A CLIMATE ACTION PLAN FOR EMORY UNIVERSITY

December 2011

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Executive Summary

Climate change is perhaps the greatest challenge to confront humanity in our lifetime, with the well-being of billions of people at risk. While it is urgent for all countries to take action, the United States has a special obligation to act. We have been the largest emitter of greenhouse gases, but it is those in the developing world who will suffer the most from our emissions. With this Climate Action Plan, Emory University recognizes a unique opportunity to help spur action in this critical area, given our resources, visibility, and history of commitment to sustainability. The timing of this Plan has particular significance as Emory celebrates its 175th anniversary, a period of reflection on the contributions of the University to promoting human health, wise action, justice, and equity. Ethical action for climate change flows from our concern to be good stewards of the campus, to be energetic partners with our region, to be strong contributors internationally, and to be wise mentors to future generations. Our strong commitment to reduce greenhouse gas emissions signals the urgency of this problem and serves as a model for other universities and organizations.

The Emory University Climate Action Plan was developed through the cooperation of two presidentially-appointed committees created in 2010: The Climate Action Plan Committee, made up of faculty, staff, and students, and the Carbon Reduction Taskforce, made up of staff members from Campus Services. Together, they studied the issues and opportunities, assessed feasibility, gathered campus advice and support, and put forward the following ambitious, yet achievable, goals for greenhouse gas emissions reduction for Emory University (from a 2005 baseline):

By 2020: 20% reduction in total emissions, 35% reduction per square foot
By 2036 (Emory's 200th anniversary year): 36% reduction in total emissions, 50% reduction per square foot
By 2050: 50% reduction in total emissions, 85% reduction per square foot

The recommendations of the Climate Action Plan propose a comprehensive approach to reach these goals, offering emission reduction strategies in the categories of sustainable building and construction, energy, transportation, waste management, food, procurement, academic programs, and individual action. Each academic and several operational units of the university are asked to choose specific strategies to reduce greenhouse gas emissions and to report their progress annually. Updates to future master plans and strategic plans of the university will also include steps for achieving these plans.

When it comes to sustainable construction, Emory has a head start with a large number of LEED (Leadership in Energy and Environmental Design) certified buildings already on campus and a mandate that all future buildings be constructed according to LEED standards. The next steps for improving sustainable construction include raising the bar of LEED standards and experimenting with new building efficiencies.

Energy use at Emory has also undergone much improvement, with over 15% energy use reduction per square foot since 2005. To meet our emission-reduction goals, we recommend

continued efforts to reduce energy use in existing buildings and the campus fleet, new sources of renewable and low-carbon energy, and behavioral changes to support energy use reduction.

Emory's greenhouse gas inventory indicates that, despite increased usage of alternative transportation for commutes, transportation-related emissions have actually increased over the past 5 years. Recommendations are provided to address the growing sector of transportation-related emissions.

To decrease carbon emissions associated with waste, it is recommended that campus groups and organizations encourage reuse, composting, and recycling and that Emory work with individual vendors to reduce the volume of material coming to campus in the form of goods and packaging.

Food venders should be encouraged to reduce carbon emissions throughout the supply chain, and improved electricity metering and kitchen efficiencies are also important steps.

For academic units, comprehensive planning is essential, combining energy reduction and transportation strategies appropriate to the unit's mission as well as behavioral change and curricular and research support.

Carbon offset purchases have not figured in Emory's Climate Action goals, but development of a peer-reviewed program of offsets may offer an opportunity for Emory to sign the American College and University Presidents' Climate Commitment to achieve net zero carbon emissions.

Finally, individual action inspired by an increased awareness of the issues and behavior changes that can contribute to reducing atmospheric carbon is the most important contribution to the success of the Climate Action Plan. Orientation programs, education in residential halls and classrooms, as well as online and on-campus publicity, can all contribute to creating a campus sustainability culture that works cooperatively towards meeting our goals.

Introduction

The Challenge

Climate change is undeniably one of the most critical issues facing our world today, and Emory faces an historic opportunity to join with peer schools and lead the way in mitigating climate change. Global heating has been caused by an increase of greenhouse gases in the atmosphere, primarily carbon dioxide.[1] To stabilize the atmosphere at a safe concentration of CO_2, a significant reduction in emissions is required. It is commonly accepted in the scientific community that a level of 350 parts per million of CO_2 is necessary to stabilize climate change, but current CO_2 levels in the atmosphere are now approximately 390 parts per million. According to the United Nations Intergovernmental Panel on Climate Change, stabilization at 350 parts per million will require an approximately 85% reduction in worldwide emissions from 2000 levels by 2050 (www.ipcc.ch).

This enormous challenge calls upon our deepest commitments to ethical engagement, cultural change, and creative innovation. Emory has exercised leadership at difficult historical moments in the past, and we have the opportunity again to step forward. As part of our fundamental mission, Emory seeks to foster ecological citizenship and intergenerational equity through climate change education and action.

As an innovative research, educational, and public health institution—as well as a contributor to climate change—we seek to reduce our greenhouse gas emissions in a manner consistent with our stature as a premier institution in campus sustainability. Emory recently earned a gold rating by the Association for the Advancement of Sustainability in Higher Education (AASHE) through their Sustainability Tracking, Assessment and Rating System (STARS). STARS is a comprehensive reporting framework that gauges campus sustainability efforts, and, so far, only a couple dozen universities nationwide have achieved a gold rating, the highest rating to date.

The Foundation for Climate Action

Emory's Climate Action Plan builds on a strong base of institutional support and grassroots action. The plan and its recommended implementation steps will involve broad participation from across the campus, spear-headed by Emory's Office of Sustainability Initiatives, which was founded in 2006. Many students and employees have played a role in this history, as sustainability-related work at Emory began over a decade earlier with student, staff, and faculty-led efforts in recycling, campus forest protection, alternative transportation, green purchasing, and sustainability in the curriculum. The University's commitment was made official in 2005, when Emory's Strategic Plan identified sustainability as a fundamental principle of the university. The plan established a vision of restoring the global ecosystem, fostering healthy living, and reducing the University's impact on the local environment. This Climate Action Plan is an important step in the further fulfillment of that vision.

Significant sustainability-related expertise has been developed on our campus, especially in areas related to greenhouse gas reduction efforts. Campus Services has pioneered a cadre of experts on

green building in this region, and Emory currently has one of the largest inventories of campus building space certified by LEED in the United States. A program of Sustainability Building Representatives brings together over 50 peer leaders from all units to promote awareness and behavior change. Annual energy reduction competitions between buildings, for example, have had a significant impact on overall usage habits and have encouraged a spirit of cooperation in the pursuit of common goals.

Emory Healthcare has also developed a leadership platform prepared to support this effort. The Health Sciences Taskforce was formed in 2009. The Taskforce developed an assessment of sustainability in health sciences at Emory and identified areas for improvement. Emory also benefits from growing expertise in alternative transportation, waste minimization and diversion, sustainable food, and green purchasing, both in the University itself and in the Emory Healthcare system. All of these units have developed experienced staff, new committees or taskforces, and innovative programs that offer a foundation to support the climate change effort.

Student groups are thriving as well. The regular meetings of the Student Sustainability Forum networking group have allowed coordination among 26 different sustainability-related student organizations from multiple units across the campus. Groups such as the Emory (College) Environmental Alliance, Rollins Environmental Health Action Coalition, Greeks Go Green, Goizueta Net Impact Chapter, Candler Creation Care, Emory Dining Green Team, and green residence hall reps have experience in developing programs and outreach efforts that have strengthened sustainability efforts. Studies show that both students and their parents value environmental stewardship practices, and this contributes to their school selection process (Princeton Review 2011 "College Hopes and Dreams" Survey).

Climate change engages many areas of study, calling forth the interest and assistance of all academic units. Educational and research efforts connected to resource use and sustainability, along with implementation of policies and practices, have grown rapidly over the last decade. For example, nearly 300 courses currently afford sustainability-related or -focused classroom experience, and 43 departments report faculty engaged in sustainability-related research. A Sustainability Minor and graduate training in sustainable development have been developed. In addition, Oxford College has a comprehensive sustainability effort, addressing operations issues as well as curriculum and co-curriculum. Continued creativity in disciplinary and cross-disciplinary academic engagement will support Emory's Climate Action Plan.

Institutional commitment and programs are critical, but individual action will also be important. Students and employees contribute to the Climate Action Plan by exploring and practicing more sustainable lifestyles, in an effort to contribute as citizens, professionals, and individuals. Behavioral change has already led to significant reductions in resource use, and technological breakthroughs and national and international political processes will further support our plan. As Emory take its rightful place in this urgent effort, part of our work will be to instill a culture of sustainability among our students, faculty, staff, administrators and patients.

The Development of the Climate Action Plan

The Climate Action Plan Committee was appointed by the president, James Wagner, in the fall of 2010 to study peer institutions and scientific recommendations and to develop carbon reduction recommendations for Emory. A critical step in the work of the committee was the completion of a multi-year inventory of Emory's greenhouse gas emissions by the Office of Sustainability Initiatives and Campus Services. After study of plans by peer schools, governmental entities, and international recommendations, the Climate Action Plan Committee also held 22 public forums across the campus to educate about the issues and gain recommendations for next steps forward. The committee concluded that our goals must be realistic, given the difficulties of the challenges we face, but must also embrace significant targets, based on the scientific certainty surrounding the need to reduce carbon emissions aggressively over the next 40 years.

The Carbon Reduction Taskforce in Campus Services was also appointed in 2010, and it consisted of staff members from Campus Services who oversee daily campus operations. Over the summer of 2011, the Taskforce investigated the feasibility, technology needs, cost, and staffing associated with recommended carbon-reduction goals. The Task Force carefully modeled various carbon reduction scenarios for Emory. It concluded that Emory can achieve the recommended goals for 2050 with a combination of behavioral changes, campus energy efficiencies, and Georgia Power's successful fulfillment of its commitment to carbon emissions reductions through planned fuel mix changes. Based on these conclusions, the Climate Action Plan Committee prepared this report in the Fall of 2011 and held a series of four town hall meetings in all parts of campus and Oxford to discuss findings and recommendations. The report was discussed in the University Senate and the Student Government Association; it was presented to the President's Cabinet for review and approval in December, 2011.

Goals

The Climate Action Plan Committee and the Carbon Reduction Taskforce affirmed the following ambitious, yet achievable goals for greenhouse gas emissions reduction for Emory University. All are in comparison to a baseline of fiscal year 2005 and are based on Emory's greenhouse gas inventory, experience with resource use reduction in the past decade, and international experience with strategies to reduce emissions.

> By 2020: 20% reduction in total emissions, 35% reduction per square foot
> By 2036 (Emory's 200th anniversary year): 36% reduction in total emissions, 50% reduction per square foot
> By 2050: 50% reduction in total emissions, 85% reduction per square foot

Some universities have established emissions reduction goals only per square foot of building space, but if campus growth is robust, such an approach will not make any reductions in total greenhouse gas emissions. In recognition of the global urgency to reduce total quantities of emissions in the atmosphere, Emory has adopted goals both for total emissions as well as per

square foot. These aggressive goals move us closer to our ultimate goal of operating in a carbon neutral manner.

Current Greenhouse Gas Emissions

To develop this plan, data were collected on Emory's greenhouse gas emissions for each year from 2005 to 2010. The inventories were conducted using the Clean Air-Cool Planet Campus Carbon Calculator, a model that is used widely across the United States and is consistent with international greenhouse gas protocol standards. Emory's inventories include all facilities directly contiguous to the main Druid Hills campus, including the Briarcliff and Clairmont Campuses and multiple Emory Healthcare facilities (Emory University Hospital, Wesley Woods Hospital, Clinics A and B, the Rehabilitation Center, 1525 Clifton, Winship Cancer Institute, and the Emory University Hospital Education Annex). Other outlying Emory-owned facilities are not included in the inventories.

Figure 1. Total Emissions of Carbon Dioxide Equivalents, Emory University, 2005-2010.

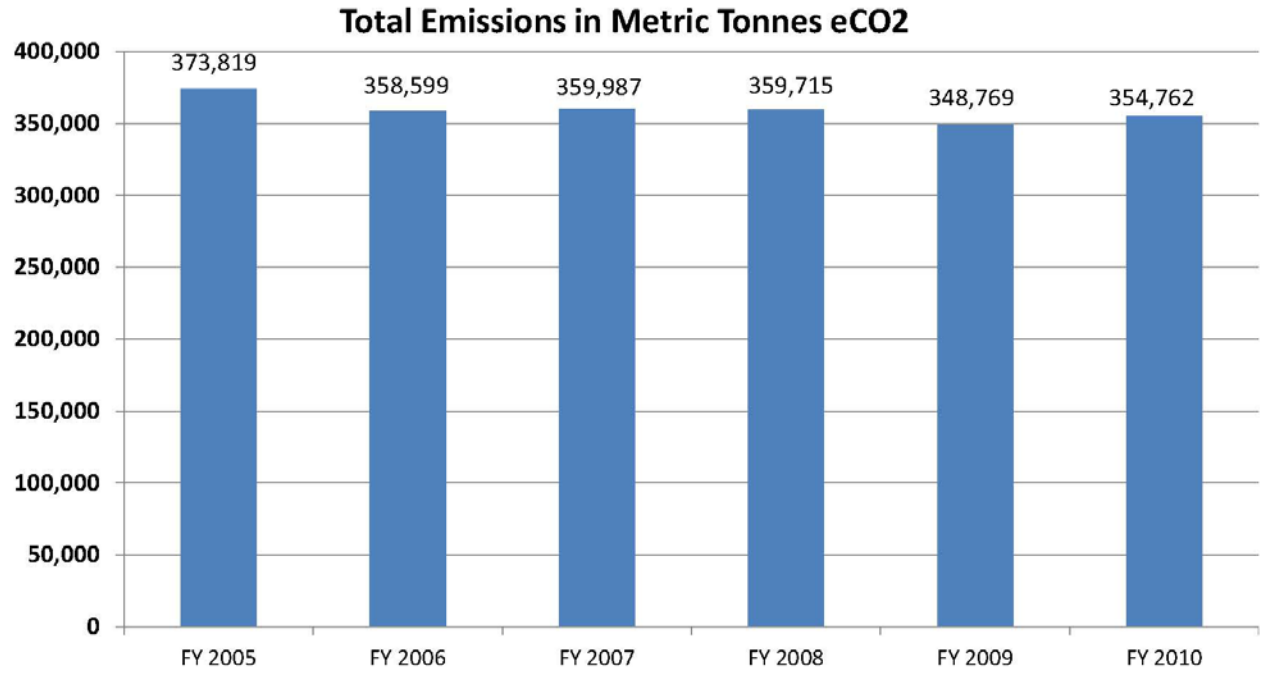


Figure 1 shows that carbon dioxide equivalent[2] emissions from 2005 to 2010 have remained relatively flat, despite significant campus growth. Overall Emory square footage has grown by approximately 12% during this period, staff has increased by roughly 14%, and student enrollment has increased by about 10%. The levels of greenhouse gas emissions have not grown significantly due to energy reduction efforts in building maintenance, more efficient new (and renovated) green buildings, and strategic behavior-change efforts across the campus.

Universities vary in the levels to which they measure emissions. Emory has chosen the most comprehensive approach which includes all three of the levels specified by the Clean Air-Cool Planet framework. The framework refers to each level as a scope. The three scopes are defined as follows:

1) Scope 1 includes all direct greenhouse gas emissions occurring from sources owned or controlled by Emory, such as emissions from burning natural gas, diesel, or gasoline in boilers or fleet vehicles.
2) Scope 2 includes indirect greenhouse gas emissions resulting from the generation of fuels purchased and consumed by an institution. For Emory, these emissions occur at Georgia Power's production plants, where the electricity is generated.
3) Scope 3 includes all other indirect emissions which occur as a consequence of University activities but come from sources not directly owned or controlled by Emory. Examples of Scope 3 emissions include faculty, staff, and student commuting and emissions from landfilled waste.

These three scopes document the sources of Emory's greenhouse gas emissions and offer guidance for where the greatest savings will be possible.

Figure 2. Total Emory University Emissions by Scope, 2005-2010

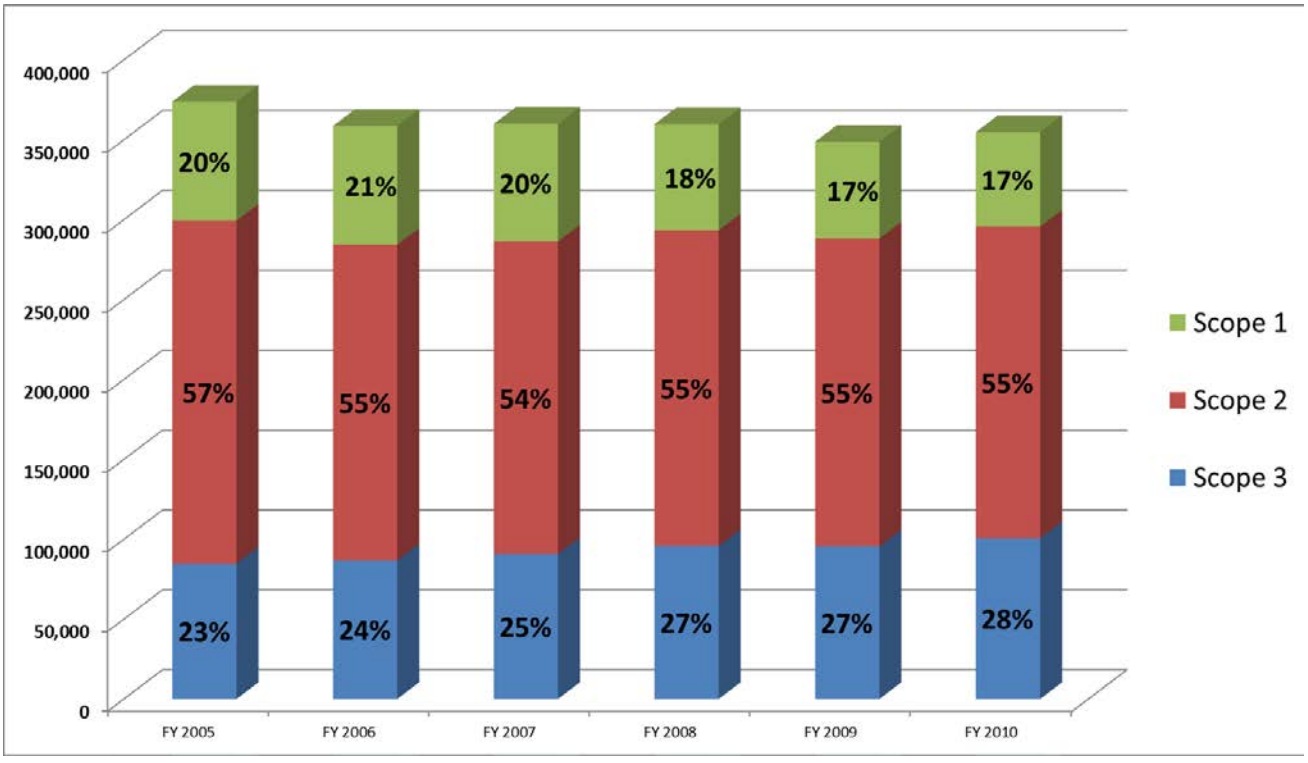
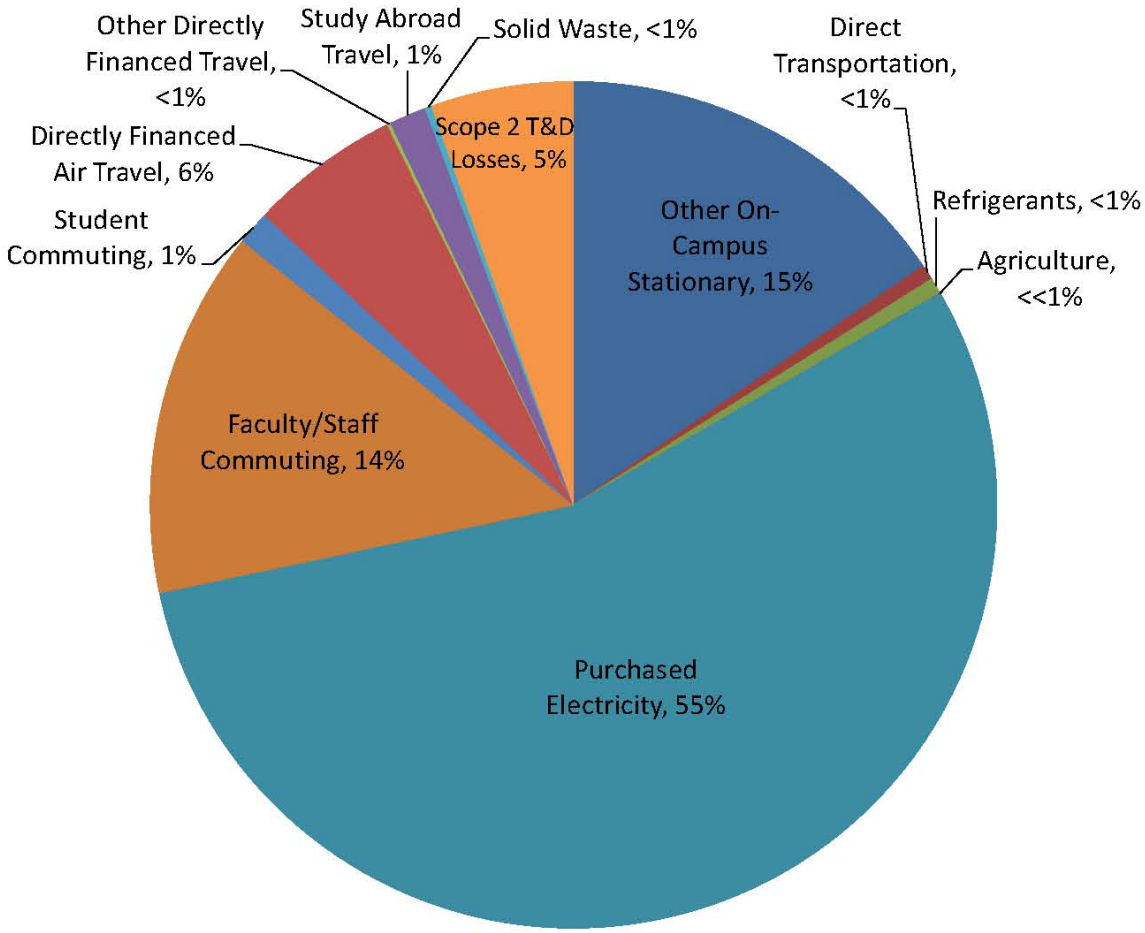


Figure 2 shows that the largest proportion of greenhouse gas emissions over the six year period comes from purchases of electricity from Georgia Power, Scope 2. The emissions from the energy generated on campus in our own boilers and used in our vehicles (Scope 1) has declined from 20% of our total to 17%, an impressive record that demonstrates the feasibility of significant reductions with technologies at hand. Further study of the inventory shows that

transportation-related emissions from staff and student travel (included in Scope 3) have grown during this period due to an increase in vehicle miles traveled, despite increased usage of alternative transportation for commutes.

Figure 3 below provides a current measure of major categories of Emory's greenhouse gas emissions. Electricity use is the highest, contributing 55% of all emissions. Georgia Power has a goal to reduce the emissions created by its electricity generation, but until those efforts bear fruit, Emory's only strategy with regard to electricity can be reduction of total purchases. On-campus natural gas usage in our boilers makes up the second largest category of emissions, followed by faculty and staff commuting (note that all transportation-related emissions are the second-largest category of emissions collectively). Emory has little control over inefficiencies in power transmission and distribution of energy (reflected as "T&D losses" in Figure 3).

Figure 3. Emory University Greenhouse Gas Emissions in 2010 by Major Sources



Implementation and Evaluation of the Plan

Each academic and several operational units of the university will be asked to appoint a committee to develop a plan and strategies to reach these carbon reduction goals. Specific recommendations for operational units and academic units are outlined below. Units can pick from these options or develop their own options. Because so much of Emory's greenhouse gas emissions comes from energy use, each unit is asked to specifically choose steps to reduce energy use. Transportation-related emissions constitute the second-largest category of emissions, so including options to reduce transportation miles will be important as well. The Office of Sustainability Initiatives will coordinate with the unit committees to offer advice on best practices, to take advantage of research and experience from other units, and to ensure consistency of the plans. A sustainability intern will also be provided to units that request assistance in developing their plans.

In creating a plan, a unit might decide, for example, to implement the following sustainable practices: adopt building temperature turn-downs for evenings and weekends, install energy monitors to provide occupants with feedback on their efforts, develop sustainable purchasing policies, implement a "paperless" office protocol, construct a LEED Gold research building, become a "zero waste" unit with a comprehensive composting and recycling program, provide incentives for flexible work arrangements to reduce commuting and enable shared work spaces to reduce need for new built space, initiate a feasibility study to achieve 20% renewable energy use by 2050, develop incentives for reduced air and car travel through teleconferencing, and adhere to sustainable catering guidelines and "green event" certification through the Office of Sustainability Initiatives for all unit events. Other units may choose a different mixture of actions—this is just an example of the type of plan that might be adopted.

In order to evaluate accurately Emory's progress toward reaching climate action goals, each school will coordinate with the Provost's Office of Strategic Planning to report progress annually and other units will submit annual reporting to the Office of the Executive Vice President for Finance and Administration. Experiences with efficiency efforts and behavior change programs will be shared across the university, to support the development of a common culture and to benefit all units. The Office of Sustainability Initiatives will compile and report progress to the university annually. The Committee expects that as new technologies are developed and new research and improved strategies emerge over time, this Climate Action Plan will have to be revised.

Recommendations

Sustainable Building and Construction

To achieve our Climate Action goals, Emory can build on considerable experience and innovation in the area of sustainable building and construction practices.

- Emory was an early adopter of the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) criteria, constructing the first LEED-certified building in the Southeast (the Whitehead Biomedical Research Building) and the first Gold LEED-EB (Goizueta Business School) in the United States. LEED-certified buildings must meet certain high standards for energy efficiency, water conservation, indoor air quality, site selection, and the use of recycled, renewable or locally-sourced products.
- In 2001, Emory adopted the U.S. Green Building Council's LEED standards as a guiding principle in all new construction projects. The current design standard requires that all new campus facilities meet silver or higher LEED building standards. Studies have shown a correlation between sustainable building practices and public health, resulting in benefits such as higher test scores among students, increased employee productivity, and reported feelings of improved health.[3]
- In 2004, Emory adopted a Land Use Plan that identifies and maps areas of campus that are suitable for development and areas to be protected. The Plan sets aside almost half of the 700-acre main Druid Hills campus as protected greenspace. Because the area of developable land is limited, it will lead to denser, pedestrian-oriented building design, deliberately instilling a "smart growth" aesthetic in our built environment. The greenspace is largely forest, and it provides important recreational, restorative, and research opportunities. This forested land also sequesters approxmiately 68,000 metric tons of CO2e.

Next Steps

In order to continue to achieve reduced greenhouse gas emissions, we recommend:

1. For all new construction projects and major renovations, Campus Services and the central administration evaluate measures to maximize energy efficiency and the feasibility of achieving LEED Gold or Platinum certification, net-zero energy and/or living building levels.[4] LEED Gold is the federal government's minimum commitment and that of several peer institutions. Net-zero energy buildings for new construction is the federal government's target by 2030.
2. Project managers conduct energy modeling and an alternative energy[5] feasibility study for every new construction or major renovation project starting in 2012 no later than the end of schematic design to ensure progress toward reduced per square foot energy use over time and total carbon emission reductions.
3. Campus Services create a revolving loan fund for energy efficiency retrofits that will pay back to the fund over time.

4. By 2050, all existing parking structures and flat roofs, when scheduled to be replaced, become green, cool, and/or solar roofs.
5. In cooperation with students and faculty in the academic units, Emory's College and professional schools actively support expanded research related to our sustainable buildings, fulfilling the vision of the Emory campus as a living laboratory.
6. In light of the correlation between increased square footage and greenhouse gas emissions, Emory's central administration and units conduct space utilization studies to seek efficiencies in space utilization within and across units and reduce the need for additional built space.

Energy

Emory has made great strides in energy efficiency since the inception of its sustainability vision and strategic plan, which adopted the goal to achieve a 25% reduction in energy use per square foot by 2015.

- Since 2005, energy use is down over 15% per square foot.
- Many campus units have participated in programs to turn down heating, cooling, and ventilation systems during evenings and weekends when buildings are not in use. These "turn-down" programs have saved hundreds of thousands of dollars and reduced greenhouse gas emissions.
- Phase I of a systematic program to audit and improve energy efficiency in some of the most energy intensive buildings was completed in summer of 2011. Called URECA (Utility Reduction and Energy Conservation Actions), the program led to significant energy efficiency improvements in five of Emory's iconic buildings: Woodruff Library, Woodruff Physical Education Center, 1525 Emory Clinic, Whitehead Biomedical Research Building, and Rollins School of Public Health. Phase II of URECA is slated to begin in late fall of 2011, improving efficiency in an additional eleven buildings.
- In June 2011, Emory also implemented a new building temperature policy, which sets maximum and minimum settings for winter and summer indoor temperatures. This policy saves not only energy, but money and carbon emissions as well.
- Annual energy competitions between campus buildings have resulted in significant energy savings, demonstrating the power of individual voluntary actions to reduce emissions.
- Emory has installed energy use monitors in eleven residential and academic buildings to provide real-time data to building occupants. Kilowatt hours of electricity are translated into relevant information, such as the tons of coal mined from Appalachia to provide that energy, the monetary cost, and even purchasing alternatives for those same dollars.

The challenges in reducing energy use on campus are compounded, however, by the particular sources from which we must make those purchases. Fifty-five percent of Emory's carbon footprint is due to the electricity we purchase from Georgia Power and that energy is derived largely from coal-fired powerplants. The coal used in the powerplants is generally mined from Appalachia, and a significant portion of it is mined using mountain-top removal, which results in ash lagoons, water contamination, and other forms of environmental destruction.[6] The social consequences of mountain-top removal include destruction of culture and community, as well as

harm to the plants and animals of Appalachia. Electricity use also requires considerable water use; in Georgia, it takes over half a gallon of water to create a kilowatt hour of electricity.[7]

The public health consequences of coal-fired power are equally significant. Not only are these power plants the largest sources of greenhouse gas pollution in the United States, they are also a major source of ozone pollution (linked with asthma and other respiratory diseases), particulate matter pollution (linked with lung cancer and cardiovascular disease), and mercury pollution (linked with neurological impairment).[8] These pollutants are a major public health concern, and Emory, as a leader in public health, is compelled to reduce its dependence on this source of energy. Currently, Emory is among Georgia Power's largest customers. Georgia Power has announced a goal of 80% reduction in greenhouse gas emissions by 2050, and Emory's success in achieving its carbon reduction targets depends on progress by Georgia Power in achieving this goal.

Natural gas use can lead to reduced greenhouse gas emissions, and sources of natural gas are also important to consider. Environmental and public health concerns are rising with hydraulic fracturing and other natural gas extraction techniques. Recent questions raised about the life cycle costs of natural gas use—the most potent of the greenhouse gases[9]—require that Emory carefully weigh the costs of natural gas dependence using the triple bottom line of sustainability, which includes environmental and social costs in addition to economic costs.

In addition to clear environmental and social costs of these energy options, the economic cost of Emory's energy use is enormous. Currently, Emory spends roughly $35 million per year on energy. Progress on energy use reduction would allow these funds to be allocated to faculty and staff salaries, student scholarships, or improved facilties for research and education.

Alternative technologies for producing energy from renewable sources on campus are available, such as geothermal, cogeneration,[10] biomass, and solar power. Renewable energy installations can provide important teaching and research opportunities on campus and serve as nationally-important demonstration sites. While these technologies are possible additions to campus facilities, payback times can be long and upfront costs significant. Some renewable energy options are also limited due to Emory's location; for example, wind resources to support a wind turbine do not exist in this part of Georgia. Creative financing is also challenging because state and federal tax incentives do not benefit nonprofits such as Emory, and Georgia Power's interpretation of current state law would prohibit Emory from purchasing electricity through power agreements with entities other than Georgia Power. That said, the curricular and community service benefits of renewable energy and the advantages it provides for security and hedging future energy costs requires a plan for adoption of renewables over time and should be an increasing part of the University's energy portfolio.

Next steps

In order to continue to achieve reduced greenhouse gas emissions, we recommend the following:

1. To achieve additional greenhouse gas emissions reductions, Emory and its units address energy use in a comprehensive manner, with a first priority to continue aggressive pursuit of energy efficiency. Examples of energy efficiency measures include retrofits to existing buildings, higher standards for energy efficiency of new construction, the purchase of energy efficient equipment and appliances, computing and data management approaches such as virtualized servers and the use of energy saving software, and reductions in the volume of purchased equipment and appliances through networked printers and other shared-use options.
2. Although enhanced efficiency is generally the fastest and least expensive option for reducing energy use, Emory and its units investigate options for generating our own energy from renewable and low-carbon sources, such as solar (including solar thermal), cogeneration, biomass, and geothermal energy. Specifically, Campus Services develop maps of Emory's campus identifying areas suitable for solar, solar thermal or geothermal installations.
3. In order to reduce greenhouse gas emissions associated with petroleum use, Campus Services and Emory Healthcare operational units develop a plan to reduce consumption of petroluem to match or exceed the federal government goal of 30% reduction in vehicle fleet petroleum use by 2020. Specifically, Campus Services explore using biodiesel in its back-up generators.
4. Emory continue to work with Georgia Power to encourage an increase in the percentage of renewable energy in its fuel mix and steady progress towards meeting its own goal of 80% greenhouse gas emissions reduction by 2050.
5. Because increased energy efficiency requires a combination of behavioral and institutional change, unit planners work with the Energy Think Tank in Campus Services, which can provide advice about efficiency measures and opportunities for renewable energy.
6. Campus Services and central administration expand the URECA building efficiency program to include additional campus buildings.
7. Campus Services and central administration install more real-time energy monitors to provide information to building occupants.

Transportation

In the area of transportation, we recognize many units are making creative changes to reduce greenhouse gas emissions:

- Emory's presidents have made courageous and unpopular decisions over the last 30 years to shift street parking to decks on the campus perimeter, thereby creating a pedestrian-only campus core. Roads were closed and converted to walkways and bike paths. Our attractive, walkable campus is now taken for granted, though it was once the site of serious political struggle.

- Emory has a strong alternative transportation program with options that have been successful in reducing miles traveled. Alternatives include carpool matching and incentives, biking and walking incentives, Zipcar, a guaranteed ride home program, free MARTA passes for employees and park-and-ride sites. Our shuttle fleet offers a good alternative to car use for areas close to campus, Grady, and Decatur, and it is fueled by a biodiesel blend. It carries approximately 240,000 passengers a month.
- Grand rounds in the Medical School are now carried out using teleconferencing, which allows physicians from Grady, Emory Hospitals, and other locations to interact without having to drive to campus.
- The mixed-use development on Clifton Road is designed to be a pilot for further efforts to support employee and student living closer to campus in order to reduce miles traveled.
- Emory's Office of Governmental Affairs has taken strong steps to improve public transportation to the Clifton Corridor, and many good alliances have been made in pursuit of that goal.
- Bike Emory has become a strong program; documented ridership has increased over 800% since 2008.

Many of these innovations have co-benefits to health, especially by reducing petroleum use, which contributes to cleaner air.

We note, however, that some indicators from our greenhouse gas inventory are not moving in a positive direction. Although the total number of alternative commuters is rising, single-occupancy commuting miles driven over the last five years has also increased. Likewise, centralization of air travel expenses now shows a 51.3% increase in University-funded travel in air and car miles.

Figure 4. Increase in Emory University Emissions from Transportation, 2005-2010

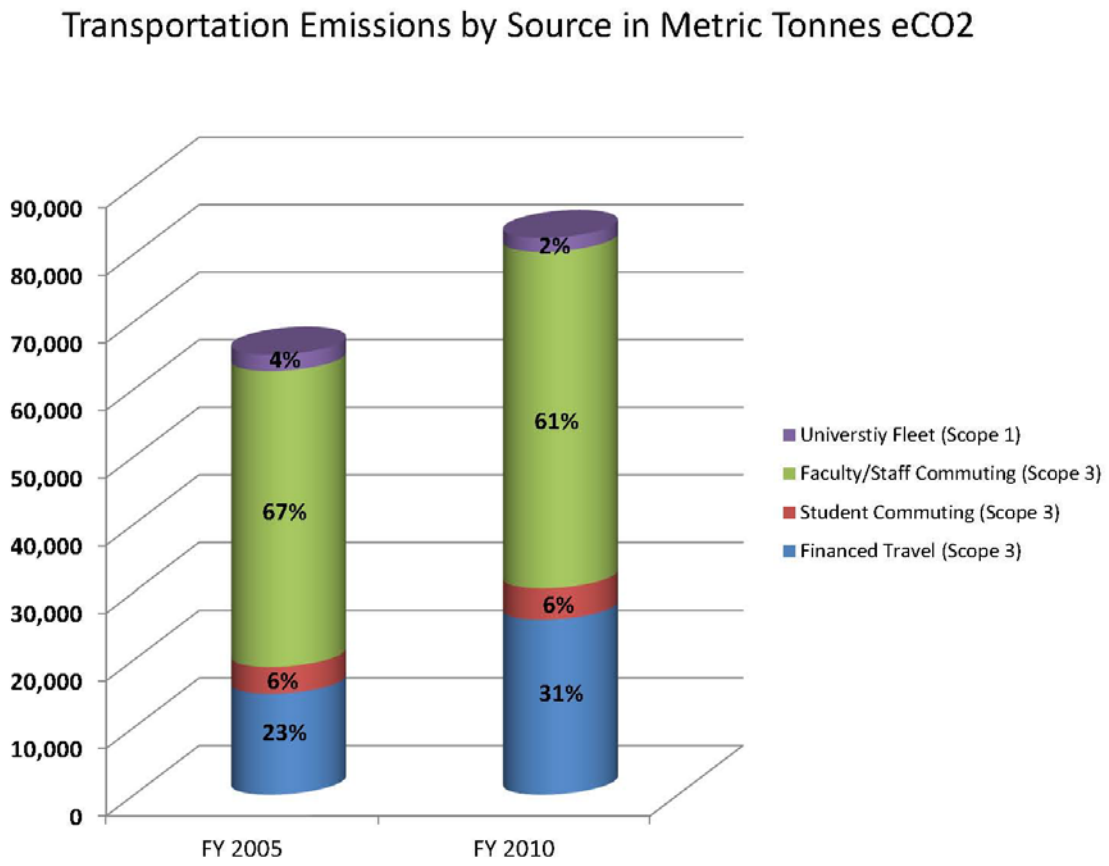


Figure 4 shows that only a small and shrinking percentage of Emory's emissions from transportation comes from the University's car and truck fleet; faculty and staff commuting makes up the largest part of our growing transportation-related emissions. Emory-financed air travel may have shown such rapid growth due to new accounting measures that centralize these charges.

Next steps

To address areas where greenhouse gas emissions remain significant, we suggest the following:

1. The Associate Vice President for Parking and Transportation and the University Senate Transportation and Parking Committee develop a set of recommendations over the next year to contribute to the Climate Action Plan goals and work with county and regional representatives when appropriate to implement the recommendations. Issues for study might include disincentives for carbon-intensive travel, such as stiffer fees for parking, or expanding incentives and capacity for non-single occupancy vehicle travel and the use of

energy efficient vehicles. Research efforts may be supported by academic units to guide campus actions and assess their effectiveness and impact.

2. Recognizing that travel is critical to allow for the experience of other places and cultures and may be essential for research, dissemination of findings, and sharing the latest developments in scholarship and creativity, Emory develop a recommended series of questions and options for travelers to consider to encourage and reward alternatives and reduced emissions. The large carbon footprint of travel – especially air travel – forces us to rethink traditional habits. In particular, administrative-related meetings with a small group may be candidates for teleconferencing or other virtual communications. While many other universities and institutions purchase carbon offsets (a third-party mechanism for balancing greenhouse gas emissions created by global travel) as their primary way to address the difficult issue of travel, the committee suggests Emory seek more innovative solutions.

   Possibilities include developing carbon awareness invoices for air travel, by department, to make individuals more aware of their air travel footprint and education about alternative travel options. Incentives for increased use of alternative technology options include "frequent teleconferencer" rewards for participating in webinars or using teleconferencing facilities. Additional equipment or technology infrastructure may be necessary to support expanded teleconferencing or web-based meetings.

   In addition, the high cost (in terms of dollars and carbon emissions) of air travel offers an opportunity for Emory to join with peer schools to consider how to balance the need for face-to-face interaction with the need to lower greenhouse emissions. Emory may consider initiating a joint declaration by Research I institutions to promote new solutions in video options, webinars and teleconferences.

3. The Vice President for Information Technology create a Taskforce to explore policies and practices in our peer institutions and develop recommendations for approval by the president for common university-wide policies and a coordinated approach to replacing a percentage of air travel with other information-sharing options.

4. Human Resources undertake a systematic review of work and telecommute options, beginning with a baseline assessment, followed by leadership endorsement, management training, goal setting, and university-wide implementation. Support a policy to promote flexible work, telecommuting, and alternative arrangements when feasible and operational and creatively use these options to improve engagement and efficiency. Identify barriers and impediments to acceptance and actively encourage participation, where feasible, throughout the organization.

5. Bike Emory work with Campus Services and other units to improve bike education, connectivity, street and path infrastructure, bicycle accommodation policies, bike parking facilities, and end-of-trip facilities to allow an expansion of ridership towards a goal of the national average of 5% of all trips taken.

Waste Minimization

Greenhouse gas emissions from traditional waste handling are generated during removal and transport; subsequent decomposition in a landfill produces methane, which is the most potent of the greenhouse gases. Emory has made great strides in the past five years to reduce the percentage of waste going to landfills, by expanding recycling and implementing composting in several of our dining facilities, hospital cafeterias and academic buildings. These programs are important in achieving Emory's current strategic plan goal of diverting 65% of the University's total waste stream from landfills by 2015. They include the recycling of all electronic waste and road construction materials, as well as composting, recycling, or reusing at least 95% of food waste, research animal bedding, and building construction materials.

Examples of positive steps taken include:

- Two Zero Waste academic buildings with comprehensive recycling and composting programs: the Candler School of Theology and Rollins School of Public Health's Claudia Nance Rollins building.
- The composting of food waste in the DUC, Cox Hall, Wesley Woods, Emory University Hospital, Emory Midtown and other locations.
- The expansion of recycling in the hospitals and adoption of innovative healthcare practices such as needle-box reuse and reusable rather than disposable surgical gowns and towels.

Emory currently recycles or composts about 75% of our waste, but a large percentage by weight of this material is construction and demolition waste. While Emory is achieving impressive construction and demolition recycling rates (95% in recent buildings), our recycling rate without construction and demolition waste is significantly lower. Emissions from waste result in a relatively small fraction of our emissions inventory, but it is an area of carbon reduction in which every member of our community can contribute.

Hazardous waste is another aspect of waste management, and greenhouse gas emissions are generated in the production of chemicals, transportation of the products, transportation of subsequent wastes, and disposal processes such as incineration or neutralization. Emory's Environmental Health and Safety Office has taken several steps to minimize hazardous waste generated by research, clinical, and operational activities, including product substitution, inventory management, process modification, segregation, neutralization, and distillation.

Next steps

To decrease carbon emissions associated with waste, we recommend the following:

1. Emory's Purchasing Division work with individual units and vendors to reduce the volume of material coming to campus in the form of goods and packaging.
2. Emory Recycles and Emory Healthcare operational units continue to expand and improve composting and recycling on campus.

3. Individual units explore ways to purchase goods that are designed to be recycled or composted and eliminate one-time-use goods as much as possible. An example is to be sure that all caterers adopt zero waste policies.
4. Emory's central administration and units reduce the volume of hazardous waste disposal through green chemistry and sustainable research lab practices.
5. Throughout Emory, units establish systems to enhance the reuse of goods and equipment, including research lab material and office supplies.
6. Emory's Office of Governmental and Community Affairs work with state and local government entities to expand composting and recycling options.

Food

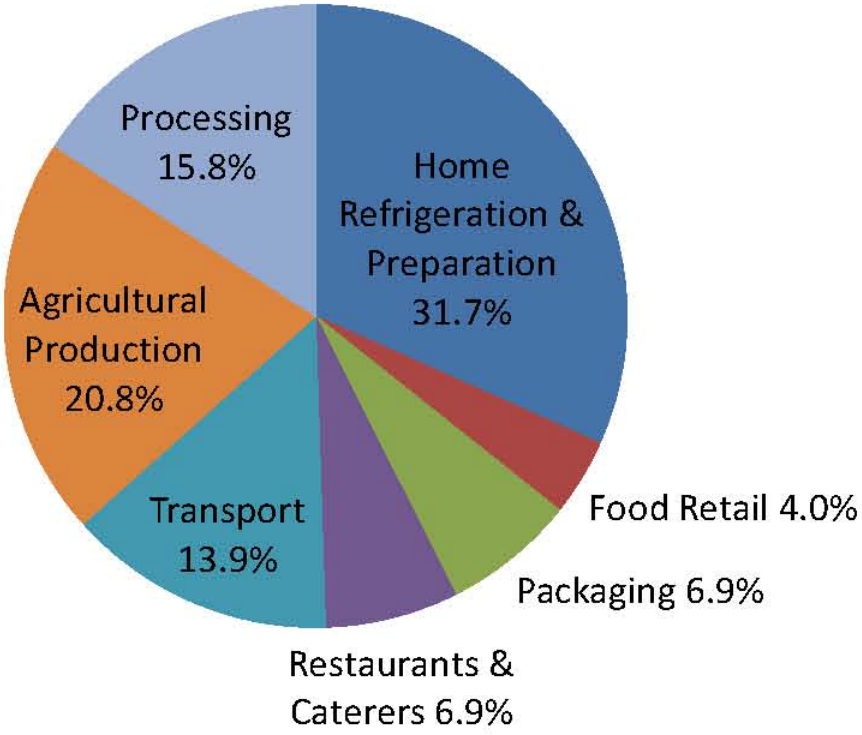
The American food supply is driven almost entirely by non-renewable energy sources and accounts for approximately 19% of the total use of fossil fuels in the United States. It takes about 7.3 units of (primarily) fossil fuel energy to produce one unit of food energy in the U.S. food system.[11] In addition to using fossil fuel in production, the food is often transported over long distances, and then cooking and waste handling also use energy and produce greenhouse gases.

Emory Dining, Emory Hospital Dining Services, and Emory's Sustainable Food Initiative have worked diligently over the last six years to innovate in ways that bring more sustainably-grown and locally-grown food on campus, and these efforts often reduce greenhouse gas emissions.

- Food purchases from the Southern region reduce transportation costs; 19% of total Emory Dining food purchases from 2010-11 are locally grown.
- Sustainable production of many food products avoids the high levels of petrochemical fertilizers and pesticides in conventional food, thereby reducing energy costs of food. Fresh fruits and vegetables from local or sustainable sources made up 48% of Emory Dining purchases in 2010-11.
- Composting of food preparation waste in dining halls also reduces greenhouse gas emissions.
- Improved appliances have upgraded energy efficiencies in several campus kitchens.

Figure 5. U.S. Energy Expenditures Related to Food Production, 2010

Source: University of Michigan, Center for Sustainable Systems (http://css.snre.umich.edu/css_doc/CSS00-04.pdf)



Emory has committed to reducing non-sustainable practices with regard to food on campus and in our hospitals. Emory's commitment to increased purchases of locally and sustainably-grown food to 75% by 2015 from a 2005 baseline reduces the overall carbon emissions of the food supply chain. Emory Hospital Food Service is also transitioning to more local and sustainably-grown food purchases. In addition, several important efforts are underway that offer opportunities to reduce greenhouse gas emissions in Emory Dining. Cox Hall kitchens are being renovated, and improved efficiencies in new appliances will be an important step. Replacement of coolers with safe refrigerants is underway, as well as hood fan motors with intermittent settings. A number of innovations to reduce water use in the kitchens will also reduce energy use. Vendors such as Coca-Cola are reducing supply-chain impacts; a hybrid truck recently began delivering soft-drinks to Emory. Through our own practices and by encouraging our suppliers, we can move to reduce greenhouse gas emissions from food.

Initiatives like Food E U, a new program from Emory Dining that educates about sustainability and food production issues, diet choice, food preparation, and ways to become engaged in the community, join with academic programs and student groups to raise awareness.

Next steps

To decrease carbon emissions associated with waste, we recommend the following:

1. To be able to document energy reductions in Emory Dining, a critical step is improved electricity metering. At present, electricity use in Cox Hall and the Dobbs University Center (DUC) is measured for the building as a whole and an estimate is applied to Emory Dining. With the heavy use of electricity in the computer lab on the second floor of Cox, it is important to create incentives for energy savings in all units of the building with accurate information about use.

2. Emory Dining and Emory Healthcare work with the Sustainable Food Implementation Committee over the next year to assess key points of greenhouse gas emissions and to formulate a roadmap for how our food sector might contribute to our goals. Several excellent opportunities present themselves in the near future, but of course must be weighed for affordability. An independent food miles analysis or use of the Clean Air-Cool Planet's CHEFS calculator (Charting Emissions from Food Services) are two possibilities.

3. The renovation of the student residential DUC dining hall offers an opportunity to showcase state-of-the-art sustainable kitchen technologies, lighting, HVAC, recycling options, and space utilization.

4. Composting is currently being phased in at dining locations throughout the campus, which should reduce greenhouse gas emissions from landfill waste. A plan to establish composting for pre-and post-consumer food waste from all hospital and campus dining locations will facilitate its broad adoption.

5. Vendors can be encouraged to reduce carbon emissions throughout the supply chain via more energy efficient transportation and warehousing, packaging alterations, take back programs, and other innovations.

Procurement

In addition to food procurement, Emory can reduce its own greenhouse gas emissions and use its power in the marketplace to reduce the emissions associated with its supply chain for all purchases. Emissions associated with procurement include the production, packaging, transport and disposal of goods. Some valuable steps to address these emissions to date include:

- transition from diesel to electric delivery vehicles by Staples
- a commitment from UPS to transition to electric delivery vehicles by 2012
- reuse of Styrofoam coolers from Fisher Scientific to transport research supplies
- enhanced surplus re-purchase program for office furniture and equipment

Emory is also interested in inventorying the embodied carbon emissions of its supply chain, and has contracted with TruCost, an external consulting company, to conduct a carbon emissions inventory of the top 71% of its purchasing. These data can inform future purchasing decisions to achieve reduced emissions impacts.

Next Steps

We recommend that Emory units assess the following strategies to reduce emissions associated with procurement:

1. Buy locally produced goods and services
2. Buy products made with recycled materials
3. Buy products designed to be recycled or composted
4. Encourage suppliers to reduce and/or take back packaging from products
5. Encourage suppliers to provide reusable totes rather than one-time-use boxes
6. Encourage suppliers to use alternative fuels in transporting goods

Offsets as a Strategy for Greenhouse Gas Reduction

Many schools have committed to becoming carbon neutral through plans to purchase carbon offsets and/or renewable energy credits (RECs) on the open market. Offsets are programs through which a university or individual contributes a certain amount of money to a non-profit organization or for-profit company to enable a project that results in a reduction in greenhouse gas emissions somewhere else. The lowering of emissions through a carbon offset in the other location "offsets" campus or homeowner emissions. Examples of such offsets are a solar power installation or a reforestation project designed to reduce the total greenhouse gases being emitted into the atomosphere. Renewable energy credits are tradable energy commodities in the United States that represent proof that one megawatt-hour of electricity was generated from an eligible renewable energy resource, such as a solar installation.

The best offset programs meet certain international standards, are third-party verified, and their greenhouse gas emissions savings are carefully measured. Emory intends to achieve the carbon reduction goals in this Plan without the use of offsets purchased on the open market. However, we recommend that Emory explore options for creating local carbon offsets that can enable the university to exceed its current carbon reduction goals. Examples of such possibilities are an expansion of Emory's forests, provision of recycling and composting for our neighboring institutions, and investments in energy efficiency for other entities, such as an Emory investment in energy efficiency at Grady Hospital. Such a program would reduce total greenhouse gas emissions, and an Emory investment in such a program—if adequately verified—would allow us to claim a portion of those greenhouse gas savings as our own.

Given the high cost of third-party verification of offsets, Emory's Office of Sustainability Initiatives is initiating the development of a peer review verification with other colleges and universities. Such a system will allow a more affordable option for establishing credible local carbon offset programs and maximize Emory's investments in carbon reduction itself rather than

associated administrative costs. It follows the model of Emory's recent participation in the U.S. Environmental Protection Agency's peer audit program for regulatory compliance. If such a program of peer-verified offsets is approved by AASHE, Clean Air-Cool Planet, and other organizations overseeing sustainability efforts in higher education, Emory may be able to sign the American College and University Presidents' Climate Commitment (ACUPCC) which would commit the University to net zero emissions in the future. Emory's reluctance to sign the ACUPCC up to this point has stemmed from concern about diverting limited institutional funds that could be invested in known carbon reduction efforts such as enhanced energy efficiency to fund off-site offset projects overseen by entities that take administrative fees. An Emory-initiated local carbon offsets program might overcome these barriers to pursuing carbon neutral campus operations as a long-term goal.

Academic Units

Faculty and administrative support for this effort is essential to the education of our next generation of civic leaders, scientists, policy-makers and advocates, who will be responsible for the protection of the present and future global environment. In addition, many important strategies for greenhouse gas reduction involve the daily practices of academic units on campus.

Our Climate Action Plan builds on nearly two decades of innovative programs and practices:

- Dynamic academic programs in Environmental Law, Environmental Health, Environmental Studies, and the Sustainability Minor
- Academic innovations within units, such as the medical and nursing school curriculum renovations that include sustainability-related paradigms
- Orientation efforts that incorporate sustainability, such as the "Emory as Place" program in the Laney Graduate School, School of Theology, and other units; Lullwater walks, Atlanta tours, reminder hangtags, free water bottles, Bike Emory guides, and pocket maps noting sites for lunchtime walks for incoming students
- Building-focused programs to turn down heating, cooling, and ventilation systems during evenings and weekends when buildings are not in use which have saved over $1million in two years
- Innovations in events, such as Zero-waste Commencement, that highlight energy use and waste reductions

Next steps

We recommend that:

1. Each academic dean appoint a broadly representative committee of faculty, staff, students and administrators to develop a plan for meeting Emory's carbon reduction goals. Because so much of Emory's greenhouse gas emissions comes from energy use, each unit is asked to specifically choose steps to reduce energy use, from the options described above and from any other options appropriate to the unit. Transportation-related emissions constitute Emory's second-largest category of emissions, and options for reducing transportation miles are critical as well.

2. Each unit coordinate with the Provost's Office of Strategic Planning to support an annual progress report on Emory's Climate Action Plan.
3. Units review academic programs and adequacy of education around climate change, global resource use, and policies for institutional change, with attention to learning outcomes for sustainability-related educational goals to allow improved assessment of student learning over time. New programs, certificates, concentrations, and team-teaching opportunities are possible innovations.
4. Units support faculty development towards innovative and community-engaged curriculum through continued support for the Piedmont Project and related efforts.
5. Units support sustainability-related research, including on-campus assessments of Emory's programs, buildings, and culture change.
6. Units design orientation, celebration, and commencement activities that support a culture of sustainability and signal Emory's sustainability commitment to parents and family as well as to graduates.
7. Units make good use of Sustainability Building Reps to support dissemination of information about sustainability practices.
8. Units seek ways to encourage appropriate actions such as incentives programs and discourage other actions, such as adding a small "carbon tax" to printing fees and using proceeds for sustainability projects and incentives.

Individual Action

Though this report has focused heavily on institutional actions that units of Emory University can take, the individuals that comprise our community are essential to the success of the Climate Action Plan. Small steps that seem insignificant to each individual add up cumulatively to major change in overall emissions. Students, faculty, staff, and administrators are partners in sustainability efforts and part of our plan will be education and encouragement to participate in actions that reduce carbon emissions, conserve resources, and preserve ecosystems.

Particular success in supporting sustainability-related individual actions have come from the on-line Sustainability Pledge, which encourages new behavioral choices, provides a forum for friendly competition and includes a greenhouse gas reduction calculator.

Next steps

The following list of actions, taken from the Sustainability Pledge, may be useful to academic units in their development of strategies for meeting the goals of this plan. The Office of Sustainability Initiatives has an "impact calculator" that units can use to determine the impact of each of the behavior changes listed below.

1. Turn off the lights when leaving rooms, bathrooms, or meeting rooms for more than five minutes.
2. Use only the lighting needed to illuminate work areas.
3. Keep the elevator rule to walk "one flight up, two flights down"
4. Unplug everyday personal items that consume energy even when not in use, such as cell phone chargers, laptops, monitors, televisions, and stereos.

5. Set sleep mode on computers and turn off PC, monitor, printer and copier at the end of the day. If unable to switch off the entire computer, turn off the monitor and desktop printer.
6. Lower the sash on research fume hoods when not in use.
7. Reduce food waste in the dining hall or office.
8. Remove names from junk mail and catalog lists.
9. Walk, use a free bike from Emory's Bikeshare Program, take a shuttle, or use the Zipcar to get around and between campuses.
10. Make meetings more sustainable by reducing travel and paper use and, where possible, utilize a conference call line or schedule meetings back-to-back.
11. Reduce paper use by printing on both sides or use the back side of old documents.
12. Wherever possible, reuse dishes by bringing cutlery and dishware to the office and carrying a re-useable coffee mug or water bottle.
13. Use less water on campus by keeping showers under 5 minutes.
14. Avoid use of bottled water.
15. Turn off vehicles to avoid unnecessary idling in conformity with Emory's anti-idling policy.

Source: Sustainability Pledge (www.sustainability.emory.edu/pledge).

Conclusion

With these recommendations, Emory claims the next step in our committed path toward a more sustainable future. Determined to meet the challenges of this Plan, we will significantly reduce our greenhouse gas emissions in a cost-effective way. We will partner with our supply chain and service providers to reach our goals and advocate these innovations across a national and even international network. A next step toward lived equity, Emory's climate action commitment joins students, staff, patients, and neighbors to achieve a new culture of energy efficiency, resource use responsibility, and innovation. By embracing a campus-wide, comprehensive effort to reduce our impact on climate change, Emory University fulfills our ethical obligations as partners with threatened resources and all life. Creating values and practices that will support new leaders in all fields, we step forward at this critical juncture, embracing what we can do today, mindful of generations to come.

Climate Action Plan Committee Members: Robert Agnew, Iris Alcantara, Peggy Barlett, Lauren Borrelli, Berry Brosi, Steve Ellwood, Ciannat Howett, Hiram Maxim, Jason Myers, Daphne Norton, Rebecca Petford, Shelby Smith, Meredith Stocks, and Cassandra Webster, with assistance from Bobbi Patterson

Carbon Reduction Task Force Members: Adele Clements, David Danielson, Matthew Early, Christopher Fox, Ciannat Howett, Deena Keeler, Rob Manchester, Jimmy Powell, Karen Salisbury, Eric Weber, Brent Zern

[1] Intergovernmental Panel on Climate Change: http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf.

[2]Carbon dioxide equivalents are a metric measure used to compare emissions from various greenhouse gases based upon their global warming potential.

[3]Kats, Gregory. "Greening America's Schools." *USGBC: U.S. Green Building Council*, Oct 2006. Web. 30 Nov 2011.

[4] Net-zero energy buildings have an annual net energy consumption of zero, often through the use of solar panels or offsets. Living buildings are defined as structures that generate all of their own energy with renewable nontoxic resources, capture and treat all of their waste water, and operate efficiently and for maximum beauty.

[5]Alternative energy, as defined here, may include switching from coal-fired electricity to natural gas-based alternatives if it results in reduced carbon emissions.

[6] Epstein, P.R., J.J. Buonocore, et al. "Full cost and accounting for the life cycle of coal." *Annals of the New York Academy of Sciences*. 1219. (2011): 87. Print.

[7]Averyt, K., J. Fisher, A. Huber-Lee, A. Lewis, J. Macknick, N. Madden, J. Rogers, and S. Tellinghuisen. Nov. 2011. Freshwater use by U.S. power plants: Electricity's thirst for a precious resource. A report of the Energy and Water in a Warming World Initiative. Cambridge, MA: Union of Concerned Scientists. See Appendix B, Table 3: Water consumption intensity of power by state.

[8]Epstein, P.R., J.J. Buonocore, et al. "Full cost and accounting for the life cycle of coal." *Annals of the New York Academy of Sciences*. 1219. (2011): 87. Print.

[9]Methane, the principle component of natural gas, is twenty times more effective than carbon dioxide at trapping heat in the atmosphere.

[10]Cogeneration refers to the practice of generating both heat and electricity from the same power plant. Other campuses have seen significant financial and greenhouse gas benefits from installing a cogeneration plant.

[11]Heller, Martin C., and Gregory A. Keoleian. *Life Cycle-Based Sustainability Indicators for Assessment of the U.S. Food System.* Ann Arbor, MI: Center for Sustainable Systems, University of Michigan, 2000: 42.