ABSTRACT

Colgate University's
2008-09 Comprehensive Greenhouse Gas Inventory

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This report provides the methods and results of Col

ACKNOWLEDGEMENTS

The following individuals made significant contributions to this report. Without their assistance, the acquisition of inventory data and the final production of this report would not have been possible.

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Peter Babich, Associate Director of Facilities and Manager of Engineering Services

Brian Belden, Physical Plant, Foreperson, Millwright Shop

Birnie Bus Co., Hamilton

Jill Burdick, Human Resources Associate

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Brendt Simpson, Director of Institutional Research

Robert Turner, Professor of Economics & Environmental Studies, Director of Social Sciences

The Village of Hamilton

Terry Wilcox, Local Farmer

Emission Coefficients

Emission coefficients for this report were taken directly from the Clean Air-Cool Planet Campus Carbon Calculator. The coefficients are used to provide an equivalent amount of carbon dioxide emissions for each of Colgate's activities. While some activities produce methane, nitrous oxide, or other greenhouse gases, international protocol designates CO2 as the standard by which other gases are measured for specific reasons: 1) in order to provide a standard unit of measurement across the board and 2) because carbon dioxide is the most abundant anthropogenic greenhouse gas. The equivalents listed below are used to convert emissions into the equivalent measure of metric tons of carbon dioxide (represented as eCO2). For example, cows emit a certain amount of methane and so the equivalent amount of carbon dioxide is calculated using the appropriate emissions coefficients.

Table 1.The emission coefficients used for the calculation of eCO2 in this report.

SCOPE 1 EMISSIONS:

These are direct emissions from sources that are owned and/or controlled by our institution. This includes combustion of fossil fuels in college-owned facilities or vehicles, fugitive emissions from refrigeration, and emissions from on-campus agriculture or livestock husbandry. Our institution has direct control over these emissions, and they are no-one else's responsibility.[1]

Fuel Usage

Data on fuel use was accessed directly via the ittfas database on the Colgate fileshare. John Pumilio (Sustainability Coordinator), Amy Davidson

Using wood chips instead of other sources of heat such as fossil fuels has other advantages for Colgate. One advantage is that wood chips are locally abundant and when we purchase them the money spent helps our local economy. Another reason is that wood chips are cheaper than fuel oil on a per BTU basis. In 2008-09, using wood chips instead of fuel oil #6 saved Colgate $1.2 million in energy costs.

University Vehicle Fleet

Colgate's vehicle fleet includes all of the vehicles owned by the University and not rented or leased from other companies. Leased vehicles are accounted for under "Outsourced Travel." As the number of gallons of gasoline consumed was available, the mileage was used in conjunction with average miles-per-gallon ratings of the vehicles in order to obtain an estimate of the gallons of gasoline used. This value was then converted to eCO2 using the emissions coefficient for gasoline (Table 6). Initial mileage data for this section of the report were provided by Amy Davidson, Facilities Office Manager.

Table 6: Gasoline Fleet Average MPG, Mileage, Fuel Consumption, and MTeCO2

*exact mileage was unavailable, therefore, total mileage was divided by the year that they were purchased to get an annual average.

**Average MPG ratings were found by averaging the EPA estimated MPG for the vehicles within each fleet. However, the ratio of city to highway driving is obviously not recorded and so the values used were mean of the city and highway mpg ratings.

The B&G gasoline vehicles were responsible for 97 MTeCO2 and the student-leased vans were responsible for 84 MTeCO2. The Campus Safety fleet contributed another 19 MTeCO2. In total, vehicle fleet emissions are a fairly significant proportion of Scope 1 emissions (Figure 4) that could be reduced by researching and implementing mitigation strategies (i.e. replacing retired vehicles with electric or hybrid models).

The total greenhouse gas emissions for Colgate's single vehicle fleet is 194 MTeCO2

Diesel Fleet

Colgate consumed 19,770 gallons of diesel fuel in 2008-09 emitting 199 MTeCO2. A complete list of diesel vehicles and generators can

Refrigerants and Chemicals

Data on Colgate's use of chemical refrigerants was provided by Brian Belden, Physical Plant,

SCOPE 2 EMISSIONS:

Scope 2 emissions include indirect emissions from sources that are neither owned nor operated by our institution but whose products are directly linked to on-campus energy consumption. This includes purchased energy: electricity, steam, and chilled water. Although our institution is not directly responsible for these emissions, it is strongly implicated. These emissions come from fossil fuel energy sources that release greenhouse gas emissions when used. Example: Although our institution did not burn coal to make on-campus electricity, someone had to, and although the electricity producer emitted the gasses, they sold the energy to Colgate for our consumption.[2]

Purchased Electricity

84 percent of Colgate's electricity comes directly from large-scale hydroelectric power mainly from Niagara Falls. The remaining 16 percent is purchased from the grid and comes from a mix of sources including nuclear, wind, coal, and other fossil fuels.

Using the Clean Air-Cool Planet Campus Carbon Calculator, we entered Colgate's mix of electricity to get an emissions coefficient of 5.96931E-5 MTeCO2 per kWh. This is based on the known 84 percent hydroelectric power that we receive and an estimate produced by our regional grid for the remaining 16 percent.

Our emissions coefficient of 5.96931E-5 MTeCO2 per kWh is relatively low in comparison to the Upstate New York average of 3.73082E-4 MTeCO2 per kWh.

Electricity consumption data is recorded by Don Partigianoni, Accounting and Control. The fuel mix was obtained from the Village of Hamilton.

In Fiscal Year 2008-09, Colgate used 31,571,030 kWh of electricity. This resulted in the emission of 1,885 MTeCO2 for FY 2008-09.

SCOPE 3 EMISSIONS:

Other emissions attributed to our institution, and deemed "optional" emissions by corporate inventories. This includes emissions from sources that are neither owned nor operated by our institution but are either directly financed (i.e. commercial air travel paid for by the institution) or are otherwise linked to the campus via influence or encouragement (i.e. regular faculty, staff, and student commuting).[3]

Faculty/Staff Commuting

The inventory for faculty and staff commuting is an approximation based on commute distances derived from the home addresses of employees. Estimating faculty and staff commuting habits was a several step process.

Step 1: A list of all the addresses for Colgate's 968 faculty and staff was obtained from Jill Burdick, Human Resources Assistant

Step 2: Distances from all of the town centers within 100 miles of Colgate were calculated and multiplied by the number of faculty and staff living in each town. It was assumed that

[2] Clean Air Cool Planet User's Guide
[3] Clean Air Cool Planet User's Guide

those living more than 100 miles from campus were not commuting daily. (The vast majority of cases were within 50 miles of Colgate, and there were very few addresses between 50 and 100 miles.)

FY 2007-08
Number of trips = 185
Total miles traveled = 94,446

FY 2008-09
Number of trips = 183
Total miles traveled = 91,674
Approximate Gallons of Gas (mileage divided by estimate of 5 MPG) = 18,335
Emissions = 23 MTeCO2*

*The emissions coefficient used by the CA-CP calculator in this report is .000254 MTeCO2 / mile. As miles were the data provided by the athletics department and the conversion to gallons is based on an estimated MPG value, it was decided that the more accurate method of calculation would use miles rather than gallons. The calculator's emissions coefficient for miles also takes in to account the methane and nitrogen emissions associated with bus travel.

Table 9. Cruiser mileage, fuel usage, and MPG for FY 2008-09

BUS #	MILES	FUEL (gal)	MPG
2800	8,731	1,838	4.8
485	9,870	1,541	6.4
461	9,518	2,093	4.6
486	4,695	994	4.7
453	4,335	764	5.8
TOTAL	37,149	7,230	

Gallons were used as opposed to miles to calculate cruiser mileage. This was done because data on the gallons of fuel used for each bus was provided by Birnie Bus, Hamilton. Using the emissions coefficient for gallons of diesel, total MTeCO2 for Cruiser travel in FY 2008-09 was 73 MTeCO2.

Business-related Air Travel
Faculty and staff air travel was calculated based on a list of flight purchases provided by Michelle Atkinson, Accounting Assistant, Accounting and Control. Contact John Pumilio (Sustainability Coordinator) for the raw data showing the airline and cost for each flight for FY 2008-09. The data includes all flights paid for using Colgate issued JP Morgan Cards (this includes all flights booked through our two travel agents: AAA and BTI). According to this data set, total money spent on faculty and staff air travel was $983,423.23.

While this method of accounting captures the vast majority of Colgate business travel, we realize that there are instances of missed flights. Examples of missed accounting include but are not limited to:

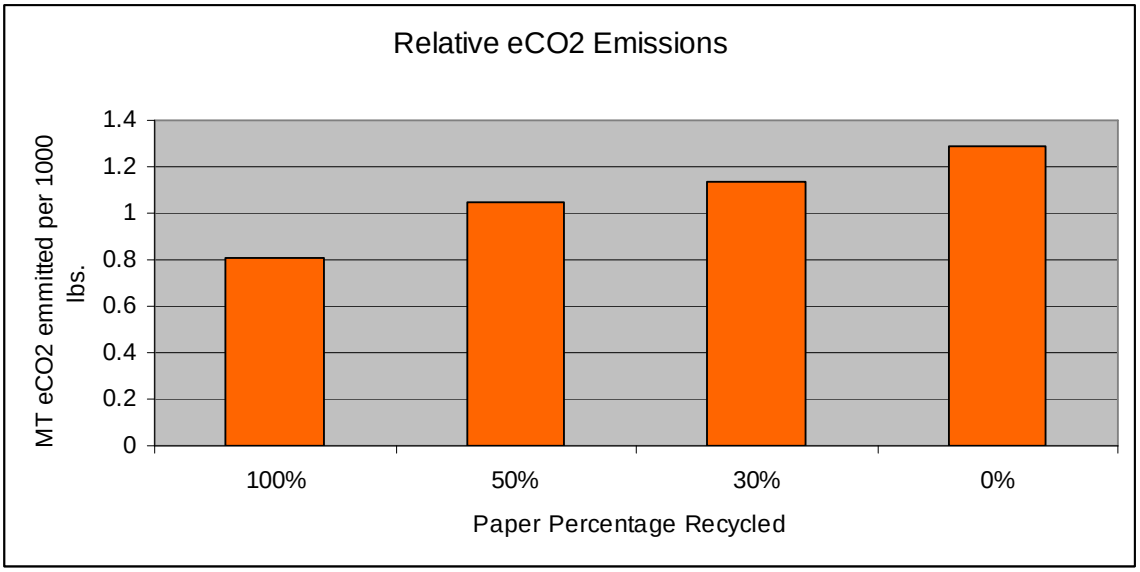
- faculty and staff who use personal credit cards to purchase a flight then were reimbursed;
- faculty and staff who purchased a flight using Expedia, Travelocity, Hotwire, etc. using PayPal or a personal debit card then were reimburse

.

Solid Waste

Data on Colgate's landfill waste was provided by Sharon Driscoll at the Madison County Landfill. Currently, Colgate's landfill waste goes to a landfill that does not capture methane but flares and vents it instead. However, Madison County Landfill has recently built a methane capture and recovery system that will allow for excess methane to be generated in to electricity. Once this generator is connected to the main grid, Colgate's own carbon footprint will be reduced. The data on our landfill waste for the past 4 years is below. Though methane is in fact the greenhouse gas being emitted, most calculators use the standard unit of measurement of MTeCO2 and so in the case of landfill waste, methane emissions are

Figure 1. Relative emissions for the production of 1000 lbs. of paper for four different recycled material percentages. These are the types of paper purchased by Colgate in the 2008-09 fiscal year. This graph demonstrates how Colgate's eCO2 emissions would decrease if we used higher content recycled paper in lieu of non-recycled paper.



Agriculture Sources

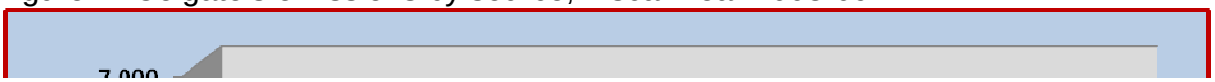
OVERVIEW OF CUMULATIVE EMISSIONS: ALL SCOPES

Colgate's gross carbon footprint for all three scopes was calculated to be 17,380 MTeCO2. This is broken down below into emissions by source and by scope (Table 13).

Table 13.Colgate's total greenhouse gas emissions by source and scope.

FISCAL YEAR 2008-09	
SOURCE OF EMISSIONS	EMISSIONS (MTeCO2)
SCOPE 1	
Fuel Oil #6	4,368
Fuel Oil #2	1,864
Vehicle Fleet	393
Refrigerant (HCFC-22)	1,247
Fertilizer	46
SCOPE 1 TOTAL	7,918
SCOPE 2	
Purchased Electricity	1,885
SCOPE 2 TOTAL	1,885
SCOPE 3	
Faculty/Staff Commuting	1,626
Cruisers/Bus Travel	96
Air Travel	4,647
Solid Waste	1,012
Paper Consumption	139
Animal Agriculture (Cows)	57
SCOPE 3 TOTAL	7,577
FISCAL YEAR 2008-09 EMISSIONS	17,380

Figure 2. Colgate's emissions by source, Fiscal Year 2008-09.



When we separate Colgate’s emissions by source, we can better assess which Scope 1 (direct emissions) are the most significant and also which

The ACUPCC recommends a publication of emissions in two categories: “per full-time enrollment” and “per 1000 square feet.” As college campuses vary significantly in terms of the size of their student body and overall physical area, this adjustment allows for more accurate comparison between colleges (Table 14).

Table 14. Breakdown of emissions by scope, full-time enrollment, and 1000 square feet.

EMISSIONS	TOTAL	PER FULL-TIME ENROLLMENT	PER 1000 SQUARE FT
Scope 1	7,918	2.84	3.40
Scope 2	1,885	0.68	0.81

APPENDIX 1. Fuel consumption, Fiscal Year 2008-09

Fiscal Year 2008-09
Fuel Consumption

	Wood (tons)	No. 6 Fuel Oil (gal)	No. 2 Fuel Oil (gal)
Jun-2008	956	14,126	0
Jul-2008	1,238	705	0
Aug-2008	1,477	2,000	0
Sep-2008	1,480	4,242	0
Oct-2008	2,031	19,582	16,066
Nov-2008	2,086	17,600	20,578
Dec-2008	2,676	57,254	29,769
Jan-2009	2,820	93,876	37,616
Feb-2009	2,316	57,421	32,397
Mar-2009	2,304	38,484	24,266
Apr-2009	1,795	23,421	24,811
May-2009	1,069	42,746	0
Total	22,249	371,457	185,503

APPENDIX 3: 2008-09 Varsity Athletics Air Travel

GROUP AND DESTINATION	DISTANCE FROM SYRACUSE (MILES)
Women's Soccer to Portland OR, Sept. 08	2,282
Volleyball to Durham NC, Sept. 08	508
Men's Soccer to Durham NC, Oct. 08	508
Women's Basketball to Clinton SC, Nov. 08	667
Men's Hockey to Denver CO, Nov. 08	1,508
Men's Basketball to Portland ME, Dec 08	300
Men's Basketball to Oakland CA, Dec. 08	2,428
Men's Hockey to Ft. Myers FL, Dec. 08	1,176
Men's Basketball to Dallas TX, Jan. 09	1,327
Swim team to San Juan, PR, Jan. 09	1,792
Men's Lacrosse to Durham NC, March 09	508
Tennis to Ft. Myers FL, March 09	1,176
Women's Lacrosse to CA and Oregon, March 09	2,282
Softball to F. Meyers FL, March 09	1,176
Women’s Track to Orlando FL, March 09	1,042
Golf team to Atlanta GA, March 09	781
TOTAL MILES	