount of paper purchased in pounds through departmental purchasing by recycled content for FY 2013.

Key Contact(s): Director of Purchasing

Comments: The Office of Sustainability and Purchasing department eliminated the option to purchase non-recycled paper in FY 2013.

Calculations: To convert pounds of paper to sheets divide pounds by 5.05 (average weight of one package) and multiple by 500 (sheets per package).

Colgate departmental purchasing (sheets of paper consumed), FY 2009 through FY 2013.

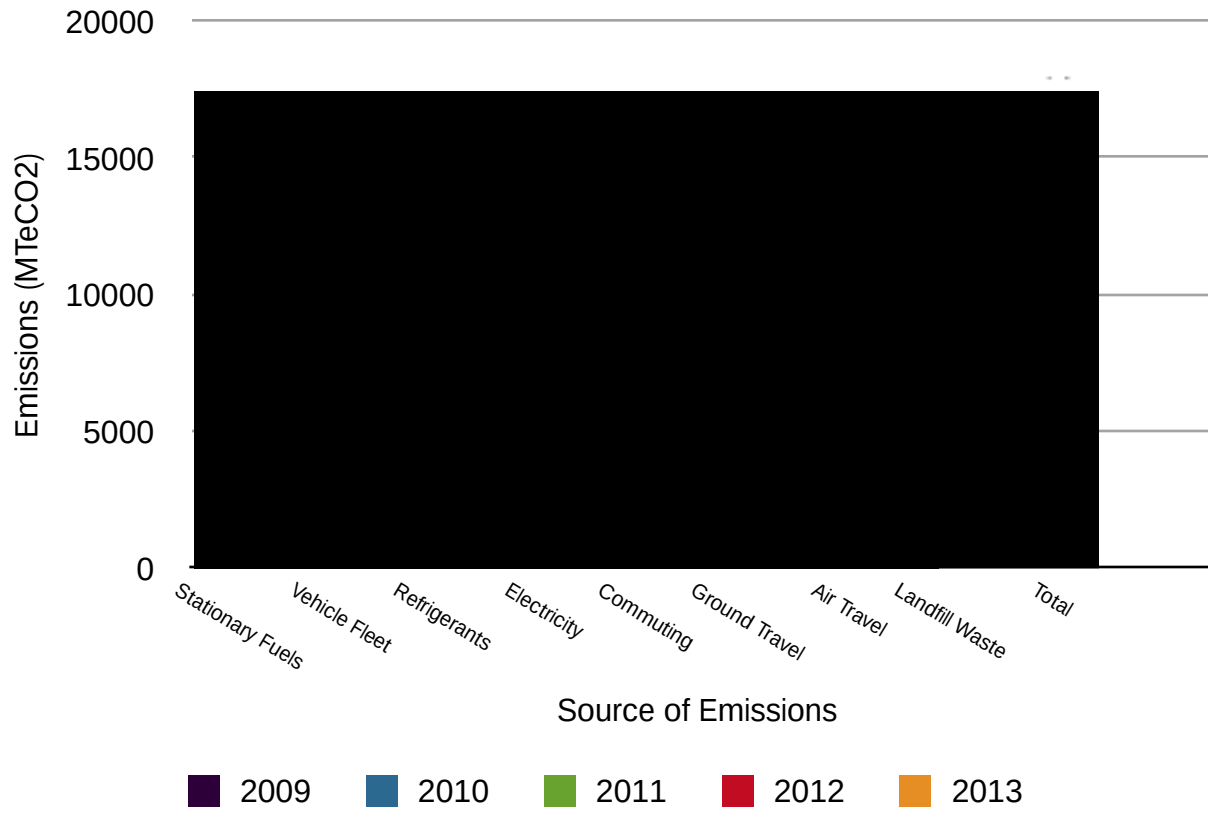
	Tree-free	0% recycled	30% recycled	50% recycled	100% recycled	TOTAL	Full-time equivalent students	TOTAL

COLGATE'S GROSS GREENHOUSE GAS EMISSIONS

Colgate's greenhouse gas footprint was 17,353 MTeCO2 (6.23 tons / FTE[15]) in 2009, 14,505 MTeCO2 (5.24 tons / FTE) in 2010, 16,194 MTeCO2 (5.63 tons / FTE) in 2011, 13,817 MTeCO2 (4.71 tons/FTE) in 2012, and 13,841 MTeCO2 (4.73 tons/FTE) (Table 19). This includes all Scope 1 emissions (on-site stationary combustion of fossil fuels, vehicle fleet emissions, fugitive refrigerant chemicals, and emissions associated with grounds maintenance) and Scope 2 emissions (purchased electricity). Colgate calculated sources of Scope 3 emissions consistent with the ACUPCC guidelines. Scope 3 emissions include faculty and staff commuting, bus travel, employee business ground travel, air travel paid for by or through the university, landfill waste, and paper consumption.

For each of the four years we have completed Colgate's greenhouse gas footprint, the stationary combustion of fossil fuels for space heating and domestic hot water remains the largest single source of emissions (Figure 3). Colgate consumes fuel oil #6, as the existing wood boiler does not have enough capacity to provide heat to all buildings connected on the steam line during the winter months. Colgate also burns fuel oil #2 in buildings not connected to the steam line. Air travel emissions are a close second. Combined, stationary combustion of fossil fuels on campus and air travel comprise nearly two-thirds of Colgate's total greenhouse gas emissions (Figure 4). The drop in landfill waste emissions since 2009 can be attributed to both a reduction in overall landfill waste due to better recycling and composting and a switch to a methane capture and electricity generation at the Madison County Landfill. This switch significantly reduced the rate of emissions associated with Colgate's landfill waste production.

Total emissions by source, FY 2009 through FY 2013.



CARBON OFFSETS AND NET GREENHOUSE GAS EMISSIONS

Thus far we have examined Colgate's activities that add greenhouse gases into the atmosphere. However, we also need

CONCLUSION

The 2013 Comprehensive Greenhouse Gas Inventory for Colgate University calculated Colgate's greenhouse gas emissions for FY 2013 in relation to our FY 2009 baseline. Since 2009, the university has reduced its gross emissions by 20 percent (from 17,353 MTeCO2 in FY 2009 to 13,841 MTeCO2 in FY 2013) and reduced our emissions per student (FTE) by 25 percent (from 6.23 MTeCO2/FTE in FY 2009 to 4.73 MTeCO2/FTE in FY 2013). This is all despite the fact that we have added an additional 150 students, 13 faculty members, and 9,543 square feet of building space. Not to mention a cooler winter in FY 2013 (compared to FY 2012) that resulted in a rise in the amount of stationary combustion of fossil fuels. The stationary combustion of fossil fuels (fuel oil #6, fuel oil #2, propane, and kerosene) and air travel

Appendix A: Faculty and Sta Commuting Survey

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Employee commuting is responsible for roughly 10% of Colgate's emissions. This annual survey is designed to provide a