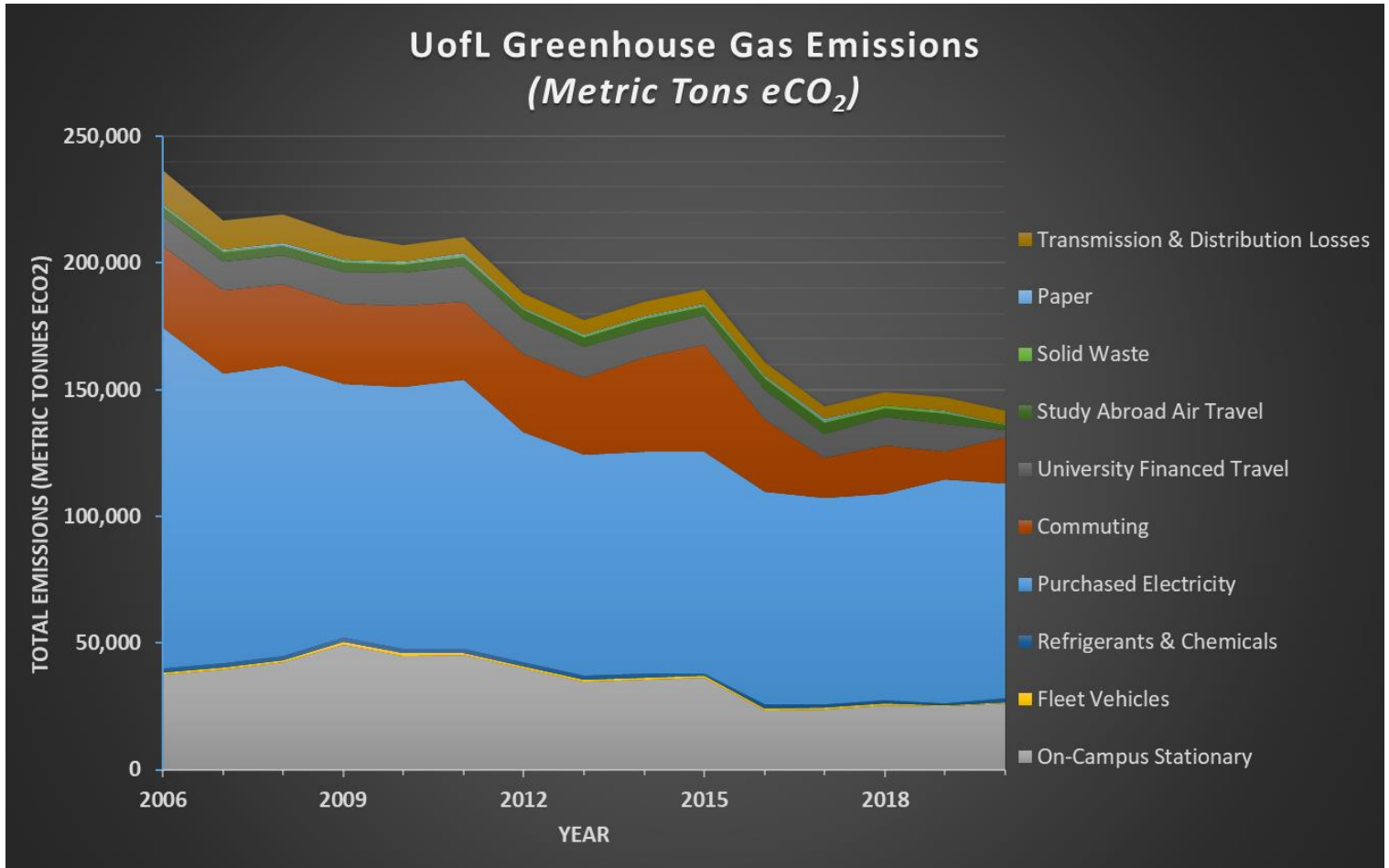


UNIVERSITY OF LOUISVILLE



GREENHOUSE GAS EMISSIONS INVENTORY 2006 – 2020

This work supports our [CARDINAL principles](#):
Community of Care, Accountability, Integrity & Transparency,
Noble Purpose, Agility, and Leadership.



UL Sustainability



Commitment to a Sustainable Future.

louisville.edu/sustainability

ACKNOWLEDGEMENTS

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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 the university grows. Efforts to implement our [Climate Action Plan](#) (CAP) continue to pay off, even in the face of budget cuts and a global pandemic.

While we have made great strides in the last decade, our progress has stalled and without larger investments, we have not been able to achieve some of our key goals in the CAP, such as sourcing 20% of our energy from renewable sources by 2020. In fact, UofL's renewable energy systems accounted for only 3.67% of our energy needs (excluding vehicle fuels) in 2020. Even with a 52% decrease in air travel, a 75% decrease in university-funded rental car mileage, and a 59% decrease in solid waste production due to the pandemic, **UofL's net emissions decreased only 3.5% from 2019 to 2020.** While any reductions in emissions should be celebrated, the latest science on the global climate crisis suggests that we must take even more aggressive action to cut emissions if we are to avoid the worst effects of runaway climate change.

From 2008 to 2020, we estimate that UofL's net carbon emissions have declined by 35.35% from 218,540 to 141,279 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 the targets necessary to prevent catastrophic global tipping points.***

Following several years of swift reduction in pollution, our emissions have essentially stabilized with little progress since 2017, when the Climate Action Plan implementation budget was slashed to a minimal operating level of \$45,000/year (25% of historical funding levels). The good news is that we were able to exceed our first milestone goal of a 20% emissions reduction by 2020 from our 2008 baseline. The lack of progress since 2017 is troubling, but it is not unfamiliar territory for UofL. We have been here before and we have righted our ship. In fact, we saw an increase in emissions from 2013 to 2015 and took action to reverse the trend. By continuing to invest in efficiency and behavior change, in 2016, the university was **able to achieve a 15% 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.

We must remain vigilant, committed, and willing to invest resources in order to accelerate our progress 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 a new energy-savings performance contract for energy efficiency, renewable energy, and behavior change** measures at the scale of our \$52M 2009-2017 performance contract.
2. **Invest in large-scale renewable energy**, both on-campus (as in an anaerobic biodigester) and off-campus (as through a virtual power purchase agreement).
3. **Prevent a return to pre-pandemic levels of driving through a Transportation Demand Management Plan** that incentivizes alternatives (including virtual), caps parking, and transitions UofL from subsidizing annual parking permits to market-rate, pay-per-use parking that subsidizes alternatives.

INTRODUCTION

This inventory represents UofL's on-going effort to track greenhouse gas (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 2020. This is the eighth inventory update (now conducted annually) since our baseline GHG inventory, submitted in 2009. It follows the release of UofL's [2019 Greenhouse Gas Emissions Report](#), in April 2020.

This inventory provides an estimate of greenhouse gas emissions resulting from the activities of some 31,058 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 1st, 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, and new Provost, Dr. Lori Gonzalez, it is imperative that we continue organizing and investing to meet our commitment. **To that end, in the coming months, UofL's Sustainability Council will be releasing a revised Climate Action Plan and our first Sustainability Plan for UofL.**

We have already seen that UofL is capable of exceeding our reduction goals even earlier than planned. Our new estimates this year, based on a correction in the way our carbon emissions had been reported in the past three years (from estimates based on a projection to actual data), show that by 2016 UofL had already blown past our initial 20% reduction by 2020 goal.

Unfortunately, we have also seen how easy it is to stall out in the fight to reduce carbon pollution. Over the last three years we saw our emissions creep back up and, with the pandemic shut down helping push emissions back down in the past year, we have only achieved a 1% reduction in carbon pollution since 2017. Of course, a pandemic is not the way to achieve our goals and we need to refocus on the imperative of climate action. Indeed, 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 accuracy of both data gathering and emissions estimates for carbon accounting as we continue 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 31,058 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 2020 report is based on a year-round commuter survey for academic year 2019-20 (i.e. Sept. 2019-Aug. 2020), with a sampling protocol designed 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, especially in light of extreme situational changes such as the pandemic lock down.

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. What the pandemic did bring us is a notable reduction in the use of highly polluting air travel to conduct university business and for Study Abroad programs, with 2020 air miles down 52% from 2019. The pent-up demand for travel post-pandemic only ***increases 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 Medical Center Steam 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 2020, our revised estimates suggest that the University of Louisville produced annual average net emissions of 194,751 metric tons of carbon dioxide equivalent (MT CO_{2e}) from all sources. By 2016, we had already exceeded our first goal of 20% reduction by 2020, as we estimate that at that time that we stood at a 26.7% reduction from the 2008 baseline. One year later, we had cut emissions to 35% of 2008 levels, and that is where we stand now, in 2020.

The good news is that our net emissions for 2020 are back on a downward trajectory, both in absolute terms and relative to growth in the size of the University. The estimated 3.5% decrease in emissions from 2019 to 2020, is reflected in reduced emissions per student, per capita, per square foot of building space, and per annual operating budget. Meanwhile, our emissions per heating and cooling degree days bucked long-term reduction trends and increased marginally in the last year, likely due to the implementation of pandemic safety guidelines for increased ventilation and fresh air in HVAC systems.

From 2008 to 2020, we estimate that UofL’s net carbon emissions have declined by 35.35% or 77,261 metric tons of CO₂ equivalent per year (from 218,540 to 141,279 metric tons/year).

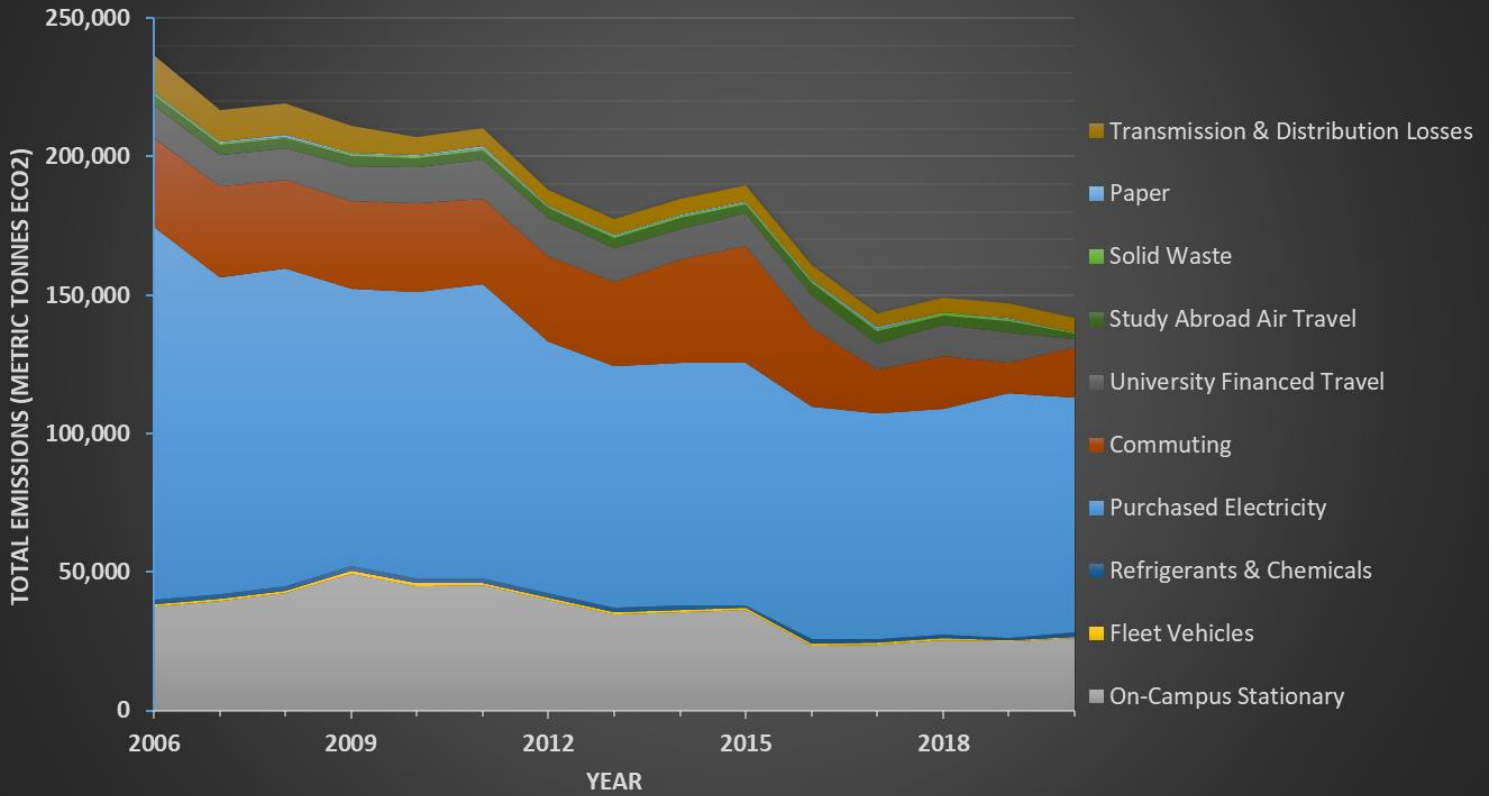
According to the [EPA's greenhouse gas equivalencies calculator](#), each year this translates to:

- Taking 16,803 cars off the road, or over 194 million miles of driving, or 8.7 million gallons of gas burned;
- 26,279 tons (or 3,754 garbage trucks) of waste recycled instead of landfilled;
- Emissions from 9,304 average U.S. homes’ annual energy use;
- 426 rail cars worth of coal burned;
- Over 2.9 million incandescent lamps switched to LEDs; or the
- Carbon sequestered by 94,658 acres of U.S. forests in one year (or 1.3 million tree seedlings grown for 10 years).

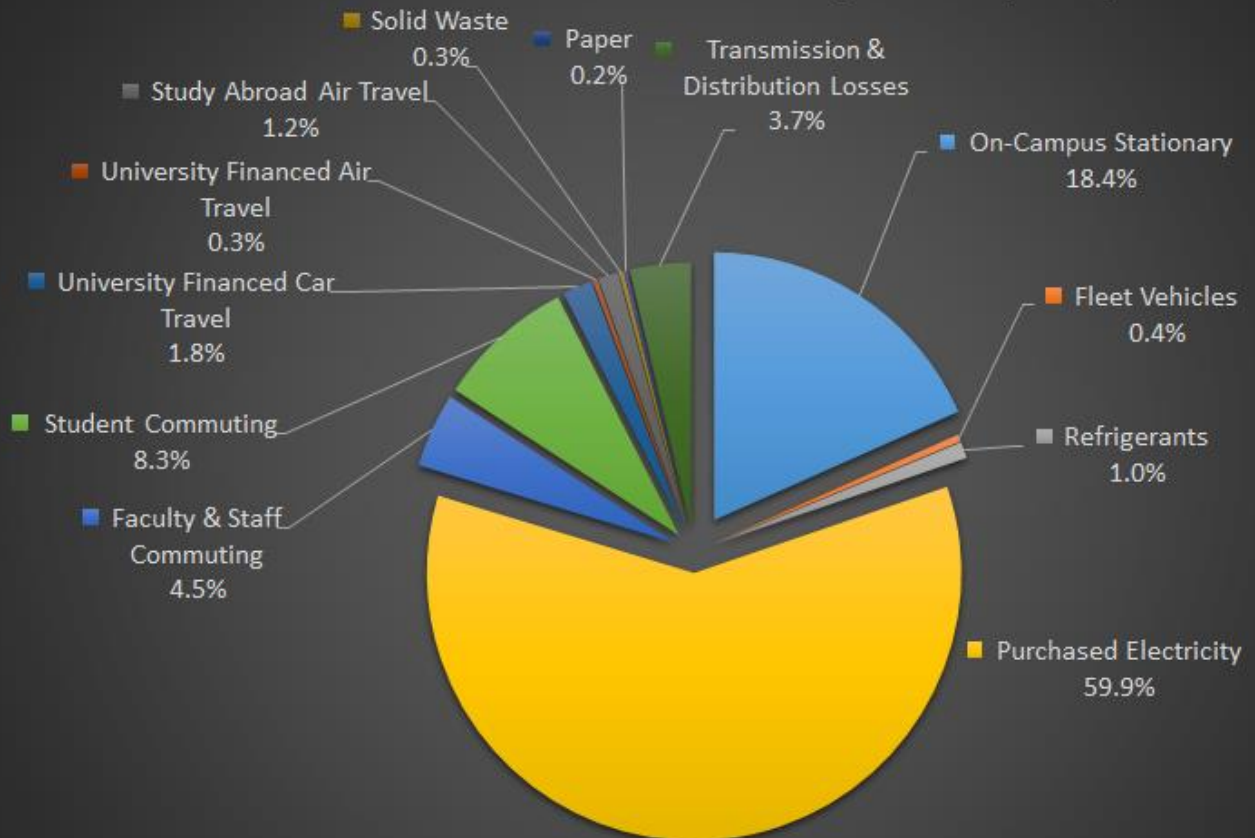
In relative terms, UofL has achieved impressive reductions in emissions even as we grow over time:

	Per sq. ft. of building space	Per Capita (Students + Employees)	Per Operating Budget Dollar
Emissions Reduction 2008-2020	49%	41%	45%

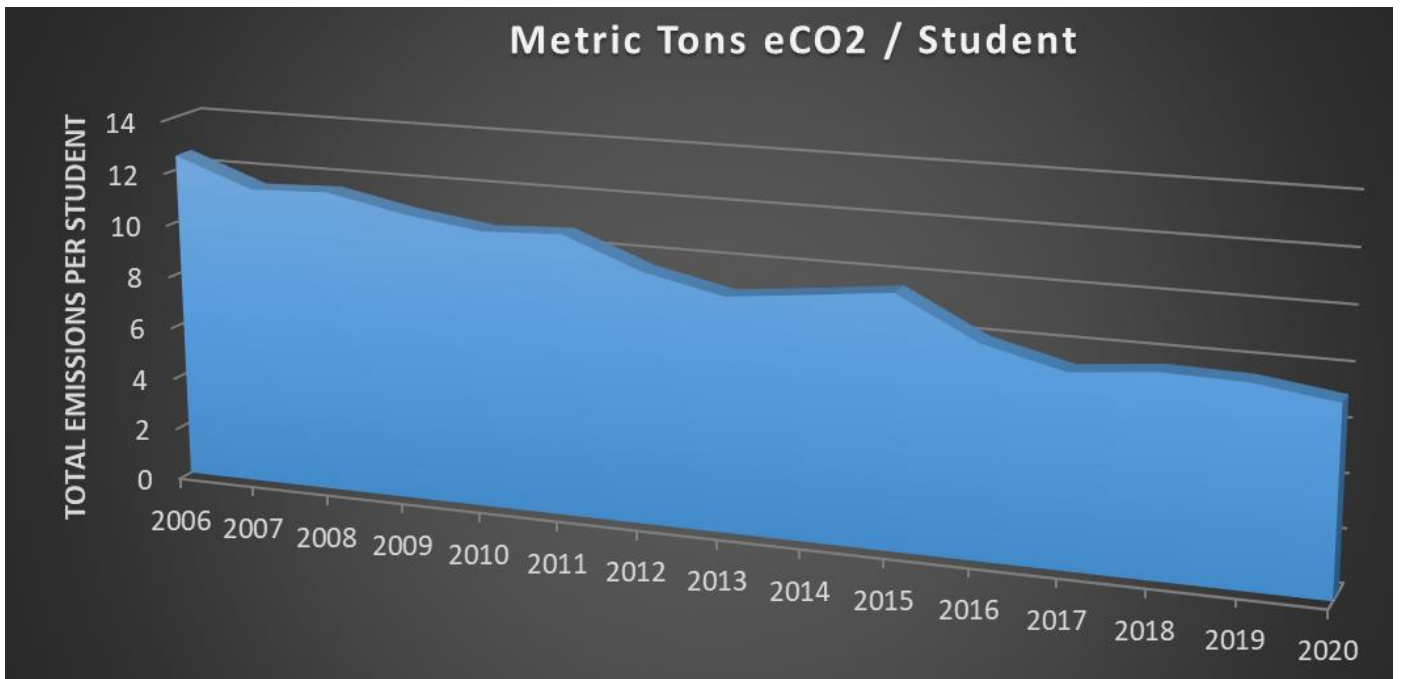
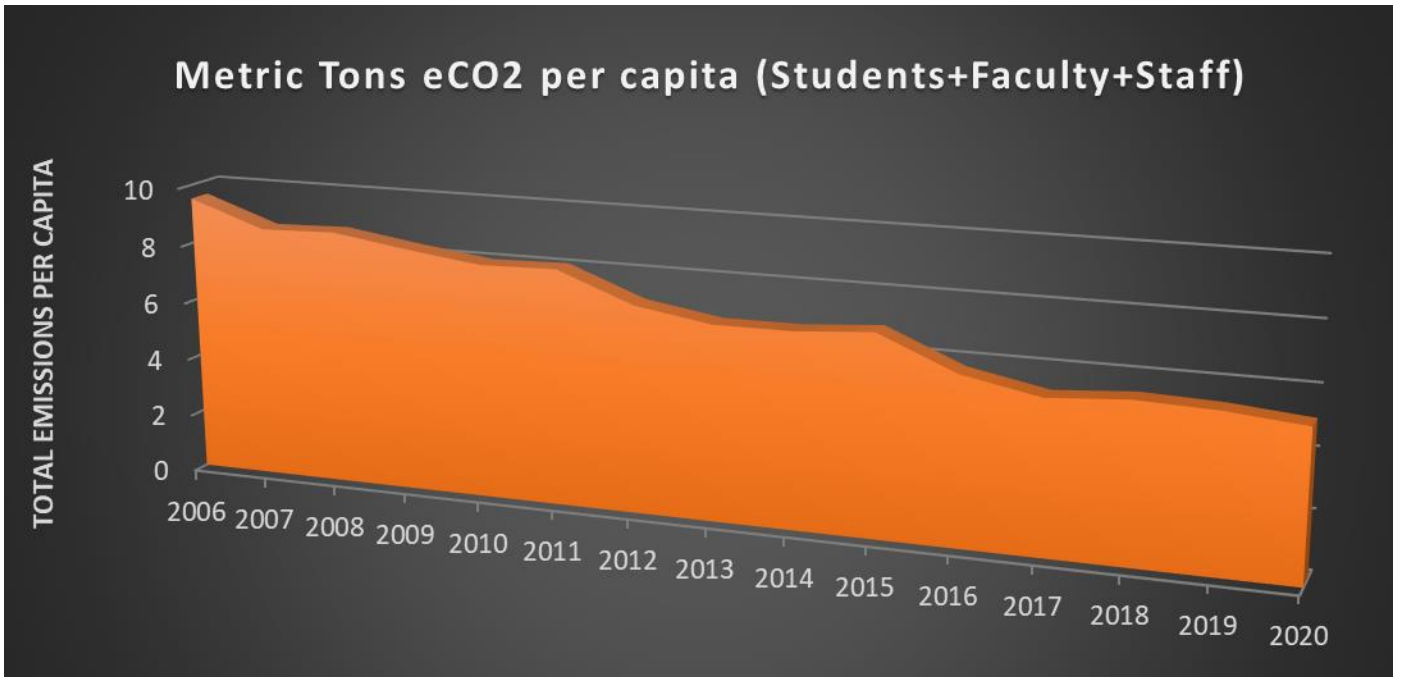
UofL Greenhouse Gas Emissions (Metric Tons eCO₂)

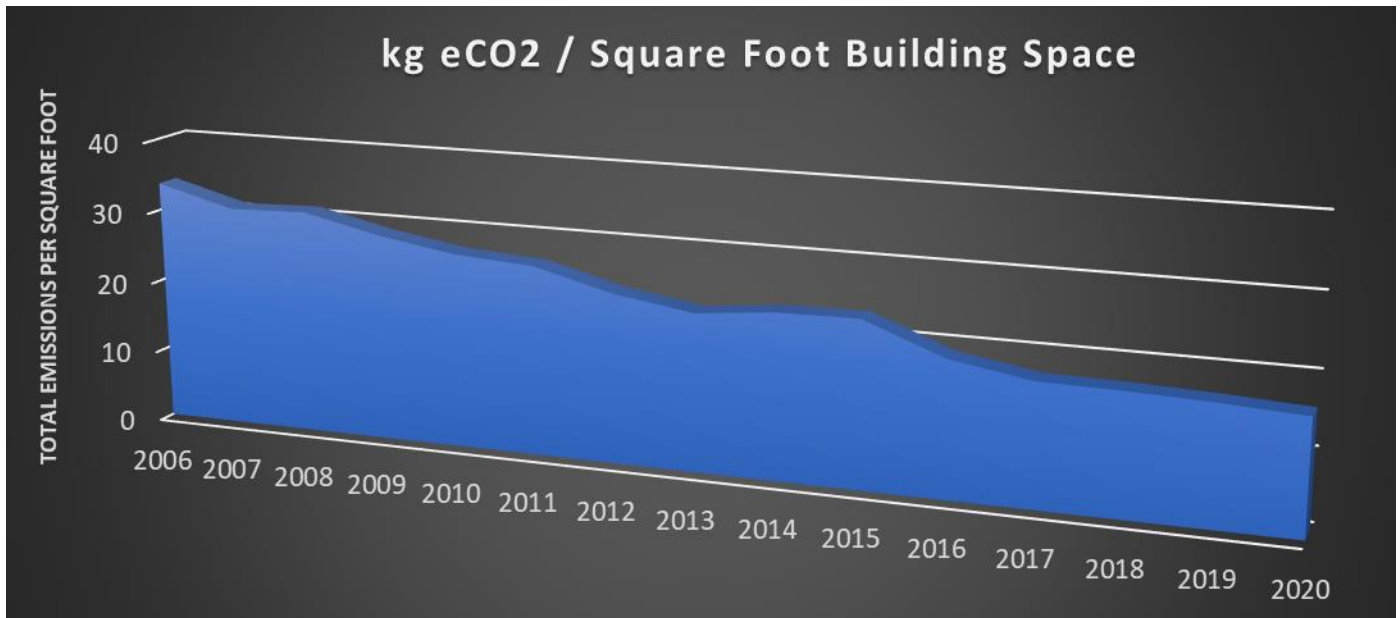
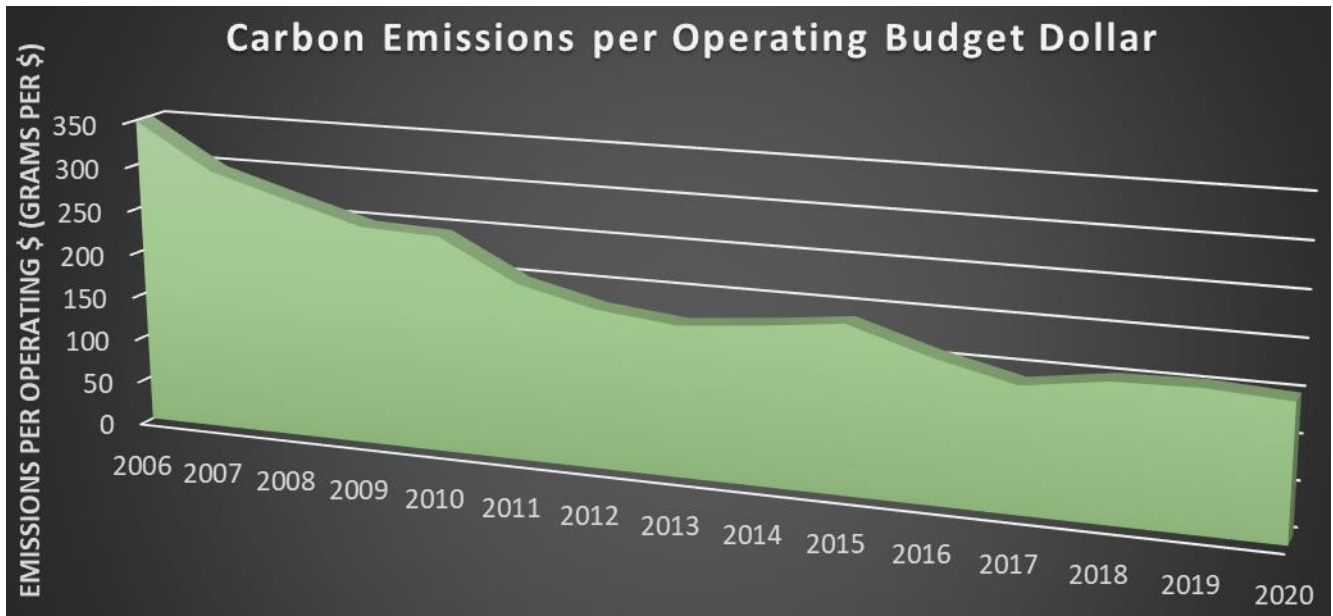


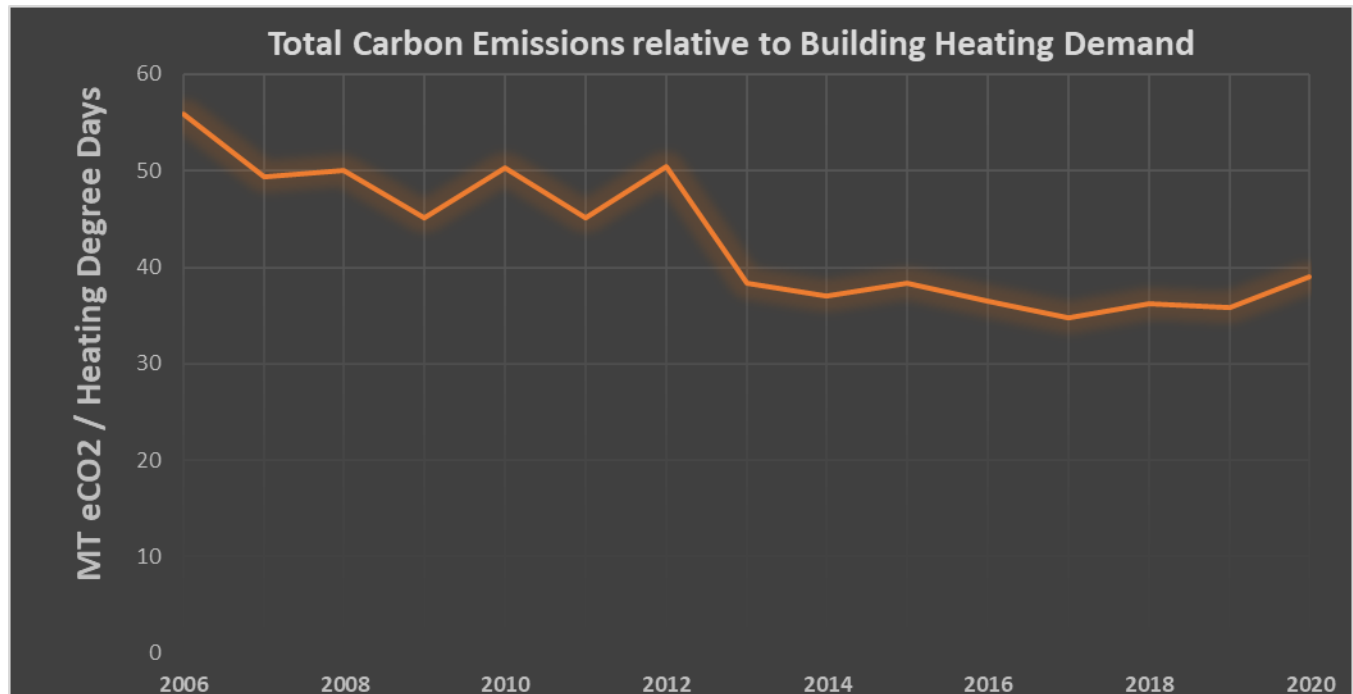
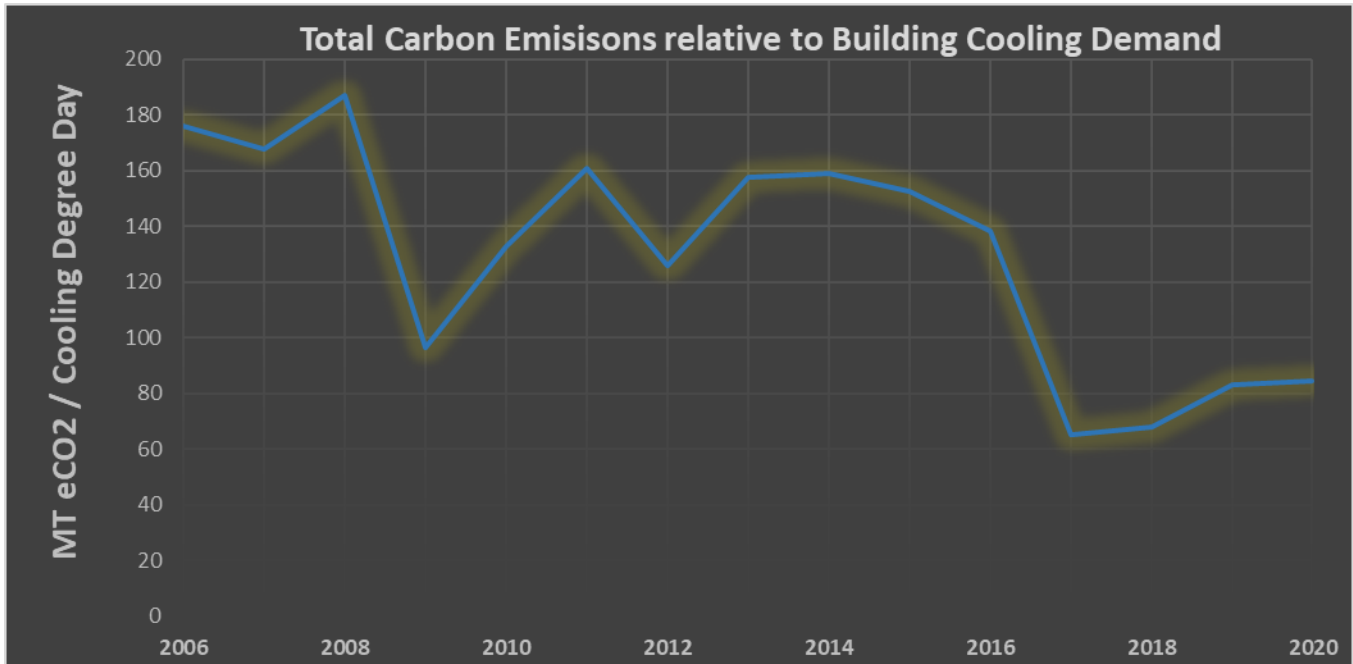
UofL Greenhouse Gas Emissions by source (2020)



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, emissions per student, per capita, per square foot of building space, and per dollar of operating budget have all held relatively steady. These trends must be reversed for the sake of our students' futures, and, indeed, for our common future on this one shared planet.







Year	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	Percent Reduction in Emissions from 2008 Baseline
	MT CO ₂ e	MT CO ₂ e / Student	MT CO ₂ e / Person	kg CO ₂ e / ft ²	g CO ₂ e / \$	MT CO ₂ e / HDD	MT CO ₂ e / CDD	
2006	236,100	12.5	9.5	33.7	349.0	55.9	176.2	8%
2007	216,170	11.5	8.6	30.9	297.5	49.4	167.8	-1%
2008	218,540	11.6	8.7	31.2	272.3	50.0	186.9	0%
2009	210,660	11.0	8.3	28.8	248.0	45.1	96.3	-4%
2010	206,489	10.6	8.0	27.1	244.7	50.3	132.7	-6%
2011	209,448	10.7	8.1	26.4	199.3	45.1	161.0	-4%
2012	187,254	9.5	7.1	23.6	178.4	50.4	126.0	-14%
2013	176,588	8.9	6.6	21.9	169.1	38.4	157.5	-19%
2014	184,001	9.2	6.6	23.0	177.4	37.0	159.0	-16%
2015	188,851	9.6	6.8	23.1	187.8	38.3	152.5	-14%
2016	160,113	8.0	5.7	18.8	160.2	36.5	138.4	-27%
2017	142,804	7.2	5.2	17.0	139.3	34.8	65.3	-35%
2018	148,318	7.6	5.4	16.8	152.6	36.2	67.8	-32%
2019	146,429	7.5	5.3	16.5	155.1	35.8	83.2	-33%
2020	141,279	7.1	5.1	15.9	149.9	39.0	84.4	-35%
Average	194,751	10	7	25	219	44	143	

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 ₂	MT eCO ₂	MT eCO ₂	MT eCO ₂	MT eCO ₂	MT eCO ₂	MT eCO ₂	MT eCO ₂	MT eCO ₂	MT eCO ₂	MT eCO ₂	MT eCO ₂	MT eCO ₂	MT eCO ₂	MT eCO ₂	MT eCO ₂
2006	37,770	811	1,561	8	134,394	12,943	19,229	10,841	757	3,784	677	676	13,292	(641)	0	236,100
2007	39,457	895	1,561	8	114,293	13,430	19,391	10,723	761	3,663	720	607	11,304	(641)	0	216,170
2008	42,267	927	1,561	8	114,784	13,443	18,563	10,630	758	3,548	691	650	11,352	(641)	0	218,540
2009	49,471	1,009	1,561	8	100,142	13,246	18,602	11,832	758	3,373	821	574	9,904	(642)	0	210,660
2010	44,858	1,246	1,561	8	103,474	13,502	18,447	12,218	761	3,308	803	559	6,395	(650)	0	206,489
2011	45,339	876	1,561	8	105,988	12,929	17,975	13,642	737	3,264	747	579	6,551	(749)	0	209,448
2012	40,087	866	1,561	8	90,648	13,222	17,730	13,087	734	3,409	595	503	5,603	(671)	(127)	187,254
2013	34,894	829	1,561	8	87,228	12,329	17,745	11,800	735	3,521	768	515	5,391	(736)	0	176,588
2014	35,704	844	1,561	9	87,364	16,808	20,590	10,220	823	4,028	814	499	5,400	(661)	0	184,001
2015	36,513	858	605	5	87,499	19,848	22,534	10,787	794	3,309	855	492	5,408	(651)	(7)	188,851
2016	23,531	843	1,434	8	83,862	12,630	15,978	10,636	783	4,635	853	400	5,183	(663)	0	160,113
2017	23,976	760	1,204	8	81,264	6,569	9,550	8,301	932	4,319	1,028	521	5,023	(650)	0	142,804
2018	25,522	660	1,230	8	81,662	8,318	10,797	10,292	858	3,456	884	223	5,047	(639)	0	148,318
2019	24,851	628	770	8	88,540	5,627	5,077	10,390	732	3,808	812	361	5,472	(647)	0	146,429
2020	26,056	626	1,389	8	85,012	6,379	11,822	2,545	430	1,747	391	289	5,254	(669)	0	141,279

TACKLING TRANSPORTATION

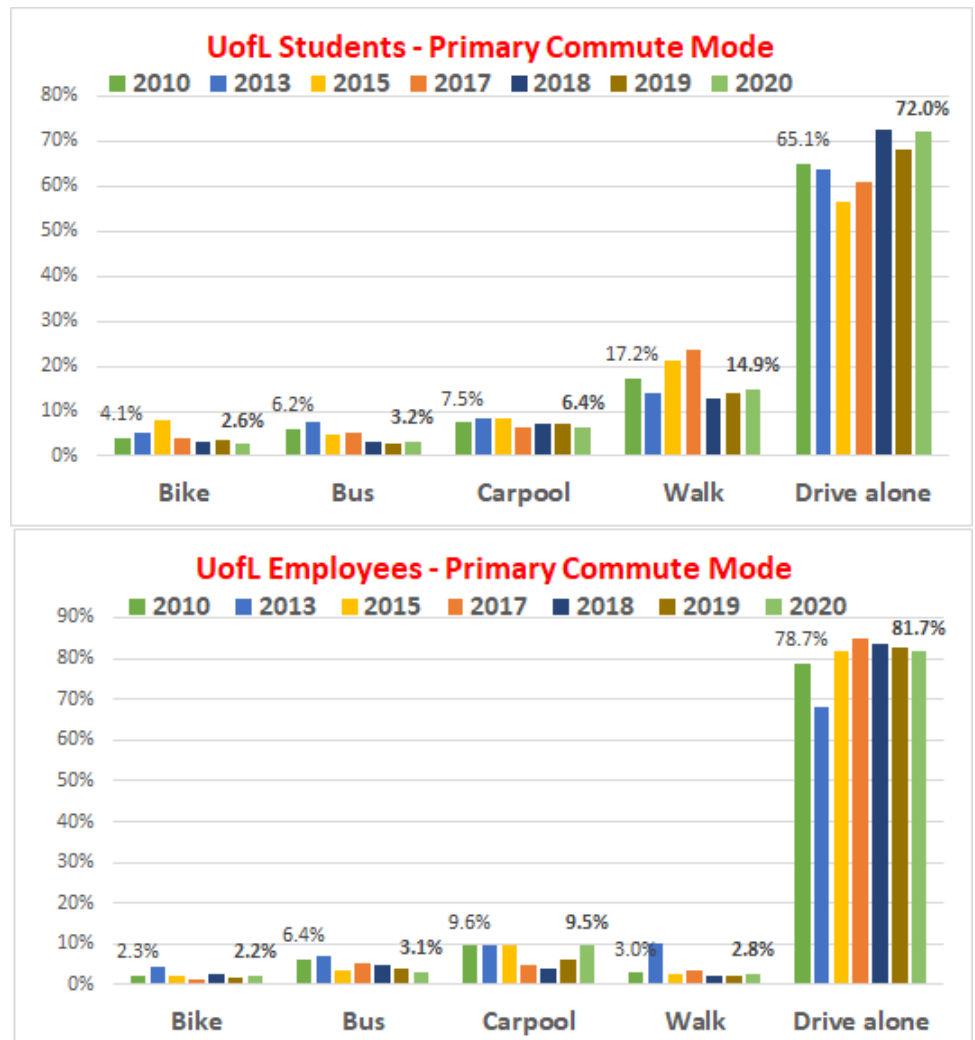
As we noted in our previous GHG inventories, **UofL has made disproportionately good progress in reducing electricity and on-campus stationary fuel consumption compared to a notable lack of progress reducing emissions from transportation sources** (commuting, university financed air travel, and study 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 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 2017-2020 commuter surveys.

Despite the on-going expansion of student-oriented housing on and 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 pollution, but it also results in traffic congestion, reduced health and wellness, expensive parking pressures, and increased costs for a UofL education.

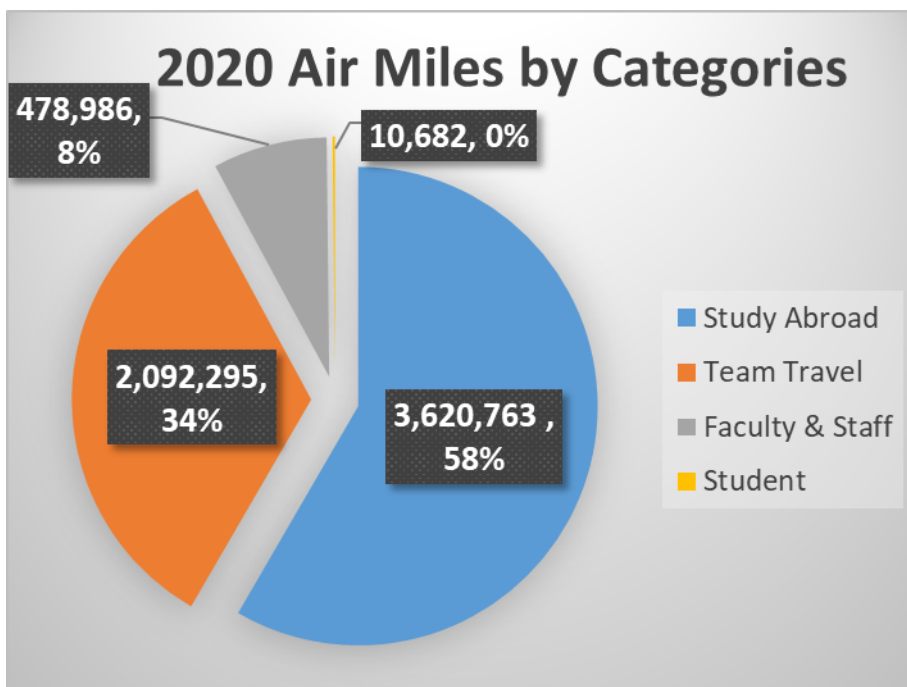
To reverse this trend, **UofL needs to develop and implement a strategic, comprehensive Transportation Demand Management Plan**, which must not only provide ease of access to alternatives and incentives for using them, but more importantly, **UofL needs to eliminate all parking subsidies and actively 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 and the pivot back to in-person instruction in fall 2021 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 investing in an annual permit that makes daily driving the rational 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, the reestablishment of a “parking cash-out” program¹, and a Sustainable Transportation Coordinator staff position to actively work on supporting efforts to reduce the number of cars on campus.

ALTERNATIVES TO FLYING

Inter-city travel also remains a major challenge for UofL’s efforts to reduce emissions. Pre-pandemic, flying on university-funded trips accounted for 9.1% of our total carbon emissions, with study abroad flights adding another 2.0%. This was 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:



¹ 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. 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.

- [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. In March 2020, Amtrak announced long-term plans to restore passenger rail service directly to Louisville. Now is the time to prepare ourselves for new, low-carbon, ground-based travel habits. 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.

INVESTING IN RENEWABLE ENERGY & EFFICIENCY

Having invested \$52 million in energy efficiency upgrades through a performance contract with Siemens, UofL significantly reduced on-campus energy use from 2009-2017. As technological efficiencies continue to improve and our existing building systems continue to age, there is still more work to be done in that regard. Some of the pay-back periods may 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 original performance contract.

One major area for future progress that UofL has yet to seriously pursue is **investment in a large-scale renewable energy project**. Conversations have begun again about partnering with local industries to convert distillery wastes and other organics to methane in an anaerobic biodigester. Off-campus options are also being pursued, whether through LG&E's plans for a solar farm, or via a virtual power purchase agreement, perhaps 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 the other key initial 20% by 2020 goal established in our 2010 Climate Action Plan – i.e. sourcing 20% of our energy needs from renewable sources by 2020 (we are currently at just 3.67% renewable).

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 have made 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 Medical Center Steam 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 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 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. 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 23,246, 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 7,812 people and operating with a budget of \$1.231 billion (2020 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
2020	2,723	5,089	7,812	16,774	6,472	23,246	31,058	\$0.944 b

DATA GATHERING

The university's Assistant to the Provost for Sustainability Initiatives served as the primary contact, author, 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

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
2020	3618	1674

through a year-round survey of the entire campus population from September 2019 – August 2020. It, thus, represents a mix of pre- and post-pandemic behaviors, though the majority of the time period represented by this data saw “normal” pre-pandemic commuting habits.

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 CO₂e). 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. 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 (CO₂e).

This year’s report updates GHG emissions estimates which were previously reported for the last three years. Due to an unnoticed glitch in the formulas used to estimate emissions in these previous reports (2017-2019), we had unknowingly been reporting estimates based on projections rather than actual data. While the source data was accurate in previous reports, the carbon emissions estimates were not. We apologize for the error.

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.

Given that the [social cost of carbon](#) is at least \$40/ton of carbon emissions, UofL's emissions in 2020 were responsible for **no less than \$5.7 million/year in damage to our planet and its people**. It is not acceptable or in line with our [CARDINAL principles](#) 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.

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](https://louisville.edu/sustainability): louisville.edu/sustainability.