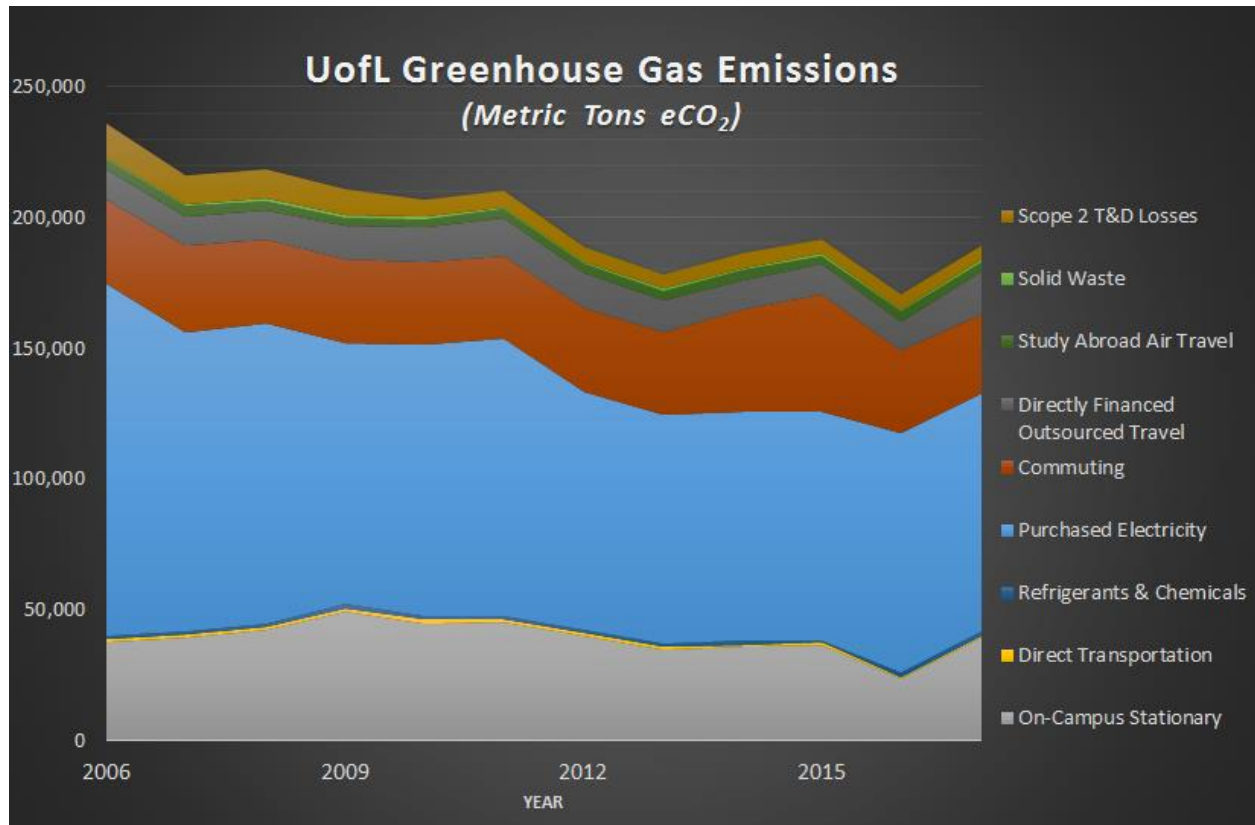


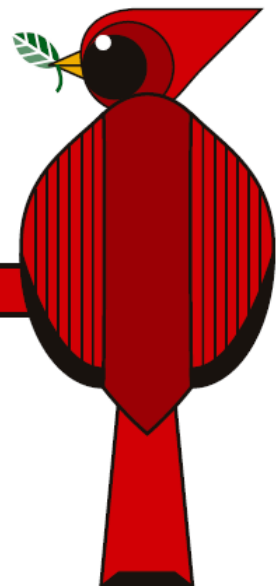
UNIVERSITY OF LOUISVILLE



GREENHOUSE GAS EMISSIONS INVENTORY 2006 - 2017



U^{OF} Sustainability



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University of Louisville Greenhouse Gas Emissions Inventory 2006 – 2017

EXECUTIVE SUMMARY

This report documents the progress the University of Louisville (UofL) has made in reducing our greenhouse gas (GHG) emissions over the past decade, even as we have grown in terms of physical size, campus population, and budget. Our efforts to implement our [Climate Action Plan \(CAP\)](#) had been paying off, thanks to sustained investment of resources and attention in fiscal years 2011-2017. However, a troubling reversal of progress has occurred in the last year during which the university's financial crisis resulted in a 100% budget cut for CAP implementation. A renewed investment of resources and leadership can get us back on track in the years to come.

From 2006 to 2017, we estimate that UofL's net carbon emissions have declined nearly 20% from 236,101 to 189,022 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.*** Following significant improvement in 2016, our **emissions actually increased 11% in 2017**, knocking us off track from achieving our first milestone goal of a 20% emissions reduction by 2020 from our 2008 baseline. In 2016, we stood at an 18.69% reduction from the 2008 baseline. In 2017, we are back down to a 13.51% reduction.

This is a troubling development, but it is not unfamiliar territory for UofL. We have been here before and we have righted our ship before. 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 7.2% reduction of carbon emissions in one year. This was a vital investment for the sake of our students' futures, and, indeed, for our common future on this one shared planet.

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. **Reduce driving through a Transportation Demand Management Plan** that invests in and incentivizes alternatives, caps parking, and transitions UofL from highly subsidized annual permits to market-rate, pay-per-use parking.
2. **Invest in large-scale renewable energy, behavior change, and energy efficiency** measures beyond the scope of the existing performance contract.
3. **Explore carbon offsetting and sequestration solutions** that would benefit our campus, community, and region.

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 2017. This is the fifth inventory update since our baseline GHG inventory, submitted in 2009. It follows the release of UofL's [2016 Greenhouse Gas Emissions Report](#), in April 2017.

This inventory provides an estimate of greenhouse gas emissions resulting from the activities of some 30,161 people who share our campuses as students, faculty and staff, as well as the operation of nearly 8.4 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, 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 a move toward climate neutrality. In 2018, as we welcome a new President to campus, Dr. Neeli Bendapudi, we are proud to report that the University remains true to this commitment, having determined a baseline inventory of greenhouse gas emissions in 2009 and having developed a comprehensive [Climate Action Plan](#) in 2010. This Plan acts as a living document for UofL and serves as roadmap to achieve net climate neutrality by 2050, with interim goals for emissions reduction along the way.

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.

METHODOLOGY

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.

The data summarized herein includes utilities data for some 115 buildings on all three campuses which are owned by the University, comprising approximately 8.4 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, the University Hospital, and off-campus leased space.

The report also tracks emissions from some of the behaviors of our total campus population of 30,161 students, faculty and staff. The transportation choices of this community have been particularly impactful on our collective carbon emissions. Our most recent fall 2017 UofL Transportation Alternatives survey uncovered a disturbing increase in driving alone to campus (including a 4% increase among students). We have also seen an increase in the use of highly polluting air travel to conduct university business. These shifts in the wrong direction may be in large part due to a precipitous drop in fuel prices, but these market conditions only **increase the need for UofL to be proactive and strategic in our efforts to change transportation behaviors.**

The University's emissions were estimated using the UNH (formerly Clean Air-Cool Planet®) Campus Carbon Calculator v8.0.

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.

Emissions not reported due to the lack of accurate, attainable data or trends on which to base projected estimates include wastewater and purchased steam and chilled water from the shared Louisville Metro Steam & Chilled Water Plant, an independent, non-profit entity that supplies steam and chilled water to the entire downtown hospital and medical center, including our Health Sciences Center.

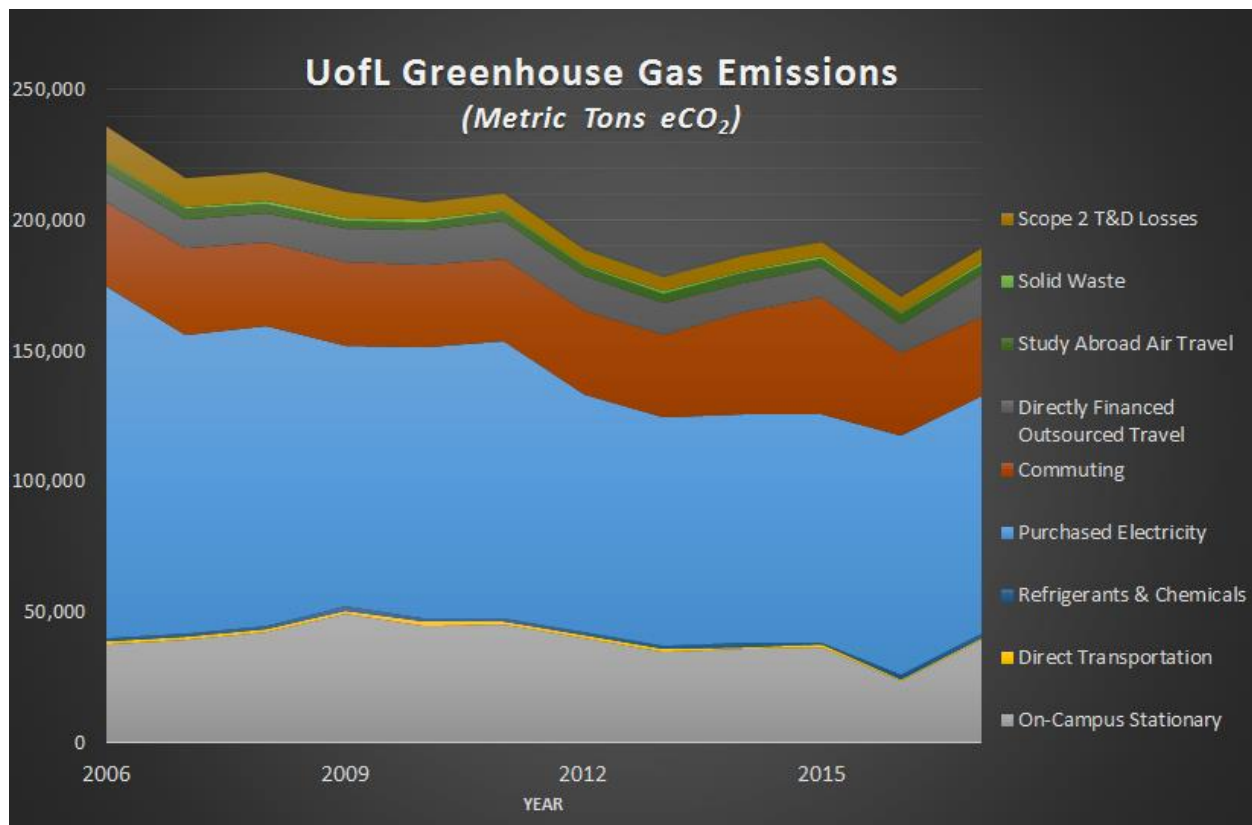
FINDINGS & RECOMMENDATIONS

For fiscal years 2006 through 2017, our revised estimates suggest that the University of Louisville produced annual average net emissions of 200,095 metric tons of carbon dioxide equivalent (MT CO₂e) from all sources. Despite a reduction in 2016, our net emissions for 2017 appear to have regressed slightly to the previous years, both in absolute terms and relative to growth in the size of the University.

From 2008 to 2017, we estimate that UofL's net carbon emissions have declined 13.51% from 218,540 to 189,022 metric tons.

We must cut emissions another 6.5% to achieve our goal of a 20% reduction by 2020.

The increases we have seen in emissions in recent years are **not solely attributable to the continued growth of our university** in terms of budget, 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.



As we noted in our 2013 and 2015 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).

In August 2012, the UofL Sustainability Council aggressively expanded the diversity and scope of [transportation initiatives](#) available on campus, and our work has gained national recognition. In addition to offering students and employees free access to the entire Louisville transit system, UofL now also offers a [car-share system](#), [bike-share](#) programs, and carpool-matching through the [Cardinal Directions](#) online platform. Unfortunately, 2017 saw the suspension due to extreme budgetary constraints 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. This likely contributed to an increase in driving and a reduction in bicycling to campus documented in our 2017 commuter survey.

In spite of our efforts to encourage the use of transportation alternatives, our fall 2017 survey demonstrated that commuting behaviors are not improving. The situation is not quite as bad amongst students, thanks to a boom in student-oriented housing around campus. Faculty and staff, however, are generally not choosing to live close to campus and are commuting to campus 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, and expensive parking pressures.

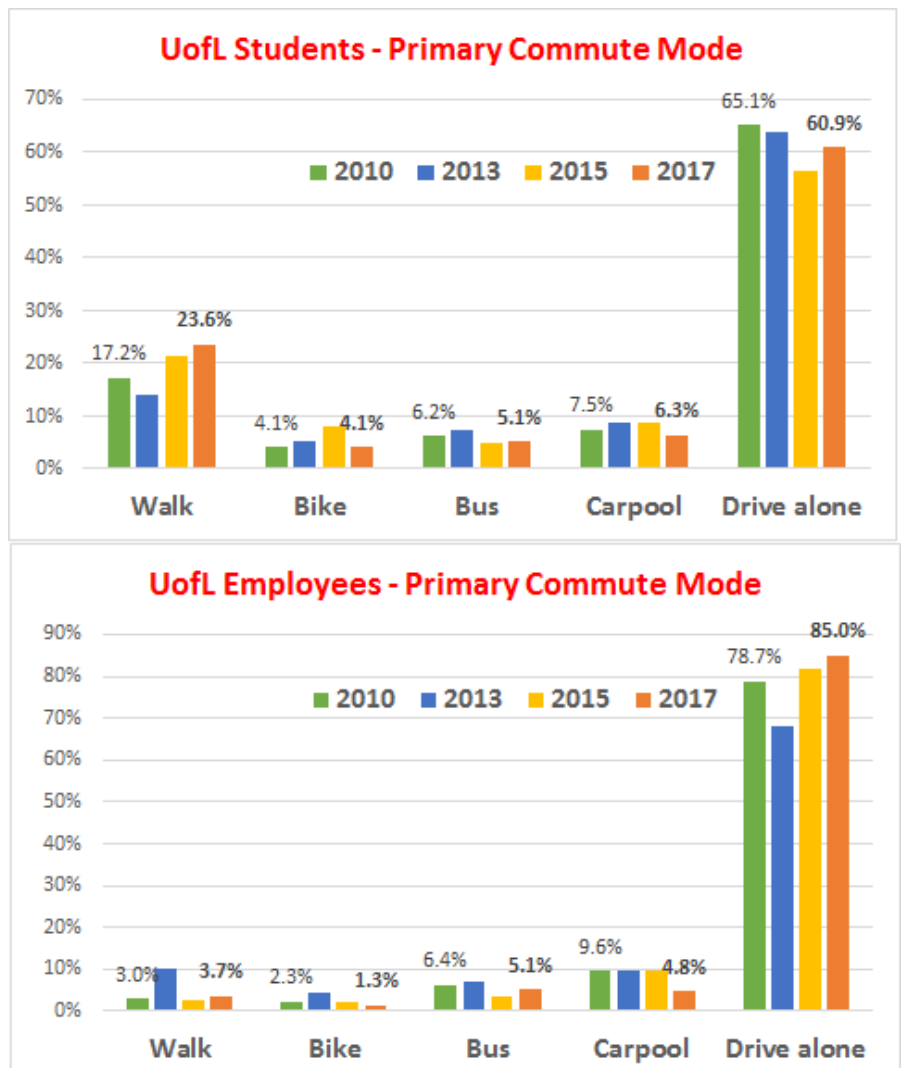
To reverse this trend, **UofL needs to develop and implement a strategic, comprehensive Transportation Demand Management Plan**, which will not only provide ease of access to alternatives and incentives for using them, but more importantly, **UofL needs to disincentivize and actively discourage driving 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 to for alternative modes to gain significant traction.

The university’s current budget crisis offers 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 UofL’s extremely popular “parking cash-out” program. The [Earn-A-Bike program](#) 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 Earn-A-Bike program should be relaunched and expanded as soon as possible.

If parking were more expensive and less convenient, UofL would also have greater success encouraging the use of carpooling and we may even be able to establish our first [vanpools](#) if we reserved the best parking on campus for those willing to share the ride.

Inter-city travel also remains a major challenge for UofL’s efforts to reduce emissions. Flying on university-funded trips now accounts for 8.2% of our total carbon emissions, with study abroad flights adding another 1.9%. 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:

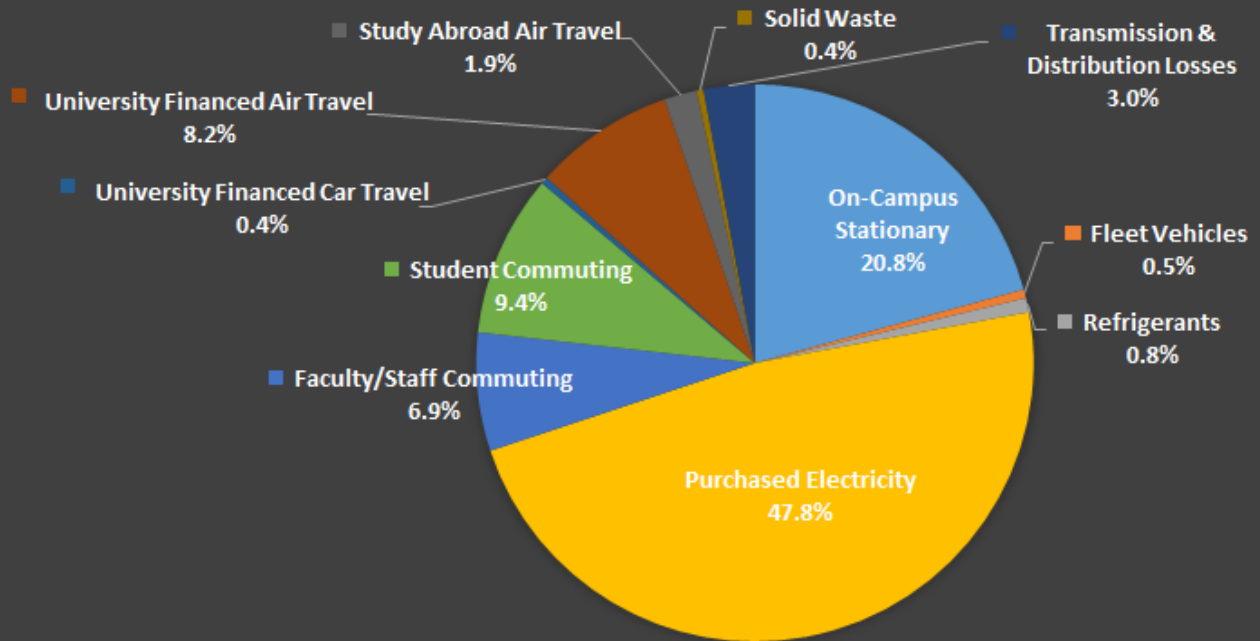
- [Videoconference](#), [Teleconference](#), or [Blackboard Collaborate](#) (free to UofL employees);
- [Carpooling](#) with fellow travelers through [Cardinal Directions](#) - UofL's trip-finding and carpool-matching system;
- **Taking the Bus** – Louisville is served by [Greyhound](#), [Megabus](#), 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 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 travel.

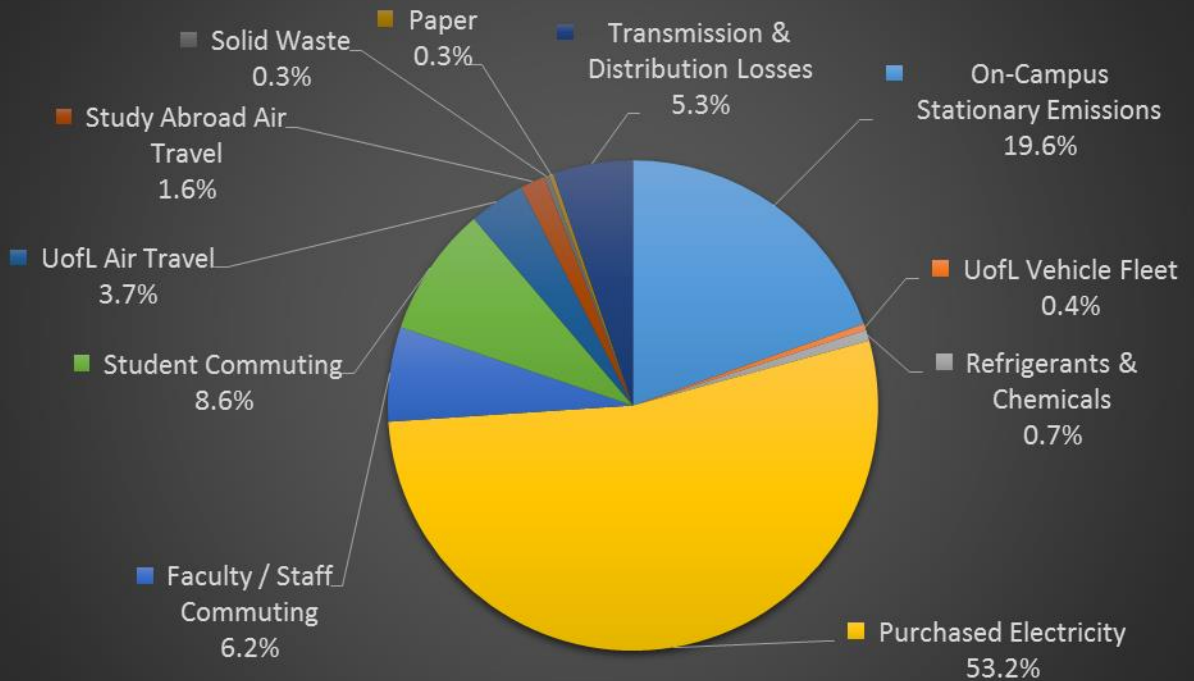
Thanks to demolition, lay-offs, and reduced enrollment, the university actual shrank in 2017 in terms of population, and building square footage. UofL’s total budget, however, rebounded some. This follows a long period of sustained growth, during which our net GHG emissions had not grown in proportion, and, in fact, had been on a downward trajectory through 2013. That appears to have all changed in 2014, and again in 2017, when UofL’s net emissions began to creep back upward, both in absolute and relative terms.

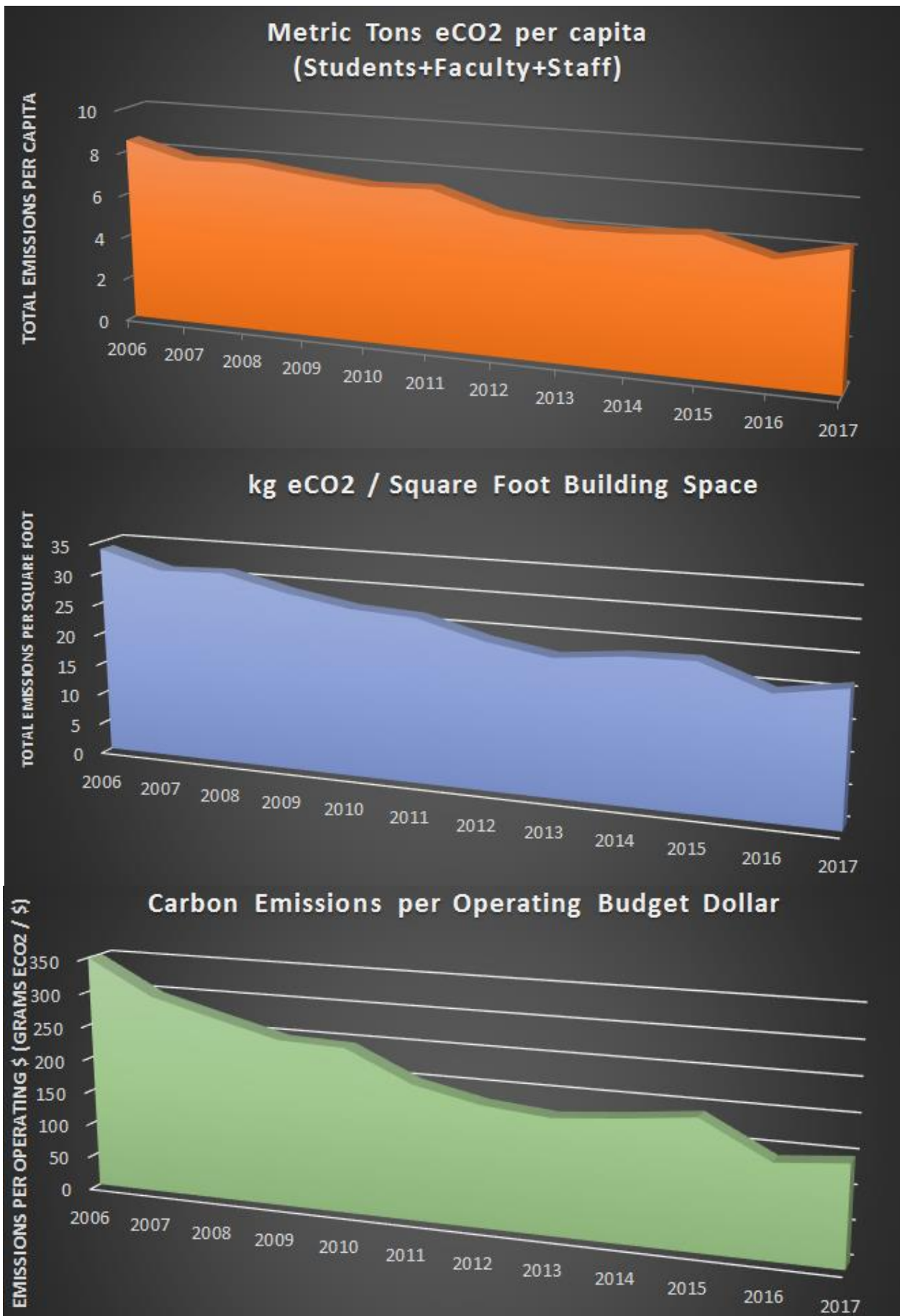
Year	Net Emissions	Per Student	Per Capita (Students + Faculty + Staff)	Per Sq. Ft. of Building Space	Per Annual Operating Budget	Per Number of Heating Degree Days	Per Number of Cooling Degree Days
	MT CO ₂ e	MT CO ₂ e / Student	MT CO ₂ e / Person	kg CO ₂ e / ft ²	g CO ₂ e / \$	MT CO ₂ e / HDD	MT CO ₂ e / CDD
2006	236,100	10.8	8.5	33.8	350.0	56.1	176.7
2007	216,170	10.0	7.8	31.0	298.4	49.5	168.3
2008	218,540	10.0	7.8	31.3	273.1	50.2	187.5
2009	210,660	9.6	7.5	28.9	248.8	45.2	207.0
2010	206,489	9.3	7.2	27.1	245.5	43.4	133.1
2011	210,299	9.5	7.3	26.6	200.9	45.4	162.2
2012	188,357	8.4	6.5	23.8	180.2	51.0	127.3
2013	177,972	7.9	6.1	22.1	171.2	38.9	159.4
2014	185,944	8.2	6.1	23.3	180.0	37.5	161.3
2015	191,490	8.6	6.3	23.5	191.1	38.9	155.2
2016	170,095	7.5	5.6	19.7	138.6	38.9	137.9
2017	189,022	8.4	6.3	21.4	147.7	53.1	100.5
Average	200,095	9	7	26	219	46	156

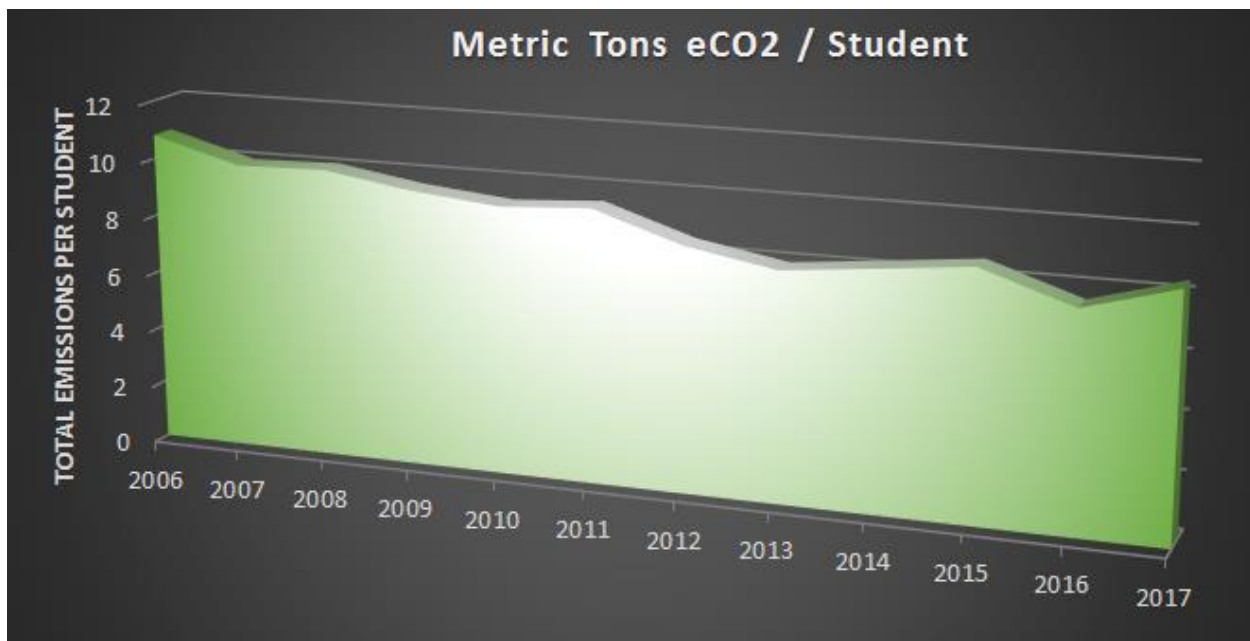
UOFL GREENHOUSE GAS EMISSIONS BY SOURCE (2017)



UofL Greenhouse Gas Emissions by Source (2008)







The overall trends reflect the fact that the University has been committed to greater energy conservation and has invested considerably in improving building efficiency through a [performance contract with Siemens](#). This nearly \$50 million project, involving 88 buildings (6.2 million square feet) on all three UofL campuses is projected to directly save the university \$4.4 million every year and to reduce our annual carbon dioxide emissions alone by over 46,000 tons (the equivalent of removing 7,690 cars from the road). With these improvements, UofL expects to reduce its utility bill by over \$12,000 per day.

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 the recent trend in the wrong direction 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 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 Travel & 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).

- **Air Travel:**

a) Air miles booked on behalf of the University but not using the University's contracted travel agent could not be directly accounted for. Instead, we have estimated this additional mileage based on a 2015 calculation that 68% of University air travel expenses are booked through contract and prorated miles traveled for the additional 32% accordingly.

b) The air miles for Study Abroad trips not booked through UofL travel agents have to be estimated for each leg of each flight using airmilescalculator.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.

- **Personal Mileage Reimbursements:**

Prior to 2016, Personal Mileage Reimbursements had been handled via thousands of paper travel vouchers. We have always lacked the staff time necessary to go back through all those paper records to come up with an estimate of total annual mileage. As promised in our last report, however, UofL has gotten a better handle on personal mileage as we transitioned to digital travel vouchers in 2016. As we did in the 2016 report, we include here UofL's total calendar year 2017 personal vehicle mileage reimbursements. This data includes all of the following types of travel: In-State Travel (447,648 mi); Out-of-State Travel (183,033 mi); Student Travel (15,762 mi); Prospect Travel (10,580 mi); International Travel (2,780 mi); Other Non-Employee Travel (NA); Employee Recruitment (2000 mi); Coach Recruitment (5,313 mi); and Student Recruitment (722 mi). With only actual data for the past two years, we have done the best we could to estimate annual personal mileage reimbursements for 2006-2017 based on each year's total campus population multiplied by the per capita mileage in 2017 = 667,838 miles / 30,161 people = 22.1424356 miles/person. This number nearly doubled from last year's report, likely due to more complete reporting.

- **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.

BACKGROUND

Though many individuals on campus had been pursuing various environmental projects for years, the University of Louisville made a formal, institutional commitment to sustainability in 2008. On August 1st, 2008, President James R. Ramsey took the bold step of signing the American College & University Presidents' Climate Commitment.

As a further indication of the University's commitment to climate neutrality and a broader social and environmental responsibility, Provost Shirley Willinghamz established the university-wide Sustainability Council that same year. Comprised of representatives from a broad spectrum of University departments along with administrators and students, the Council aims to do the following:

- Oversee the work of four committees on sustainability initiatives (Operations; Education & Research; Planning & Administration; and our new Engagement committee);

- Develop and review policies to recommend for implementation to the President and Provost;
- Set metrics and provide oversight to measure progress using the categories in the Association for the Advancement of Sustainability in Higher Education (AASHE) Sustainability Tracking, Assessment and Rating System (STARS) and in other areas deemed important to the University;
- Serve as a clearinghouse of information and organizational hub for University activities related to sustainable practices;
- Encourage faculty, staff and students to become involved in sustainability efforts at all levels; and to
- Publicize sustainability initiatives internally and externally in order to create momentum for substantial change.

One year later, the University further solidified its commitment to sustainability by creating a new full-time professional and administrative staff position devoted exclusively to the effort. UofL hired its first-ever Assistant to the Provost for Sustainability Initiatives in August 2009.

UofL's environmental progress has a rich, collaborative history. In 1992, the University of Louisville established the Kentucky Institute for the Environment and Sustainable Development (KIESD), with the mission "to provide multidisciplinary research and applied scholarship, teaching and educational outreach, and public service on issues of the environment, its protection, and sustainable development at the local, state, national and international levels." KIESD has achieved these goals through the work of a variety of centers focused on different aspects of sustainability.

In August 2004, the University teamed with the biggest public institutions in Louisville to manage environmental resources better through the [Partnership for a Green City](#). As the first of its kind in the country, the Partnership represents a collaborative effort to improve environmental education, health, and management by combining the resources of Louisville's four largest public entities: the University of Louisville, the Jefferson County Public Schools, Louisville Metro Government, and now Jefferson Community & Technical College. Through the coordination of efforts and cooperation, the Partnership has been able to realize real results that will have long-term impact on the health, education, and well-being of our citizens while also improving and institutionalizing environmental practices within the organizations themselves.

In December 2006, the Partnership formed a Climate Change Committee that commissioned a Climate Action Plan. Part of the plan was to develop an inventory of the community's GHG emissions based on 2006 data. This initial effort, in which the University participated, laid the groundwork for the University to develop its own Climate Action Plan.

Today at UofL, the purchasing department and food vendors are using more locally sourced, recycled, and renewable materials. Faculty members from many disciplines are offering classes that focus on various aspects of the sustainability puzzle. Our researchers are conducting investigations to help further develop renewable forms of energy and are developing pilot devices that will let our technology operate more efficiently and save our land and waterways.

The University is doing a lot, but can, and will, do more. One of the goals of UofL's strategic plan for 2020 is to be "creative and responsible stewards" of resources. For the University, part of that stewardship means making a commitment to sustainability and efficiency; and to tracking our progress through STARS. As a Charter Participant in STARS back in 2011, UofL was the first school in the region -- and the 10th in the nation -- to achieve a STARS rating. To this day, we continue to have the highest STARS rating in Kentucky, a [STARS Gold rating \(65.19%\)](#) earned in February 2016. This represented a 6.9 point increase from our February 2013 [STARS Silver rating \(58.29%\)](#), and a significant improvement from our first rating in January 2011 of [STARS Silver \(50.11%\)](#).



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 7,702 people and operating with a budget of \$1.279 billion (2017 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 (8,399,648 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	\$6.76 m
2007	2,130	4,008	6,138	16,061	5,628	21,689	27,827	\$7.26 m
2008	2,124	4,050	6,174	16,027	5,734	21,761	27,935	\$8.02 m
2009	2,125	3,961	6,086	16,377	5,654	22,031	28,117	\$8.49 m
2010	2,188	4,087	6,275	16,818	5,472	22,290	28,565	\$8.44 m
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	\$.999 b
2017	2,370	5,332	7,702	16,951	5,508	22,459	30,161	\$1.025 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 Services,
- Department of Physical Plant Operations
- 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. Data was gathered in November 2017. Strategies for gathering the necessary data had been developed five years prior for UofL's baseline emissions inventory.

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.

Scope 1 emissions refer to those 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 refer to those produced off-site by the electric utility as part of the generation process. The University purchases electricity from Louisville Gas & Electric, which has coal-powered generating stations located on the Ohio River.

Scope 3 refers to other indirect emissions generated off-site by commuter travel, business travel and waste transported to landfills. These emissions, although not produced directly on campus, are a result or consequence of university activities.

Estimated 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. 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).

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

In calculating our carbon footprint, the University used rough, upper-bound estimates to designate as *de minimus* (or materially insignificant) small 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, and sulfur hexafluorides used in ultrasound imaging. While emissions from these sources were excluded from this inventory, the University recognizes the very real contribution to global warming that these emissions make. It is the intention of the University to continue to seek ways to minimize all GHG emissions, whether they are closely tracked and reported or not.

FINDINGS & RECOMMENDATIONS

The following table summarizes the GHG emissions estimates produced by this survey for the University of Louisville:

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 eCO2	MT eCO2	MT eCO2	MT eCO2	MT eCO2	MT eCO2	MT eCO2	MT eCO2	MT eCO2	MT eCO2	MT eCO2	MT eCO2	MT eCO2	MT eCO2	MT eCO2	MT eCO2
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	13,190	18,542	761	13,642	3,264	747	579	6,551	(749)	0	210,299
2012	40,087	866	1,561	8	90,648	13,590	18,435	764	13,087	3,409	595	503	5,603	(671)	(127)	188,357
2013	34,894	829	1,561	8	87,228	12,781	18,640	773	11,800	3,521	768	515	5,391	(736)	0	177,972
2014	35,704	844	1,561	9	87,364	17,547	21,747	870	10,220	4,028	814	499	5,400	(661)	0	185,944
2015	36,513	858	605	5	87,499	20,991	23,978	846	10,787	3,309	855	492	5,408	(651)	(7)	191,490
2016	23,565	844	1,434	8	91,672	13,543	17,928	773	10,652	3,532	740	400	5,666	(663)	0	170,095
2017	39,322	940	1,561	8	90,607	13,012	17,810	775	15,487	3,599	742	416	5,600	(729)	0	189,022

The largest portion of the University's carbon footprint (47.8%) can be attributed to scope 2 emissions produced from purchased electricity. Since the electricity available from the grid in Louisville is produced almost exclusively from the burning of coal and now some natural gas, a vital part of our strategy for reducing our carbon footprint must be a reduction in the use of this purchased electricity. This can be achieved through a multi-pronged approach involving:

1. **Renewable Energy:** The University will seek to produce more of our own electricity from renewable sources. While we have implemented some exciting renewable systems on campus through grants and specific building projects, we will need to scale-up our efforts to achieve our initial goal of 20% renewable energy by 2020. The University is also conducting locally-relevant research on renewable energy technologies and sharing the findings with the utilities and industries to help speed the transition away from fossil fuels.
2. **Energy Conservation:** The 'greenest' energy is that which is not wasted. The University is taking a wide variety of steps toward reducing its overall and peak demand for electricity. UofL has implemented a wide variety of energy saving measures through a performance contract with Siemens Corp., including lighting upgrades, high efficiency motors, building envelope improvements, water conservation measures, and improved HVAC systems and temperature controls on all three UofL campuses. But there are more opportunities for conservation.
3. **Behavior Change:** A key component of the Climate Action Plan is to implement strategies for changing the campus culture and individual behaviors associated with energy use. This effort began in 2008, when UofL's College of Arts & Sciences Green Team conducted energy audits in all 700 individual offices of the College and employees were provided with comparative data about their energy use. Now sustainability and energy conservation are woven into all new student and new

employee orientation programs at UofL. New members of our community are encouraged to sign a “Cards Go Green!” pledge to reduce their contribution to UofL’s environmental impact by selecting individual actions they will take to reduce consumption and waste. Weekly green tips in campus publications help reinforce this message regularly, and the Sustainability Council recently launched an [EcoReps](#) program designed to move faculty, staff & students beyond talk to action for a more sustainable UofL. We provide basic training & resources, service opportunities, and certification as a point-person & peer-to-peer advocate for sustainability.

Over the last decade, the University has been able to offset its emissions by 12% through on-campus carbon sequestration. This is the result of the increased planting and preservation and of over 2500 trees on Belknap campus and at UofL's mostly forested 200-acre [Horner Conservation Property](#) (also referred to as the Moore Observatory). The University also composts organic wastes from grounds maintenance and began composting kitchen wastes from campus dining facilities in July 2010. We estimate that these practices sequester nearly as much carbon as is released due to the solid waste UofL sends to the landfill.

CONCLUSION

With this update to our greenhouse gas emissions inventory, the University of Louisville 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.

The University very much expects the trend in actual emissions to improve as it continues to make significant improvements in energy efficiency throughout the institution.

UofL’s mission is to teach the next generation and research solutions to our pressing problems. In striving for climate neutrality as an institution, the University of Louisville is leading by example and providing our students and employees vital lessons in stewardship and responsibility.

We invite you to learn more about our sustainability initiatives and get involved through our [UofL Sustainability website](http://louisville.edu/sustainability): <http://louisville.edu/sustainability>.