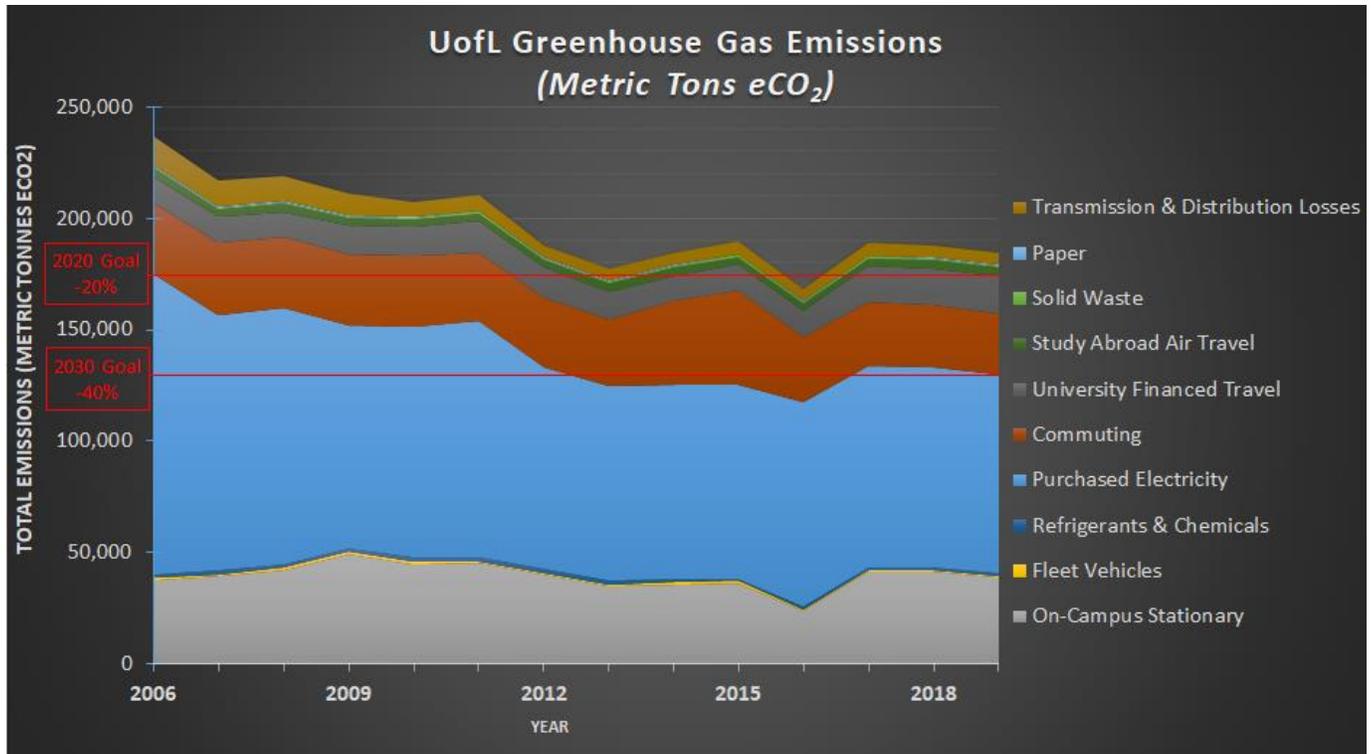


# UNIVERSITY OF LOUISVILLE



## GREENHOUSE GAS EMISSIONS INVENTORY 2006 - 2019



**U<sup>OF</sup>** Sustainability



Commitment to a Sustainable Future.

[louisville.edu/sustainability](http://louisville.edu/sustainability)

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## EXECUTIVE SUMMARY

This report documents the progress the University of Louisville (UofL) has made in reducing our greenhouse gas (GHG) emissions, even as we have grown in physical size and campus population. Our efforts to implement our [Climate Action Plan](#) (CAP) continue to pay off, though we have yet to recover from the rise in emissions that occurred in 2017, when the university's financial crisis resulted in a 100% budget cut for CAP implementation. Prior to the 2020 COVID-19 pandemic, the university's financial situation had been improving and the CAP budget was restored to a minimal operating level of \$45,000/year (25% of historical funding levels) in FY20. However, without larger investments to scale-up and maintain CAP projects, UofL's emissions have only decreased slightly in recent years. While any reductions in emissions should be celebrated, it is clear that we have lost the momentum we gained through sustained investment of resources and attention in fiscal years 2011-2017. The good news is that history has already shown us that a renewed full investment of resources and leadership can get us back on track in the years to come.

**From 2008 to 2019, we estimate that UofL's net carbon emissions have declined by 15.9% from 218,540 to 183,805 metric tons/year.**

Yet this is no time to rest on our laurels. In fact, the most important finding of this inventory is that ***renewed investment will be required to make further progress and to meet our targets.***

Given that the [social cost of carbon](#) is at least \$40/ton of carbon emissions, UofL's emissions in 2019 were still responsible for **no less than \$7.35 million/year in damage to our planet and its people.** It is not acceptable to continue externalizing these costs and imposing such a debt on the future generations for whom UofL ought to be a source of hope and flourishing.

Following a disturbing rise in emissions in 2017, our emissions essentially stabilized in 2018, and have only slightly decreased in 2019. This means **UofL remains off track** for achieving our first milestone goal of a 20% emissions reduction by 2020 from our 2008 baseline. This is troubling, but it is not unfamiliar territory for UofL. We have been here before and we have righted our ship. We saw a similar increase in emissions from 2013 to 2015 and took action to reverse the trend. In 2016, by continuing to invest in efficiency and behavior change, the university was **able to achieve a 7.75% reduction of carbon emissions in one year.** This is a vital investment for the sake of our students' futures, and, indeed, for our common future on Earth.

We must remain vigilant, committed, and willing to invest resources in order maintain our progress and to ensure a sustained effort toward our ultimate goal of climate neutrality by 2050. ***We must continue to invest in emissions reduction, to innovate solutions that work in our unique urban setting, and to prioritize efficiency, behavior change, transportation alternatives and renewable energy.***

The most important steps that UofL needs to take in the near-term are:

1. **Invest in large-scale renewable energy, behavior change, and energy efficiency** measures at the scale of our \$52M 2009-2017 three-phase performance contract.
2. **Reduce driving through a Transportation Demand Management Plan** that invests in and incentivizes alternatives (including online classes & working from home), caps parking, and transitions UofL from subsidizing annual parking permits to market-rate, pay-per-use parking that subsidizes alternatives.
3. **Explore carbon offsetting and sequestration solutions** that would benefit our campus & community.

## INTRODUCTION

This inventory represents UofL's on-going effort to track GHG emissions for the purpose of developing and refining strategies to reduce the pollution that results from our activities. ***Due to variations in methodologies, scales and contextual settings, this report is not intended to be used for comparison to other higher education institutions nor for any regulatory requirements.***

You will find herein a summary of the estimated GHGs for which UofL was responsible during the years 2006 through 2019. This is the seventh inventory update (now conducted annually) since our baseline GHG inventory, submitted in 2009. It follows the release of UofL's [2018 Greenhouse Gas Emissions Report](#), in June 2019.

This inventory provides an estimate of greenhouse gas emissions resulting from the activities of some 30,670 people who share our campuses as students, faculty and staff, as well as the operation of 8.9 million square feet of buildings on all three of the university's campuses, including the Belknap, Health Sciences Center, and Shelby campuses.

## BACKGROUND

On August 1<sup>st</sup>, 2008, former University of Louisville President, James R. Ramsey, took the bold step of signing the American College & University Presidents' Climate Commitment. This pledge expresses UofL's long-term commitment to sustainability and shifting toward climate neutrality. It is now firmly rooted in over a decade of work as we determined a baseline inventory of greenhouse gas emissions in 2009 and then developed a comprehensive [Climate Action Plan](#) in 2010. The Plan acts as a living document for UofL and serves as roadmap to achieve net climate neutrality by 2050. Now, under the leadership of our current President, Dr. Neeli Bendapudi, it is imperative that we continue organizing and investing to meet our commitment. **The time has come for us to update our Climate Action Plan and to devise financing strategies for implementation.**

We have already seen that UofL is capable of reaching our reduction goals even earlier than planned. Our new estimates this year, based on more accurate local data about commuter vehicle efficiency, show that UofL had already achieved a 19% reduction in emissions by 2013, and that in 2016, we had already blown past our initial 2020 goal with a 23% reduction.

Unfortunately, we have also seen how quickly we can lose ground in the fight to reduce carbon pollution. In 2017, our emissions shot back up to just a 14% reduction, and we've made only marginal progress since then. Ironically, the spring 2020 emergency shut-down of regular university operations in response to the COVID-19 pandemic may in fact help us achieve our 2020 carbon emissions target. **Of course, a pandemic is not the way to achieve our goals.** Yet, this is a pivotal, defining moment for us all and we must use this opportunity to engage in **long-term planning for a sustainable and resilient rebound around a commitment to return to a less polluting "new normal" post-pandemic.**

## METHODOLOGY

The enclosed findings are estimates only, based on an admittedly imperfect system of data gathering. This reporting represents a significant step forward in the comprehensiveness and accuracy of data gathering for carbon accounting as the University continues to strive to improve data collection methods and to more accurately track emissions.

GHG emissions are typically broken down into three categories and defined as scope 1 (on-campus sources), scope 2 (off-campus sources), and scope 3 (indirect sources). All three categories are included in this report. As we have done from the very beginning, the University's emissions were estimated using the UNH (formerly Clean Air-Cool Planet®) Campus Carbon Calculator v8.0.

The data summarized herein includes utilities data for some 115 buildings on all three campuses which are owned by the University, comprising approximately 8.9 million gross square feet of building space on 660 acres of land. The data encompasses all the University's academic, health science, medical, dental, athletic, dormitories, research, and office buildings and grounds.

Several buildings which are associated with the University but not owned or operated by UofL are not included in this report. Examples of these include fraternity and sorority houses, residence halls operated by third parties, UofL Hospital and UofL Health facilities, and off-campus leased space.

The report also tracks emissions from some of the behaviors of our total campus population of 30,670 students, faculty and staff. The transportation choices of this community have been particularly impactful on our collective carbon emissions. We have tracked commuting habits since 2010 using a university-wide commuter survey that has evolved considerably over time as we have refined our methods.

The 2019 report is based on a relatively new, year-round commuter survey for academic year 2018-19 (i.e. Sept. 2018-Aug. 2019), with a new sampling protocol to get more accurate year-round data. Prior to 2018, we surveyed a subset of the university population during one month in the fall (with relatively good weather) and asked them a variety of questions related to their commute. In those early years, we calculated mode-share based upon self-reported "most frequent" means of getting to campus. In 2018 we began surveying the entire university population, one fraction at a time during each week of the year, asking fewer questions about their most recent trip to campus. This gives us much more accurate data about year-round behaviors.

Our commuter surveys show that, despite some years of progress, over the last decade we have had little success in coaxing people out of their cars and reducing the percentage of our campus population that drives alone to campus. We have also continued to see little change in the use of highly polluting air travel to conduct university business and for Study Abroad programs, with 2019 air miles similar to 2018. These shifts in the wrong direction may be due in part to low fuel prices, but these market conditions only ***increase the need for UofL to be proactive and strategic in our efforts to change transportation behaviors.***

Emissions not reported because levels were considered to be *de minimus* include nitrous oxides used in the medical and research facilities, perfluorocarbons used in eye surgeries and MRIs, and sulfur hexafluorides used in ultrasound imaging.

Sources of emissions not reported due to the lack of accurate, attainable data or trends on which to base projected estimates include wastewater and UofL's portion of the natural gas, oil, and electricity consumed at the shared Louisville Metro Steam & Chilled Water Plant. That Plant supplies steam and chilled water to the entire downtown medical center, including our Health Sciences Center, but it is an independent, non-profit entity that we struggle to get detailed present and historical fuel mix data from. UofL recognizes these flaws in our GHG accounting and that these are not insignificant sources of carbon emissions.

**FINDINGS & RECOMMENDATIONS**

For the years 2006 through 2019, our revised estimates suggest that the University of Louisville produced annual average net emissions of 199,180 metric tons of carbon dioxide equivalent (MT CO<sub>2e</sub>) from all sources. In 2016, we appeared to be on track to meet our first goal of 20% reduction by 2020, as we estimated at that time that we stood at an 18.69% reduction from the 2008 baseline. With new local data on commuter vehicle fuel efficiency, however, we now estimate that the reduction in 2016 was much greater: **at 23.17%, we had reached our goal early!** Now, in 2019, after a sharp 12% rise during 2017, we are behind with only a 15.9% reduction.

The good news is that our net emissions for 2019 appear to have slightly decreased, both in absolute terms and relative to growth in the size of the University. The estimated 1.7% decrease in emissions from 2018 to 2019, is reflected in reduced emissions per student, per capita, per square foot of building space, and per heating degree days. Bucking long-term trends, however, our emissions appear to have increased slightly in 2019 per operating budget dollar and per cooling degree days.

**From 2008 to 2019, we estimate that UofL’s net carbon emissions have declined by 15.8% or 32,781 metric tons of CO<sub>2</sub> equivalent per year (from 218,540 to 183,805 metric tons/year).**

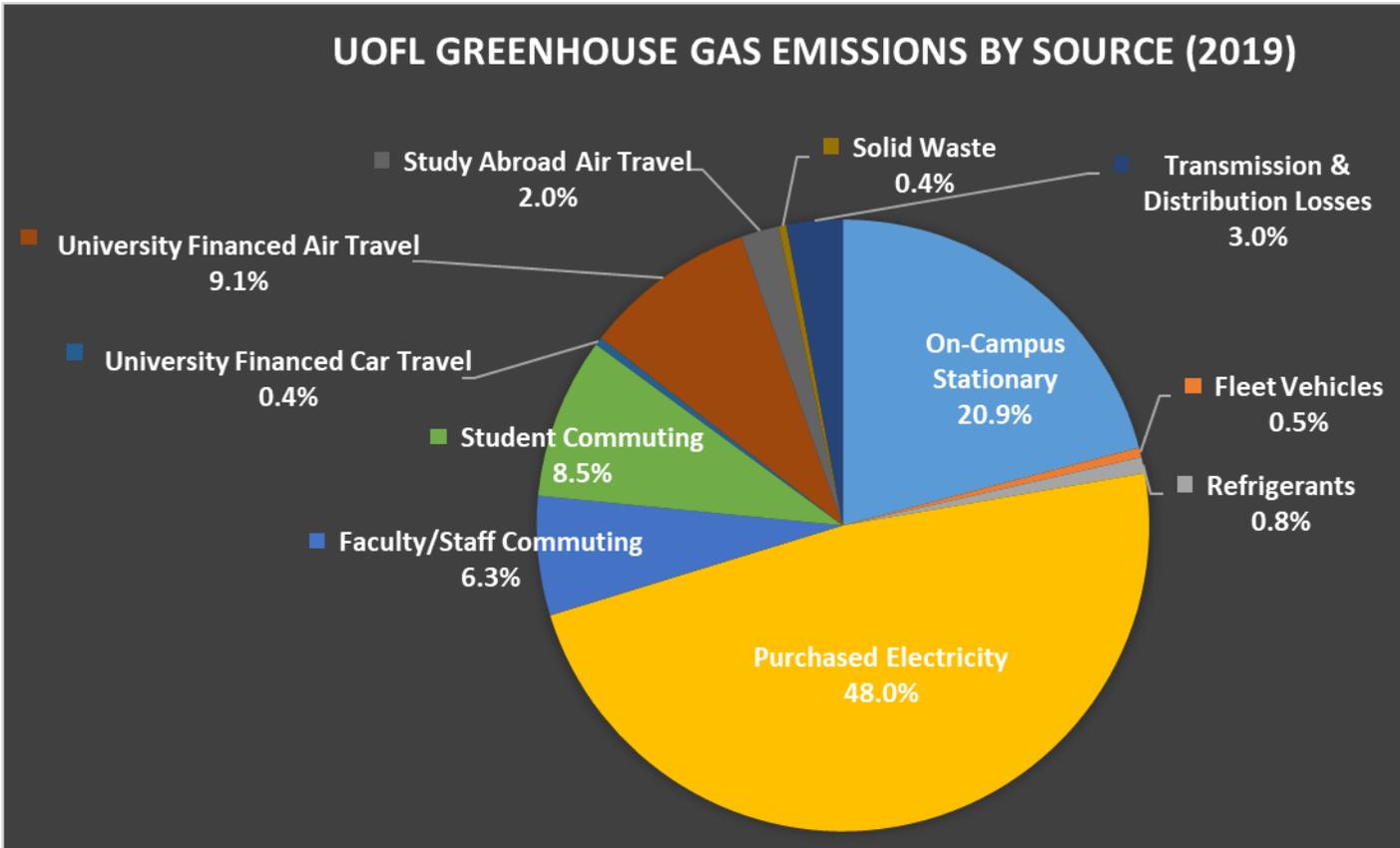
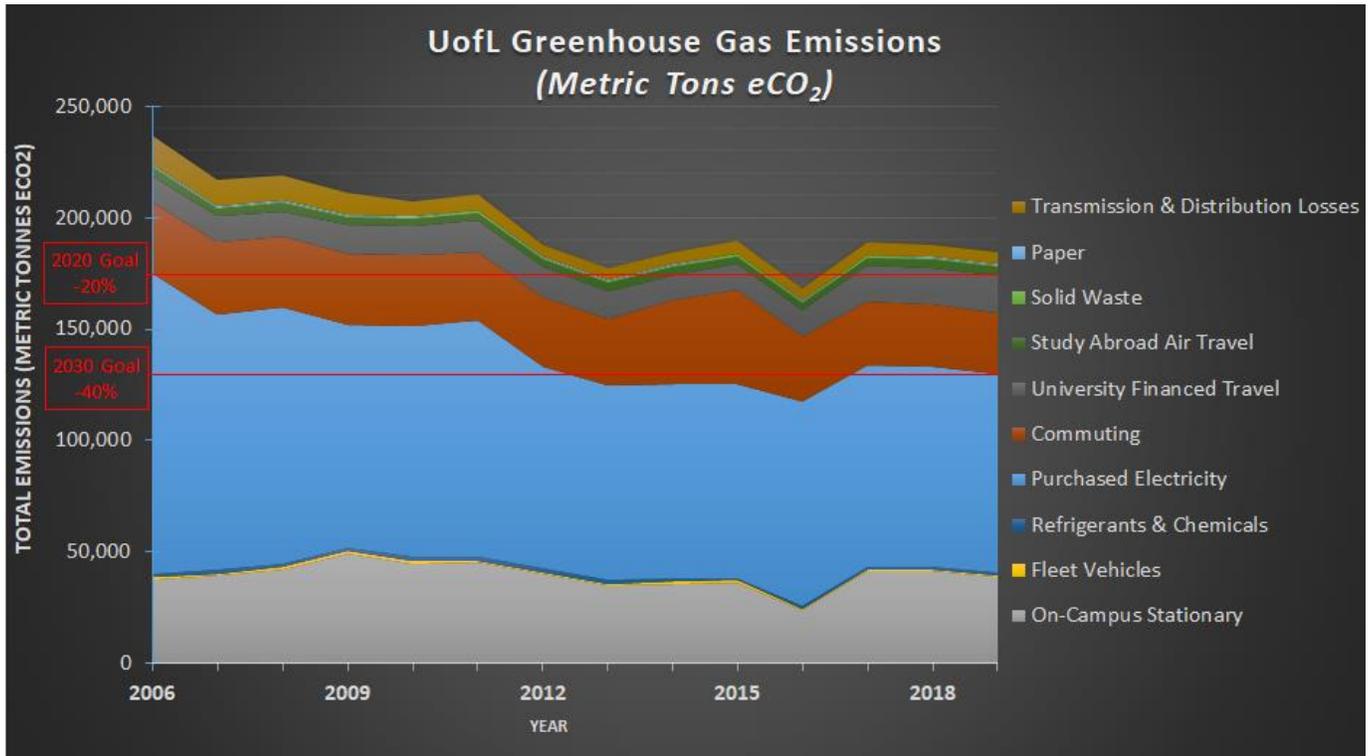
According to the [EPA's greenhouse gas equivalencies calculator](#), this translates to:

- Taking 7,082 cars off the road, or 81,342,432 miles of driving, or 3,688,646 gallons of gas burned;
- 11,150 tons (or 1,593 garbage trucks) of waste recycled instead of landfilled;
- Emission from 3,783 average U.S. homes’ annual energy use;
- 180 rail cars worth of coal burned;
- 1,245,337 incandescent lamps switched to LEDs; or the
- Carbon sequestered by 42,810 acres of U.S. forests in one year (or 542,041 tree seedlings grown for 10 years).

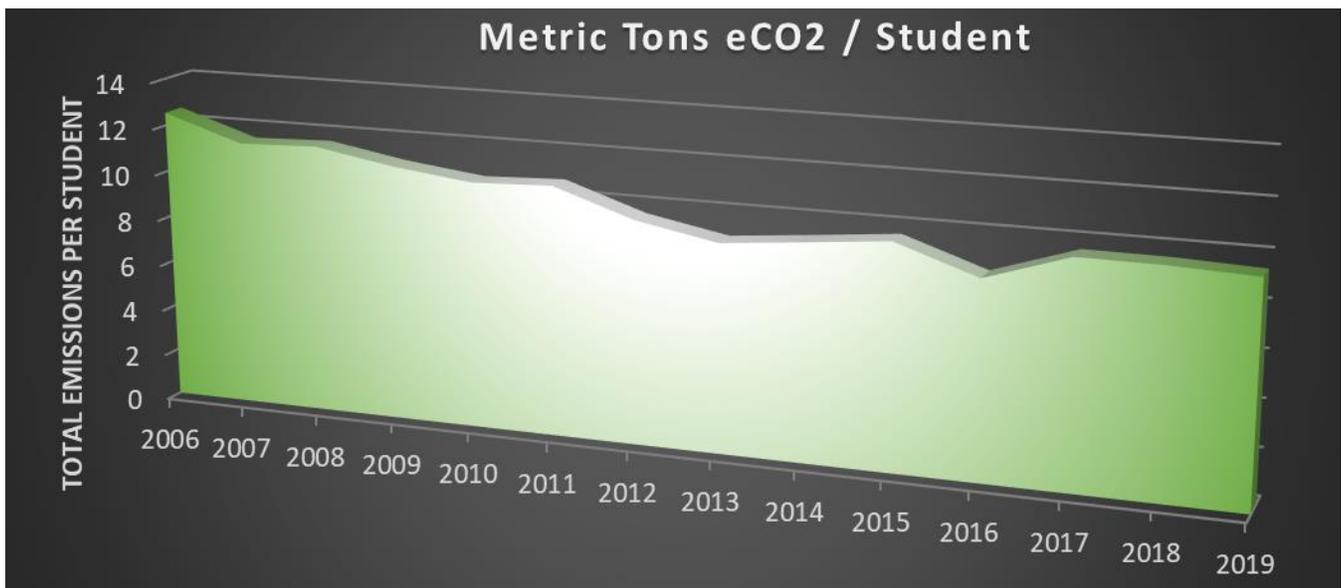
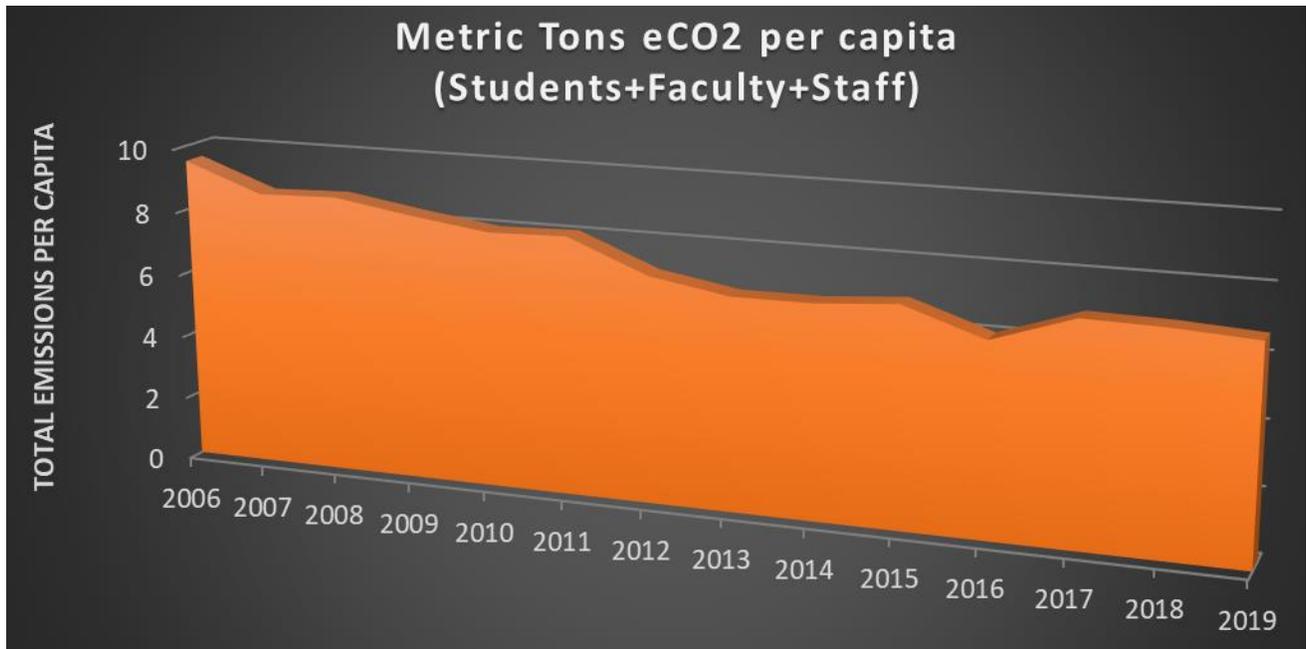
In relative terms, UofL has achieved impressive reductions in emissions even as we grow over time:

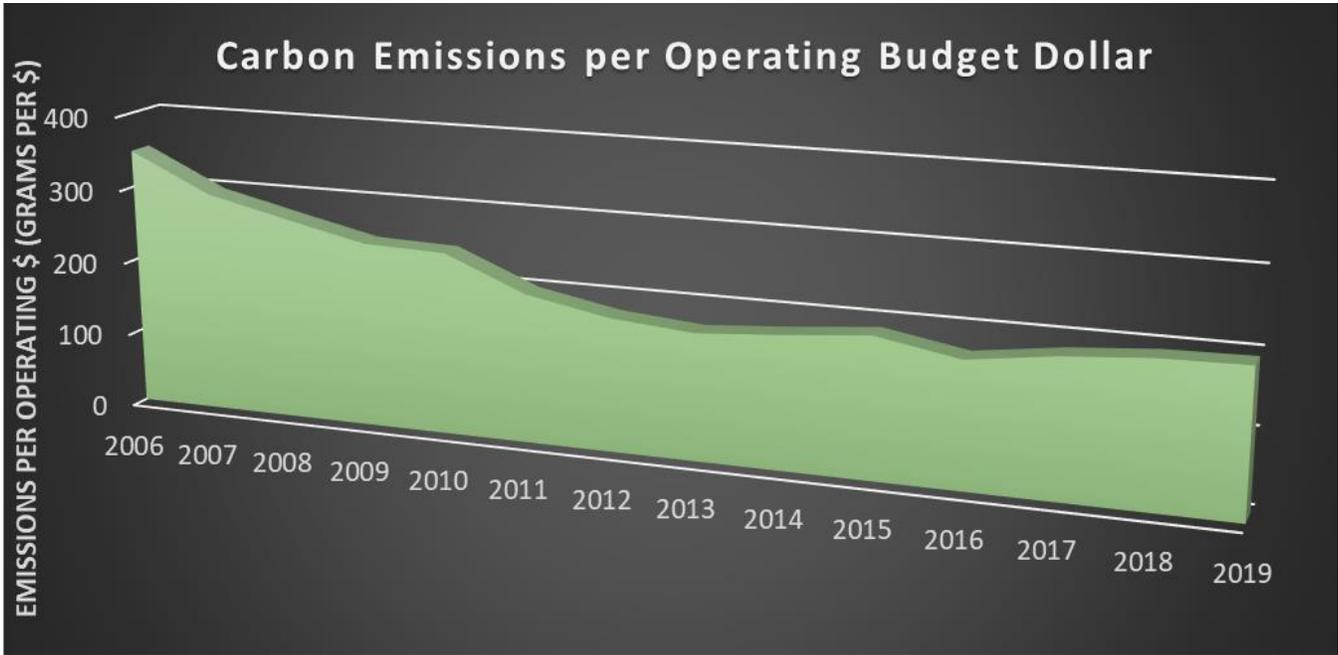
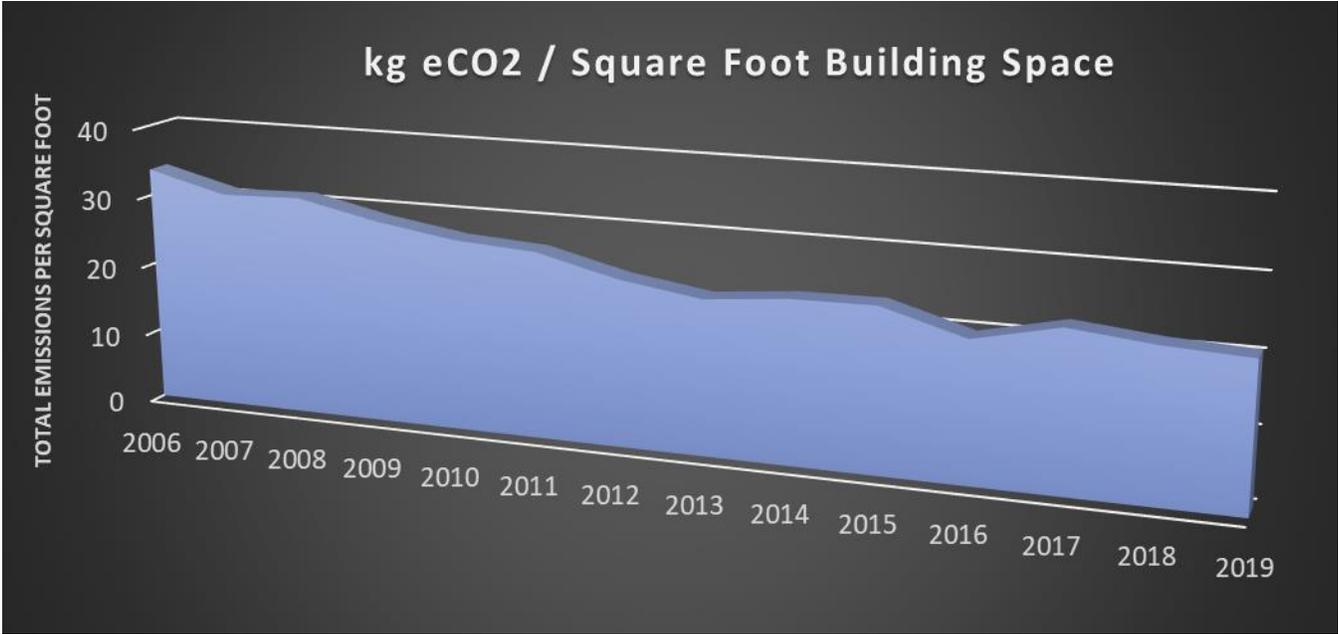
	Per sq. ft. of building space	Per Capita (Students + Employees)	Per Operating Budget Dollar
<b>Emissions Reduction 2008-2019</b>	33.7%	22.99%	28.7%

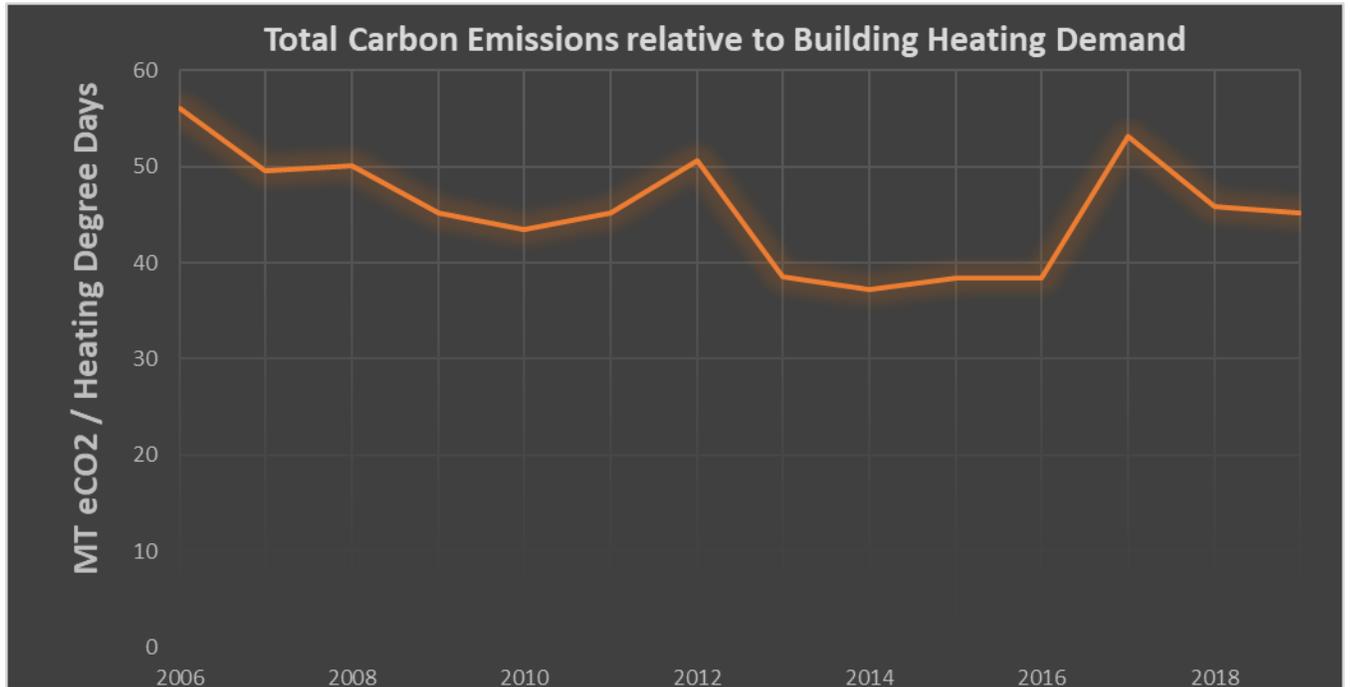
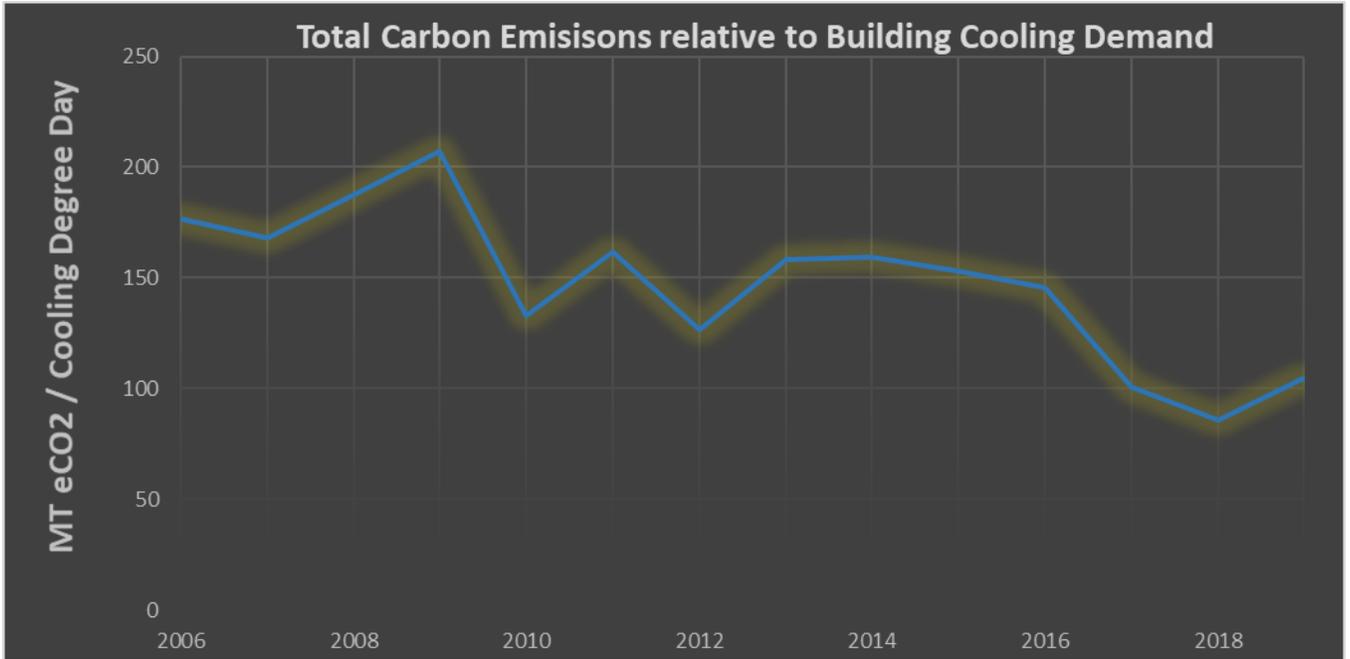
Despite this progress, it is imperative that UofL continue to invest in climate action as we must cut emissions another 4% in order to achieve our goal of a 20% reduction by 2020.



The failure to cut emissions in recent years is **not solely attributable to the continued growth of our university** in terms of employees, students, land, and building space. In fact, it is particularly troubling to note increases since 2016 across the board in terms of emissions per student, per capita, per square foot of building space, and per dollar of operating budget. These trends must be reversed for the sake of our students' futures, and, indeed, for our common future on this one shared planet.







Annual Carbon Emissions	Net Emissions	Per Student	Per Capita (Students + Faculty + Staff)	Per Sq. Ft. of Building Space	Per Annual Operating Budget	Per Number of Heating Degree Days	Per Number of Cooling Degree Days
	MT CO <sub>2</sub> e	MT CO <sub>2</sub> e / Student	MT CO <sub>2</sub> e / Person	kg CO <sub>2</sub> e / ft <sup>2</sup>	g CO <sub>2</sub> e / \$	MT CO <sub>2</sub> e / HDD	MT CO <sub>2</sub> e / CDD
2006	236,100	12.5	9.5	33.7	349.0	55.9	176.2
2007	216,170	11.5	8.6	30.9	297.5	49.4	167.8
2008	218,540	11.6	8.7	31.2	272.3	50.0	186.9
2009	210,660	11.0	8.3	28.8	248.0	45.1	96.3
2010	206,489	10.6	8.0	27.1	244.7	50.3	132.7
2011	209,448	10.7	8.1	26.4	199.3	45.1	161.0
2012	187,254	9.5	7.1	23.6	178.4	50.4	126.0
2013	176,588	8.9	6.6	21.9	169.1	38.4	157.5
2014	184,001	9.2	6.6	23.0	177.4	37.0	159.0
2015	188,851	9.6	6.8	23.1	187.8	38.3	152.5
2016	167,890	8.4	6.0	19.8	168.0	38.3	145.1
2017	188,172	9.5	6.9	22.4	183.5	45.9	86.0
2018	186,945	9.5	6.8	21.2	192.4	45.6	85.4
2019	183,805	9.4	6.7	20.7	194.6	45.0	104.4
<b>Average</b>	<b>199,180</b>	<b>10</b>	<b>8</b>	<b>26</b>	<b>223</b>	<b>45</b>	<b>146</b>

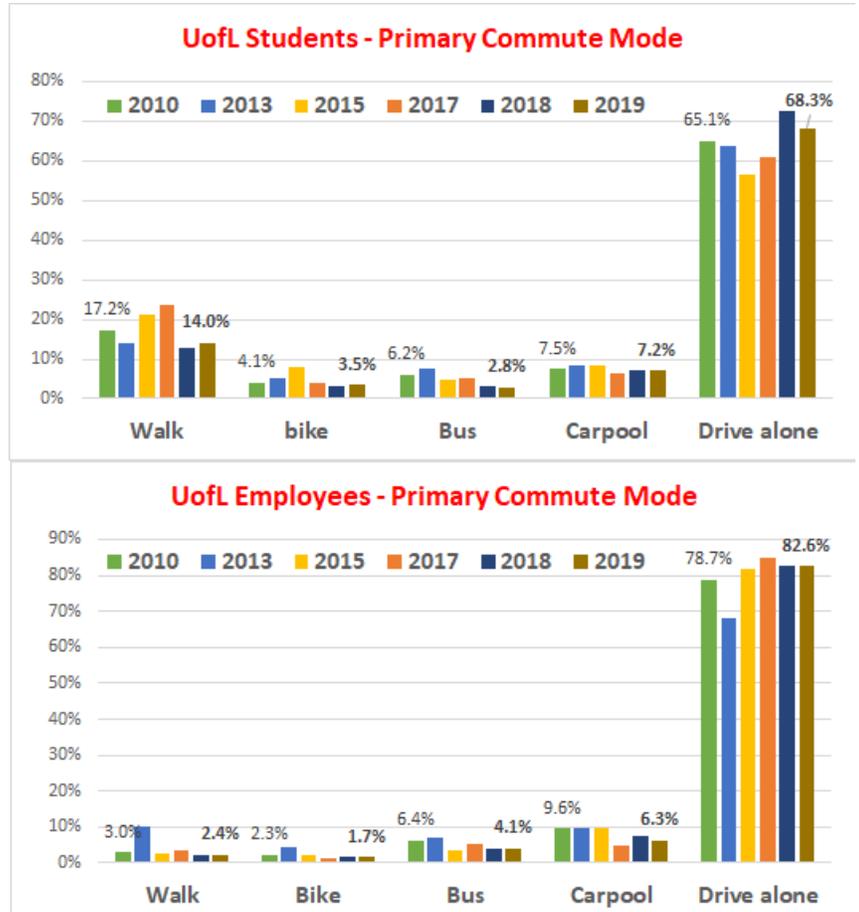
Year	Carbon Emissions													Offsets		NET
	On-Campus Stationary	Fleet Vehicles	Refrigerants	Fertilizer	Purchased Electricity	Faculty/Staff Commuting	Student Commuting	University Financed Car Travel	University Financed Air Travel	Study Abroad Air Travel	Solid Waste	Paper	Transmission & Distribution Losses	Sequestration due to composting & trees	Green Energy Certificates	Net Emissions
	MT eCO <sub>2</sub>	MT eCO <sub>2</sub>	MT eCO <sub>2</sub>	MT eCO <sub>2</sub>	MT eCO <sub>2</sub>	MT eCO <sub>2</sub>	MT eCO <sub>2</sub>	MT eCO <sub>2</sub>	MT eCO <sub>2</sub>	MT eCO <sub>2</sub>	MT eCO <sub>2</sub>	MT eCO <sub>2</sub>	MT eCO <sub>2</sub>	MT eCO <sub>2</sub>	MT eCO <sub>2</sub>	MT eCO <sub>2</sub>
2006	37,770	811	1,561	8	134,394	12,943	19,229	757	10,841	3,784	677	676	13,292	(641)	0	236,100
2007	39,457	895	1,561	8	114,293	13,430	19,391	761	10,723	3,663	720	607	11,304	(641)	0	216,170
2008	42,267	927	1,561	8	114,784	13,443	18,563	758	10,630	3,548	691	650	11,352	(641)	0	218,540
2009	49,471	1,009	1,561	8	100,142	13,246	18,602	758	11,832	3,373	821	574	9,904	(642)	0	210,660
2010	44,858	1,246	1,561	8	103,474	13,502	18,447	761	12,218	3,308	803	559	6,395	(650)	0	206,489
2011	45,339	876	1,561	8	105,988	12,929	17,975	761	13,642	3,264	747	579	6,551	(749)	0	209,448
2012	40,087	866	1,561	8	90,648	13,222	17,730	764	13,087	3,409	595	503	5,603	(671)	(127)	187,254
2013	34,894	829	1,561	8	87,228	12,329	17,745	773	11,800	3,521	768	515	5,391	(736)	0	176,588
2014	35,704	844	1,561	9	87,364	16,808	20,590	870	10,220	4,028	814	499	5,400	(661)	0	184,001
2015	36,513	858	605	5	87,499	19,848	22,534	846	10,787	3,309	855	492	5,408	(651)	(7)	188,851
2016	23,565	844	1,434	8	91,672	12,627	16,694	773	10,652	3,532	740	400	5,666	(663)	0	167,890
2017	41,328	940	1,204	8	90,607	11,955	16,328	775	15,487	3,599	742	521	5,600	(729)	0	188,172
2018	41,355	941	1,230	8	89,543	11,759	15,974	777	16,136	3,666	744	223	5,534	(739)	0	186,945
2019	38,556	942	1,561	8	88,478	11,626	15,725	779	16,784	3,732	746	361	5,469	(748)	0	183,805

## TACKLING TRANSPORTATION

As we noted in our previous GHG inventories, **UofL has made disproportionately good progress in reducing electricity and on-campus stationary fuel consumption compared to a notable lack of progress reducing emissions from transportation sources** (commuting, university financed air travel, and study abroad air travel).

### COMMUTING – REDUCING VEHICLE MILES TRAVELED

In August 2012, the UofL Sustainability Council aggressively expanded the diversity and scope of [transportation initiatives](#) available on campus, and our work gained national recognition. With the onslaught of a financial crisis and a transition in leadership beginning in 2017, we took our eye off the ball and our transportation alternatives began to contract. The first significant blow was the loss of our extremely popular and nationally recognized [Earn-A-Bike program](#) through which students and employees willing to give up their right to a UofL parking permit for at least two years could earn a \$400 bike shop voucher. Then, in 2019, UofL lost its [carshare system](#), and our free internal [bikeshare](#) program contracted from 11 check-out locations to just one (though we shifted the operation from daily to semester-long check-outs). The good news is that the citywide [LouVelo bikeshare system](#) expanded across Belknap campus in March 2019 and, for the time being, UofL continues to offer students and employees free access to the entire Louisville transit system, and carpool-matching through the [Cardinal Directions](#) online platform. This erosion of alternatives has likely contributed to the increase in driving alone to campus that is documented in our 2017-2019 commuter surveys.



Despite the recent boom in student-oriented housing around campus, many students, as well as faculty and staff, are generally not choosing to live close to campus, but are instead commuting to UofL in record numbers of single-occupancy vehicles. This not only challenges our ability to reduce emissions, but it also results in traffic congestion, reduced health and wellness, expensive parking pressures, and increased costs for a UofL education.

To reverse this trend, **UofL needs to develop and implement a strategic, comprehensive Transportation Demand Management Plan**, which must not only provide ease of access to alternatives and incentives for using them, but more importantly, **UofL needs to eliminate all parking subsidies and actively discourage driving to campus**. An overabundance of parking combined with parking costs well below market-rate and a pervasive campus culture built on the expectation of driving makes it extremely difficult for alternative modes to gain significant traction. The rationalization of parking prices implemented in FY20 was a step in the right direction, but it is insufficient.

The university's ongoing budget problems offer us a prime opportunity to reconsider parking fees and to rationalize our parking structure so that people can pay market-rate prices for parking only when they truly need it rather than purchasing an annual permit that makes daily driving the norm.

The resulting additional revenue could also be used to help fund transportation alternatives, including free transit, our [Cardinal Directions](#) carpool-matching platform, subsidies for carshare, bikeshare, and vanpools, incentives for commuter challenges, and a reestablishment of some kind of "parking cash-out" program<sup>1</sup>.

## ALTERNATIVES TO FLYING

**Inter-city travel also remains a major challenge** for UofL's efforts to reduce emissions. Flying on university-funded trips now accounts for 9.1% of our total carbon emissions, with study abroad flights adding another 2.0%. This is up from 3.7% and 1.6%, respectively, in 2008. **Flying is the most polluting, carbon-intensive option** for achieving the goals of inter-city travel. The university needs to consider ways to encourage lower-impact options such as:

- [Videoconference](#), [Teleconference](#), and remote meeting options such as Microsoft Teams and [Blackboard Collaborate](#) (free to UofL employees);
- [Carpooling](#) with fellow travelers through [Cardinal Directions](#) - UofL's trip-finding and carpool-matching system;
- **Taking the Bus** – Louisville is served by [Greyhound](#), [Megabus](#), and [Miller Transportation](#) but UofL has no established relationship with any of these service providers and none of these can be booked through UofL's travel agent;
- **Taking the Train** - [Amtrak](#) trains depart from Indianapolis and Cincinnati, with bus connector service to/from Louisville. Employees can easily book Amtrak trips through [Anthony Travel](#), by clicking on the train tab in the Concur booking portal.

**Additionally, the university must take steps to make carbon offsetting a standard, convenient part of the travel booking process for university business.** Services such as [Carbon Footprint Ltd](#), [Native Energy](#), [CarbonFund](#), and [TerraPass](#), already make carbon offsetting simple and affordable. Use of such services should be the default option for anyone booking university-financed travel.

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<sup>1</sup> Akin to UofL's extremely popular [Earn-A-Bike program](#) which rewarded students and employees for giving up their right to a UofL parking permit for two years in exchange for a \$400 voucher to a local bike shop. From 2012-2016, we typically received about 800 applications to the program despite having funding for only 400 vouchers. The current UofL Administration does not support this particular idea, but a "parking cash-out" program of some kind has proved vital in convincing commuters at other schools and businesses to leave their cars at home.

## INVESTING IN RENEWABLE ENERGY & EFFICIENCY

Having invested \$50 million in energy efficiency upgrades through a performance contract with Siemens, UofL has significantly reduced on-campus energy use. There is still more work to be done in that regard, but the pay-back periods will be longer and uncertainties may be higher, especially as we refocus attention on behavior change and personal accountability for utility use on campus. Nonetheless, it is imperative that UofL continue to invest in behavior change programs and energy efficiency measures beyond the scope of the 2009-2017 performance contract.

One major area for future progress that UofL has yet to seriously pursue is **investment in a large-scale renewable energy project**, most likely off-campus and probably best pursued in a consortium model with other universities or entities such as through our [Partnership for a Green City](#). Such an investment has the potential to save the university money through bulk energy procurement and to reduce risk through avoided future hikes in utility rates. It would also provide a much-needed boost to our efforts to achieve two key initial 20% by 2020 goals established in our 2010 Climate Action Plan – i.e. a 20% reduction in emissions and 20% renewable energy by 2020 (we are currently at 13% and 4.27%, respectively).

Given the educational and operational value, we must continue to incorporate renewable energy into our on-campus construction and renovation projects, but **the time has come for us to pursue an agreement for renewable energy sourcing from a new large-scale, off-site project.**

UofL's goal is to achieve climate neutrality by 2050. We had been making tremendous progress toward this goal, but we need to step up our efforts and accelerate progress to achieve that target. Current rates of reduction will not get us there by 2050, and failure to do so is dangerous for the institution and our planetary future.

Our plan for making progress toward climate neutrality is dynamic and multifaceted. We recognize that sustainability demands progress on multiple fronts and that lasting change cannot be achieved without coordinated, university-wide efforts. As such, we will be taking a variety of steps to lead UofL down a path toward climate neutrality.

## DATA LIMITATIONS

It must be stressed that these findings are *estimates* of GHG emissions, not actual measurements. The accuracy of these estimates is limited by the quality and extent of the data gathered. Actual emissions are likely to vary from the calculated estimates.

Limitations to the data used in this survey include:

- **Purchased Steam & Chilled Water:**  
UofL's Health Sciences Center does rely on purchased steam (in FY15 it was 209,517.98 MMBtu) and purchased chilled water (in FY15 it was 235,715.79 MMBtu) from the shared Louisville Metro Steam & Chilled Water Plant, an independent, non-profit entity adjacent to HSC that supplies steam and chilled water to the entire downtown hospital and medical center. We are not

reporting these numbers directly as part of our scope 2 emissions, however, because we have no way of knowing what the fuel mix was and because we have no other historical data to compare to. Each year, we do, however, report as scope 1 steam coal emissions an estimate of UofL's portion of the total coal burned at the shared Louisville Metro Steam & Chilled Water Plant. We report these numbers instead of MMBtu of purchased steam and chilled water because it is impossible for us to know what the complete fuel mix is at that Plant. We know that coal is not the only fuel source, but we cannot access records to give us a complete accounting. UofL recognizes this flaw in our GHG accounting. We are not able to report UofL's portion of the natural gas, electricity, or other fuel sources consumed at the Louisville Metro Steam & Chilled Water Plant. This is not an insignificant source of carbon emissions, but we have no way of tracking it.

- **Facilities UofL Does Not Own:**

The University recognizes that its true carbon footprint includes emissions from facilities that it does not own (such as private residence halls, leased off-campus space, or which are owned by separate affiliated entities such as the UofL Hospital, UofL Health, and UofL Foundation). However, these emissions are not included in our reporting, as it is not possible for the University to track or control these emissions. We chose to focus our inventories on facilities we have direct control over.

- **Wastewater:**

UofL's wastewater volume is not measured, nor is freshwater input as the water utility does not provide the University with annualized gallon data. In the future, gallons of water consumed by the University could be calculated based on average costs, but currently there is no central repository for the information and the University receives some 150 different water bills each month. We recognize that scope 3 emissions from the University's sewage are not insignificant and would like to find a way to include these figures in future reports.

- **Athletics Events:**

Though we now capture Athletics travel in our annual reporting, we are not able to include an accounting of emissions resulting from on-campus Athletics events (such as fan travel), other than the utilities consumed (as these are paid out of general funds).

- **Study Abroad Air Travel:**

The air miles for Study Abroad trips not booked through UofL travel agents have to be estimated for each leg of each flight using [webflyer.com](http://webflyer.com). For a small percentage of these trips, the exact itineraries between home and destination cities was not known and had to be assumed. Study Abroad data prior to 2011 is not available and had to be roughly estimated based on trend.

- **De Minimus Emissions:**

In calculating our carbon footprint, the University used rough, upper-bound estimates to designate as *de minimus* (or materially insignificant) emissions sources that collectively comprised less than 5% of the University's total GHG emissions. Some emissions considered *de minimus* for this report include nitrous oxides used in the medical and research facilities, perfluorocarbons used in eye surgeries and MRIs, sulfur hexafluorides used in ultrasound imaging, and fugitive emissions from laboratory animals used in medical research.

## **INSTITUTIONAL DATA**

Founded by decree of city council on April 3rd, 1837, with roots stretching back to 1798, the University of Louisville is today a premier metropolitan research university with two campuses in downtown Louisville and one on the urban fringe. UofL is a state supported institution located in Kentucky's largest metropolitan area. It was a municipally supported public institution for many decades prior to joining the statewide university system in 1970.

The University has three campuses. The 287-acre Belknap Campus is three miles from downtown Louisville and houses seven of the University's 11 colleges and schools. The Health Sciences Center is situated in downtown Louisville's medical complex and houses the University's health related programs and the University of Louisville Hospital. The 243-acre Shelby Campus is located in eastern Jefferson County.

The University of Louisville is committed to teaching, research, and service to its community and the advancement of educational opportunity for all citizens thereof. With a total enrollment of 22,459, and a growing number of full-time and residential students, UofL's academic programs continue to attract students from every state and from countries all over the world.

Now employing 7,986 people and operating with a budget of \$1.214 billion (2019 dollars), UofL is a major economic force in the community, lending even greater import to its policies with respect to environmental stewardship.

The University owns and maintains a fleet of roughly 200 road vehicles in addition to a number of pieces of heavy machinery used for grounds maintenance (backhoes, tractors, etc.). Physical Plant is responsible for maintaining the majority of these, as well as over 115 buildings (8.9 million gross square feet) and 660 acres of land on all three campuses. Physical Plant also operates and maintains a central steam and chilled water plant on the Belknap campus and a 13,800-volt distribution system at the Health Sciences Center and Belknap campuses.

### A Growing University

Year	Employees			Students			Total Campus Population	Operating Budget (adjusted for inflation 2005 \$)
	Faculty	Staff	Total	Full Time	Part Time	Total		
2006	2,074	3,875	5,949	15,804	6,037	21,841	27,790	\$0.676 b
2007	2,130	4,008	6,138	16,061	5,628	21,689	27,827	\$0.726 b
2008	2,124	4,050	6,174	16,027	5,734	21,761	27,935	\$0.802 b
2009	2,125	3,961	6,086	16,377	5,654	22,031	28,117	\$0.849 b
2010	2,188	4,087	6,275	16,818	5,472	22,290	28,565	\$0.844 b
2011	2,309	4,103	6,412	16,924	5,325	22,249	28,661	\$1.051 b
2012	2,316	4,585	6,901	16,963	5,330	22,293	29,194	\$1.050 b
2013	2,381	4,356	6,737	17,198	5,331	22,529	29,266	\$1.044 b
2014	2,383	5,333	7,716	17,317	5,282	22,599	30,315	\$1.037 b
2015	2,401	5,461	7,862	17,125	5,242	22,367	30,229	\$1.006 b
2016	2,439	5,500	7,939	17,406	5,234	22,640	30,579	\$0.999 b
2017	2,370	5,332	7,702	16,951	5,508	22,459	30,161	\$1.025 b
2018	2,540	5,273	7,813	16,780	5,691	22,471	30,284	\$0.972 b
2019	2,650	5,336	7,986	16,464	6,220	22,684	30,670	\$0.944 b

#### DATA GATHERING

The university’s Assistant to the Provost for Sustainability Initiatives served as the primary contact, author, and data compiler and analyst for this report. The data was gathered from across the university by collaborators with the university-wide Sustainability Council, in conjunction with the following units:

- Office of Institutional Research
- Business Operations
- Physical Plant
- Department of Environmental Health and Safety
- University Planning, Design and Construction
- Office of Study Abroad and International Travel
- Contract Administration & Procurement Services

Faculty and graduate students in the Department of Urban & Public Affairs took a lead role in developing the commuter survey and analyzing the data. Strategies for gathering the necessary data have been refined over the years since UofL’s baseline emissions inventory. The commuter data for this year’s report was gathered through a new year-round survey of the entire campus population from September 2018 – August 2019.

Year	Heating Degree Days	Cooling Degree Days
2006	4222	1340
2007	4379	1288
2008	4370	1169
2009	4671	1021
2010	4773	1556
2011	4646	1301
2012	3712	1486
2013	4599	1121
2014	4970	1157
2015	4934	1238
2016	4386	1157
2017	3558	1881
2018	4102	2188
2019	4089	1761

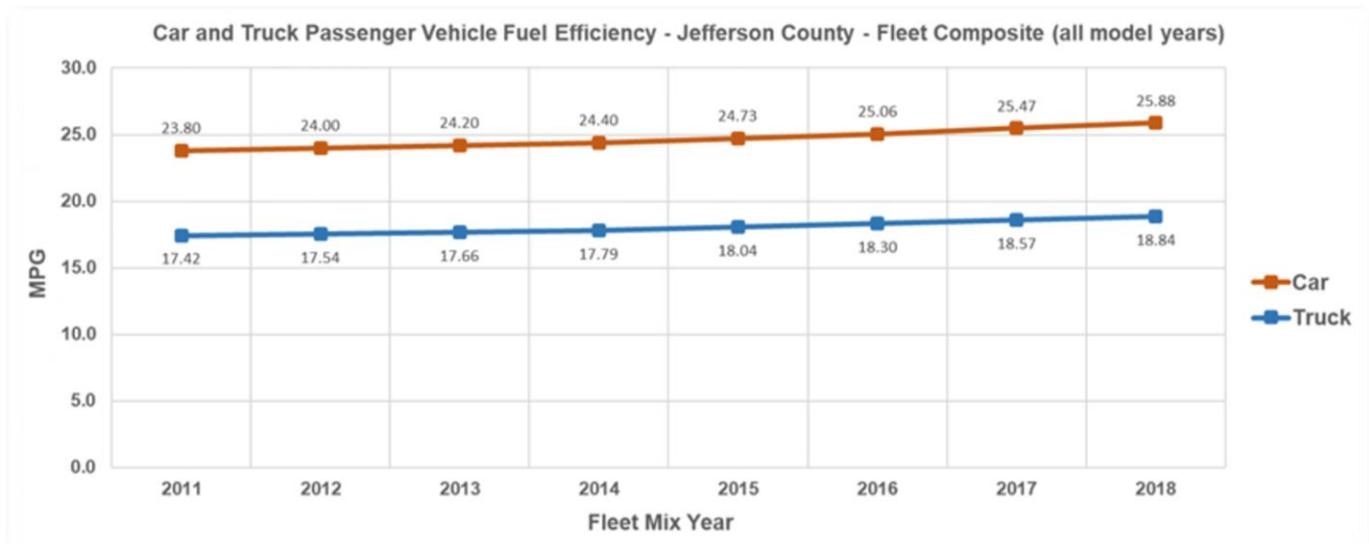


Figure 1 Provided by Craig Butler, Louisville Metro Air Pollution Control District, 2020

An improvement to this year's report is the result of receiving historical data on *average fuel efficiency* (AFE) for Jefferson County from the Louisville Metro Air Pollution Control District. This information has provided a new perspective to our outlook on the past, present and future. This factor estimates emissions generated by commuters to campus including students, staff and faculty. In each previous report, AFE had been estimated at 21.83 MPG for students, 21.22 MPG for faculty, and 21.16 MPG for staff. Using our own data from our earlier commuter surveys about what type of vehicles people drive (combining response categories of SUV, Minivan and Truck) and the trend presented above from a public source, we can see that the default emissions coefficients AFE supplied in the UNH Campus Carbon Calculator v8 was approximately equivalent to the AFE that would have existed in Louisville in 2010.

Our campus community's probable distribution of vehicle type for each year was then estimated based on commuter data gathered in 2013 and 2015. We applied the rising trend of fuel efficiency proportional to our campus community's probable distribution of vehicle type to estimate the campus AFE for each year between 2011 and 2018. We also followed the trend to represent AFE for 2019. Taking into account that *average fuel efficiency* in Louisville gradually increased about 1.5-2.0 MPG over the past eight years, we see a **reduction in our Scope 3 Emissions estimates**, and, in turn, our estimated Net Emissions for those years.

The GHG emissions included in this report include:

**Scope 1** emissions occurring from sources owned or controlled by the University. These consist of direct operations on campus that produce greenhouse gases, such as on-site fuel consumed (i.e. natural gas burned for heat and fuel consumed by campus fleet vehicles).

**Scope 2** emissions produced off-site by the electric utility as part of the generation process. The University purchases electricity from Louisville Gas & Electric, which has coal- and natural-gas powered generating stations located on the Ohio River, along with a small percentage of renewable energy (hydropower and a new solar array).

**Scope 3** indirect emissions generated off-site by commuter travel, business travel, waste transported to landfills, and some university purchases (notably paper). These emissions, although not produced directly on campus, are a result or consequence of university activities.

Emissions were estimated using the **UNH (formerly Clean Air-Cool Planet®) Campus Carbon Calculator v8.0** software utilizing annual facility data. The calculator was used for university data collection, storage and conversion into a common greenhouse gas emission unit, metric tons of carbon dioxide equivalent (MT CO<sub>2</sub>e). In the conversion process, the calculator uses scientifically based factors for specific activities leading to GHG emissions (e.g., commuter miles traveled, tons of waste disposed, gallons of fuel burned, etc.). These conversion factors have been modified as more is learned about the global warming effects of various greenhouse gases.

The default emissions coefficients supplied in the UNH Campus Carbon Calculator v8.0 were used in preparing this report for all emissions factors other than automobile fuel efficiency. As explained above, the GHG Reporting Team was able to find more accurate, local estimates of automobile fuel efficiency. The version of the Carbon Calculator we employed uses a global warming potential (GWP) factor from the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). GWP is the ratio of the degree of warming to the atmosphere that would result from the emission of one unit of a given GHG compared to one unit of carbon dioxide over a specified time period. This is used to convert emissions of other GHGs into units of carbon dioxide equivalents (CO<sub>2</sub>e).

## CONCLUSION

With this update to our greenhouse gas emissions inventory, UofL is proud to uphold its climate commitment and to continue tracking its emissions. While we recognize that these numbers are merely estimates and not a complete and precise accounting, we remain focused on the primary purpose of this effort – to continue developing and refining strategies to **reduce** our emissions, as laid out in our Climate Action Plan. The University recognizes the need to further refine our techniques for gathering more and better data about our climate impact and we continue working on strategies to do so.

UofL's mission is to teach the next generation and research solutions to our pressing problems. In striving for climate neutrality as an institution, UofL is leading by example and providing our students and employees vital lessons in stewardship and responsibility. We invite you to learn more about and get involved through our [UofL Sustainability website](http://louisville.edu/sustainability): [louisville.edu/sustainability](http://louisville.edu/sustainability).