



The University of Georgia

®

Campus Sustainability Plan



UGA Campus Sustainability Plan

PART ONE: CLIMATE

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Abbreviations:

CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
FY	Fiscal year
CAES	College of Agricultural and Environmental Sciences
T&D	Transmission and distribution
GHG	Greenhouse gas
UGA	University of Georgia
CAP	Climate Action Plan

Glossary:

Tonne	Metric ton, or 1,000 kilograms. Sometimes also shown as MT, or megagrams (Mg)
CO ₂ equivalent	All greenhouse gases associated with a source, normalized by their warming potential relative to that of carbon dioxide
Gross emissions	Total emissions from all sources without subtracting offsets
Net emissions	Gross emissions minus offsets
Offset	A reduction in emissions of carbon dioxide or greenhouse gases made in order to compensate for or to offset an emission made elsewhere.



EXECUTIVE SUMMARY

Leadership in sustainability research, education and service is a hallmark of The University of Georgia's 2020 Strategic Plan. The University's campuses serve as living, learning laboratories providing tangible examples to others in the pursuit of economic security, ecologic integrity and social well-being. The University will continue to evolve this leadership role in relation to "grand challenges" as we move toward more sustainable practices and technologies. Part One of the UGA Sustainability Plan establishes a current inventory of greenhouse gas emissions attributed to our campuses within the state of Georgia and serves as a road map with goals and strategies to increase resiliency and significantly reduce the University's emissions over time. Future development and implementation of this plan will continue to evolve with UGA's capacity to address challenges and as other issues emerge.

The University of Georgia's greenhouse gas or CO₂-equivalent emissions come from on-campus sources such as the central steam plant, solid waste and campus fleet vehicles, as well as off-campus sources such as purchased electricity and student, faculty and staff commuting. Members of the UGA community continue to engage in projects and programs that reduce the use of fossil fuels and advance campus sustainability, typically with a direct correlation to avoided costs. In fiscal year 2010, UGA campuses and facilities throughout the state of Georgia contributed approximately 270,000 net tonnes of CO₂e emissions, including offsets provided by UGA's managed forest lands. By FY2014, UGA's net emissions decreased by 8% to approximately 249,000 tonnes. (See Appendix A for a list of data sources.)

The UGA Sustainability Plan identifies near, mid, and long-term strategies to reduce UGA-related greenhouse gas emissions in five major categories: Energy (84% of current UGA emissions); Transportation (14% of current UGA emissions); Land Management (<1% of current UGA emissions); Waste Reduction (<1% of current UGA emissions); and Education, Research & Service. Recommended strategies to reduce emissions focus on economically feasible solutions with direct benefit to the University. Emission reduction goals represent aspirational yet attainable targets for reducing greenhouse gas emissions from a fiscal year 2010 baseline over the next 45 years. Resiliency planning will strengthen UGA's ability to advance campus sustainability.

Current Progress (FY14): 8% reduction in greenhouse gas emissions vs. 2010 baseline
Near-term Goal: 20% reduction in greenhouse gas emissions by 2020
Mid-term Goal: 40% reduction in greenhouse gas emissions by 2040
Long-term Goal: Strive for carbon neutrality by 2060

These goals present considerable challenges in the context of a dynamic research institution, however they are achievable with focused effort, continued commitment toward a safer and healthier environment for all, and concentration on long-term economic benefit. Most recommended strategies for achieving near-, mid- and long-term emissions reduction goals offer lifecycle economic benefits to UGA and are feasible without purchasing additional carbon offsets. Aggressive energy use intensity reductions and increased use of renewable energy will be required to reduce emissions while simultaneously expanding campus facilities. Reduced fossil fuel use in vehicles and a drastic reduction in solid waste will require participation from all campus stakeholders. This plan identifies feasible solutions for UGA to exceed 60% reductions in UGA's emissions by 2060. Achieving a goal of carbon neutrality will require additional commitments such as producing a minimum of 25% of UGA's electricity demand through onsite renewable sources, purchasing green power to meet 20% of the remaining power needs, and securing high-quality carbon offsets such as expanded UGA forest preserves to mitigate any remaining net emissions. (See Appendix B for a 2060 climate neutrality projection model.) Planning, management, and restoration of shared natural resources will continue to ensure a safe, sustainable university campus and community.



I would like to thank the dedicated students, faculty, staff, and community members who developed the University of Georgia's Sustainability Plan, which outlines short- and long-term strategies for advancing campus sustainability.

Today, UGA uses 17 percent less energy per square foot and 25 percent less water than it did in 2007. In addition, an aging coal-fired boiler was recently replaced with a more cost-effective and energy-efficient solution, and a 1MW solar tracking demonstration project is in the process of being installed to enhance renewable energy research and teaching. It also is worth noting that last year UGA sent approximately 300 fewer tons of materials to the local landfill than in 2010, and the institution continues to implement programs geared toward zero waste. Moreover, students, faculty, and staff are playing a critical role in the effective management of precious natural resources such as agriculture, forest, and marsh lands throughout the state of Georgia. These outcomes fall directly in line with UGA's mission as a land-grant and sea-grant university.

Taken together, the institution's accomplishments—and many others—point to a thoughtful and coordinated commitment to the effective stewardship of our resources and to the advancement of campus sustainability. Although the University has opportunities for improvement—as described in this action plan—I hope each member of the UGA community shares a collective sense of pride in where we are as an institution right now and in the direction we are moving to protect and enhance the educational environment at the University of Georgia and beyond.

Jere W. Morehead
22nd President of the University of Georgia

As a native son of the state of Georgia, I walk the beautiful campus of our flagship university proudly as a member of its faculty. I am still humbled by the beauty of various buildings, trees, and wildlife that share this space with us.

On a grander scale, I have been fortunate enough to study, as a former NASA scientist, our Earth from the vantage point of space using advanced satellites. When astronauts first looked back at our planet many decades ago, they realized that not only was our "small corner" of the universe beautiful, it is fragile and the only corner we have to sustain us for some time to come. This realization motivated global citizens and policymakers of all cultures, political ideologies, and backgrounds to protect and sustain the Earth. Polluted air, acid rain, and a depleted ozone layer were some of the most challenging environmental issues of that day. Those actions are the reason our kids are not subject to air that requires daily masks or health threats from ultraviolet (UV) radiation because of an ozone hole.

In 2014, I received Captain Planet Foundation's Protector of the Earth Award and even shared the stage with the amazing Dr. Jane Goodall. The Foundation was founded by Ted Turner and is directed by Laura Turner Seydel, whose family is a strong supporter of the University of Georgia (UGA). Upon accepting the award, I noted that we are in a new renaissance of environmental sustainability and stewardship of the Earth.

UGA's Plan is a bold step towards a healthier and sustainable university and environment. While clearly there is more to learn, science continues to elucidate the environmental risks associated with elevated carbon emissions. The essential systems of our planet (carbon-nitrogen-water cycles, weather, oceans, and ecosystems) are changing. Such changes, irrespective of our varying perspectives on causation, affect crops of farmers, fishing yields, coastal communities, health of citizens in urban to rural communities, and even national security. The University's Climate and Society Initiative is a great place to find out what scholars at UGA are doing to help our state, national, and global community (climateandsociety.ovpr.uga.edu). I applaud President Morehead, the University leadership, faculty, and students for taking a step forward on this matter and exhibiting leadership.

As a representative of an international community of scholars, I can proudly cite our University of Georgia as an exemplar for other institutions of higher learning. And the citizens of the state can know that we are diligently upholding our responsibility to have stewardship and dominion over this great creation that we call home.

Dr. J. Marshall Shepherd
Georgia Athletic Association Distinguished Professor
Department of Geography
Director, Atmospheric Sciences Program
2013 President, American Meteorological Society





INTRODUCTION

The University's campuses strive to serve as living laboratories providing tangible examples to others in the pursuit of economic security, ecologic integrity and social wellbeing. The UGA Sustainability Plan and associated actions to reduce greenhouse gas emissions help address goals of the University's 2020 Strategic Plan and contribute to a healthy, resilient, and sustainable campus and community.

Greenhouse gases (GHGs) in Earth's atmosphere prevent heat from escaping into space. According to the US EPA, burning of fossil fuels and deforestation are two significant factors that lead to increasing concentrations of GHGs in the Earth's atmosphere, causing surface temperatures to increase above past levels. While the magnitude, rate and exact effects are unclear, changes in climate can increase or decrease rainfall, influence agricultural crop yields, affect human health, and cause changes to ecosystems and communities.

The Sustainability Plan establishes a current inventory of greenhouse gas emissions attributed to UGA campuses throughout the state of Georgia and serves as a road map to significantly reduce the University's emissions over time. UGA'S greenhouse gas emissions inventory measures the impact of UGA operations in terms of carbon dioxide equivalent (CO₂e) emissions. Future planning will incorporate additional indicators for campus and community resilience.

When will these strategies be implemented?

This plan establishes aspirational yet attainable targets for reducing greenhouse gas emissions from a fiscal year 2010 baseline over the next 45 years. Additional resiliency goals will be developed and implemented in concert with emissions reduction.

Current Progress (FY14): 8% reduction in greenhouse gas emissions vs. 2010 baseline
Near-term Goal: 20% reduction by 2020
Mid-term Goal: 40% reduction by 2040
Long-term Goal: Strive for Carbon Neutrality by 2060

What causes UGA's emissions?

This Sustainability Plan includes activities on UGA properties within the state of Georgia; however it is also noteworthy that the UGA Costa Rica Campus provides an effective model for ongoing efforts toward carbon neutrality, and Georgia Sea Grant and others are actively engaged in resilience planning with coastal communities in our state.

This plan documents the University's current emissions inventory from three scopes as described by the US Environmental Protection Agency (EPA). Scope 1 emissions include direct emissions from sources owned or controlled by UGA including fuel use at the Central Steam Plant and in campus transit and service vehicles. Scope 2 emissions are indirect emissions associated with the generation of purchased utilities such as electricity. Scope 3 emissions are other indirect emissions from sources not owned or directly controlled by UGA but related to the University such as transmission and distribution (T&D) losses associated with purchased electricity, employee travel and commuting, and solid waste disposal.

The UGA Sustainability Plan tracks emissions and identifies mitigation strategies in five categories:

- Energy
- Transportation
- Land Management
- Waste Reduction
- Education, Research & Service

84% of UGA's carbon emissions are attributed to fossil fuel use related to facility energy consumption.

14% of UGA's carbon emissions come from fossil fuel use in UGA-related transportation.

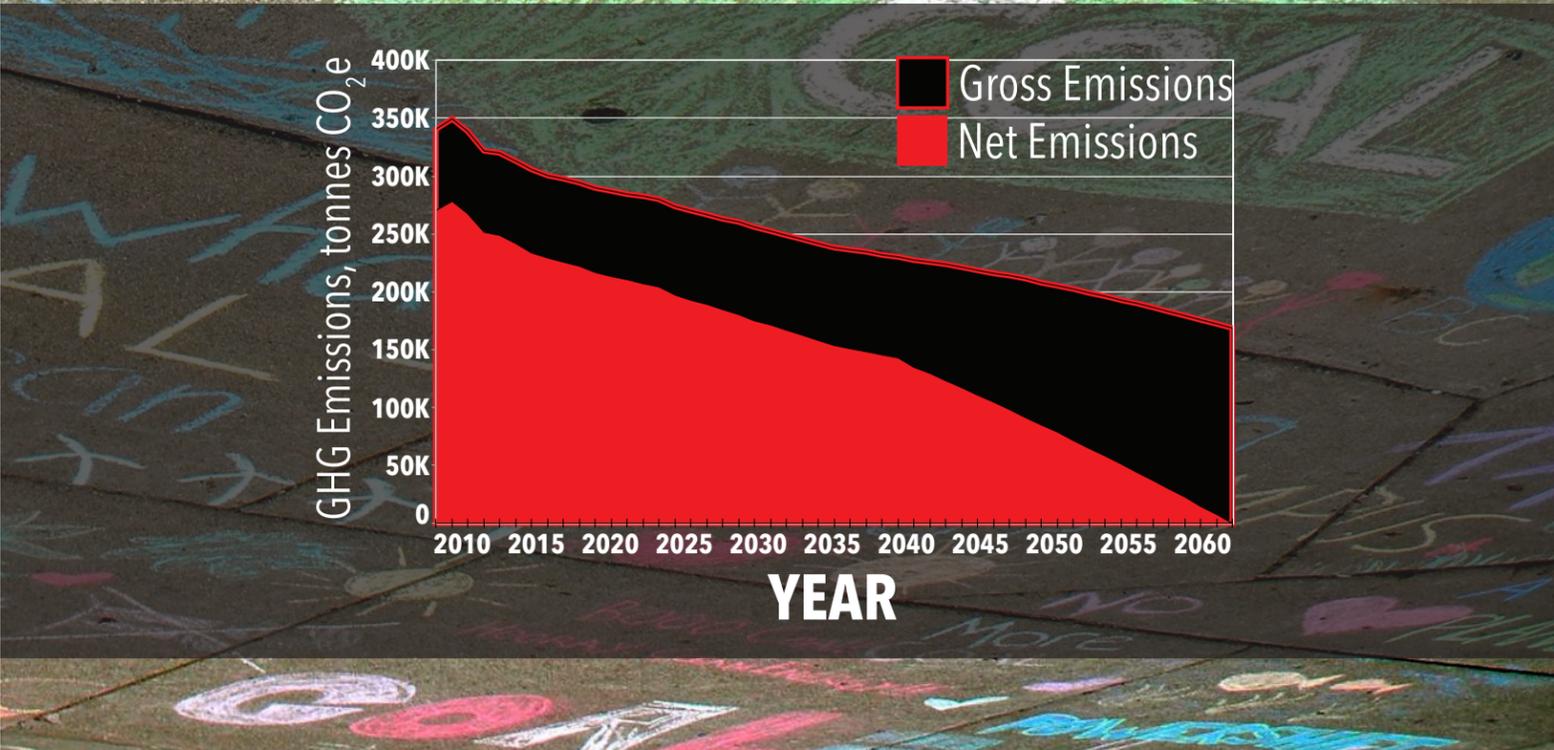
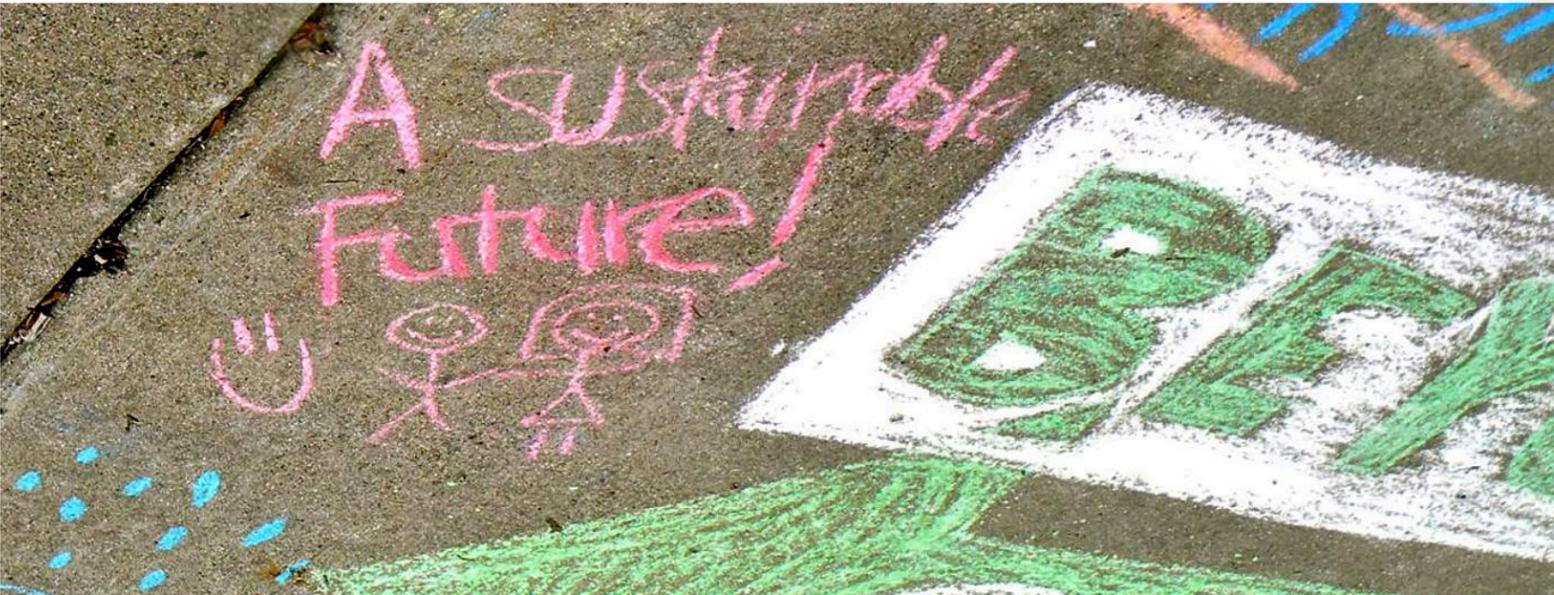
The remaining 2% of UGA's emissions are primarily generated by agricultural practices and landfilled waste.



Who is involved?

The UGA Sustainability Plan - Part One was developed by students, faculty, and staff, led by the Office of Sustainability in partnership with the Georgia Initiative for Climate and Society, to serve as a guide to reduce emissions, steward natural and financial resources, and promote wellbeing. (See Appendix C for a list of individual contributors.)

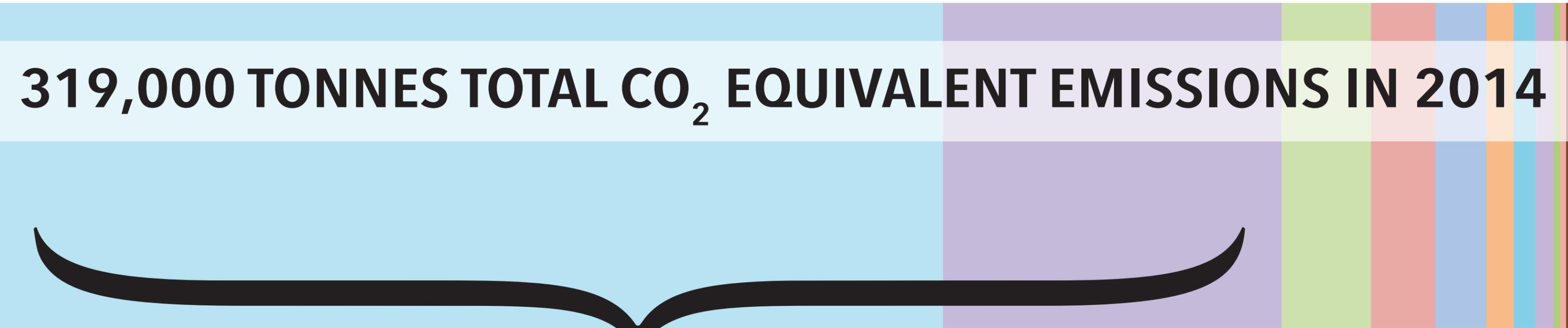
Effective implementation of the strategies listed in this report will require commitment and participation from administration, operational and academic units, and each individual within the University of Georgia community. Effective and adaptive planning and partnerships within our university and local communities will enhance long-term health and resiliency in a changing climate.



THE UNIVERSITY OF GEORGIA
Franklin College
of Arts and Sciences



UGA GREENHOUSE GAS EMISSION SOURCES



ENERGY MAKES UP 84% OF UGA'S CURRENT EMISSIONS

- ELECTRICITY 64.7%**
- HEATING FUEL COMBUSTION 19.2%**

TRANSPORTATION, LAND MANAGEMENT, REFRIGERANTS & WASTE MAKE UP 16% OF CURRENT EMISSIONS

- FACULTY/STAFF COMMUTING 4.9%**
- STUDY ABROAD AIR TRAVEL 3.6%**
- STATE VEHICLE FUELS 2.8%**
- FACULTY/STAFF AIR TRAVEL 1.5%**
- REFRIGERANTS 1.2%**
- STUDENT COMMUTING 1.1%**
- AGRICULTURE 0.5%**
- REIMBURSED VEHICLE TRAVEL 0.3%**
- SOLID WASTE 0.2%**



ENERGY

The University of Georgia steam plant has reduced overall energy usage by 11% since 2010, and decommissioned its last remaining coal boiler in the spring of 2015. "The electrode boiler will generate savings that can be invested to enhance the University's teaching, research, and service activities." said Ryan Nesbit, UGA Vice President for Finance and Administration.

*"If everyone tries a bit harder,
our fuel will go farther and farther."*

- Schoolhouse Rock

ENERGY

Energy use represents the largest segment of UGA's greenhouse gas footprint at 267,434 tonnes of CO₂e, or 84% of the total gross emissions. 77% of the energy-related emissions occur at offsite power plants that provide electricity to the university, including electricity that was generated but lost due to inefficiencies in transmission and distribution (T&D). The remaining 23% is due to onsite, stationary fuel combustion in the Athens campus central steam plant and in individual boilers and furnaces in other facilities on the main campus and around the state. The central steam plant on the UGA Athens campus uses various fuel sources to generate steam for heating campus buildings and operating laboratory equipment; while this system does not specifically generate electricity it is an integral part of UGA's energy infrastructure.

The energy data used in this calculation include all electricity and stationary heating fuels (coal, natural gas, and fuel oil) used at the Athens, Tifton, Griffin, and Skidaway campuses. Energy associated with the distribution of potable water is not included in this study, although UGA remains committed to reducing potable water use and has demonstrated a 31% reduction in water use intensity since 2007. See Appendix A for further details regarding what is and is not included in CAP data calculations.

The 2020 Strategic Plan outlines goals that will reduce the university's energy-related carbon footprint, including a 20% overall greenhouse gas emissions reduction compared to 2010, and a 25% reduction in energy use intensity per square foot compared to 2007. By 2020, UGA also commits to purchasing 10 percent of energy from renewable sources, generating 10 percent consumed energy through on-site using renewable sources, and evaluating on-site renewable energy opportunities for all capital projects.

Emissions from purchased electricity and T&D losses depend on the fuel mix used to supply the electric grid. While the university has little to no control over these external factors, improving campus energy efficiency, adding renewables to the purchased electricity portfolio, and generating renewable energy on UGA property will substantially reduce the emissions associated with this category.

Emissions from onsite stationary combustion depend primarily on which fuels are used in the steam plant. Unlike the electric grid, the university has ultimate control over this factor. Retiring the coal boiler, continuous steam plant improvements, and university-wide heating efficiency efforts are all means by which UGA can reduce emissions from stationary combustion.

UGA spends over \$18 Million annually in energy costs. Investments in energy infrastructure improvements lead to direct economic returns through energy cost avoidance over time. While the return on investment period for renewable energy projects is longer than energy efficiency measures, renewable technologies offer significant opportunities for education and research.

Achievements to Date

As of FY2015, UGA has reduced its energy use intensity by 17.5% since 2007.

In 2013 UGA adopted a building standard that requires new projects and major renovations to have 20% lower energy use intensity compared to current minimum state energy codes.

The steam pit rehabilitation program, including the re-insulation and repair of 75 steam pits on UGA's Athens Campus, has reduced steam energy inputs by 13% since 2010.

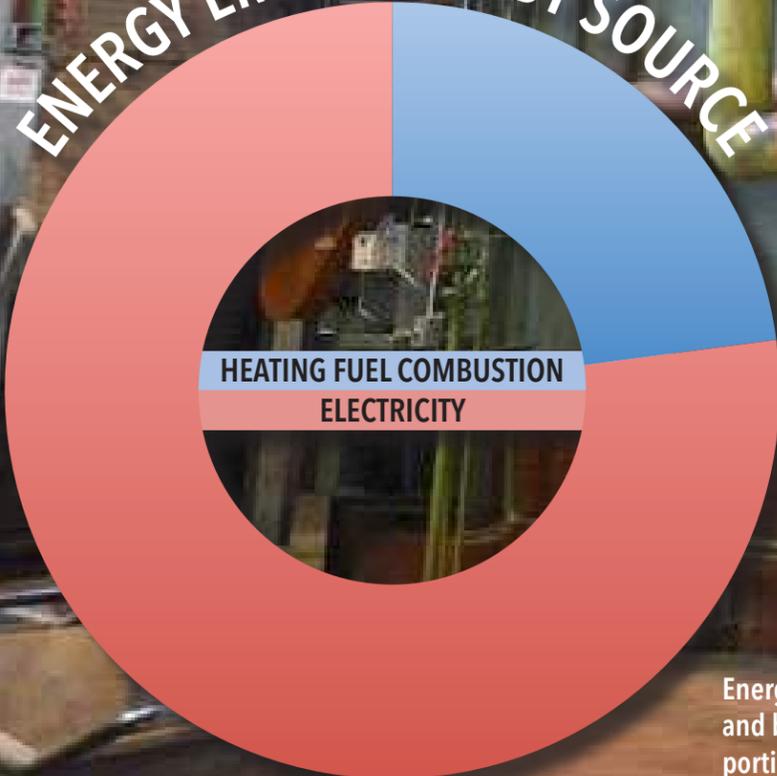
On March 24, 2015, the steam plant's aging coal-fired boiler became history. A new electrode boiler took its place in the fall of 2015 to supplement the existing natural gas boilers during periods of extreme cold and/or natural gas curtailment.

Compared to FY2014 usage, this will reduce GHG emissions from the steam plant by 5% and overall UGA emissions by about 1%, taking into account the resulting GHG emissions from increased electricity usage.

ENERGY MAKES UP 84% OF TOTAL GROSS EMISSIONS



ENERGY EMISSIONS BY SOURCE



Energy as a portion of overall gross emissions (top) and breakdown of electricity vs. heating fuel as portions of energy emissions (bottom). (FY2014)

In 2014 the Board of Regents selected UGA to pilot the Guaranteed Energy Performance Contract process. An energy services contractor (ESCO) will conduct energy related renovations in East Campus buildings, paid for by a loan, which UGA will pay back through future energy savings. Assuming this program is successful it will be replicated throughout the University System of Georgia.

Demand controlled ventilation (DCV) retrofits have been added to classrooms to reduce conditioning fresh air during periods of low or no occupancy, and this technology is now common in new building designs.

During winter 2014-2015 the central steam plant successfully operated at reduced output pressure without compromising service at the farthest points of the steam distribution network. This change has been adopted permanently and has the potential to yield significant cost and emissions reductions.

In Fall 2015 UGA Energy Services funded an aggressive LED retrofit campaign to replace aging fluorescent light fixtures in buildings with high hours of use. The savings from this program will fund similar retrofits in subsequent years.

Near-term Goals (2015-2020)

Expand outreach and education campaigns to foster a culture of sustainability among staff, faculty, and students, promote energy literacy, and provide guidance and tools for reducing energy use through personal behaviors and choices.

Construct up to 3 MW of solar at the UGA Tifton campus. When combined with the 1 MW of solar power on South Milledge Avenue, this will offset approximately 2% of UGA's conventional electricity usage.

Reduce energy use intensity by 35% from 2010 baseline (note: this exceeds the 2020 Strategic Plan 25% energy reduction goal to maximize reduction of carbon emissions).

Continue to decommission remaining R11 and other aging chillers and shift capacity to more efficient district energy plants.

Update UGA Guidelines for Design and Construction to incorporate, implement, and monitor current sustainable design strategies, including Leadership in Energy and Environmental Design (LEED) and Sustainable Sites Initiative standards when appropriate.

Establish a green labs program which encourages best practices for energy conservation in laboratories.

Replace old and inefficient appliances as part of the Appliance Replacement Initiative Program.

Establish minimum energy efficiency standards for purchased goods including lighting components, appliances, and office equipment.

Implement a university-wide IT energy conservation program.

Mid-term Goals (2020-2040)

Reduce energy use intensity by 50% from 2010 baseline.

Supply 12% of overall electricity use with on-site solar PV generation and implement solar thermal water heating in hot water intensive facilities.

Implement university-wide, building-level energy and water metering to track utilities in real time and quickly identify and diagnose energy and water waste occurrences.

Systematically retro-commission existing buildings to ensure they are working as designed (or better).

Expand the university building energy requirement to include all relevant sections of ASHRAE Standard 189.1, Standard for the Design of High Performance Green Buildings.

Expand the use of heat recovery chillers to supply heating hot water and reduce demand on the steam plant.

Decommission all dual-duct and multi-zone air systems that heat and cool air in parallel (Bioscience, Chemistry, Boyd Hall, Science Library).

Implement departmental utility billing to encourage conservation by end users.

Long-term Goals (2040-2060)

Reduce energy use intensity by 70% from 2010 baseline.

Supply 25% of overall electricity use with on-site renewable energy generation and purchase at least 20% of remaining electricity demand from renewable sources.





TRANSPORTATION

The UGA Campus Transit System is the largest in the United States, surpassing 11,000,000 passenger trips annually. "We're hopeful that one day we'll be able to provide zero-emissions transit options to the students, employees, and residents of Athens," said Ron Hamlin, Director of UGA Campus Transit

"I thought of that while riding my bicycle."

- Albert Einstein

TRANSPORTATION

Transportation involves every member of the campus community, making it a highly visible reflection of UGA's climate commitment. Transportation accounts for 24,766 tonnes of CO₂e or 14% of the University of Georgia's total gross emissions.

The transportation-related emissions in this category include Athens campus faculty, staff and student commuting, study abroad air travel, faculty and staff air travel booked through the travel agency, reimbursable personal vehicle travel, campus transit, and statewide fleet vehicle fuel usage. Not included here are reimbursed faculty and staff air travel, rental car travel, visitor travel (e.g. invited speakers, prospective faculty), and third-party contractor vehicle usage. See Appendix A for further details regarding transportation emissions calculations.

The 2020 Strategic Plan outlines goals that will reduce the university's transportation-related emissions. Based on a 2010 baseline, by 2020 UGA commits to: increase the number of campus bus passengers; increase by 20% the number of faculty, staff, and students who bus, bike, or walk to campus; increase the number of Alternative Transportation Permit users by 20%; and establish a carpool membership program with 1,000 members.

UGA spends about \$3,000,000 per year in fleet vehicle fuel. Reductions in fuel use leads to a direct reduction in operating costs and emissions.

Achievements to Date

Ongoing implementation of UGA's physical campus master plan prioritizes pedestrian-centered development, including over 50 acres of new green space creation and 19 miles of campus bike ways to date.

UGA Parking Services has developed and implemented commuter friendly options for students, faculty, and staff as part of its Alternative Transportation Program (ATP).

Bulldog Bikes, a bike share program that encourages UGA community members to use bicycles as a primary source of transportation on and around campus, was launched in 2012 and in 2015 the pilot reCYCLE bike recycling and donation program was established.

UGA boasts the largest campus transit system in the United States, and is responsible for the Athens area ranking fourth in the nation for per capita ridership (behind New York City, San Francisco, and Washington, DC).

Annual financial contributions from UGA Parking Services and Campus Transit enable individual members of the UGA community to ride Athens Transit free of charge.

UGA Campus Transit has increased ridership from 9 million to 11 million passengers between 2010 and 2015, a 22% increase.

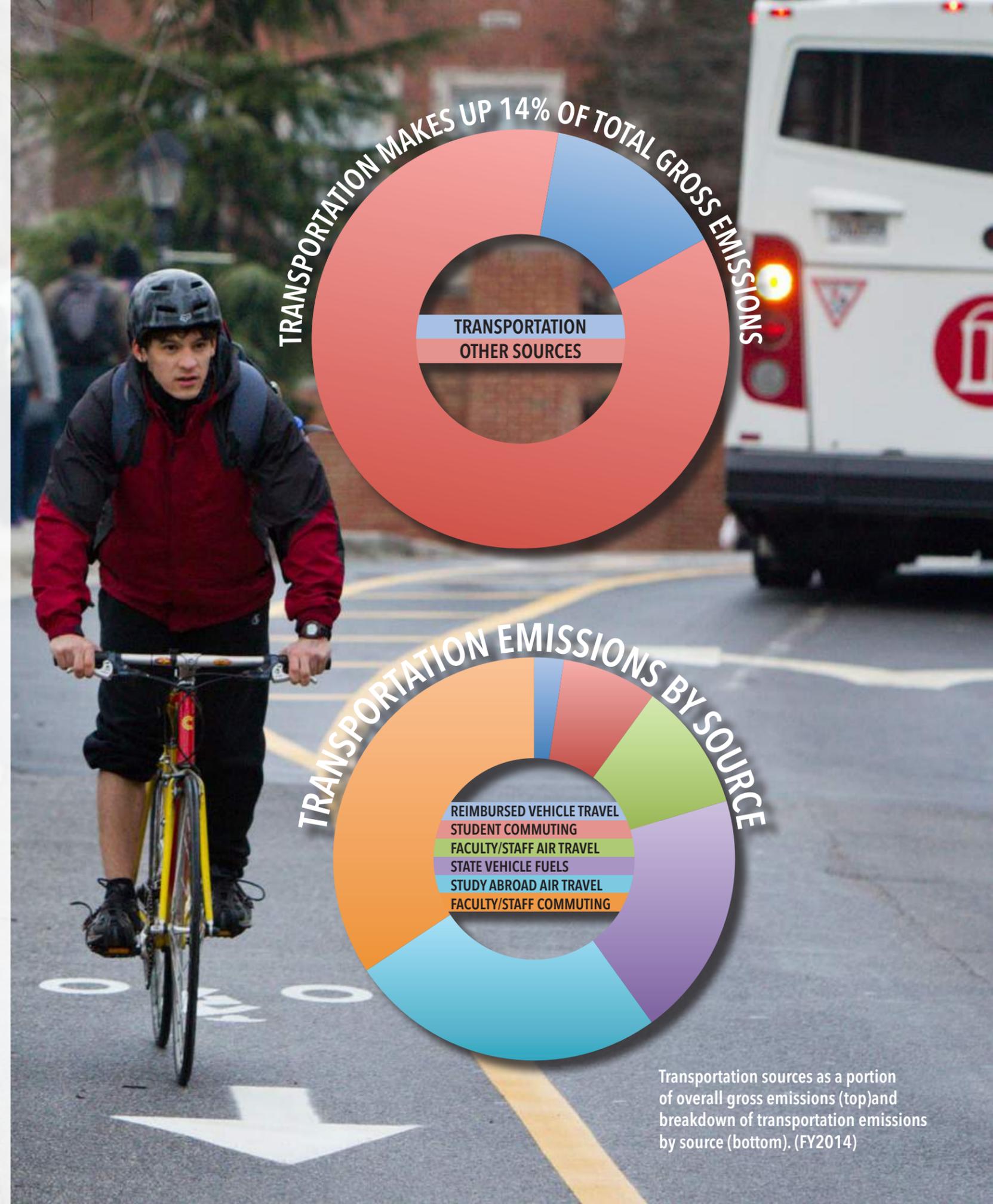
UGA Campus Transit and Athens Transit adhere to strict idling policies.

Real-time tracking of UGA buses is available in the UGA App to enhance safety and ease of use for members of the campus community.

Approaching Vehicle Identification systems have been installed in all UGA parking decks, reducing vehicle idling at access control gates.

In the fall of 2013 UGA installed its first public electric vehicle charger in the North Campus parking deck. In early 2015 two more were installed in the East and South Campus decks.

In 2015 the UGA Complete Streets Committee was founded to address current and future campus transportation systems holistically.



TRANSPORTATION MAKES UP 14% OF TOTAL GROSS EMISSIONS

TRANSPORTATION
OTHER SOURCES

TRANSPORTATION EMISSIONS BY SOURCE

REIMBURSED VEHICLE TRAVEL
STUDENT COMMUTING
FACULTY/STAFF AIR TRAVEL
STATE VEHICLE FUELS
STUDY ABROAD AIR TRAVEL
FACULTY/STAFF COMMUTING

Transportation sources as a portion of overall gross emissions (top) and breakdown of transportation emissions by source (bottom). (FY2014)

UGAMAN



Have class in 5 but Blinky is in your way? Need a shortcut to get a banana?

Check out the UGA app! Offering real time tracking of UGA and ACC busses and great campus information!

It will help get you where you need to be without running into ghostly difficulties!



MEITS
ENTERPRISE INFORMATION TECHNOLOGY SERVICES

The University of Georgia
Campus Transit



SUSTAINABLE UGA

Near-term Goals (2015-2020)

Begin transition of Campus Transit fleet from diesel to electric while retiring pre-2007 vehicles.

Promote awareness among the University community of the environmental, human health, and economic impacts of transportation choices.

Improve bicycle facilities, including the expansion of bike lanes and routes on campus, as outlined in the comprehensive UGA Bike Study.

Install covered bike storage and shower facilities in new buildings.

Expand bike sharing and bike recycling / donation programs.

Achieve Bicycle Friendly University status from the League of American Bicyclists.

Continue to partner with Athens-Clarke County and the Oconee Rivers Greenway Commission to expand the greenway trail network.

Decrease the prevalence of single occupancy vehicles on campus through enhanced alternative transportation infrastructure, programs and incentives.

Expand transit service to additional UGA facilities on College Station Road and S. Milledge Avenue.

Establish car share and ride share opportunities for students, faculty and staff.

Install electric vehicle chargers in each parking deck on campus.

Encourage teleconferencing instead of driving, and driving instead of flying to events within a 6-hour range if attendance is necessary.

Enhance participation in the UGA Costa Rica Study Abroad Carbon Offset Program to offset UGA air travel.

Mid-term Goals (2020-2040)

Implement fuel economy standards for all university-owned vehicles, and increase the number of alternative fueled vehicles in the service and rental fleets.

Fully integrate electric vehicle charging infrastructure on campus.

Continue to decrease the prevalence of single occupancy vehicles on campus through expanded infrastructure, programs and incentives.

Cooperate with Athens-Clarke County and other transportation authorities to plan and build the greenway network and enhanced infrastructure along commuter and rail corridors to facilitate bicycle commuting.

Develop a local emissions offset program comparable to the UGA Costa Rica Study Abroad Carbon Offset Program. Incentivize and facilitate purchase of airline emissions offsets for faculty, staff, and student air travel.

Long-term Goals (2040-2060)

Continue to develop a connected, pedestrian-centered campus.

Maintain a zero emission bus fleet.

Establish a commuter rail with trail program along railroad corridors on UGA property.

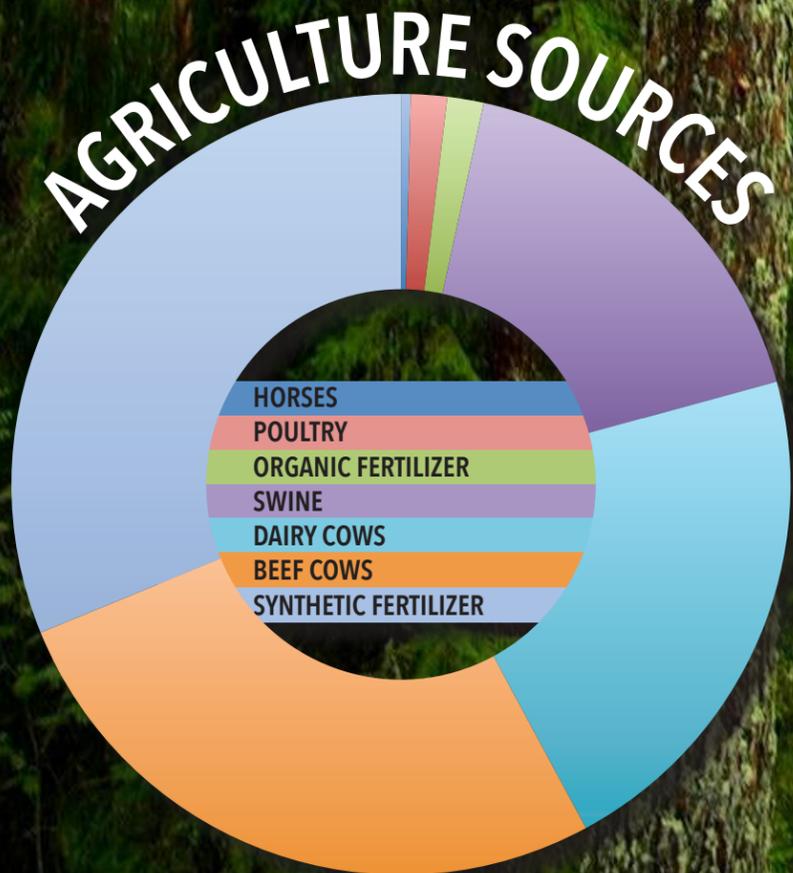
A photograph of a pine forest. The foreground is filled with tall, dry grasses. The middle ground is a dense stand of tall, slender pine trees. The background shows a clear blue sky with a few wispy clouds.

LAND MANAGEMENT

UGA forest lands offset 20% of its state-wide carbon emissions.

"The College of Agricultural & Environmental Sciences remains committed to fostering environmental stewardship and wise management of natural resources," said Dr. Scott Angle, Dean.

AGRICULTURE VS. OTHER SOURCES



Agriculture sources as a portion of overall gross emissions (top) and breakdown of agricultural emissions by source (bottom). (FY2014)

"The care of the earth is our most ancient and our most worthy and, after all, our most pleasing responsibility. To cherish what remains of it, to foster its renewal, is our only legitimate hope."
- Wendell Berry

AGRICULTURE, FORESTRY & GROUNDS

As a Land and Sea Grant Institution, UGA owns agricultural, forest, and marsh land throughout the state of Georgia, as well as built environments including the main campus grounds in Athens, GA. Some of these properties are managed by the university as a whole and some are managed by individual colleges, including the College of Agriculture and Environmental Sciences (CAES) and the Warnell School of Forestry.

Agriculture

As one of the oldest agricultural schools in the nation, CAES manages twenty properties around the state for teaching, research and extension services to meet UGA's land grant mission. Collectively, activities on these properties constitute 2,746 tonnes of CO₂e or less than 1% of UGA's gross emissions. Out of this total, 32.6% comes from fertilizer application which leads to nitrous oxide emissions, and 67.8% from livestock which results in methane emissions. The potential for offsetting carbon on the roughly 4000 hectares of land designated as crop or pasture-hayfields has not been evaluated.

Achievements to Date

CAES coordinates a Sustainable Agriculture Program which promotes production and marketing practices that are profitable, environmentally sound, and that improve the quality of life for farmers, farm workers and the community. Workshops, training sessions, and seminars are organized throughout the year to educate farmers about sustainability implementation strategies.

UGA received U.S.D.A. Organic Certification of a 4 acre U.S.D.A. Farm in Watkinsville, GA which is used for the sustainable agriculture program. The 1055-acre J. Phil Campbell Sr. Research and Education Center, also in Watkinsville, develops and transfers environmentally sustainable and profitable agricultural systems to land owners and managers in order to protect the natural resource base, build accord with non-agricultural sectors, and support healthy rural economies.

UGArden is a student run learning and demonstration farm located on Milledge Avenue near UGA's main campus. The mission is to build a student community centered on a sustainable food system. It includes solar electricity, organic practices and onsite composting.

The UGA Tifton Campus Future Farmstead was developed to serve as an energy independent experimental farm and farmstead dedicated to developing and demonstrating advanced technologies which will enhance farmer efficiency to achieve the nation's future energy, food, and environmental requirements.

Near-term goals (2015-2020)

Continue to research and implement crop rotation, tillage and livestock management practices that mitigate and sequester carbon, particularly at the J. Phil Campbell Sr. Research and Education Center. Capture methane biogas at the UGA swine center using an anaerobic digester.

Develop the Georgia Sustainable Agriculture Consortium to facilitate interaction between key institutions and stakeholders, enhance research and create local food hubs to improve rural economies and communities in Georgia.

Mid and Long-term goals (2040-2060)

Continue to research and implement crop rotation, tillage and livestock management practices that mitigate and sequester carbon.

Improve fuel efficiency of farm equipment and increase feed efficiency to reduce carbon emissions.

Generate more energy on UGA farm properties using digesters and crop residues.

Evaluate the carbon storing capacity of UGA's crop and grazing lands, and sequester carbon in soils through rotational grazing practices and by adding organic matter.



Forests and Grounds

The University of Georgia owns and manages approximately 19,000 hectares of forested lands throughout the state of Georgia including the grounds of the main campus in Athens. These properties represent many unique habitats with different carbon absorption capacities. Researchers in the Warnell School of Forestry and Natural Resources developed models to estimate the amount of UGA's carbon emissions that the growing tree canopy absorbs on these lands. According to this research, these properties offset about 70,000 tonnes of CO₂e, which equals about 21% of UGA gross emissions as estimated for FY2014. UGA's campus grounds are designed and managed to promote beautiful, ecologically functional, and pedestrian-centered spaces to create the optimal student environment.

Achievements to date

UGA's main campus incorporates sustainable site design including native plants, reducing chemical inputs, minimizing paving, creating greenspace, improving storm water quality and using efficient irrigation.

In the past 15 years, the University has removed over 1.5 million square feet of asphalt and added over 50 acres of campus green space.

The UGA Athens campus is designated as a Campus Arboretum with a Sustainable Tree Trust that ensures long-term viability of the campus tree canopy. Over 9,000 individual trees have been documented in developed campus areas providing air and water quality, shade, urban habitat and beauty. In FY14, UGA was awarded Tree Campus USA status for the fourth consecutive year.

The Facilities Management Division Grounds Department composts organic leaf and limb debris, animal bedding and dining hall food scraps to create nutrient-rich compost for restoring campus soils and nurturing the campus landscape. This program diverts approximately 700 tons of organic materials from the landfill each year.

In 2013 UGA added the historic Wormsloe property on the coast of Georgia which includes 15 acres of marsh and forest to be used for interdisciplinary research.

Near- and long-term goals (2015-2060)

UGA's carbon projections anticipate a growth factor of 0.25% increase in forested land per year.

Continue to manage properties around the state for optimal carbon mitigation and sequestration.

Consider additional property acquisitions to increase forested land holdings.

Increase campus green space envisioned in the UGA Physical Campus Master Plan.

Manage and expand tree canopy for optimal health and coverage by planting new and replacing sick or dying trees with long living native species.

Replace non-priority turf grass areas with native plant species.

Implement green roofs and water collection and reuse systems where feasible.

Expand Integrated Pest Management and minimize the use of synthetic chemical herbicides, pesticides and fertilizers to the greatest extent possible.

Replace aging landscape equipment with electric and energy efficient models and incorporate biofuels when appropriate to reduce fossil fuel use.



WASTE REDUCTION

UGA is composting all organic materials from its dining halls and striving to make it equally as easy to recycle as it is to throw something away. "As we continue to evolve from waste management to materials management, a new paradigm is being created," said Dr. Jenna Jambeck, assistant professor in the College of Engineering.



"There is no such place as away."

- Chief Seattle

WASTE REDUCTION

Every member of the UGA community has a role to play in reducing waste. In FY10, solid waste comprised approximately 5% of UGA's overall emissions at 15,800 tonnes of CO₂e due to methane generated during its decomposition. Through an innovative, energy-producing landfill gas collection system installed by Athens-Clarke County in 2013, landfilled waste from the UGA Athens campus currently accounts for less than 1% of UGA's gross emissions.

Waste-related emissions calculations account for landfilled tonnage from the UGA Athens Campus including both municipal solid waste sent to the Athens-Clarke County Landfill and construction and demolition (C&D) waste sent to the Oglethorpe County Landfill from minor renovation projects. C&D waste from major capital projects is handled by external vendors and is not included in this calculation, although UGA Design and Construction Standards require C&D recycling and a large percentage of this waste is typically diverted from the landfill. Fuel used for transporting waste materials is captured in the Transportation section of this report (it is noteworthy that recycling uses less than 1/2 of the fossil fuels required for transporting waste due to proximity of recycling and landfill facilities to the UGA Athens campus). Supply-chain emissions from goods and services purchased by UGA are also not included in current calculations.

UGA spends nearly \$200,000 per year in landfill tipping fees. Waste reduction initiatives lead to landfill cost avoidance, income generation through the sale of recyclable materials, and avoided costs of soil amendments through creation of value-added compost from organic waste materials.

Achievements to Date

In FY14, UGA sent 295 fewer tons to the landfill than in 2010, about a 6% reduction overall.

New single-stream "waste reduction stations" for "landfill" and "mixed recyclables" have been installed in over 80 campus buildings, placing a recycling bin next to each trashcan and making it equally as easy to recycle as it is to throw something away.

70 solar-powered exterior waste reduction stations have been installed throughout the UGA Athens campus. The solar-powered exterior waste reduction stations are diverting over 50% of materials from the landfill and avoiding \$83,000 in labor and fuel costs per year.

Athens-Clarke County (ACC) installed a Landfill Gas Collection System in 2013 to convert landfill gas to electricity. This not only prevents release of methane to the atmosphere, but also offsets a portion of conventional electricity generation.

The UGA composting program managed by Office of Sustainability student interns currently serves over 30 departmental break rooms in campus buildings and as of spring 2015 has diverted over 3500 pounds of coffee grounds, apples cores and other organics from the landfill.

UGA's dining hall composting program was "scaled up" in April 2014 from a pilot pre-consumer program in one dining hall to collection of all organic wastes from all dining halls on the UGA Athens campus. UGA's switch to trayless dining saves over \$2 million dollars per year in avoided food waste. Overall, the UGA composting program diverts over 700 tons of organic materials from local landfills each year.

The UGA Material Reuse Program has diverted over 200 tons of construction and demolition debris from the landfill for reuse in student-led campus and community construction projects.

UGA Food Services participates in the GA Grown program and currently purchases approximately 20% of all food items, including 33% of fresh produce, from Georgia or bordering states.

The UGA Athletic Association and Office of Sustainability implemented pilot composting in Sanford Stadium diverting over 2000 pounds of organic materials during 3 home football games in 2015.

Near-term Goals (2015-2020)

Establish "zero waste" communications campaigns targeting all UGA students, faculty, staff and administration to promote education, awareness and action to reduce waste.



Develop and adopt sustainable purchasing standards, starting with high-use and high-impact items.

Provide training and educational resources to assist UGA employees in making sustainable purchasing decisions.

Install convenient single-stream recycling stations inside all campus facilities.

Provide composting options in 50% of UGA facilities. Institutionalize waste-free events at UGA.

Partner with UGA Athletic Association to eliminate waste inside event venues and significantly reduce exterior waste associated with sporting events.

Expand the UGA Material Reuse Program to salvage, reuse &/or recycle a minimum 65% of debris from in-house construction and renovation projects.

Promote and expand proper sharing of state property, materials, furniture and equipment through social media and other outlets.

Invest in efficient, reliable equipment and processes to support collection, transport, reuse, recycling and composting of materials.

Purchase 35% of food items served on campus through local and sustainable sources.

Mid-term Goals (2020-2040)

Continue to implement purchasing policies and practices to address economic, social and environmental sustainability from supply chain to end use.

Institutionalize composting options in every UGA facility. Implement zero waste operations resulting in a 90% reduction in landfilled materials as compared to 2010 baseline.

Drastically reduce or eliminate waste generated during all types of UGA events.

Long-term Goals (2040-2060)

Embrace cradle-to-cradle thinking in regard to product and material management at UGA and eliminate the generation of waste altogether.



EDUCATION



RESEARCH



SERVICE

UGA is committed to experiential learning for all students and offers over 400 courses related to sustainability. "Our mission statement makes it clear that a healthy environment is vital in our interdependent, global society," said Dr. Pamela S. Whitten, UGA Sr. VP for Academic Affairs & Provost.





"Awareness is the greatest agent for change."

- Eckhart Tolle

EDUCATION, RESEARCH & SERVICE

The motto of the University of Georgia is "to teach, to serve, and to inquire into the nature of things." While the Climate Leadership Plan primarily focuses on techniques to reduce and offset carbon-equivalent emissions, this plan also proposes strategies that promote the integration of climate and other sustainability-focused concepts into UGA's research, education and service missions. UGA is committed to providing meaningful experiential learning opportunities for every UGA student. The Climate Leadership Plan builds upon the current extensive efforts the University has made; it also identifies new strategies that aim to further engage faculty, staff, and students in their communities.

Achievements to Date

The University of Georgia offers 431 sustainability related courses, with 100 of those courses directly focused on sustainability.

The UGA Committee for Integration of Sustainability Across Curriculum annually provides interdisciplinary curriculum development workshops and networking opportunities for faculty.

The Georgia Initiative for Climate and Society, initiated in 2012, fosters a scientific community that investigates the processes, effects, risks, and impacts of climate variability and change, and develops strategies and solutions for mitigation and adaptation.

Created in the fall of 2013, the sustainability-focused Faculty Learning Community serves as a collaborative working group on curriculum as it relates to global stewardship.

The UGA Archway partnership, initiated in 2005, provides Georgia communities with faculty and student expertise who in turn gain practical experience outside of the classroom. Collaborative projects have addressed community resiliency to changes in the environment.

Following a 2012 study of Sea Level Rise on the coast of Georgia, Georgia Sea Grant is collaborating with many academic and outreach units to serve coastal Georgia communities dealing with sea level rise. Partner organizations include UGA's Carl Vinson Institute of Government, Odum School of Ecology River Basin Center, UGA Marine Extension Service, UGA Marine Science Department, Skidaway Institute of Oceanography, UGA Geography Department, Georgia Initiative for Climate and Society, Georgia Southern University, Georgia Tech, UGA Cooperative Extension and others.

The Southeast Climate Consortium comprised of southeastern universities works with farmers, city water managers to help them reduce the impact of climate variability.

Georgia Automated Environmental Monitoring Network is a series of approximately 80 weather stations that collect weather information for agricultural and environmental applications. Each station monitors air temperature, relative humidity, rainfall, solar radiation, wind speed, wind direction, soil temperature, atmospheric pressure, and soil moisture summarized at 15 minute intervals and disseminated online through the georgiaweather.net website.

The Poultry Carbon Footprint Calculation Tool was developed by UGA to help poultry farmers determine their greenhouse gas emissions and reduction strategies.

UGA Animal and Dairy scientists have developed an intensive grazing system for livestock that can sequester carbon to soil.

Near-term goals (2015-2020)

Continue to achieve the University's land-grant mission by serving as a leader in researching, visioning and realizing long-term economic security, ecological integrity and social wellbeing for our state, campuses and diverse communities.

Enhance awareness among the campus community concerning energy use, sustainable practices, and individual actions to reduce carbon emissions.



Increase the number of curricular and co-curricular sustainability offerings by 10% each over a 2010 baseline.

Offer a Certificate in Sustainability to supplement existing majors with knowledge of human and environmental systems and the complex interactions that exist between them.

Distribute sustainability literacy surveys to incoming and outgoing students to gauge the influence and impact of sustainability-related efforts and to assess social, environmental and economically conscious knowledge and behaviors.

Develop and expand interdisciplinary partnerships to research climate adaptation, resiliency, and change.

Increase participation by undergraduate and graduate students in community service-learning projects which connect UGA research with key challenges to address quality of life issues in Georgia.

Provide additional opportunities for students in experiential research, service, international, and co-operative learning opportunities, integrated with their area of study.

Increase the number of grand challenge research projects supported by UGA

Increase sponsored funding for community-engaged research initiatives with external partners that address key quality-of-life indicators (economic growth, health, and environment) in Georgia and internationally by 10 percent.

Mid and long-term goals (2020-2060)

Continue to expand support for faculty integrating sustainability into the curricula through workshops and mini grants.

Increase research focused on climate science, solutions, education, and policy that enhance resiliency by establishing structures to effectively support interdisciplinary collaborations.

Expand support to communities in Georgia to build resiliency by providing user-inspired, effective and appropriate adaptation and mitigation strategies, solutions, information and tools.

Serve as a leading participant in statewide and local transformations to more sustainable practices and technologies.



The UGA Climate Leadership Plan reflects a resolve within the University community to address the “grand challenge” of sustainability and resiliency.

“University of Georgia students, faculty, staff and administrators are making profoundly responsible choices to promote the health and wellbeing of all, now and in the future.”

Kevin M. Kirsche, Director of Sustainability

Appendix A: Data Sources

Emissions are tracked and analyzed using the Campus Carbon Calculator version 1.0 developed by the University of New Hampshire Sustainability Institute.

Facility Energy Use and Square Footage
UGA Energy Services provided electricity, natural gas, coal, and fuel oil usage and cost for all facilities listed below. The associated building square footage totals for these facilities are included in the analysis.

Included Facilities

Athens Campus
Athens Health Sciences Campus (added FY12)
Griffin Campus
Tifton RDC
Tifton Diagnostic Lab
Tifton Main Campus
Skidaway (added FY13)
Facilities Not Included

Not included in the energy and square footage totals are small field offices such as Small Business Development Center branches, Archway Foundation offices, 4H facilities, and CAES regional research and education centers. The data for these facilities is too difficult to collect and are considered negligible.

Direct Transportation

Direct Transportation includes all UGA-owned state vehicle fuel card expenditures for gasoline, diesel, and ethanol blends. Fuel usage data were acquired from the Automotive Center fleet manager. Data include all state fuel card transactions that occurred on and off campus as well as out of state. UGA Transit bus diesel fuel is included.

Data from the fuel database were divided into three major fuel types: Gasoline, Diesel, and E85. "Gasohol" was included in the gasoline category. There was a small percentage of the overall usage where the fuel type field was blank, so the data were allocated to the gasoline category. There may be some diesel usage misrepresented here, but it is assumed to be a very small amount. In very rare cases where the fuel type was "Other," educated guesses were used to allocate the data into the gasoline and diesel categories depending on the unit cost and vehicle type.

FY2010 data were not available so the FY11-14 average was used as a placeholder for that year.

Commuting

Faculty/Staff Miles, Student Miles

Commuter miles are for the Athens campus only. In April 2013, Office of Sustainability interns submitted a Qualtrics survey to 20,000 parking pass holders via Parking Services. Of 2,900 respondents, 1,570 were complete. The surveys requested demographic (staff, faculty, student), vehicle (make, model, year), frequency of commute, and distance traveled per commute. Fuel consumption per respondent was calculated using EPA fuel economy data for each vehicle; weekly fuel usage was scaled to the full population of permit holders. Rick Watson of the Terry College MIST Department performed the analysis.

Ideally the survey would be performed at least every three years. So far it has been done once, and the results were applied without variation to FY10 through FY14.

Directly Financed Outsourced Travel

Faculty and Staff Air Travel

Data were received from Accounts Payable. These only capture flights purchased through the UGA travel agency and do not count reimbursed airfare. Accounts payable is unable to distinguish airfare from any other travel reimbursements. Data were reported in dollars and converted to miles by using a conversion factor of \$0.15/mile based on annual figures from Airlines for America for domestic and international flights. This method is also used by UNH.

Average placeholders were used for FY10 and FY11 because Accounts Payable records were unavailable. Reimbursed Personal Vehicle Miles
Personal vehicle travel reimbursement figures were available from Accounts Payable for FY12, 13, and 14. Reported data were in dollars reimbursed; these were converted to miles using the reimbursement rate for the applicable period of time.

Estimates for FY10 and FY11 were made using linear regression from the FY12 through FY14 data points.

Study Abroad Air Travel

Information provided by Office of International Education.

Refrigerants and Chemicals

Refrigerant usage is only reported for the Athens campus. O&M Shop 48 and Shop 56 track refrigerant refills in large and small AC units respectively. Housing has its own technicians for small AC units in their buildings, but use so little they do not track refrigerant usage. Only the top six refrigerants (in terms of CO₂ equivalence) are listed in the calculator due to space constraints; the remaining refrigerants are relatively minor.

No other chemical data are reported.

Agricultural Sources

Susan Varlamoff, CAES, collected annual synthetic fertilizer, organic fertilizer, and livestock data for the following facilities:

Georgia Mountain Research & Education Center
Northwest Research & Education Center
Southwest Research & Education Center
Attapulgus Research & Education Center
Eatonton Beef Research Farm
Athens-Clarke County area farms
Vidalia Onion & Vegetable Research Center
C.M. Stripling Irrigation Research Park

Solid Waste

Solid waste data are reported only for the Athens campus and were provided by UGA Support Services. From FY10 through September 2013, Athens-Clarke and Oglethorpe (C&D Waste) tonnage are combined in the "No Methane Recovery" category in the calculator. Starting October 2013 the ACC Landfill started the methane capture and electric generation program, so ACC landfill tonnage from that point is listed under "Methane Recovery and Electric Generation," while Construction and Demolition tonnage remains in the previous category.

Offsets

Forest Preservation
Dr. Daniel Markewitz, UGA School of Forestry & Natural Resources, calculated the carbon sequestration potential of UGA owned forest lands at the request of the Office of Sustainability. The result, 70,773 MT CO₂e per year, is considered valid through 2020.

Appendix B: 2060 Projection Model

How close can we get to carbon neutral?

UGA has established the goal of 20% net greenhouse gas reductions by 2020, 40% reductions by 2040, and carbon neutrality or a minimum of 60% reductions by 2060. These goals present considerable challenges in light of a dynamic university. The UGA Office of Sustainability developed a projection model to gauge the feasibility of these goals. While the 2020 emissions goal is within reach, energy use intensity reductions must be more aggressive than called for in the 2020 Strategic Plan in order to overcome building growth. Looking farther out to 2040 and 2060, our calculations show that 40% and 60% emissions reductions, respectively, are feasible without purchasing additional offsets. More aggressive measures are required for net zero emissions by 2060.

The following assumptions are factored into the analysis: Building square footage projections from the Office of University Architects: 22.5 million square feet in 2020; 26.1 million in 2035; and 33.1 million in 2050. Linear growth between milestones is assumed. By 2060, building space will amount to nearly 38 million square feet, about 150% more than in 2010.

Electric grid greenhouse gas emission factor decreases by 0.5% per year.

Natural gas is the primary heating fuel through 2060. Fleet vehicle fuel economy will increase as older vehicles are phased out.

Commuter vehicle miles decrease at a marginal rate (1% for faculty/staff, 2% for students) as local housing options and transit choices increase. Commuter vehicle efficiencies increase.

To achieve 20% by 2020, 40% by 2040, and 60% by 2060, the following measures will be required: Reduce energy use intensity (energy use per square foot of building space) by 35% by 2020, 53% by 2040, and 70% by 2060.

Generate 6 million kWh per year of solar electricity on campus property from 2016 to 2024, double that in 2025, and increase by 2.5% per year until 2060. By 2060 this will amount to 10% of the total electricity use on campus.

Continue current rate of forest preservation, allowing carbon sequestration to increase by 0.25% per year.

Gross and net emissions projections targeting 40% net reduction by 2040 and 60% by 2060

In addition to the above, the following measures are necessary to achieve the more aggressive goal of net zero emissions by 2060:

Starting with the doubling of on-campus solar generation in 2025 mentioned above, increase capacity so that the percentage of total electricity use generated by on-site solar increases linearly to 25% by 2060.

Starting in 2021, increase the percentage of purchased green power linearly so that by 2060 20% of net purchased electricity is from renewable sources. Starting in 2040, begin purchasing additional offsets, growing linearly from about 5,150 tonnes CO₂e in 2040 to 67,000 in 2060.

Gross and net emissions projections targeting 50% net reduction by 2040 and net zero by 2060

Appendix C: Collaborators

Following is an incomplete list of students, faculty, staff and community members served on, or as a resource to, the UGA Climate Action Planning Task Force.

Students

Alex D'Agostino
Heather Osborn Blaikie
Kasey Bowles
Sarah Carnes
Tyler Faby
Jacob Spalding
James Sykes

Faculty

Dr. Alfie Vick, College of Environment & Design
Dr. Anne Marie Zimeri, College of Public Health
Dr. Chris Cuomo, Franklin College of Arts & Sciences (Philosophy)
Dr. Daniel Everett, Franklin College of Arts & Sciences (Computer Science)
Dr. Daniel Markewit, Warnell School of Forestry & Natural Resources
Dr. John Schramski, College of Engineering
Dr. Jennifer Rice, Franklin College of Arts & Sciences (Geography)
Dr. Laurie Fowler, Odum School of Ecology
Dr. Mark Risse, College of Agricultural & Environmental Science
Dr. Marshall Shepherd, Franklin College of Arts & Sciences (Geography)
Dr. Nik Heynen, Center for Integrative Conservation Research
Dr. Rick Watson, Terry College of Business
Dr. Rob McDowell, Carl Vinson Institute of Government
Dr. Ryan Adolphson, Bioenergy Systems Research Institute
Dr. Susan Varlamoff, College of Agricultural & Environmental Science
Dr. Tish Yager, Georgia Initiative for Climate & Society
Dr. Tom Lawrence, College of Engineering

Staff

Andrew Lentini, Facilities Management Division - Office of Sustainability
Cris Taylor, Facilities Management Division - Services Department
David Spradley, Facilities Management Division - Energy Services
Dexter Adams, Facilities Management Division - Grounds Department
Don Walter, Parking Services
Jason Perry, Facilities Management Division - Office of Sustainability
Jeanne Fry, Food Services
Ken Crowe, USG Board of Regents Facilities Office
Kevin Kirsche, Facilities Management Division - Office of Sustainability
Lara Mathes, Office of University Architects
Ron Hamlin, Campus Transit
Tyra Byers, Facilities Management Division - Office of Sustainability

Community

Butch McDuffy, Athens Transit System
Rich Rusk, Georgia Climate Change Coalition (GC3)
Andrew Saunders, Athens-Clarke County Central Services

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