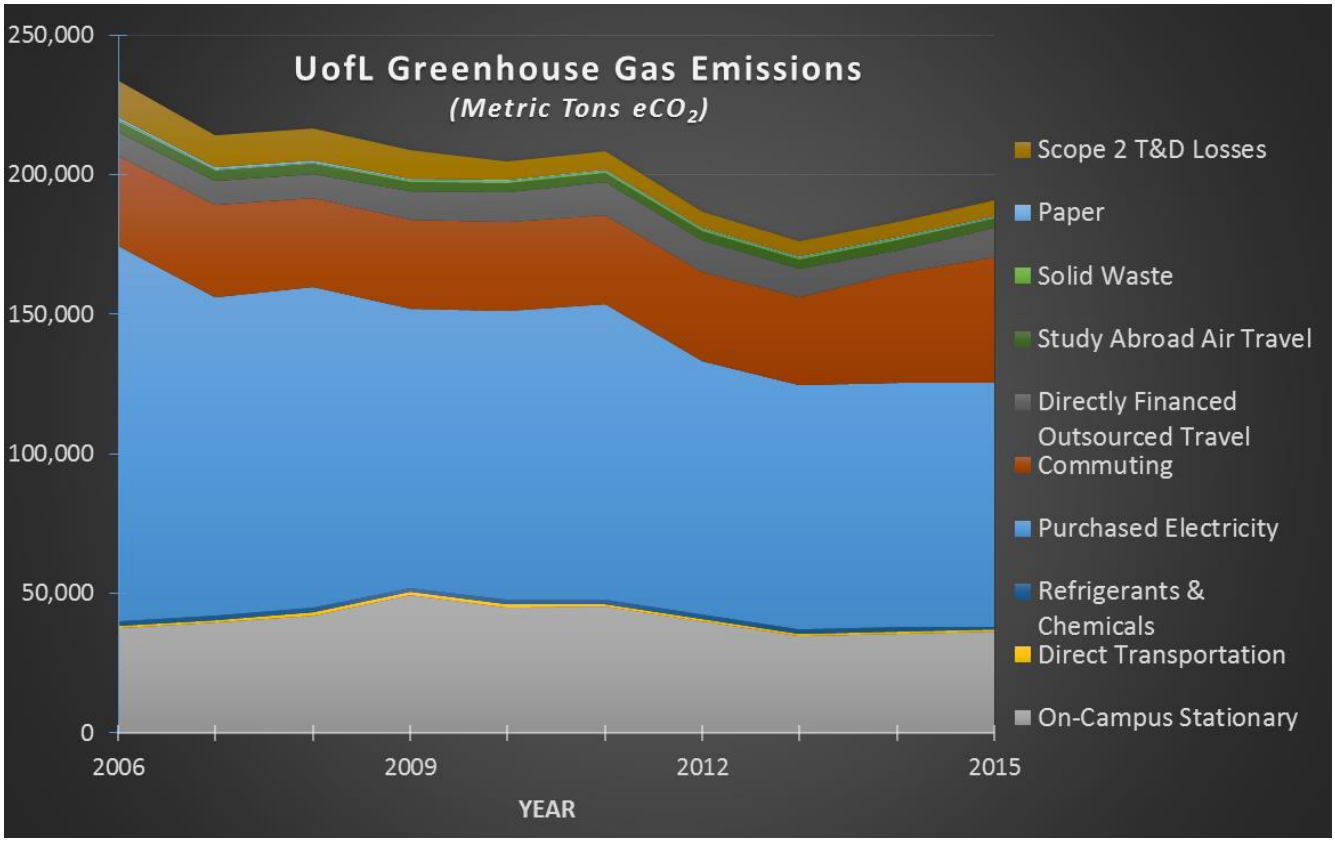
UNIVERSITY OF LOUISVILLE



GREENHOUSE GAS EMISSIONS INVENTORY 2006 – 2015

UofL Sustainability

Commitment to a Sustainable Future. It's Happening Here.

louisville.edu/sustainability

ACKNOWLEDGEMENTS

Report Prepared By:

Project Coordination, Narrative, Data Collection & Analysis:
Justin Mog, PhD
Assistant to the Provost for Sustainability Initiatives

Lead Data Consultant:
Teresa Rutledge
Assistant Vice President for Business Affairs

Commuting Data Analysis:
Benjamin Leamon
Graduate Research Assistant in Urban & Public Affairs

Data Gathering:
Laura Krauser
Sustainability Council Student Intern

The preparers of this report would like to acknowledge the work of all of those who aided in the development of this document, including but not limited to:

Brian Barnes, Director, EcoReps Program & Composting Operations
Russ Barnett, Director, Kentucky Institute for the Environment & Sustainable Development
Shari Barrow, Senior Analyst, Institutional Research
Aaron Boggs, Assistant Director, Physical Plant Maintenance and Renovations
Brad Bohannon, Business Rental Sales Manager, Enterprise
Stephen Bottorff, Mechanical Systems Technician for HSC, Physical Plant
Glen Todd, Interim Assistant Vice President for Facilities
Kenneth Dietz, Director of University Planning, Design & Construction
Robert Goldstein, Vice Provost, Institutional Research
Geoffrey Hobin, Capital Projects Administrator, Transit Authority of River City (TARC)
Virginia Hosono, Associate Director, Office of Study Abroad and International Travel
Paul Hoza, Chemical Regulatory Specialist, Dept. of Environmental Health & Safety
George Kirwan, Assistant Director or Engineering, Physical Plant
Kyle McWhirter, PanAm Travel
Curtis Monroe, Assistant Director of Purchasing/Materials Management
Peggy Moore, Space Coordinator, University Planning, Design & Construction
Mitchell Payne, Associate Vice President for Business Affairs
Teresa Rutledge, Assistant Vice President for Business Affairs
Kerry Schmidt, Director of Finance & Operations, Provost Units
David Simpson, Chair & Professor of Urban & Public Affairs, Chair of Sustainability Council
Robin Stewart, Assistant Director, Contract Administration & Procurement Services
Dennis Sullivan, Assistant Director, Dept. of Environmental Health & Safety

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University of Louisville
Greenhouse Gas Emissions Inventory
Fiscal Years 2006 – 2015

EXECUTIVE SUMMARY

Our efforts to implement our Climate Action Plan have been paying off for many years, but a troubling reversal of progress has occurred in the last two years. This report documents the overall progress the University of Louisville (UofL) has made in reducing our greenhouse gas (GHG) emissions, even as we continue to grow in terms of physical size, campus population, and budgetary expenditures.

From 2006 to 2015, we estimate that UofL's net carbon emissions have dropped over 18.5% from 233,128 to 189,958 metric tons.

While this reduction is important and laudable, we certainly cannot rest on our laurels. In fact, ***the most important finding of this inventory is that UofL's overall emissions reduction trajectory has reversed course and we have actually been INCREASING annual emissions over the last two years***. We must remain vigilant and committed in order to get back on course to achieve our goal of a 20% reduction by 2020 and 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 increases we've seen in emissions over the last two 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's particularly troubling to note increases over the last two years 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.

You will find herein a summary of the estimated GHGs for which UofL was responsible during the fiscal years 2006 through 2015. This is the third inventory update since our baseline GHG inventory, submitted in 2009. It follows the release of UofL's January 2015 Climate Action Plan Progress Report.

This inventory provides an estimate of greenhouse gas emissions resulting from the activities of some 30,229 people who share our campus as students, faculty and staff, as well as the operation of some 8,180,080 square feet of buildings on all three of the university's campuses, including the Belknap, Health Sciences Center, and Shelby campuses.

This inventory represents UofL's on-going effort to track GHG emissions for the purpose of developing and refining strategies to reduce our emissions. ***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.***

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. 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.

Newly captured data reflected in this report include: rental car mileage (including that used by UofL Athletics); on-campus solar thermal energy capture; the university's first purchase of retail carbon offsets (by the Law School); and more accurate estimates of commuter behaviors and local transit bus efficiency, refrigerant emissions, and study abroad travel.

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 120 buildings on all three campuses which are owned by the University, comprising approximately 8,180,080 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 30,229 students, faculty and staff. The transportation choices of this community have been particularly impactful on our collective carbon emissions. Our most recent fall 2015 UofL Transportation Alternatives survey uncovered a disturbing increase in driving alone to campus (especially amongst employees). We've 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, perflurocarbons 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

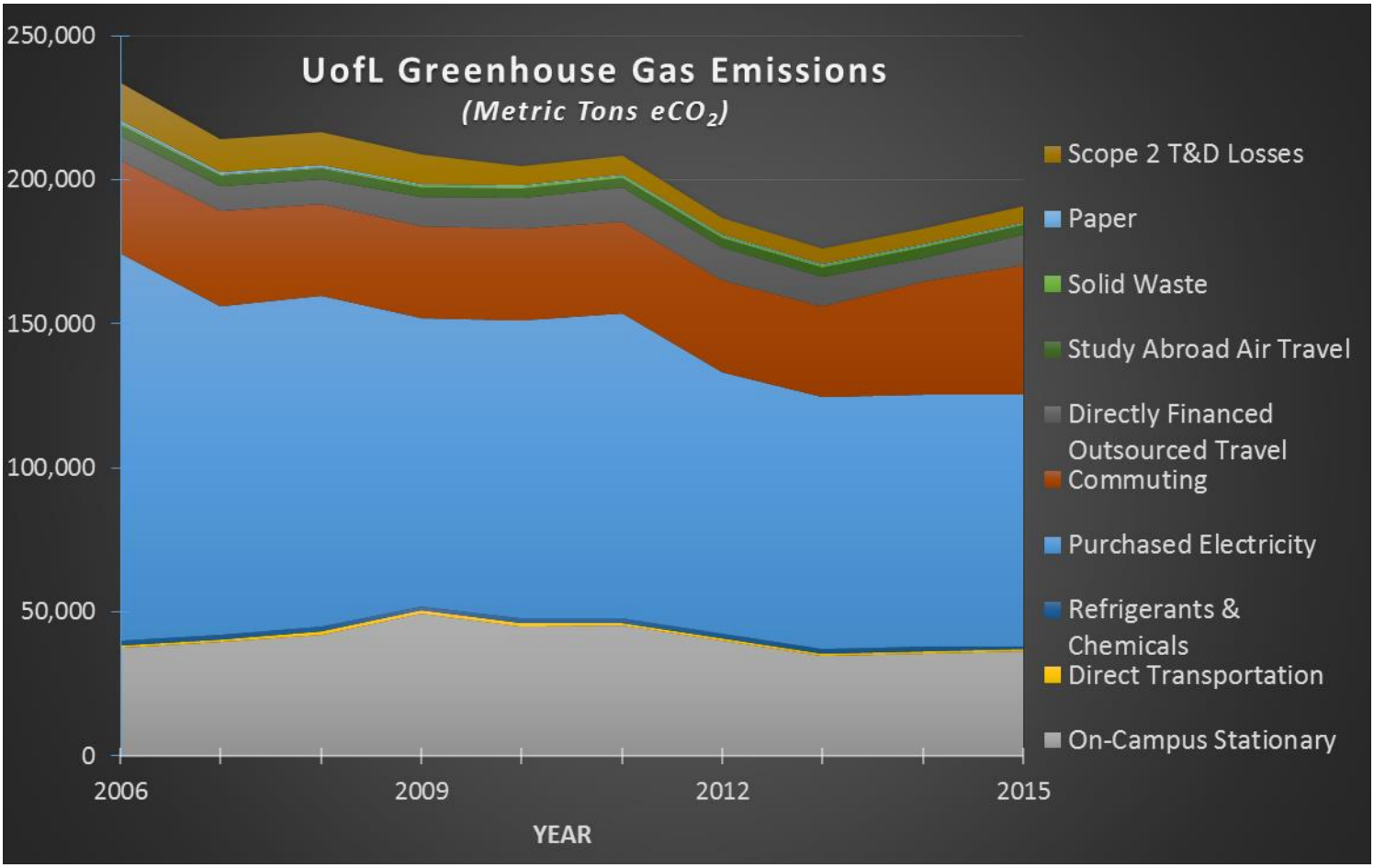
For fiscal years 2006 through 2015 our revised estimates suggest that the University of Louisville produced annual average net emissions of 201,561 metric tons of carbon dioxide equivalent (MT CO_2e) from all sources. Unfortunately, after seven years of consistent, steady progress in the right direction, from 2013 to 2015, our net emissions appear to have begun to creep back upward again, both in absolute terms and relative to growth in the size of the University.

From 2006 to 2015, we estimate that UofL's net carbon emissions have dropped over 18.5% from 233,128 to 189,958 metric tons.

While this reduction is important and laudable, we certainly cannot rest on our laurels. In fact, ***the most important finding of this inventory is that UofL's overall emissions reduction trajectory has reversed course and we have actually been INCREASING annual emissions over the last two years***. We must remain vigilant and committed in order to get back on course to achieve our goal of a 20% reduction by 2020 and 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 increases we've seen in emissions over the last two 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's particularly troubling to note increases over the last two years 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.

UofL Carbon Emissions 2006 - 2015
(Metric Tons of Carbon Dioxide Equivalent, eCO_2)



Trends

As we noted in our 2013 GHG inventory, UofL has made disproportionately good progress in reducing electricity and on-campus stationary fuel consumption (though even this progress has leveled off in recent years) 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 Louisville's first car-share system, bike-share program, ride-sharing through Zimride, and our 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 can earn a $400 bike shop voucher.

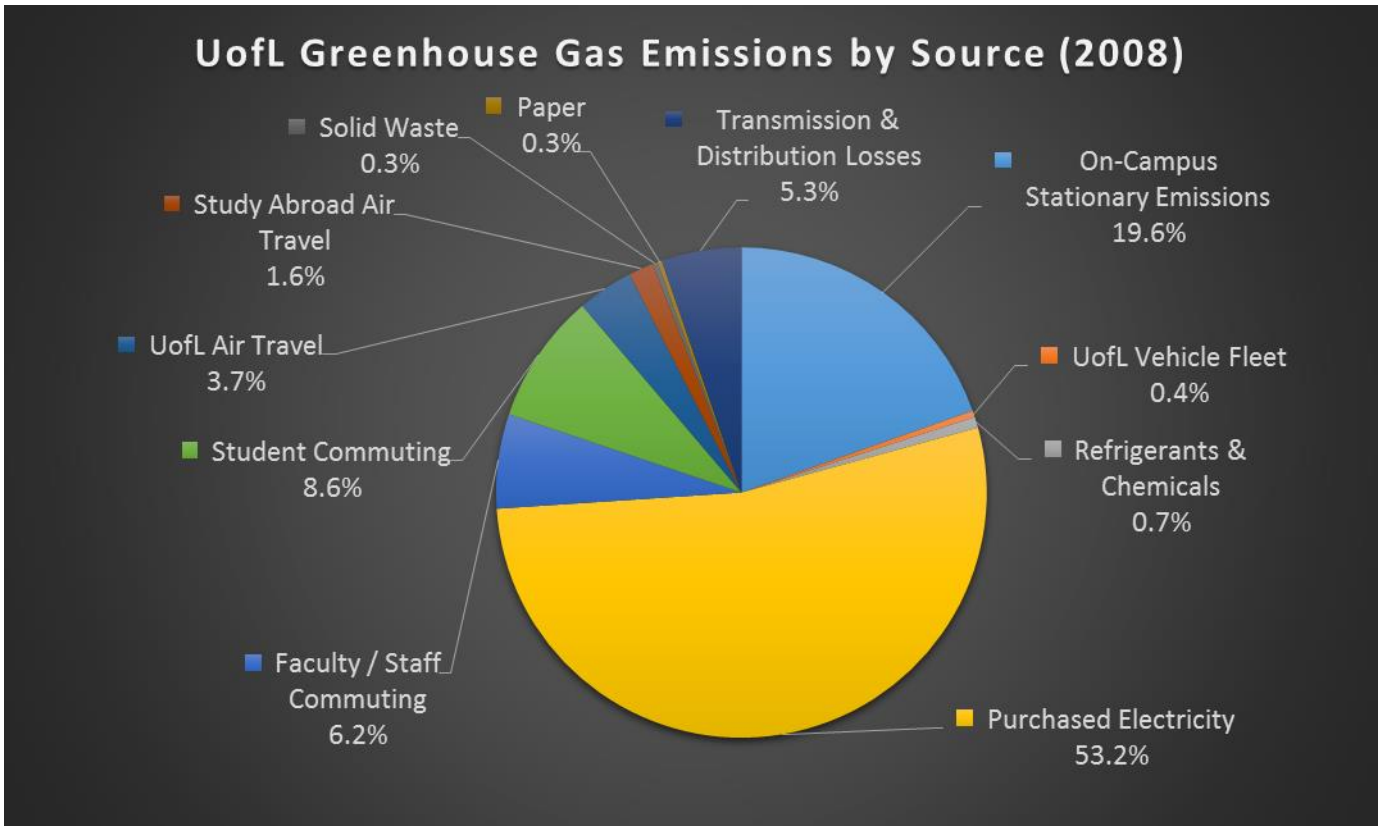
Despite this good work, our fall 2015 survey revealed that many UofL commuters have reverted to prior bad habits of driving alone and choosing to live far from campus. More student housing

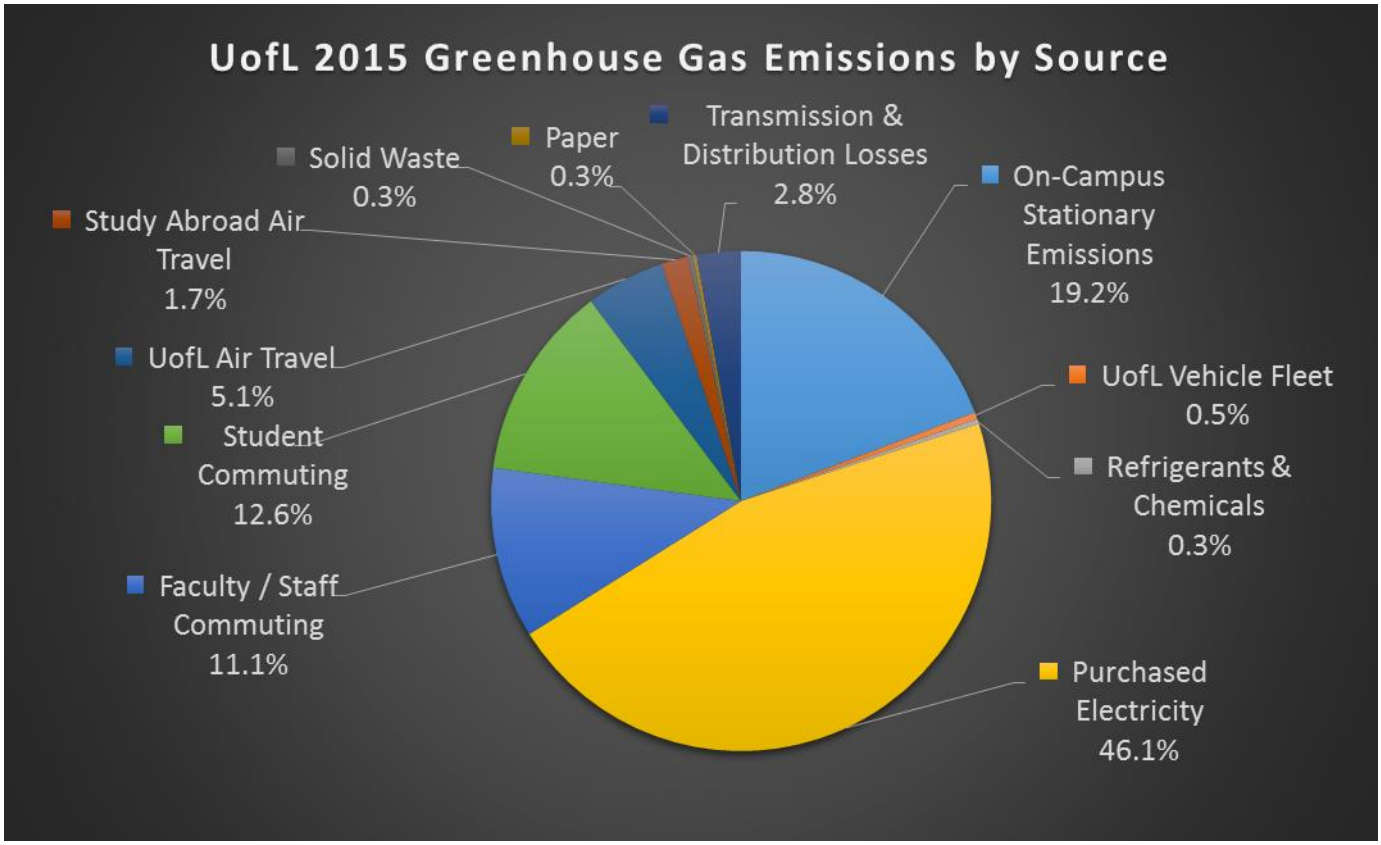
has opened around campus, so student commute numbers are better, but employees are not doing their part to reduce emissions, traffic congestion, and parking pressures associated with driving to campus.

To reverse this trend, ***UofL needs to develop and implement a strategic, comprehensive Transportation Demand Management Plan which will provide not only ease of access to alternatives and incentives for using them, but more importantly, UofL needs DISINCENTIVES to driving to campus.*** An overabundance of parking combined with parking costs well below market-rate and a pervasive culture of driving makes it extremely difficult to for alternative modes to gain significant traction amongst our campus population.

The one transportation alternative we have failed to launch are Vanpools due to a lack of a critical mass of willing participants commuting from the same location on the same schedule. We also were not successful in setting-up with Miller Trailways a new Campus Connector service with direct daily departures to Frankfort and Lexington from UofL's Belknap campus on coaches equipped with Wi-Fi and at-seat plug ins. Despite UofL's eagerness to launch the service, the University of Kentucky did not provide a welcoming solution on the other end of the Connector.

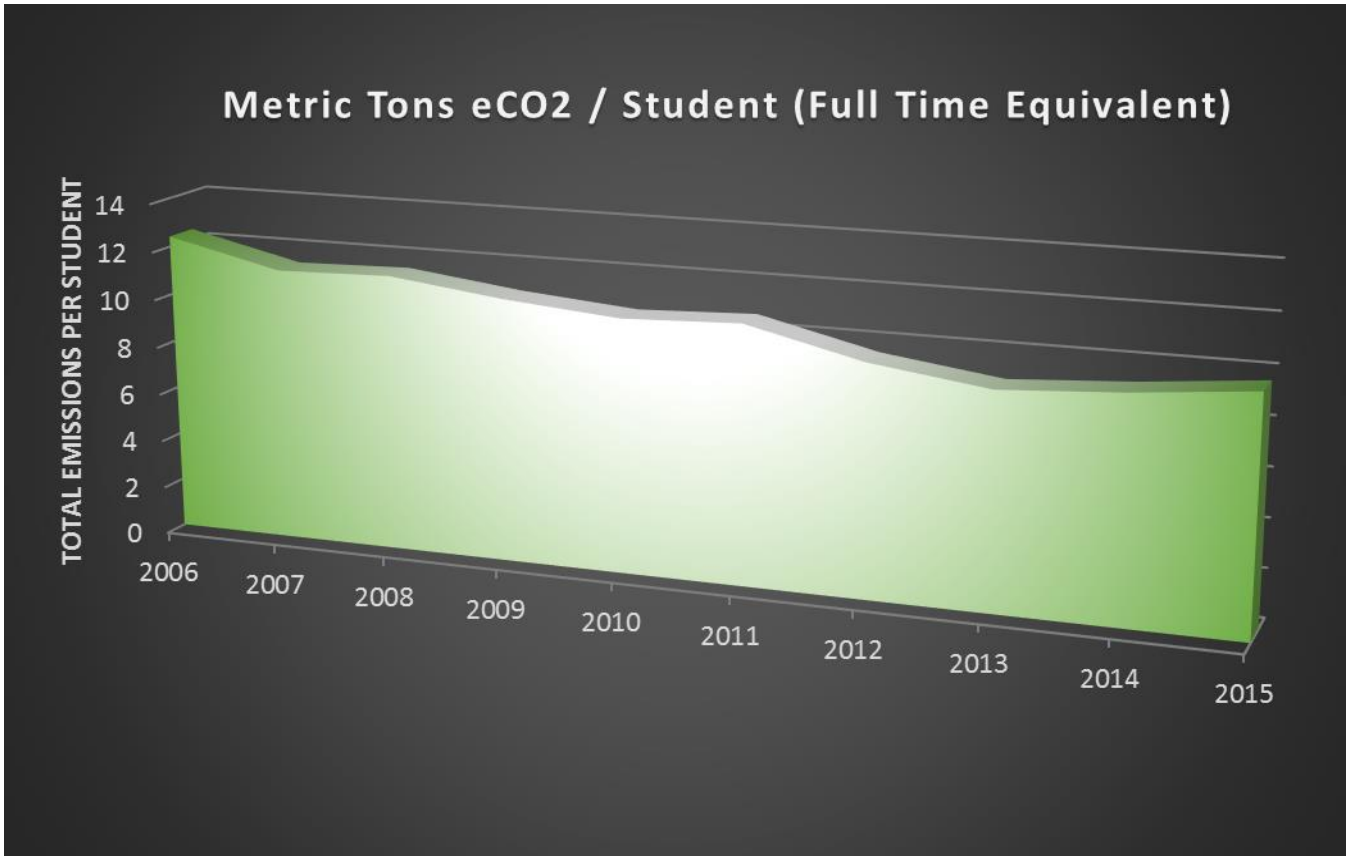
An exciting new development in 2015, after piloting with other schools a Kentucky Colleges & Universities Carbon Consortium, is that UofL's Law School took the step of becoming the first unit on campus to voluntarily offset travel carbon emissions through the Appalachian Carbon Partnership (MACED). Through a simple "flat tax" of $1 per trip to be invested in protecting small landholder forests in Appalachia, the Law School was able to pioneer the practice of offsetting carbon from university travel.

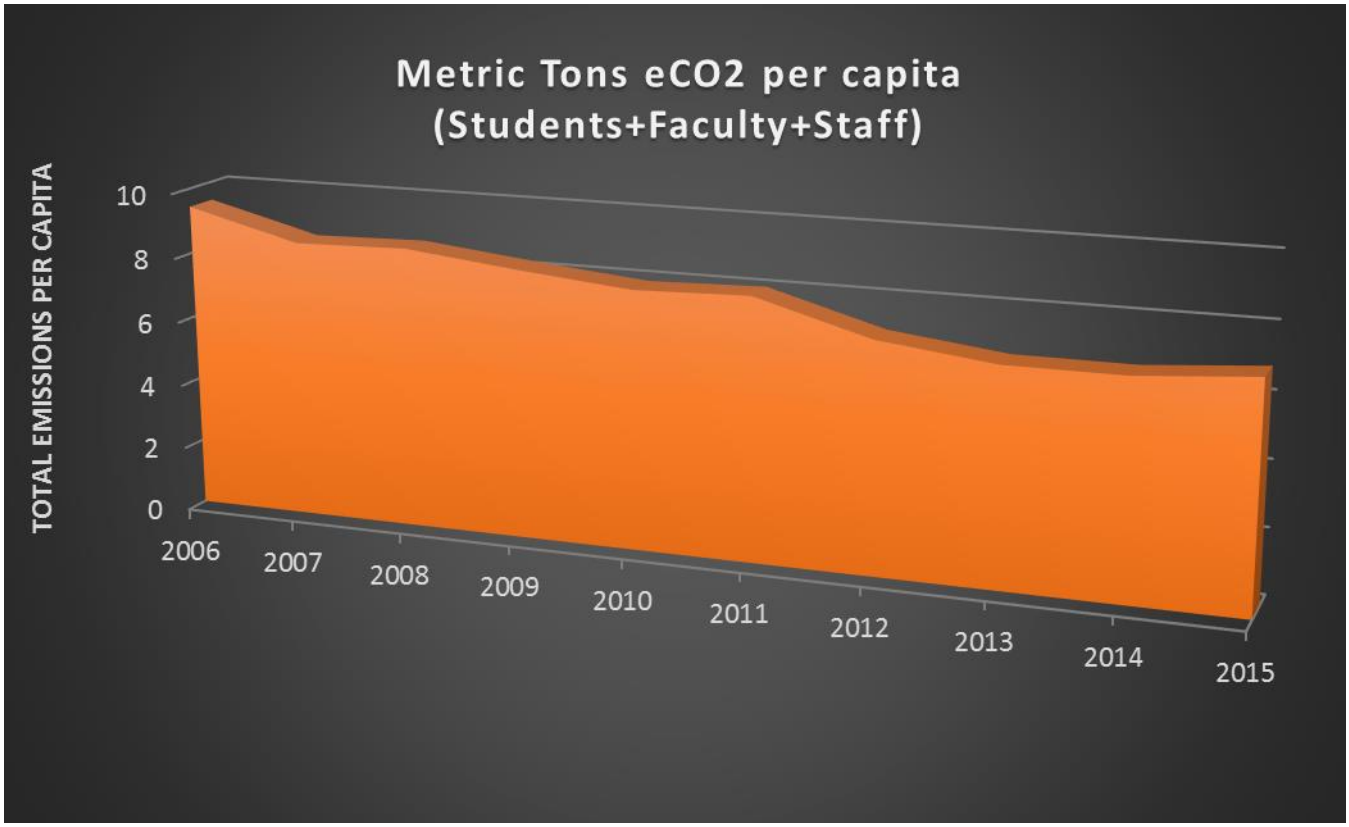

UofL Greenhouse Gas Emissions by Source (2008)
Solid Waste 0.3%
Paper 0.3%
Transmission & Distribution Losses 5.3%
On-Campus Stationary Emissions 19.6%
Study Abroad Air Travel 1.6%
UofL Air Travel 3.7%
UofL Vehicle Fleet 0.4%
Student Commuting 8.6%
Refrigerants & Chemicals 0.7%
Faculty / Staff Commuting 6.2%
Purchased Electricity 53.2%

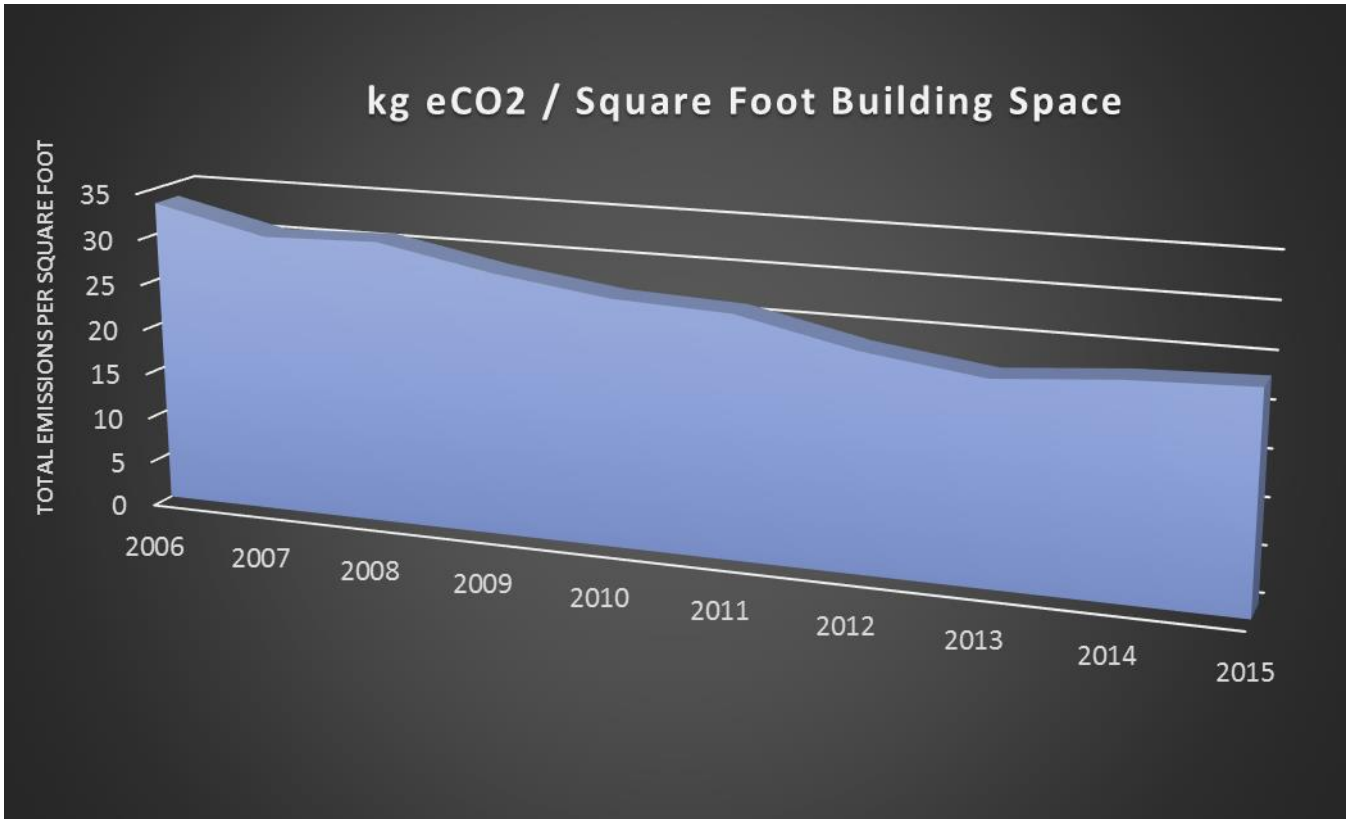

UofL 2015 Greenhouse Gas Emissions by Source
Solid Waste 0.3%
Paper 0.3%
Transmission & Distribution Losses 2.8%
On-Campus Stationary Emissions 19.2%
Study Abroad Air Travel 1.7%
UofL Air Travel 5.1%
UofL Vehicle Fleet 0.5%
Student Commuting 12.6%
Refrigerants & Chemicals 0.3%
Faculty / Staff Commuting 11.1%
Purchased Electricity 46.1%

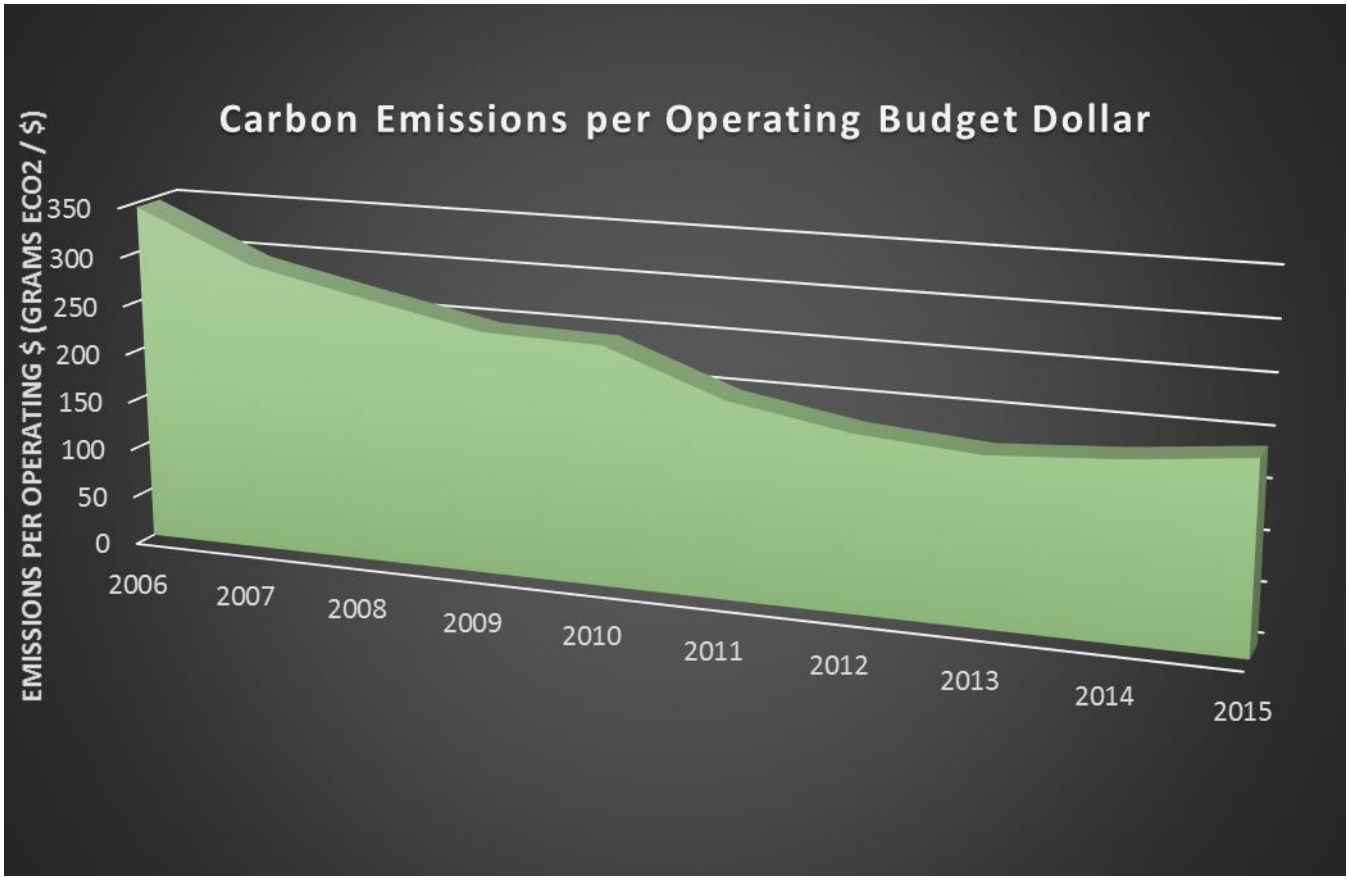
The University's population, budget and land holdings have continuously grown over this period. Despite the growth, our net GHG emissions had not grown in proportion, and, in fact, had been on a downward trajectory through 2013. That appears to have all changed in 2014, when UofL's net emissions began to creep back upward, both in absolute and relative terms.

Fiscal 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_2e	MT CO_2e / FTE Student	MT CO_2e / Person	kg CO_2e / ft^2	g CO_2e/ $	MT CO_2e / HDD	MT CO_2e / CDD
2006	233,128	12.4	9.4	33.4	345.6	55.4	174.5
2007	213,288	11.3	8.6	30.6	294.5	48.9	166.1
2008	215,753	11.5	8.6	30.9	269.7	49.5	185.1
2009	208,018	10.9	8.3	28.5	245.7	44.7	204.4
2010	203,921	10.5	7.9	26.8	242.4	42.9	131.5
2011	207,816	10.6	8.0	26.2	198.5	44.9	160.3
2012	185,870	9.5	7.0	23.5	177.9	50.3	125.6
2013	175,352	8.9	6.6	21.8	168.7	38.3	157.1
2014	182,509	9.2	6.6	22.9	176.6	36.9	158.3
2015	189,958	9.7	6.9	23.3	189.5	38.6	154.0
Average	201,561	10	8	27	231	45	162




Metric Tons eCO2 per capita
(Students+Faculty+Staff)
TOTAL EMISSIONS PER CAPITA
10
8
6
4
2
0
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015


kg eCO2 / Square Foot Building Space
TOTAL EMISSIONS PER SQUARE FOOT
35
30
25
20
15
10
5
0
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015



Despite recent setbacks, the larger trends all 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 $46.2 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 about $12,086 per day.

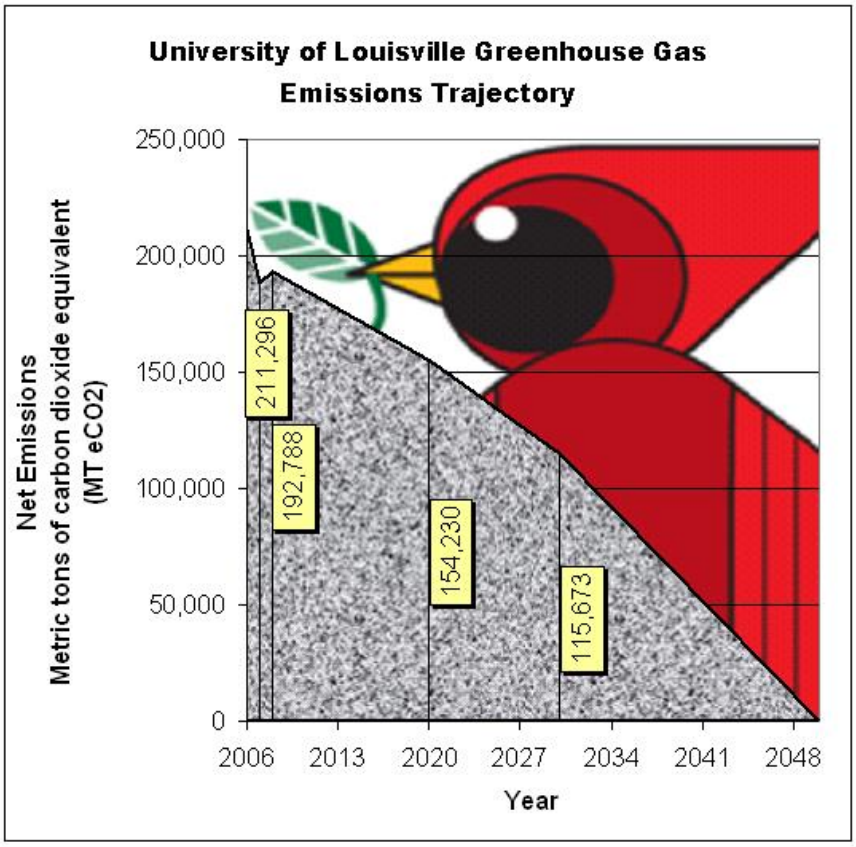
In June 2015, we launched a third phase to invest an additional $5.4M in improvements in lighting, heating, electrical systems, water conservation and other areas. While details of the project are not yet final, we have already identified $5.4 million in improvements which are expected to lead to another $457,600 in annual cost savings. Cardinal Sports Park, Ekstrom Library, J.B. Speed, Strickler, Shumaker, and Sackett halls on Belknap Campus will be among buildings receiving improvements, along with the Research Tower and Baxter I, Baxter II and Medical-Dental research buildings at HSC.

As can be seen in this report, these efforts have already produced documented results. In FY 2011-12, for instance, Belknap Campus reduced fuel use 48%, electricity use 27%, and water use 31%. Efficiency-minded campus users helped us exceed our engineers' expectations. They had predicted fuel use to decline nearly 40% and electricity use to drop at least 20% annually. This represents a large step for UofL in emissions reduction, but it is only the first of many laid out in our Climate Action Plan.

UofL's goal is to achieve climate neutrality by 2050. We are well on our way, but we need to step up our efforts and accelerate progress to achieve that goal. 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.
UofL's Climate Action Plan addresses current and future initiatives in the following areas:

- Green purchasing
- Energy conservation and efficiency
- Renewable energy
- Carbon sequestration
- Master planning
- Green building design
- Composting and horticultural practices
- Behavior change: Green Team pilot program
- Behavior change: university-wide
- Recycling
- Transportation
- Food
- Carbon offsets



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:

- Many numbers for utilities consumption in 2014 had to be estimated. Actual records were unavailable due to heavy staff turn-over and loss of institutional knowledge in Physical Plant.

- In FY2015, total Purchased Chilled Water was 235,715.79 MMBtu and our total Purchased Steam was 209,517.98 MMBtu (both at the Health Sciences Center). We are not reporting these numbers, however, because we have no historical data to compare them to and because we have no way of knowing what the fuel mix was. In the Steam Coal column, we report an estimate of UofL's portion of the total coal burned at 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. We report these numbers instead of MMBtu of Purchased Steam and Purchased 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.

- 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.

- The Athletics department has a separate budget from the University. Athletics was unable to report travel statistics so the associated emissions are not included here. We were also unable to include an accounting of emissions resulting from Athletics events, other than utilities consumed (as these are paid out of general funds).

- The University recognizes that its true carbon footprint includes emissions from facilities that it does not own (such as private residence halls and leased off-campus space); however it is difficult for the University to track or control these emissions.

- Air miles booked on behalf of the University but not using the University's contracted travel agent could not be directly accounted for. Instead, the University estimated based on a historic average of 51% of University air trips booked through contract and prorated miles traveled for the additional 49%.

- While the University houses no farm animals, it is responsible for laboratory animals used in medical research. Fugitive emissions from these animals (e.g. releases of methane produced as part of normal digestive processes) could not be monitored.

- Prior to 2016, Personal Mileage Reimbursements have been handled via thousands of paper travel vouchers. We lack the staff time necessary to go back through all those paper records to come up with an estimate of total mileage. UofL recognizes this is not an insignificant number and this is a notable shortcoming of our GHG accounting. We intend to get a better handle on personal mileage and other travel-related emissions as we transition to digital travel vouchers.

- 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, perflurocarbons used in eye surgeries and MRIs, and sulfur hexafluorides used in ultrasound imaging.

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 Willinghanz 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, including:

- The Center for Environmental Education
- The Center for Environmental Engineering
- The Center for Environmental and Occupational Health Sciences
- The Environmental Cardiology Center (Public Health)
- The Center for Environmental Policy and Management
- The Environmental Finance Center (EPA Region IV)
- The Center for Environmental Science
- The Center for Land Use and Environmental Responsibility
- The Center for Sustainable Urban Neighborhoods
- The Kentucky Pollution Prevention Center

In August 2004, the University teamed with the biggest public institutions in town 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 is 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 the 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, UofL was the first school in the region -- and the 10th in the nation -- to achieve a STARS rating and we continue to have the highest STARS rating in Kentucky, a **Silver rating (58.29 points)** on February 6, 2013. We are currently gathering data to submit for a new STARS rating in February 2016.

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.

Under the leadership of its seventeenth president, James R. Ramsey, the University of Louisville has become known especially for teaching, research, and service to its community and the advancement of educational opportunity for all citizens thereof. With a total enrollment of 22,529, 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.

A Growing University

Fiscal 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

Now employing 7,862 people and operating with a budget of $1.218 billion (2015 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 (8,180,080 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.

METHODOLOGY

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
- Office of the Vice President of Business Affairs,
- 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 September 15th to October 15th of 2015. 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 CO_2e). 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 (CO_2e).

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

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, perflurocarbons 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:

Fiscal Year	Carbon Emissions (eCO2)												Offsets		NET
	On-Campus Stationary	Fleet Vehicles	Refrigerants	Fertilizer	Purchased Electricity	Faculty/Staff Commuting	Student Commuting	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
2006	37,770	811	1,561	8	134,394	12,943	19,229	7,983	3,784	678	693	13,292	(641)	0	233,128
2007	39,457	895	1,561	8	114,293	13,430	19,391	7,957	3,663	721	622	11,304	(641)	0	213,288
2008	42,267	927	1,561	8	114,784	13,443	18,563	7,959	3,548	691	666	11,352	(641)	0	215,753
2009	49,471	1,009	1,561	8	100,142	13,246	18,602	9,308	3,373	822	588	9,904	(642)	0	208,018
2010	44,858	1,246	1,561	8	103,474	13,502	18,447	9,770	3,308	804	573	6,395	(650)	0	203,921
2011	45,339	876	1,561	8	105,988	13,190	18,542	11,280	3,264	748	594	6,551	(749)	0	207,816
2012	40,087	866	1,561	8	90,648	13,590	18,435	10,725	3,409	596	516	5,603	(671)	(127)	185,870
2013	34,894	829	1,561	8	87,228	12,781	18,640	9,558	3,521	515	528	5,391	(736)	0	175,352
2014	35,704	844	1,561	9	87,364	17,547	21,747	7,161	4,028	569	512	5,400	(661)	0	182,509
2015	36,513	858	605	5	87,499	20,991	23,978	9,683	3,309	560	504	5,408	(651)	(7)	189,958

The largest portion of the University's carbon footprint (46.1%) 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 will be achieved through a multi-pronged approach involving:

1. Renewable Energy: The University will seek to produce more of our own electricity on campus from renewable sources, with an 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.

The University has been able to offset its emissions by a small fraction (0.3%) 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. With President Ramsey's commitment to achieve climate neutrality and the day-to-day work of the Sustainability Council, the Assistant to the Provost for Sustainability Initiatives, and numerous individual staff, faculty, researchers and students across our campuses, the University of Louisville is bound for a brighter, greener future.

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.