Tulane University

2017 Greenhouse Gas Inventory Report

INTRODUCTION

This document highlights the findings of the 2017 Greenhouse Gas (GHG) Inventory for Tulane University. The Office of Sustainability has conducted an inventory each year since 2007 to report the GHG emissions associated with Tulane University activities in order to analyze the university's contributions to climate change.

Tulane University joined the Presidents' Climate Leadership Commitments in 2008, a commitment to annually inventory our GHG emissions and to develop a Climate Action Plan. The Tulane University 2014 Climate Action Plan (https://campusservices.tulane.edu/departments/sustainability/climate-commitment) outlines measures to reduce 2007 baseline GHG emissions 15% by 2020 and 30% by 2025, with the eventual intention of climate neutrality by 2050. The Climate Action Plan presents near-term, mid-term, and long-term strategies for achieving climate neutrality.

Although Tulane's GHG targets outlined in the 2014 CAP are similar to the reduction goals of the 2015 Paris Agreement, a recent special report published by the Intergovernmental Panel on Climate Change (IPCC) deemed these goals insufficient in mitigating major climate change impacts. *Global Warming of 1.5*°C provides an explanation of the advantages of capping global warming at 1.5ºC compared to 2ºC. Globally, present temperatures have already increased by 1°C since preindustrial times, resulting in rising sea levels, shrinking Arctic sea ice, and more extreme weather events. The IPCC report emphasizes that impacts of 2°C warming are significantly more extreme than 1.5°C warming. The climate impacts modeled for 2°C warming, as opposed to 1.5°C, could mean the difference of 20 million more people exposed to flooding from sea level rise, 60 million more people exposed to severe drought in urban areas, and 20% more of the world population exposed to more severe heat waves. To limit these potentially catastrophic effects, the IPCC recommends implementing a widespread goal of a 45% reduction of 2010 GHG emissions by 2030 in attempts to limit global warming at 1.5°C. In order to serve as a leader among globally responsible institutions, Tulane University must commit to GHG emission reductions on par with this most recent report and strive towards the eventual goal of climate neutrality.

BOUNDARIES AND SCOPES

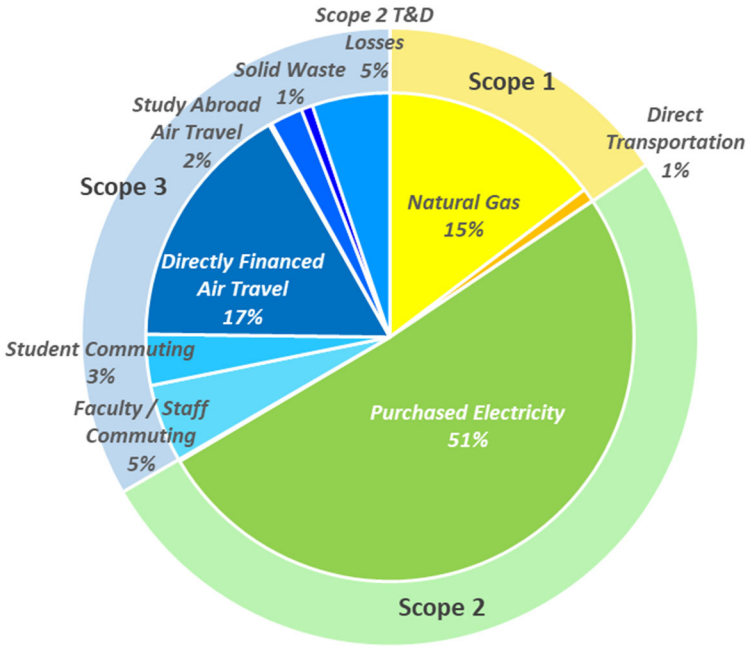
This GHG Inventory includes emissions from all facilities that are operated by Tulane. This includes both the Uptown and Downtown Health Sciences Campuses, the Primate Research Center, the Tulane River and Coastal Center, the Houston Campus, and the Biloxi Campus. The Tulane Medical Center and the Tulane Lakeside Hospital are owned and operated by Hospital Corporation of America (HCA) and are not included in this inventory. This inventory spans the period of January 1–December 31, 2017.

The 2017 GHG Inventory reports Scope 1 and Scope 2 GHG emissions. Scope 1 GHG emissions encompass all direct emissions from the university. Fossil fuels burned on site for building energy use and vehicle transportation as well as the use of refrigerants are all examples of Scope 1 emissions. Scope 2 GHG emissions encompass indirect emissions that result from university

utility purchases. These are the emissions released by the utility as it generates the electricity, steam, and chilled water that the university purchases for use.

In past years, Tulane's GHG inventories have included Scope 3 emissions. Scope 3 emissions encompass indirect emissions not accounted for in Scope 2. This includes emissions associated with waste disposal, commuter emissions, and study abroad air travel among other factors. Figure 1 below shows the relative proportion of emissions from each scope from the 2016 GHG Inventory. Scope 3 emissions are difficult to measure and accurately quantify; the past figures represent an estimation. The Office of Sustainability has decided to include only Scopes 1&2 in the 2017 GHG Inventory in order to focus on direct emissions and indirect emissions from our energy use. This follows the practice of many other institutions, specifically other universities within the Ivy Plus Sustainability Working Group. The Office of Sustainability will continue to work on procedures for estimating Scope 3 emissions and welcomes student interns interested in pursuing this project.

Figure 1: 2016 Emissions by Scope



RESULTS

In 2017, Tulane University's Scope 1 and Scope 2 GHG emissions totaled 91,703 Metric Tons Carbon Dioxide Equivalent (MTCO2e). This represents a 1% increase in GHG emissions from 2016 to 2017. Table 1 below shows Scope 1, Scope 2, and combined Scope 1&2 totals for the university each year since 2007. The 2007 Scope 1&2 total was 84,144 MTCO2e. In order to achieve the 2020 emissions goal of a 15% reduction from the 2007 baseline, total GHG emissions for 2020 Scope 1&2 must be below 71,522 MTCO2e, a 22% reduction from 2017 GHG total emissions.

The use of the unit MTCO2e indicates that the inventory includes the release of GHG other than carbon dioxide. The 2017 inventory includes HFC-134a (1,1,1,2-Tetrafluoroethane), CH4 (methane), and N2O (nitrous oxide) in addition to CO2. Each GHG has a varying global warming capacity, also known as Global Warming Potential (GWP). For each GHG, GWP is to convert the amount into the carbon dioxide equivalent of emissions, measured in MTCO2e.

Table 1: Emissions by Scope

GHG Emissions (MTCO2e)				
	Total Scope 1	**Total Scope 2**	**Scope 1&2**	**2020 Goal**
2007	20,244	63,900	84,144	
2008	17,566	64,427	81,993	
2009	23,953	68,571	92,524	
2010	23,275	71,088	94,363	
2011	20,303	68,097	88,399	
2012	21,546	66,095	87,641	
2013	24,971	64,004	88,975	**71,522**
2014	21,559	63,776	85,335	
2015	22,089	67,900	89,989	
2016	21,248	69,526	90,774	
2017	**22,938**	**68,765**	**91,703**	
2017 with CAP Reductions implemented			70,928	

Table 2 shows the normalized emissions ratios of Scope 1&2 emissions to student population and to building space. Emissions per student slightly decreased from 2016 to 2017, however, emissions per building space slightly increased from 2016 to 2017. Overall student full time equivalent (FTE) increased to 12,591 in 2017. FTE is calculated as full time students plus half of all part time students. Building area decreased from 2016 to 2017 with the removal of the Madison, Mississippi campus.

Table 2: Normalized Emissions

Normalized Emissions											
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Full Time Student Equivalent (Full Time + 1/2 Part Time)	9,641	10,091	10,695	10,945	12,034	11,699	12,248	12,341	12,293	12,397	12,591
MTCO2e (Scopes 1&2)	84,144	81,993	92,524	94,363	88,399	87,641	88,975	85,335	89,989	90,774	91,703
MTCO2e/ FTE Student	**8.73**	**8.13**	**8.65**	**8.62**	**7.35**	**7.49**	**7.26**	**6.91**	**7.32**	**7.32**	**7.28**
Building Area (1,000 sq. ft.)	6,747	7,038	7,156	7,168	7,193	7,210	7,210	7,475	7,297	7,303	7,292
MTCO2e/ 1,000 sq. ft.	**12.47**	**11.65**	**12.93**	**13.16**	**12.29**	**12.16**	**12.34**	**11.42**	**12.33**	**12.43**	**12.58**

2017 ENERGY SAVING PROJECTS

					Actual or Projected			Annual Savings		
	PROJECT ▲	STATUS	INSTALL COMPLETE DATE	TYPE	COST	ANNUAL ROI	PAYBACK (YRS)	EMISSIONS (MTCO2E)	ENERGY (MMBTU)	WATER (GAL)
☐	Downtown Security Lighting and LED Retrofit	Completed	05/01/2017	Lighting	$ 65,005	-9.4%	>100	3	18	0
☐	Jones Hall Basement Unscrewing 268 t32 bulbs	Completed	09/01/2017	Lighting	$ --	0.0%	0.0	44	253	0
☐	Uptown and Diboll Parking Garage LED Lighting Retrofit	Completed	06/30/2017	Lighting	$ 300,000	11.3%	4.7	472	2,721	0

METHODOLOGY

The 2017 GHG Inventory for Tulane University used the Sustainability Indicator Management & Analysis Platform (SIMAP) calculator designed by the Sustainability Institute at the University of New Hampshire. This is the first year the Office of Sustainability has used this tool; previous inventories used an Excel Campus Carbon Calculator, also produced by the Sustainability Institute. For purposes of consistency, the historic annual GHG emission totals presented in this report represent the totals as they were calculated in that year. Recently, the Sustainability Institute has updated some of the emissions factors within the SIMAP program. An emissions factor is a value that attempts to equate the amount of GHG emissions released associated with an activity. For the 2017 GHG Inventory, SIMAP updated its emissions factors for on-campus stationary combustion and electricity custom fuel mix (for specifics on changes in emissions factor for the 2017 calculator, visit https://unhsimap.org/resources/changes-in-simap/emission-factors).

Energy use data for Tulane buildings was obtained from utility monthly bills. Statistics on full time student equivalent were derived from the data reported by the Tulane University registrar (https://registrar.tulane.edu/enrollment-profiles). Vehicular fuel data for the University Transportation Fleet was compiled using Cardlink Fuel Summary Reports. These reports track the fuel type, either gasoline or diesel, and gallons of fuel purchased by each department in 2017.

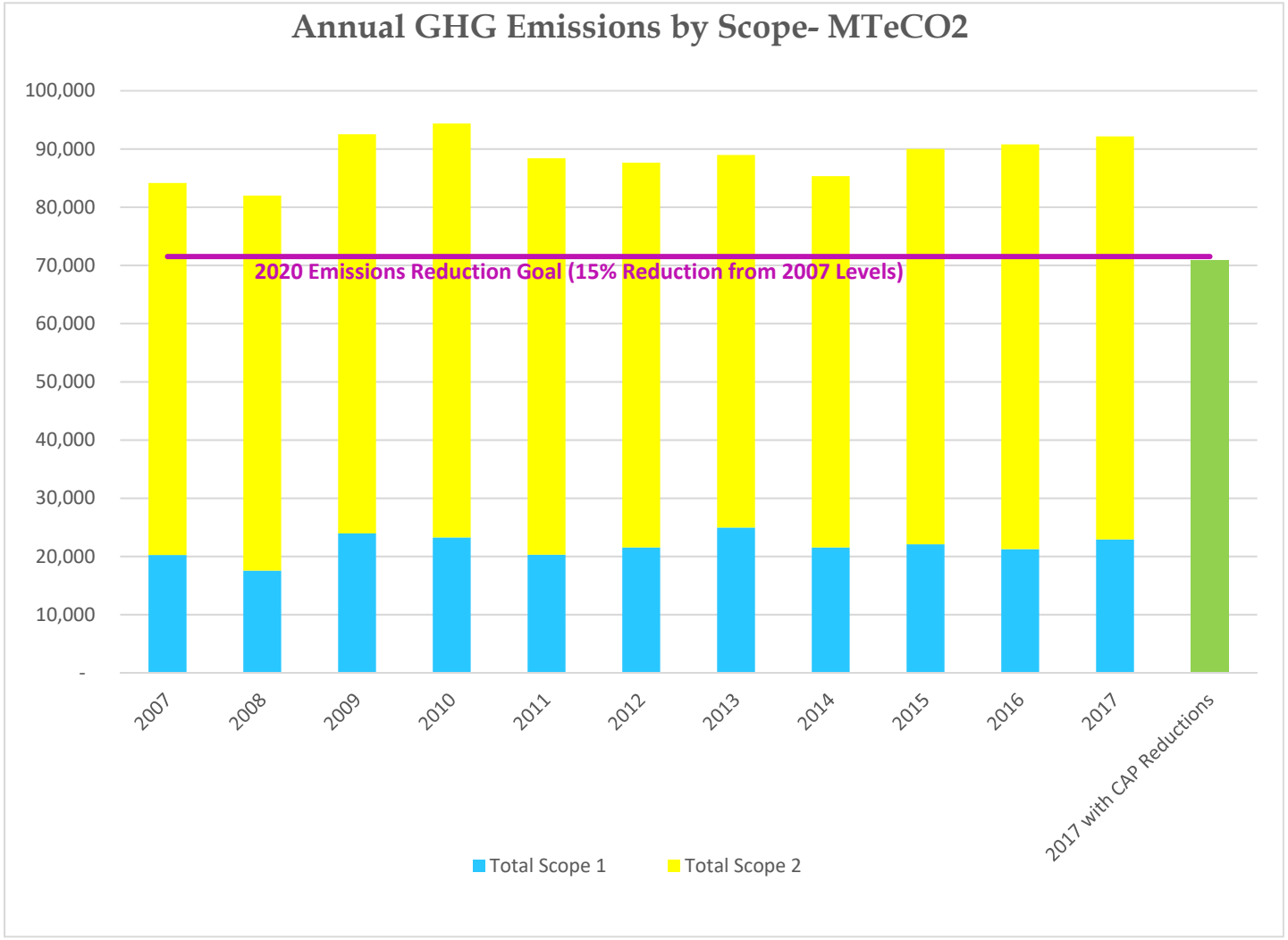
At the Houston Campus, Tulane occupies approximately 7% of the total building square footage of a larger commercial building. The proportion of energy used by Tulane's specific suite in the building is not available, however, an energy bill was available for the entire building. Total energy use for the larger building was multiplied by Tulane's proportion of the building to create an estimate.

CONCLUSIONS

Overall, Tulane University's GHG emissions increased by 1% from 2016 to 2017. Table 1 shows that Scope 1 emissions increased from 2016 to 2017 while Scope 2 emissions decreased, so although the university has produced less emissions from purchased electricity, steam, and chilled water, Tulane has increased its direct emissions as compared to 2016. In order to achieve the first benchmark of the Climate Action Plan of reducing 2007 emissions by 15% by 2020, total Scope 1&2 emissions must be reduced by 22% from the 2017 totals.

As shown in Figure 2 below, Tulane University can achieve its 2020 emissions reduction goal by implementing the strategies outlined in the Climate Action Plan. Table 1 indicates that the 2020 target of less than 71,522 MTCO2e would be met by implementing key strategies outlined in the Climate Action Plan, resulting in emissions of 70,928 MTCO2e. These measures can be found in Appendix A of this report.

Figure 2: Annual Scope 1 and Scope 2 Emissions



MOVING FORWARD – CAPPING 1.5°C WARMING

The 2014 CAP outlines the target emissions reductions set forth by Tulane University. The emissions goals are based off of 2007 baseline GHG emissions. It is important to note that 2007 did not serve as the most representative year to determine baseline emissions from, as the university was still experiencing the impacts of Hurricane Katrina and student, faculty, and staff populations had not yet returned to pre-Katrina levels. In recovering years since, emissions have increased as the Tulane community has grown. Despite this, Tulane University should still strive to achieve the goals described in the CAP.

As discussed in the introduction, the IPCC recently released a special report about the necessity to cap global warming at 1.5°C rather than the previously established goal of 2°C. Overall, the report emphasizes that the new standard target for GHG emissions must be a 45% reduction of 2010 emissions by 2030. Applying this target, Tulane University would need reach GHG emissions below 42,463 MTCO2e by 2030. Due to the complex nature of global feedback systems, climate impacts are expected to differ non-linearly from 1.5°C to 2°C warming, with significantly worse impacts resulting from 2°C warming[1].

Tulane University's 2017 Greenhouse Gas Emissions Inventory data collection and analysis were conducted by Aliyah Daniels (Tulane University '18, Office of Sustainability Student Intern), the report was written by Grace Cushing (Tulane University '19, Office of Sustainability Student Intern).

APPENDIX A:

This table lists energy-saving measures that would enable Tulane University to achieve target goals outlined in the 2014 CAP. These projects include energy conservation measures targeted for the Downtown and Uptown campuses, efficiency improvements for the steam and chilled water distribution systems, and efficient use of the uptown campus's existing power plant. The complete plan is available at https://campusservices.tulane.edu/departments/sustainability/climate-commitment.

[1] For a coherent explanation of the major points outlined in *Global Warming of 1.5°C, an IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*, read the "Summary for Policymakers" on the report's webpage.

Climate Action Plan Recommended Near Term Measures *Actions to reduce emissions 15% by 2020*

Measure	CAP Estimate: Capital Investment (2014 $)	CAP Estimate: Annual O&M Costs (2014 $)	CAP Estimate: Anticipated Annual Savings (2014 $)	CAP Estimate: Savings per MTCO2e reduced	CAP Estimate: Annual GHG Reduction (Tons)	Action on CAP Measures and Status (2/7/2019)
Fully Utilize Combined Heat and Power (CHP) Use the uptown campus's existing CHP system more & install a chiller that can use the CHP plant's waste steam to provide cooling	$1,900,000	$203,844	$508,000	82	4,796	Will be completed when an absorption chiller is added to the CHP plant in 2019 as an emergency preparedness measure. A 2016 DOE study estimated GHG savings of about 16,000 CO2e tons/yr (includes Scope 3 Transimission & Distribution losses)
Uptown Chilled Water & Steam Distribution System Efficiency Improve the efficiency of the systems that deliver chilled water and steam to uptown campus buildings.	$5,900,000	$50,000	$400,000	53	2,229	Plant Operations and Utilities staff have worked with vendors to develop proposals for chilled water optimization. Proposals are ready for review and action.
Uptown Energy Conservation Measures A comprehensive, intentional building energy efficiency program that implements measures with a combined simple payback of less than 7 years	$4,000,000	$600,000	$990,000	$86	8,992	Substantial work in building metering, scheduling and temperature setbacks has been done. Physical upgrades such as variable speed drive pumps, demand control ventilation, retrocommissioning and lighting upgrades still needed. Budgeting underway for Energy Manager position and dedicated funding for energy efficiency projects.
Downtown Energy Conservation Measures A comprehensive, intentional building energy efficiency program that implements measures with a combined simple payback of less than 7 years	$2,000,000	$300,000	$611,000	$97	5,140	See Uptown ECM immediately above.
100 kW Building Integrated Solar PV Develop experience with an initial renewable energy project	$381,000	$19,000	$8,060	No savings--Cost of $199/MTCO2e reduced	61	Costs for solar panels have dropped significantly since 2014. Need to identify location and concept for initial campus pv project.
Fleet-Fuel Standards Establish fuel efficiency standard & incentive program for fleet vehicles		$20,000	$1299 x number of years implemented	$98	3 x number of years implemented	Review underway of alternative fuel options such as hybrid electric and CNG that would qualify for future Clean Diesel grants. We are participating in local RPC's Clean Fuel Partnership.
Higher Construction Standards Achieve high level of energy efficiency in new buildings and major renovations						New standard and commitment needed. Consultants recommended $9/sq. ft. increase in construction costs for new buildings.