



University of South Florida Greenhouse Gas Emissions Inventory FY 2014-2015



DR. KIRAN C. PATEL COLLEGE OF
GLOBAL SUSTAINABILITY



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I Executive Summary

The purpose of this report is to gauge the annual greenhouse gas (GHG) emissions for the Tampa Campus of the University of South Florida (USF). There is a considerable effort by numerous individuals in different departments throughout USF to make this report come together. This is the fourth time the report has been published and reflects the emissions for FY 2014-2015.

Due to some inconsistencies and incorrect data used for purchased steam in the previous reports, we decided to collect and analyze all the data starting 2007. Therefore, we have recalculated the GHG emissions of the previous reports.

It has been noticed that after reaching peak levels over the past few years, the main contributors of GHG (Electricity and natural gas), have started to decline, which is a positive indication of GHG reduction and it reflects the efforts and commitment of USF to achieving its climate action plan. Some of the positive results are believed to have come from projects funded by the Student Green Energy Fund and USF investments on energy efficient systems.

Compared to the emissions of the previous year the current data shows that the total GHG emissions reduced by 2%. Scope 1 emissions, those that are most directly connected to USF, and Scope 2 emissions, mainly purchased electricity, have both reduced by 4%. While Scope 3 emissions, which are not directly owned or operated by USF, but inside its sphere of influence, have increased by 2%, which is mainly attributed to increasing number of students, faculty and staff as well as the expansion of the study abroad program. The reductions in scope 1 and 2 emissions, which are by far the largest contributors, have come after GHG emissions have peaked over the past few years where USF added several energy intensive buildings. This trend is expected to continue and will be important to achieving the targets set by the Climate Action Plan. It is also noted that although the total GHG has slightly increased due to the growth of USF infrastructure and its population, the normalized GHG emission (per person or per square foot) has been declining over the years. This reflects USF's efforts to increase energy efficient systems.

II Background

This report presents the results of the fourth annual Greenhouse Gas (GHG) Inventory conducted at the University of South Florida for FY 2014-2015. This report was directed by the USF Office of Sustainability. It was made possible through assistance from USF Physical Plant, Facility Planning and Construction, Purchasing, Parking and Transportation Services, Travel Office, Education Abroad Office and the Center for Urban Transportation Research.

The purpose of this report is to get a general estimate on the impact USF operations has on GHG emissions. The amount of emissions is calculated using the Cool Air Clean Planet Campus Carbon Calculator Version 8.0. The report breaks up emission sources into three scopes, a similar classification system that is used by the EPA and other carbon accounting practices. Scope 1 includes sources that are directly owned or operated by USF. Scope 2 emissions are indirect emissions from the purchase of offsite electricity, steam, and chilled water. Scope 3 emissions are indirectly related to USF operations, but are encouraged or influenced by the University.

This year we decided to revisit the previous reports due to inconsistency of data. Purchased steam (which is one of the major GHG contributors) was not included in the 2007 report and the data in the 2009 and 2010 reports had significant difference. Therefore, new GHG summaries have been produced for all the years based on revised data. The collection of data was greatly simplified this year as the information provided by the Physical Plant included all the auxiliary units on campus. As a result only some data was collected from other units such as purchasing, CUTR and an online database on population. It should be noted that this report is simply an estimate. It is a difficult task to account for all the GHG emissions that are the result of USF Tampa campus operations.

As the reality of climate change is becoming more prevalent, this report can help assess what USF can do to help combat global GHG emissions. There are already some initiatives being pursued by the University that could help with regard to this effort. These programs, such as bike share, enterprise car share, solar installations, the biodiesel project, and several other projects supported by the Student Green Energy Fund and USF administration have contributed to the reduction of GHG emissions and will help further reduce the amount.

III Institutional Data

1 Budget

The University of South Florida has been facing state budget cuts during the past several years. Its operating budget has reduced from \$1.67 billion in 2008 to \$1.25 billion in 2014. This has had some negative consequences on the activities pursued by the University; however, there has been a substantial effort on the University's behalf to overcome this deficit through alternative funding. This negative economic impact could have positive consequences for GHG emissions. However, it is noted that the student population and space has been increasing over time, which contributed to increased energy demand and transportation needs.

2 Physical Size

The research and total physical sizes at USF have increased over the last several years. Total building space and research building space increased by 3.3% each from 2009 to 2014. Total building space increased from 9,915,973 square feet in 2009, to 10,245,765 square feet in 2014. This should suggest that there has been a constant physical impact on the environment during this time frame. It is important to note that some of the new buildings are highly energy intensive that created a significant energy demand, hence increasing GHG emissions. Moreover, there have been other developments in both athletic, educational, and research building space that increased energy demand of the campus significantly.

3 Population

Information on the population of the University was obtained through USF's InfoCenter online database and consultation with personnel of the InfoCenter. Individuals were classified as faculty, staff, or student. In 2014, the total number of faculty and staff were 3,766 and 9,811, respectively, which showed an overall increase of 7% compared to numbers in 2008. The numbers of full time and part time students in 2014 were 28,494 and 11,728 (An overall increase of 4.4%). Summer school students were 25,929.

The number of staff reported includes OPS Other, OPS Graduate assistant, OPS Fellowship, OPS Student assistant, A&P, and USPS for the Tampa campus. Full time and part time student numbers include graduate, undergraduate, and part time individuals.

IV Emissions by Scope

1 Scope 1 Emissions

These emissions are the most directly tied to USF's Tampa campus actions. They are either owned or controlled by USF and include natural gas consumption for heating and cooling, the fuel used by the University's fleet of vehicles, refrigerants, and fertilizers used during 2014-15.

- **Natural Gas Consumption**

During FY 2014-15 there was a notable reduction of natural gas consumed by USF compared to the previous three years. For example, USF reduced natural gas consumption by 1.9% from the previous year (2013-2014). This number includes consumption of the main campus in addition to all the auxiliary units. The amount of natural gas used from 2007 to 2014 is provided in Table 1. The data shows that starting 2012, natural gas consumption has been declining. Normalized natural gas consumption per square foot is shown in Figure 1. This data reveals that the unit natural gas consumption has been reducing or remained the same through the years, even though the total natural gas consumption has been increasing until the previous year due to the addition of new spaces that are energy intensive.

Table 1. Natural Gas Consumption, 2007-14

Fiscal year	Natural Gas Use (Therms)
2007-08	3,827,309.100
2008-09	3,484,266.900
2009-10	3,864,154.000
2010-11	3,855,210.618
2011-12	3,846,266.000
2012-13	3,932,433.700
2013-14	3,923,289.400
2014-15	3,849,798.900

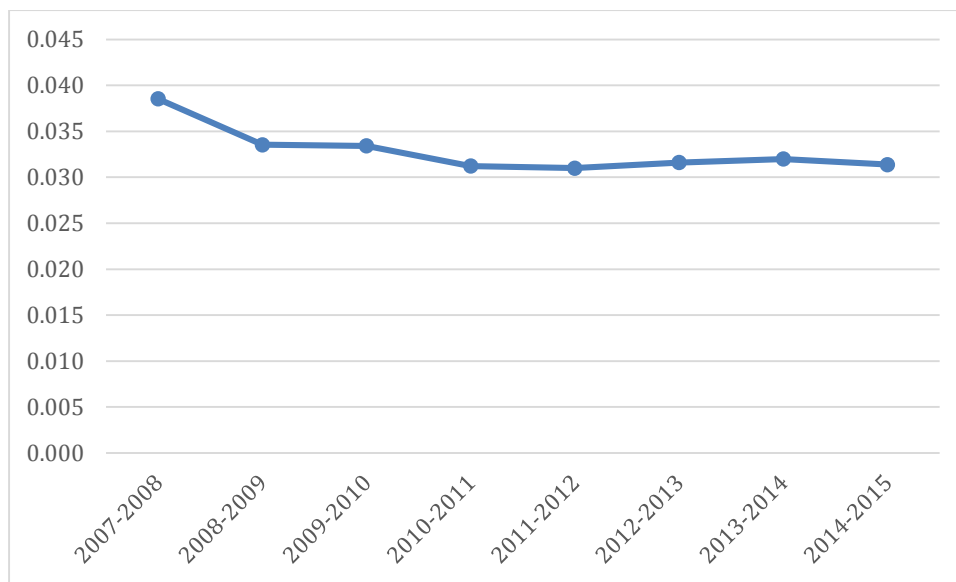


Figure 1. Natural gas consumption per unit area (Therms/square ft)

- **University Fleet Vehicles**

The University provides fuel for its bus line the “Bull Runner” in addition to the various vehicles in the different colleges and departments. Information for the type and quantity of fuel used was obtained from USF Parking and Transportation Services and the Purchasing Department. In 2010-11 there was a complete elimination of gasoline for the bull runner. Over the years, we observed a reduction in Ultra Low Sulfur Diesel and an increase in Biodiesel consumption separate from the gasoline consumption for individual department vehicles. This is a notable accomplishment, although Biofuels might not be the optimal vehicle fuel, it is the better than the fuels used in the past.

Table 2. Fuel Consumption by University Fleet, 2007-14

Fiscal Year	Gasoline (gal)	Diesel (gal)	Biofuel(gal)
2007-08	117,756		95,362
2008-09	295,948		84,328
2009-10	318,793	30,915	53,696
2010-11	267,809	1,959	94,633
2011-12	360,093	4,697	105,992
2012-13	428,949	3,830	112,827
2013-14	492,739	2,526	115,805
2014-15	423,451	7,382	99,440

- **Refrigerants and Chemicals**

The main consumption of refrigerants comes from the demand for maintenance and the central plant of Physical Plant department. In FY 2014-15, the physical plant reported using only 1,550 lbs of HCFC-22 (also known as R-22). Although the quantity of refrigerants used has substantially reduced, there is still a concern about the chemical that is being used. However, when it comes to refrigeration there are only few alternatives, especially considering the chemical that are compatible with the exiting technology on campus.

Table 3 – Refrigerants used at USF Tampa Campus, 2007-14

Fiscal Year	HFC-134a (lbs)	R-404a (lbs)	HCFC-22 (lbs)	HCFE-235da2 (lbs)	HG-10 (lbs)	Other (lbs)
2007-08	2,000	2	3,034			4
2008-09	-	-	1,000			300
2009-10	-	-	1,150			7,600
2010-11	-	-	1,000			-
2011-12	-	-	2,000			300
2012-13	-	96	1,120			75
2013-14	60	24	1,690			-
2014-15	-	24	1,550			-

- **Fertilizers**

The significant increase in the quantity of nitrogen fertilizer (Table 4) in the past few years is due to the addition of two new training fields. However, its contribution to the overall GHG emissions is not significant. Nitrogen fertilizer not only creates GHG emissions in its production, but can also lead to other environmental problems such as the eutrophication of water bodies.

Table 4 - Fertilizer used at USF Tampa campus, 2007-14

Fiscal Year	6% N (lbs)	9% N (lbs)	13% N (lbs)	14% N (lbs)	16% N (lbs)	18% N (lbs)	Total (lbs)
2007-08		38,000				37,500	75,500
2008-09		38,000	2,500				40,500
2009-10	2,750		500		35,000		38,250
2010-11	2,100		13,250		6,000	12,000	33,350
2011-12	750		8,000		18,350	24,000	51,100
2012-13			6,000		5,800	54,264	66,064
2013-14	421		2,000	99,867	2,000	0	104,288
2014-15	16		57,580	100	20,024	77,930	155,650

2 Scope 2 Emissions

These emissions are less directly related to USF than the Scope 1 emissions. The sources are characterized as being neither owned nor operated by USF, but whose emissions are directly related to energy-orientated activities at the USF Tampa Campus. The major component of Scope 2 emissions is purchased electricity from TECO.

At USF, Chilled water is produced using purchased electricity; therefore, the amount of “purchased chilled water” is already accounted for in the purchased electricity. Similarly, steam is produced using natural gas that has been included in Scope 1. Therefore, Scope 2 emissions will include only purchased electricity.

- **Purchased Electricity**

Table 5 shows the amount of purchased electricity reported by Physical Plant from 2007 to 2014. This data includes consumption by the main Tampa campus and the auxiliary units. Electricity consumption has started to decline, especially after peaking in the past several years. Compared to the previous year, electricity consumption has declined by 3.9%. Considering that the burning of fossils fuels for electricity is one of the largest GHG generations, this is a large reduction to GHG emissions, which is an exceptional accomplishment. USF obtains its electricity from TECO that has a general fuel mix of 55% coal , 45% natural gas and less than 1% other.

Table 5 - Electricity consumptions, 2007-14

Fiscal Year	Electrical Use (kWh)
2007-08	177,334,805
2008-09	187,650,662
2009-10	187,855,637
2010-11	189,941,156
2011-12	192,026,675
2012-13	193,959,994
2013-14	192,283,374
2014-15	184,837,562

The normalized electricity consumption (Figure 2) shows that USF has consistently been reducing its unit electricity consumption even though it has added new energy intensive buildings over the past several years.

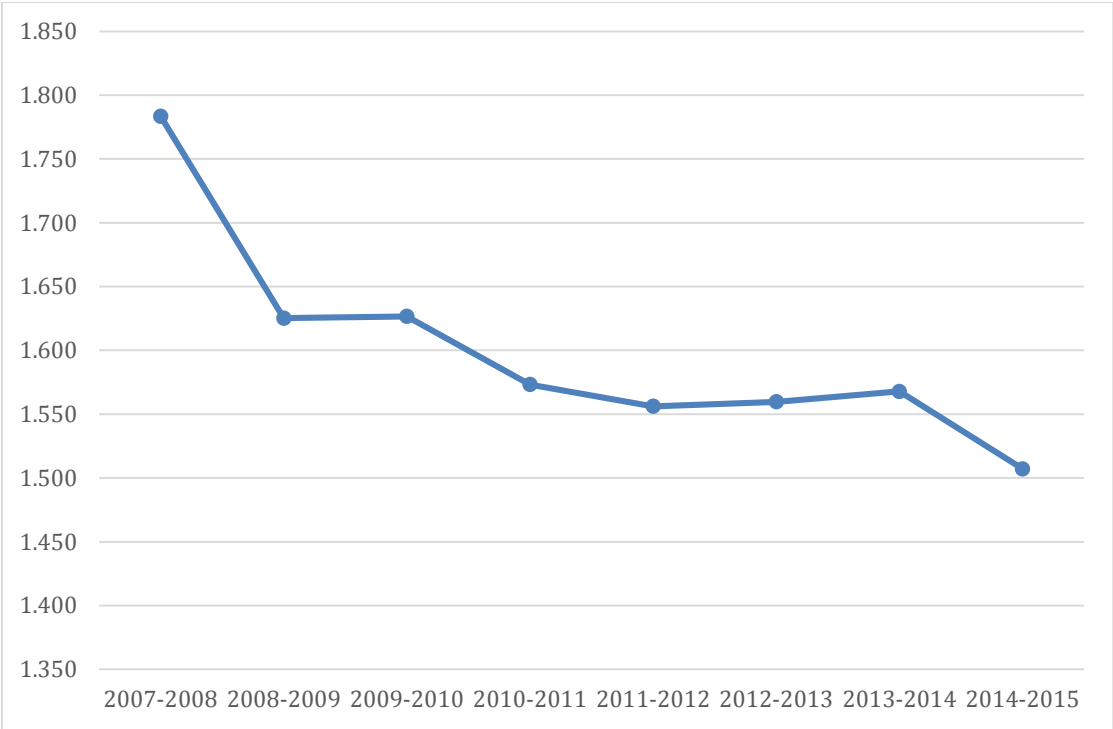


Figure 2 Electricity consumption per unit building space (kWh/square ft.)

3 Scope 3 Emissions

These emission sources are more indirectly connected to USF activities than either Scope 1 or Scope 2. They include activities that are in USF’s sphere of influence including commuting by students, faculty/staff, university related travel, solid waste, and wastewater. Although some inventories consider this Scope to be optional, it is important to consider these factors when attempting to reduce the GHG emissions related to USF.

- **Commuting to and from University**

Commuting to and from the University for the faculty, staff, and students of USF is the largest Scope 3 source of greenhouse gases. Data on the mode of transportation and average distance traveled were obtained from a survey done by the Center for Urban Transportation Research at USF and Parking and Transportation Services. The survey results indicated that about 83% students and 90% faculty/staff drive alone. These are very high proportions that contributed to the Scope 3 emissions. However, an encouraging observation is that usage of carbon free modes and bus transportations have increased. Encouraging ride-sharing options such as enterprise car share, increased tree shaded walkways, free bike share program and

reduced fee public transportation have contributed to this. Miles travelled by students using carbon free modes and bus have increased over the years by about 10.8% each. For staff and faculty mileage for carbon free modes and bus increased by about 12%. On the other hand, automobile and public transportation miles have also increased by 10.8%. Increasing access to public transit and carbon free transportation will help further reduce this trend.

- **Directly Financed Outsourced Air Travel**

Data on air travel for faculty and staff was extracted from a database of the Purchasing Department at USF. Compared to the 2008-09 FY, the numbers of air travel miles by faculty and staff in 2014-15 have increased by 13.5%. This is due to the fact that USF has increased its global interactions and increased number of faculty/staff by about 7%.

- **Directly Financed Auto Travel**

This source of emissions includes the reimbursement of mileage by USF for university related student, faculty, and staff travel. This information was obtained from database of USF's Purchasing Department. The total directly financed auto travel for fiscal year 2014-15 was 7,200 miles. This is a decrease of 5.5% compared to that of 2008-09.

- **Study Abroad Travel**

Information of the destinations of study abroad trips was obtained from the USF Purchasing Department. The total distance traveled for FY 2014-15 was 15,594,114 miles, a significant increase from the fiscal year 2008-09 (almost doubled). This was expected to increase as USF has encouraged study abroad programs in recent years.

- **Solid Waste**

In FY 2014-15, USF produced 1,055 tons of solid waste, about 11.3% lower than FY 2010-11, which produced 1,190 short tons. This can be attributed to the increase in recycling programs throughout the University. It should be noted that most of USF's solid waste is sent to an off-site waste-to-energy facility of Hillsborough county, leading to a slight reduction in net GHG emissions.

- **Wastewater**

The wastewater amount only slightly decreased. During 2014-15, USF produced 264,590,252.3 gallons of wastewater that was sent offsite for advanced anaerobic digestion treatment. This is about 8.5% decrease from FY 2008-09, in which USF produced 243,684,199 gallons of wastewater.

- **Paper**

The paper use and type is an important factor to consider when reducing GHG emissions. Not only is the production of paper a source of GHG emissions, but also the production of non-recycled paper decreases the amount of carbon captured by trees. The total amount of paper usage has significantly reduced over the years from 239,888 tons in 2008-09 to 131,133 tons in 2014-15. The data on paper consumption came from an Office Depart Green Business Review Report and the Purchasing Department. The report

estimated the amount of money spent on paper in “different shades of green” including Unknown, 10-29% Recycled, 30-69% Recycled, 70-89% Recycled, and 90-100% Recycled. The pounds of paper purchased were estimated by determining the average price per pound of paper. This information indicated that around 96% of paper purchased is not certified, while only around 2.3% of paper is 30-69% recycled. It should be noted that paper contributes only slightly to USF’s carbon footprint in comparison to other emission sources. In addition, the number reported might not fully reflect the total amount of a paper purchased and used by USF.

V Offsets

Although there are no direct offsets that can be represented in the Clean Air Cool Planet model, there are numerous activities pursued by USF to reduce its carbon footprint. An increase in paper, glass, plastic, and aluminum recycling has reduced the amount of solid waste and the amount of raw material that needs to be produced offsite. In addition, alternative forms of transportation are encouraged through a Bike Share program, Bull Runner bus service, car share and city public transportation systems. USF has a large reserve of natural trees and shrubs found on campus that contribute towards carbon sequestration. Over the last three years, USF has planted more than 300 trees on campus. USF has also purchased total Renewable Energy Certificates (RECs) in the amount of 1815 metric tons of CO₂ equivalent to offset its carbon emissions carbon offsets.

VI Limitations to the Model

The Clean Air Cool Planet Campus Carbon Calculator is a good estimator for greenhouse gas emissions. However, there are some limitations to the model that does not allow it to accurately portray the total GHG emissions associated with the University. For such an abstract idea such as measuring carbon for such a large institutional body can definitely led to some inaccuracies. Ensuring consistency from year to year can help overcome any inaccuracies by having a constant barometer for carbon related activities.

VII Conclusion

The Scope 3 emission sources have almost continuously increased overtime although at a declining rate in the past few years. The increases have come from commuting to and from the University (increase by 10.8%), and study abroad program almost doubled. As a result, there is a net increase in GHG emissions from 185,538 metric tons of greenhouse gases in 2009 to 189,235 metric tons of greenhouse gases in 2014, which is a 1.9% increase. However, emissions over the past few years have stabilized and have started to decline. For example total emissions in 2014 have declined by 2.2% compared to that of last year. The main decline is attributed to reduce natural gas and purchased electricity consumption. GHG emissions from the main contributors such as steam generation (by natural gas) and purchased electricity have started to decline after reaching peak values in the last few years as shown in Table 1 and Table 5.

The distributions of emissions by the three scopes and overall GHG emission for USF in 2014-2015 are summarized in Table 6 and Figure 3.

Focusing more on reducing purchased electricity and natural gas can help USF reduce its overall GHG emissions and achieve the targets set by its climate action plan.

Table 6. Summary of greenhouse gas emissions at USF, FY 2014-15

	2014	Energy Consumption	CO ₂	CH ₄	N ₂ O	eCO ₂
		MMBtu	kg	kg	kg	Metric Tons
Scope 1	Co-gen Electricity	-	-	-	-	-
	Co-gen Steam	-	-	-	-	-
	Other On-Campus Stationary	385,118.7	20,420,197.7	1,825.8	36.6	20,476.7
	Direct Transportation	67,221.3	4,633,633.8	850.6	291.6	4,741.8
	Refrigerants & Chemicals	-	-	-	-	1,315.2
	Agriculture	-	-	-	348.1	103.7
Scope 2	Purchased Electricity	630,205.6	103,321,342.8	1,431.8	2,017.9	103,958.5
	Purchased Steam / Chilled Water	-	-	-	-	-
Scope 3	Faculty / Staff Commuting	214,293.3	15,297,884.1	3,186.6	1,066.8	15,695.5
	Student Commuting	315,793.3	22,552,119.1	4,660.7	1,561.9	23,134.1
	Directly Financed Air Travel	26,166.1	5,103,183.6	50.6	58.1	5,121.8
	Other Directly Financed Travel	36.4	2,605.1	0.5	0.2	2.7
	Study Abroad Air Travel	38,432.9	7,495,560.8	74.3	85.4	7,522.9
	Student Travel to/from Home (OPTIONAL)	-	-	-	-	-
	Solid Waste	-	-	-	-	-
	Wastewater	-	-	322.4	431.3	136.6
	Paper	-	-	-	-	177.4
	Scope 2 T&D Losses	41,512.2	6,805,861.2	94.3	132.9	6,847.8
Offsets	Additional					-
	Non-Additional					-
Totals	Scope 1	452,340.0	25,053,831.6	2,676.4	676.3	26,637.5
	Scope 2	630,205.6	103,321,342.8	1,431.8	2,017.9	103,958.5
	Scope 3	636,234.2	57,257,213.9	8,389.4	3,336.7	58,638.7
	All Scopes	1,718,779.9	185,632,388.3	12,497.6	6,030.9	189,234.7
	All Offsets					-
					Net Emissions:	189,234.7

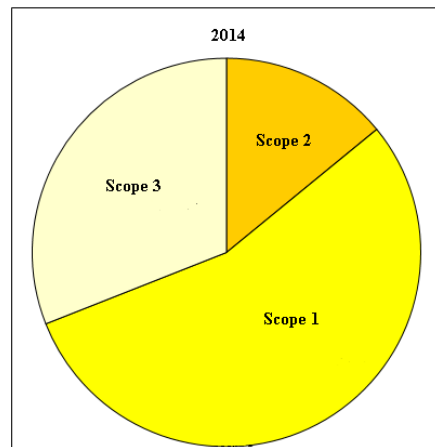


Figure 3. Distribution of greenhouse emissions among scopes FY 2014-15