Tulane University Greenhouse Gas Emissions Inventory 2016

An Annual Progress Report on Tulane's Climate Impact

Introduction

Measuring Greenhouse Gas & Climate Impact at Tulane

Since 2006, Tulane University has been conducting an annual Greenhouse Gas (GHG) Emissions Inventory, which tracks the emission of greenhouse gases from university activities to measure our impact on climate change. The inventory allows the university to analyze the effectiveness of Tulane's efforts to address climate change and pinpoints areas to reduce GHG emissions. This report is the result of the most recent GHG inventory for the 2016 calendar year.

In 2008, Tulane joined the Presidents' Climate Leadership Commitments (PCLC)[1]. The pledge includes measuring the university's impact on climate change and developing a climate action plan to address these impacts. Participating universities publish their greenhouse gas inventories on secondnature.org.

The Tulane University 2014 Climate Action Plan, which presents an analysis of the costs and savings of measures to reduce greenhouse gas emissions, was adopted by the university in 2015. It consists of short, medium and long term strategies to reach an ultimate goal of carbon neutrality by 2050. The 2007 GHG inventory was set as a baseline year for GHG emissions. Using this baseline the Climate Action Plan calls for a 15% reduction by 2020 and 30% reduction by 2025. The Climate Action Plan can be found at https://campusservices.tulane.edu/departments/sustainability/climate-commitment or http://green.tulane.edu/climate-commitment.html

Terms to Note

Emissions Scopes

In measuring greenhouse gas emissions, this report categorizes emissions into three Scopes. In this report, Scope 1 and 2 are most relevant for the university to study because they include all energy used on campus.

Scope 1 includes direct emissions from the institution, including refrigerants and fossil fuel burning from both buildings and transportation.

Scope 2 includes indirect emissions that result from purchasing of utilities, like electricity, chilled water and steam by the university.

Scope 3 includes other indirect emissions that happen as a result of university activities, like faculty, staff and student commuting, travel (business and study abroad) and waste disposal.

Greenhouse Gas: Greenhouse Gases (GHG) trap heat within earth's atmosphere, which leads to changes in temperature and climate. They are released as a result of many human activities, including the burning of fossil fuels.

Global Warming Potential (GWP): Each GHG has a different effect on the Earth's warming and therefore is given a GWP based on this effect.

[1] Previously called the American College and University President's Climate Commitment

Metric Tons of Carbon Dioxide Equivalent (MTeCO2): A unit in which GHGs are measured. The GWP is used to convert each GHG into the carbon dioxide equivalent and the Carbon Calculator then converts all measurements to MTeCO2.

Results

GHG emissions from Tulane University activities in 2016 totaled 136,194 MTeCO2, which is a 2% increase from 2015 totals. General trends are shown in Figure 1. The 2020 emissions goal of a 15% reduction from 2007 totals is shown with solid blue line at 122,492 MTeCO2. 2016 emissions were 5.5% below 2007 totals. Table 1 shows the ratios of emissions to student population and building space. Emissions per student and per building space slightly increased from 2015 results.

Figure 1: Total Net Emissions (MTeCO2)

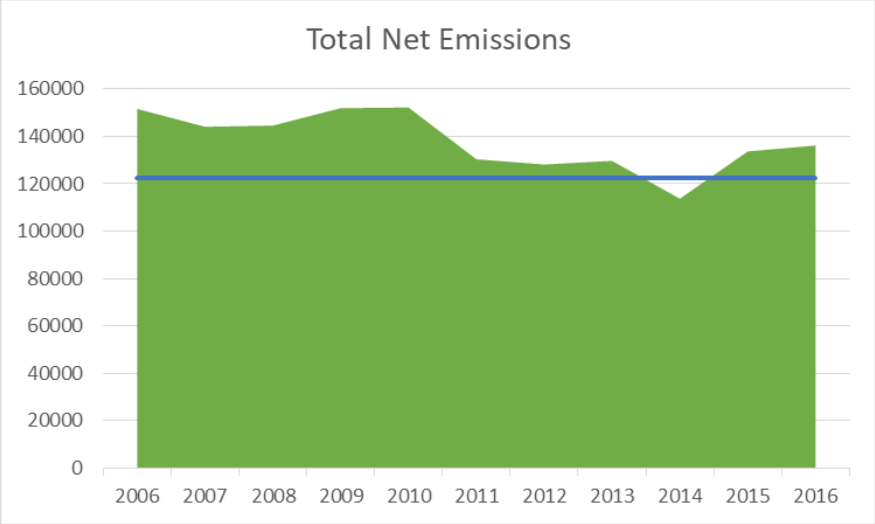


Table 1: Normalized Emissions

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	PCLC Average
Full Time Student Equivalent (Full Time + ½ Part Time)	9641	10091	10695	10945	12034	11699	12248	12341	12293	12397	**7.08**
MTeCO2/FTE Student	**14.95**	**14.33**	**14.21**	**13.91**	**10.83**	**10.95**	**10.59**	**9.22**	**10.88**	**10.99**	
Building Area (1,000 sq. ft.)	6747	7038	7156	7168	7193	7210	7210	7475	7297	7303	**16.76**
MTeCO2/1,000 sq. ft.	**21.36**	**20.54**	**21.23**	**21.24**	**18.13**	**17.78**	**17.99**	**15.22**	**18.32**	**18.6**	

Emissions According to Scope

It is important to review emissions trends by Scope, which are shown in Figure 2. Scope 1 includes emissions from the institution that happen on site, including the use of refrigerants and burning fossil fuels for buildings and transportation. Scope 2 includes emissions from purchasing utilities, like electricity, chilled water and steam. Scope 3 emissions result from indirect emissions not included in Scope 2. This includes student, faculty and staff commuting, travel, waste disposal and transmission & distribution losses (the loss of energy during delivery between the power plant and building of use).

Scope 1 & 2 emissions directly reflect energy use at Tulane, which comprises the majority of Greenhouse Gas Emissions on campus. Scope 1 & 2 emissions increased by 1% from 2015 to 2016. Due to the concrete nature of this data and Tulane's ability to directly manage campus energy use, trends in Scope 1 & 2 emissions give the most accurate picture of how our campuses manage emissions from year to year.

Scope 3 emissions can vary more widely and have a higher margin of error as data comes from a variety of sources and emissions are calculated based on broader estimations. Scope 3 emissions increased by 4% between 2015 and 2016 due to increased business travel (plane travel and private vehicle) for faculty and staff. As described in the Methodology section of this report, emissions from business travel are estimated by using monetary reimbursement data provided by the accounting department which is then translated to miles with conversion factors.

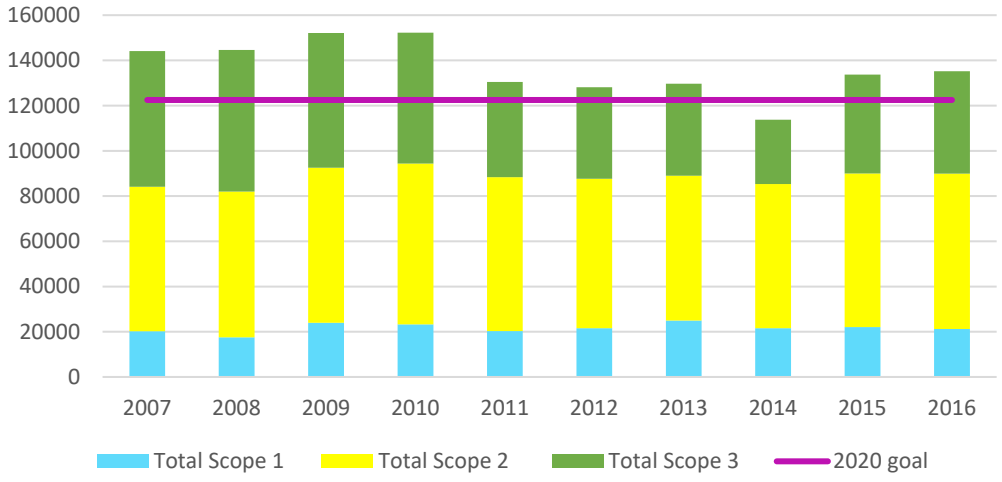
When Scope 3 emissions are included, overall emissions appear to vary more widely from year to year. For example, Greenhouse Gas Emissions in 2014 were significantly lower than other years due to very low business travel totals that were reported, which may have been due to data collection issues.

Table 2 shows total emissions and emissions by scope from 2007 to 2016.

Table 2: Emission by Scope and Total Emissions (MTeCO2)

	Total Scope 1	Total Scope 2	Total Scope 3	Total Scope 1 + 2	TOTAL EMISSIONS
2007	20244	63900	59964	84144	144108
2008	17566	64427	62598	81993	144591
2009	23953	68571	59596	92524	152120
2010	23275	71088	57868	94363	152231
2011	20303	68097	42070	88399	130470
2012	21546	66095	40522	87641	128163
2013	24971	64004	40737	88975	129712
2014	21559	63776	28412	85335	113747
2015	22089	67900	43709	89989	133698
2016	21248	69526	45420	90774	136194

Figure 2: Emissions by Scope (MTeCO2)



2016 Energy Saving Actions

The following actions were taken in 2016 to reduce Tulane's energy use and GHG emissions.

Building Energy Dashboard and Navigator System This software tool, which was launched in late 2015, tracks and monitors building energy use. The Building Energy Dashboard has a user-friendly design that makes electricity data available to students and faculty. The dashboard can be found at http://buildingdashboard.net/tulane/#/tulane. The Navigator System is a more complex dashboard of building energy information that is used by Facilities Services staff to monitor buildings. If you would like to use this tool for a class or a special project, please contact the Office of Sustainability.

Steam System Improvements Underground piping for transporting steam to buildings on front campus were made more efficient.

Siemens Analysis Siemens conducted an energy and performance analysis on the following buildings: Reily Center, Greenbaum House, Yulman Stadium, Sharp Hall, Dixon Hall, Jones Hall, Richardson Memorial, Bruff Commons, Dinwiddie Hall, Josephine Louise Hall, Monroe Hall, Howard-Tilton Memorial Library, and Weinmann Hall. All improvements made were documented and strategies changed for efficiency. Control system deficiencies were corrected.

Tulane Unplugged An energy conservation competition between on campus residence halls was run in both the Spring and Fall 2016 semesters. The Office of Sustainability uses the Building Energy Dashboard to track energy usage in residence halls that participate in Tulane Unplugged.

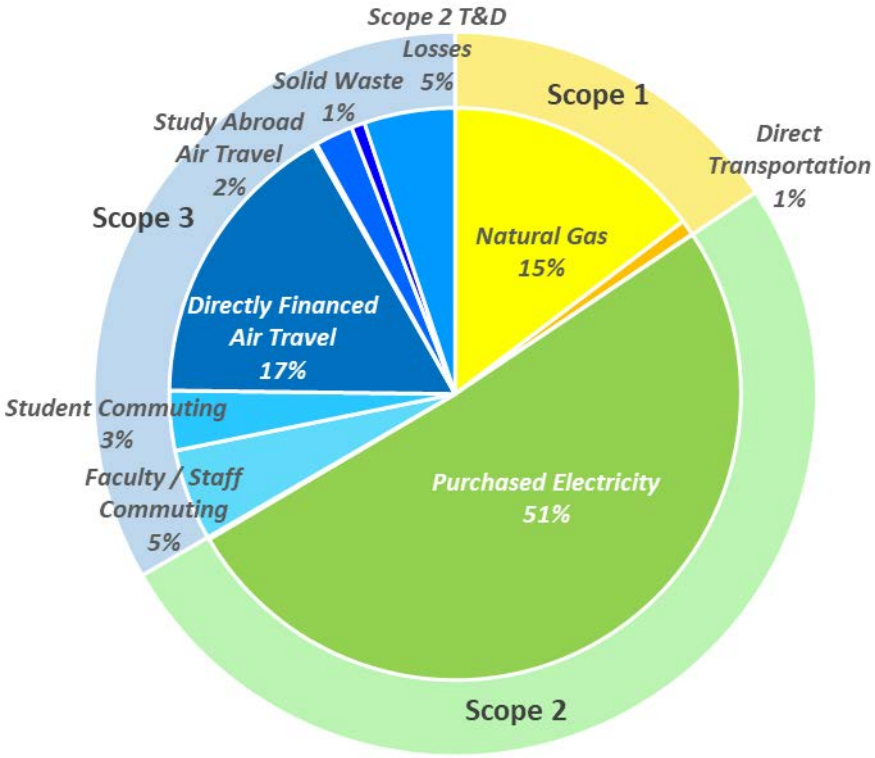
Winter Break Shutdown This program was implemented during winter break, placing most buildings on an energy-saving, unoccupied mode.

Tulane River and Coastal Center

Tulane's only new building opened in 2016, the River Center is a 5900 sq. ft. research center built on the Mississippi River as part of the Riverfront Initiative. This building is certified LEED Gold.

Conclusion and Next Steps

Figure 3: Proportion of Emissions by Scope & Category



In conclusion, overall Greenhouse Gas Emissions increased by 2% from 2015 to 2016. Scope 1 & 2 emissions, which represent energy use on Tulane's campuses, remained nearly identical to 2015 totals, increasing by 1% between 2015 and 2016. To reach our 2020 Climate Action Plan goal, overall emissions need to be reduced by 10% from 2016 totals.

In order to meet the 2020 goal, consumption of energy by buildings must be reduced through structural improvements and outreach campaigns. The first step in reducing energy is understanding current energy usage trends in buildings. Tulane's online building dashboard helps us track and benchmark energy use and will continue to be used for energy literacy campaigns on campus. Additionally, a number of energy reduction projects are currently being completed on campus in the 2017 calendar year. These include a campus-wide LED Lighting Upgrade, which is expected to save a total of $67,626 and 516,203 kWh annually.

Methodology

Calculator

Tulane University uses the Clean Air-Cool Planet (CA-CP) Campus Carbon Calculator, which can be downloaded from the University of New Hampshire's Sustainability Institute. Version 9.0 was used for this inventory. Further information on data sources and methodology for this inventory is provided below.

Buildings

Electricity and Gas

Most data for Tulane buildings was provided through Entergy utility bills and building managers. Table 3 lists the methods used when data was not accessible.

Table 3: Breaches in Data

Location	Utility	Method of Accounting for Missing Data
Aron Apartments	Electricity	Averaged electricity usage from 2013, 2014 and 2015 for the 2016 figure due to lack of data.
Houston, TX campus	Electricity	Carried electricity usage from 2012 for following years due to lack of data.
Madison, MS campus	Electricity	Averaged electricity usage from 2014 and 2015 due to lack of data.
1555 Poydras Street	Electricity	Multiplied total building energy use by percentage of building leased by Tulane.
1555 Poydras Street Servers	Electricity	Missing September bill- averaged surrounding months.

Steam and Natural Gas Conversions

Tulane's only location that purchases steam and chilled water is on the downtown Health Sciences campus. Data from EnWave bills was converted from pounds and tons to total energy used. The following conversions were provided from EnergyStar and Entergy.

Steam (pounds) to mmBtu = multiply by 1.003342
Chilled water (tons) to mmBtu = multiply by .012

Propane

Monthly propane totals were provided by an employee of the Primate Center, the only location using propane.

Refrigerants

Data was provided by Facilities Services.

Table 4: Refrigerant Use

Refrigerants used in 2014, 2015 and 2016 (lbs)				
Refrigerant	GWP (100-year values)	2014	2015	2016
HFC-134a	1,430	1,170	655	
HCFC-22	1,810			40
R-123	76	600		

Sources: IPCC 4th Assessment Report; LEED Reference Guide Version 4

Methodology

Commute Data

The results of the 2014 university-wide commute survey, completed by the Office of Sustainability, were adjusted based on the current population numbers at Tulane.

Study Abroad

The Tulane Office of Study Abroad provided the number of students that studied abroad in each country for 2016. Total miles traveled were calculated based on statistics found by the US Department of Transportation. This was determined based on assumptions that students left from Houston George Bush International Airport and arrived in the largest international airport in each country traveled to.

Travel

Data collected from the accounting department provided business travel reimbursement in USD, which was categorized by domestic travel by car and both domestic and foreign travel by air. Recruitment expenses and visiting professionals were calculated as 75% domestic air travel, with the remainder being lodging, meals and incidentals. Total miles travel by car was calculated from mileage rates from the US General Services Administration. Air travel was calculated with conversion factors from Airlines for America.

Vehicle Fleet

Retif Oil & Fuel provided data from fuel cards that supply Tulane fleets with fuel, charged to each department. Purchases from each department were divided into gasoline, diesel and ethanol.

Waste

Tulane last accurately measured waste in 2014 and that data was used in 2016. Recycling data was provided by the Office of Sustainability.

Tulane University's 2016 Greenhouse Gas Emissions Inventory was conducted and written by Melanie Patapis '17, student intern, Tulane University Office of Sustainability.

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