

University of Pennsylvania

CLIMATE ACTION PLAN 2.0



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I am pleased to present the University of Pennsylvania's *Climate Action Plan 2.0*, our roadmap for environmental sustainability. Drawing from the successes and lessons of the last five years, *Climate Action Plan 2.0* sets challenging new standards for campus performance, expands educational opportunities for students, and provides enriched support for faculty research, teaching, and collaboration.



When I signed the Presidents' Climate Commitment in 2007, we set in motion university-wide efforts to build on Penn's strengths, identify opportunities for progress, and bring together passionate students, faculty, and staff to develop environmental strategies that will impact our local community, our nation, and the world. The Environmental Sustainability Advisory Committee (ESAC) produced Penn's first *Climate Action Plan* in 2009 and set ambitious goals for achievement by 2014. The Committee dedicated itself and the University community to the

highest ambitions of performance and transparency, in the areas of academics, utilities and operations, physical environment, transportation, waste minimization, and engagement.

The dedicated students, faculty, and staff of Penn's ESAC subcommittees reviewed our progress and wrote the goals set forth in this new blueprint for environmental excellence. Penn's *Climate Action Plan 2.0* represents Penn's considerable expertise across a variety of disciplines and anticipates the demands of the next five years. We look forward to continued engagement across campus in making Penn a model of environmental academics and stewardship. The future of our University, and beyond, depends on it.

Dr. Amy Gutmann
President



EXECUTIVE SUMMARY

Five Years of Progress

Five years since the launch of the University's first *Climate Action Plan*, Penn looks back on a remarkable and steadily deepening array of accomplishments, and forward to a path of continual improvement in its ecological performance. In 2007, as the first Ivy League signatory to the American College and University Presidents' Climate Commitment, the University began the process of creating and executing a vision of environmental sustainability at Penn.

In 2009, the launch of the *Climate Action Plan* set concrete goals and began the formal process of integrating sustainability into coursework, community, campus planning and design, and campus operations. Significant progress has been made and accelerating momentum established. Below is a review of the main objectives by the numbers:

- *Bolstering the Curriculum* — Penn now offers **over 170 courses** focused on and related to sustainability, and the Integrating Sustainability across the Curriculum program added **22 faculty** and **12 students** who have collaborated to infuse principles of sustainability into **21 courses**.
- *Reducing our Carbon* - Penn achieved an **18% reduction** in its carbon emissions from FY 2007 to FY14, and also achieved a **6.6% reduction** in normalized energy consumption.
- *Growing Greener* – As a major research university, Penn meets its mission of teaching and research with new facilities. But the *Climate Action Plan* focuses that growth to be more sustainable, resulting in **six new buildings achieving LEED Gold Certification**, and more than **27 new acres** of green space.

- *Minimizing Waste* - Penn **recycles nearly 26%** of its waste, including traditional recycling, composting, and e-waste and educates our community about the importance of decision making in what products they consume. Penn's **continued reduction of landfill waste by almost 10%**, provides a more complete picture of waste minimization on campus.
- *Commuting with fewer emissions* — **50% of Penn commuters now use public transit, walk or bike**. Our community has witnessed an increase in people using alternative transit by nearly 10%, playing to our strength as a dense campus easy to traverse by foot or bike and well connected by public transit.
- *Engaging the Penn Community* — Penn's Green Fund made **49 grants** to faculty, students and staff totaling over **1M** over the last five years, and whose ideas are enhancing our campus' environmental sustainability. **350 students and more than 100 staff** have volunteered as Eco-Reps over the past five years, championing sustainable actions in offices, College Houses, student organizations and athletic teams.

While implementing the initiatives explicitly identified in the *Climate Action Plan* has been rewarding for the faculty, staff, and students who helped create it, the unanticipated outcomes, programs, and projects that have evolved through heightened exchange have often been even more profound and exciting. Not only have students, faculty, and staff eagerly embraced the initiatives we have undertaken, they have also responded by creating new programs at a rate that was impossible to predict, including:

- *PennGreen*: Upperclass students who wanted to provide a sustainability-themed pre-orientation program created PennGreen, which in 2014 welcomed its fifth class of freshmen to Penn with a whirlwind of tours, meetings, dialogues, and lectures by local experts in environmentalism.
- *Move-In Green*: Staff in College Housing and Academic Services and Residential Services were essential to the implementation of Move-In Green, Penn's signature New Student Orientation student volunteer opportunity.
- *School and Center Sustainability Coordinators*: A role not foreseen in the 2009 Plan, seven Schools and Centers are now meeting monthly, sharing their enthusiasm and best practices, and implementing projects across campus.
- *Penn Green Fund*: The success of the Penn Green Fund has exceeded expectations, with funding awarded to College Houses, Greek Houses, Athletics and Recreation, the Morris Arboretum, and the University of Pennsylvania Museum of Archeology and Anthropology, among many more.
- *The Century Bond Program*: The Century Bond Program is investing in energy efficiency in campus buildings at an unprecedented scale, demonstrating Penn's commitment to bringing sustainability to the heart of its planning operations.

Development & Format of Climate Action Plan 2.0

Developing a new five year plan, *Climate Action Plan 2.0*, is an exciting opportunity that builds on such successes, institutionalizes organic change, and uses the experience learned from past challenges to better frame new goals and strategies. One of the most ambitious elements of *Climate Action Plan 2.0* is the expansion of the Plan's geography, from the core academic campus, to more fully capture the range of environmental leadership across the University's entire built assets. By including the University of Pennsylvania Health System, the Morris Arboretum, the New Bolton Center, and the University's leased space and real estate portfolio, *Climate Action Plan 2.0* reflects an expanded approach to environmental stewardship, and highlights important work accomplished, underway, and planned for the future.

The recommendations included throughout *Climate Action Plan 2.0* were formalized by the respective Environmental Sustainability Advisory Committee (ESAC) Subcommittees, building upon five years

of collective experience implementing the initial plan. ESAC Subcommittees are organized by topic area: Academics, Utilities & Operations, Physical Environment, Transportation, Waste Minimization & Recycling, and Outreach & Engagement.

This *Climate Action Plan 2.0* document is organized by the above subcommittee initiatives, with each section including a Mission, Five Year Summary, and Recommendations.

Climate Action Plan 2.0 Recommendations at a Glance

The recommendations included in *Climate Action Plan 2.0* build upon those outlined in the original *Climate Action Plan* and achievements of the past five years. The carbon and energy goals in *Climate Action Plan 2.0* align with the long-term goal of carbon neutrality by 2042, and include the following:

Academics – Expand opportunities for teaching, learning, and researching sustainability among students, staff, and faculty.

- Create a Faculty Working Group on Sustainability to provide outreach and support to faculty interested in researching and teaching sustainability.
- Promote existing sustainability programs and classes to Penn's undergraduate and graduate student body.
- Create a Speaker Series / Symposium dedicated to sustainability.

Utilities & Operations – Promote and adopt best practices in energy management, design, and maintenance to improve efficiency and reduce Penn's carbon footprint.

- Achieve Total Carbon Reduction in Buildings (absolute)
 - 7% reduction by 2019 in comparison to the FY14 baseline
 - 18% reduction by 2042 in comparison to the FY14 baseline
- Achieve Energy Reduction in Buildings (absolute)
 - 10% reduction by 2019 in comparison to the FY14 baseline
 - 27% by 2042 in comparison to the FY14 baseline
- Recommission the top 20% of the buildings that have the highest energy use every five

years and complete a deep energy retrofit by 2042. The remaining 80% of buildings will be recommissioned on a ten year basis.

- Develop an energy reduction plan for all building renovation projects, including basic energy benchmarking for all buildings and energy modeling & analysis of alternatives for major renovations.

Physical Environment - Create and maintain a sustainable campus by increasing green space, decreasing building energy consumption, and increasing education and awareness of sustainable design.

- Continue to pursue LEED Silver Certification for all new construction, with focus on “Penn plus” credits, those that are identified as critical to Penn’s environmental initiatives.
- Implement the *Green Guidelines for Renovations* to provide direction on Penn’s renovation work on modest sized projects, as defined in the Guidelines. Significant renovations that satisfy criteria identified in the *Guidelines*, including exceeding \$1M, are recommended to pursue

LEED Silver Level under the Commercial Interiors (CI) protocol.

- Develop an *Ecological Landscape Stewardship Plan* that through pilot projects examines how to minimize chemical use, promote biological diversity, and incorporates best practices from the Sustainable SITES pilot on Shoemaker Green.
- Extend the Plan’s geography from the core academic campus, to more fully reflect the full range of the University’s built assets, to include the Hospital of the University of Pennsylvania, Morris Arboretum, the New Bolton Center, and Penn’s leased space and real estate projects.

Waste Minimization & Recycling - Improve Penn’s environmental performance by minimizing solid waste through community education, strategic purchasing, appropriate infrastructure, and proper disposal, strengthened by relevant and accurate metrics.

- Increase recycling rate, currently approximately 24%, to 30% by 2019, and continue to reduce overall municipal solid waste.
- Implement the *Solid Waste Management Plan*, including the creation and implementation of a data reporting tool to track waste diversion

metrics and improve composting operations on campus.

- Increase participation in and awareness of sustainable purchasing options and recognize green purchasing champions.
- Increase the number of zero waste events and expand composting on campus.

Transportation - Emphasize and plan a quality pedestrian campus environment, encourage use of bicycling and public transportation for commuting, and provide safe, efficient local transportation services for the University community.

- Create a centralized online resource for bicyclers on campus, including bicycle rack maps, the University Bike Policy, bike lane maps, etc.
- Continue to replace older bicycle racks with University standard bike racks.
- Expand the number of bike repair stations on campus.

Outreach & Engagement - Build a culture of sustainability that informs all constituents of University life.

- Work with School and Center senior leadership to encourage and expand Sustainability Coordinator roles within all Schools and Centers at Penn.
- Sustain a vibrant Student Eco-Reps program in College Houses, Greek chapters, and Athletics that fosters a culture of sustainability among students on campus.
- Maintain a dynamic Faculty/Staff Eco-Rep program as an active and accurate source of sustainability information.

Leadership & Awards

Since the launch of the 2009 *Climate Action Plan*, the University of Pennsylvania has been repeatedly recognized by both internal and external audiences for the University’s commitment to environmental sustainability.

Princeton Review

The University of Pennsylvania has annually been highlighted in *The Princeton Review’s Guide to Green Colleges* since 2010. This guide profiles institutions of higher education in the US and Canada which exhibit a commitment to sustainability in both the

academic arena and university operations. The guide has highlighted Penn Park, the Green Fund, and the Student Eco-Reps program over the past five years.

Tree Campus USA

The University of Pennsylvania earned 2013 *Tree Campus USA*® designation, awarded by the Arbor Day Foundation. This marks the fifth year in a row that Penn has received this designation. *Tree Campus USA*® is a national program created in 2008 to honor colleges and universities for effective campus forest management and for engaging staff and students in conservation goals. Penn achieved the title by having an active Tree Advisory Committee, a Campus Tree Care Plan, and finance and personnel resources allocated for the Tree Care Plan.

Sustainability Tracking Assessment & Rating System

In May 2014, Penn submitted its first application to STARS - the Sustainability Tracking, Assessment & Ratings System – and received a Silver rating. STARS is a self-reporting framework of sustainability metrics specifically developed by the Association for the Advancement of Sustainability in Higher Education (AASHE) for college and university campuses. STARS' standard categories and transparent scoring metrics allow for easy assessment of the University's performance and future opportunities. Although the STARS ratings last for three years, Penn will update its submission every two years so that content remains relevant and progress can be regularly measured against these defined standards.

EPA Green Power Award

The University of Pennsylvania finished in first place in the U.S. Environmental Protection Agency's nationwide *College and University Green Power Challenge*. EPA defines green power as electricity produced from solar, wind, geothermal, biogas, biomass, and low-impact hydroelectric sources, and this program recognizes colleges and universities that purchase Renewable Energy Credits (RECs), which are created through the generation of green power.

EPA began its Green Power Challenge for higher education institutions in 2006, and the University of Pennsylvania has been the Ivy League winner every year since. Penn took top honors nationally in 2013 by purchasing more than 200 million kWh of wind power -- more green power than any of the 75 other competing schools.

As part of EPA's Green Power Partnership, more than 1,400 organizations are purchasing more than 26 billion kilowatt-hours of green power annually, avoiding carbon pollution equal to that created by the electricity use of more than 2.8 million American homes. The partnership provides quarterly updated lists of partners using green power in several other categories including K-12 schools, technology and telecommunications, local government, among others.

Green Purchasing Award

A Special Recognition Award from Office Depot was presented to Penn at the GreenBuild Conference & Expo, on November 22, 2013 at the Pennsylvania Convention Center, recognizing Penn as an institution that proactively seeks out products with environmental attributes. Office Depot's Special Recognition Awards are based on specific aspects of a customer's purchasing program or leadership in greening. For 2013, the University of Pennsylvania was one of 28 organizations selected out of 17,000 Office Depot customers.

Best Work Places for Commuters

The National Center for Transit Research has named Penn among the Best Workplaces for Commuters for two years in a row, in acknowledgement of the University's integrated approach to commuting options, which includes discounts for public transit commuters, van and carpooling programs, and support of cycling on campus.

International Sustainable Campus Network

Penn has been a member of the International Sustainable Campus Network (ISCN), which is a part of the Global University Leaders Forum, since 2010. In 2014, Penn's Integrating Sustainability Across the Curriculum program was included as one of the ISCN's case studies for the World Economic Forum.

With *Climate Action Plan 2.0* as the blueprint, Penn now embarks on another five years of environmental leadership guided by long-term vision and commitment from senior leadership, students, staff, and faculty. There is still more to do. We are excited about the next five years of engagement with the Penn community and look forward to our journey together.



ACADEMICS

Mission

- To make climate change and sustainability part of the curriculum and educational experience available to all students;
- To support faculty teaching, learning, and research into the impact of principles of sustainability on all fields of knowledge;
- To inform the entire University community of the principles of sustainability and its three key constituent pillars: environmental protection, economic prosperity, and equitable distribution of resources.

Five Year Summary

Vagelos Integrated Program in Energy Research

The Vagelos Integrated Program in Energy Research (VIPER), established in 2011 through a generous grant by Roy and Diana Vagelos, is an innovative program in energy, engineering, and science. A joint program of Penn's School of Arts and Sciences (SAS) and the School of Engineering and Applied Science (SEAS), VIPER leads to dual Bachelor of Arts (BA) and Bachelor of Science in Engineering (BSE) degrees by combining majors from each school. The focus of the program is on the science and technology of alternative and efficient methods of production, conversion and use of energy. The program takes advantage of existing expertise and resources within SAS, SEAS and other schools. Students do research in the laboratories of Pennergy, the Penn Center for Energy Innovation, and thereby contribute to Penn's core initiatives in the area of science and technology solutions for sustainable energy.

Kleinman Center for Energy Policy

The Kleinman Center for Energy Policy at PennDesign was launched in Fall 2014 through a \$10M gift from Scott (C'94, W'94) and Wendy Kleinman. The Center will advance energy productivity by reframing the relationship between research and practice in support of policy innovation. Specifically, the Center will focus on overcoming persistent barriers to energy productivity and to construct energy policy options that provide fairness for stakeholders, reliability for investors, and opportunity for innovators. The Center will provide a forum that brings together eminent scholars and multiple stakeholders in a collegial and productive environment to generate tangible progress on energy policy. At the same time, it will expand the engagement of Penn faculty and students through distinguished guests, visiting fellows, lectures, courses, internships, and research support. The Kleinman Center for Energy Policy is led by faculty director Mark Alan Hughes, Professor of Practice at PennDesign, founding Director of the City of Philadelphia's Office of Sustainability, and former Chief Policy Adviser to Mayor Michael A. Nutter. The products of this initiative are expected to greatly enrich the next five years of implementation of *Climate Action Plan 2.0*.

Sustainability & Environmental Management Minor

One of the first actions implemented after the launch of the 2009 *Climate Action Plan* was the launch of the Sustainability & Environmental Management Minor. This minor is available to all undergraduate students in the School of Arts & Sciences, School of Engineering & Applied Science and Wharton, and requires completion of six courses selected from a list of mandatory and optional courses in each of the three participating schools. This versatile minor allows Penn students to incorporate sustainability

into their coursework in tandem with their major.

Master in Environmental Building Design

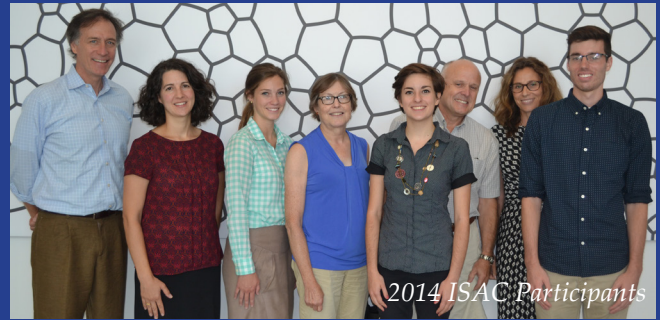
The Master in Environmental Building Design in the School of Design is a specialized, post-professional degree developed to train architects in the new skills and knowledge required for environmental design. The three-semester course of study, established in 2010, includes coursework on building performance simulation, integrated building design, building envelopes and systems, lighting, daylighting, and the theory and practice of environmental design. Coursework is complemented and extended by a Performance Design Workshop and then explored in depth in an intensive Environmental Design Studio in the summer.

Integrating Sustainability Across the Curriculum

Initiated in 2012, the Integrating Sustainability Across the Curriculum program (ISAC) is an eight-week summer program teaming undergraduates with faculty to refine an existing course or develop a new course that incorporates sustainability as an academic theme. A key component of ISAC is a faculty workshop held at the beginning of the program. This workshop engages faculty participants in an exercise examining the concepts of environmental sustainability in a variety of disciplines. Resource experts are invited to discuss how sustainability has been incorporated into their field and daily work.

The collaboration between faculty members and students is one of the strongest features of this program. Each research assistant is paired with two faculty members and works over the course of eight weeks to help integrate sustainability into their existing or new courses. This may involve researching material for the course, developing new assignments, compiling course reading lists, or creating lecture notes and digital slides. Structuring the program to have one student work with two faculty members allows for cross-pollination of ideas and expands the breadth of knowledge the student is exposed to during the program.

Over the course of the program, the students participate in mini-workshops and field trips to provide an opportunity to exchange ideas and share experiences with fellow participants. At the end of the summer, the students present their course development work in a poster session for the other students, faculty and staff involved in the program. Some students go on to present their posters at the University's Center for Undergraduate Research and Fellowships' research poster session in the fall as well.



Integrating Sustainability Across the Curriculum Courses and Faculty

- *Architecture in the Anthropocene* - Daniel Barber
- *Cities & Sustainability* - Ariel Ben-Amos
- *Climate Policy & Technology* - Andrew Huemmler
- *Construction Technology 1* - Franca Trubiano
- *Critical Approaches to Popular Culture* - Felicity Paxton
- *Educating for Sustainability* - Liz MacKenzie
- *Energy in American History* - Ann Greene
- *Energy Systems and Policy* - Andrew Huemmler
- *Environmental Chemistry* - Marsha Lester
- *Environmental Management, Law and Policy* - Sarah Light
- *Introduction to Economics* - Rebecca Stein
- *History of Coca to Cocaine* - Ann Farnsworth
- *Landscape Sustainability* - Doug Jerolmack
- *Metropolitan Nature* - Michael Nairn
- *Microbial Fuel Cells Investigation* - Karen Hogan
- *Principles of Sustainability Science* - Alain Plante
- *Responsibility in Professional Services* - Sarah Light & Eric Orts
- *Sustainable Goods* - Jim Hagan
- *Sustainability in Practice* - Mark Alan Hughes & Leslie Billhymer
- *Toward Sustainability at Penn* - Dan Garofalo
- *Utopian Visions* - Bethany Wiggin

Since 2012, 22 faculty and 12 students have participated in the ISAC program, resulting in twelve revised courses and nine new courses. Faculty from Communications, Chemistry, Urban Studies, Environmental Studies, German, Latin American Studies, and Design have taken part in the ISAC program.

Climate Action Research Grants

Climate Action Research grants were developed to keep Penn at the forefront of addressing global climate change by supporting undergraduate research in academic fields related to sustainability. Eligible projects, conducted under the direction of Penn faculty, lead to environmentally sustainable programs and policies, contribute to scientific innovations, and/or deepen our understanding of the social, cultural, artistic, and humanistic aspects of sustainability. Climate Action Research Grants are intentionally open-ended, to allow students to define their projects in innovative ways that support twenty-first century solutions to environmental challenges.

Undergraduate students apply for research grants, typically between \$2,500 to \$5,000, in the spring, with the funded research occurring in the summer. Thirty-three Climate Action Research Grants have been awarded to undergraduates since 2010, on topics ranging from sustainable energy development in China, to the impact of climate change on tropical oceans, to sustainable behavior inducement.

Ben Franklin Scholars Course Design Grants

Ben Franklin Scholars (BFS) Course Design Grants are awarded to faculty for exceptional proposals for the development of new BFS seminars. Since 2009, the Green Campus Partnership has sponsored a minimum of one BFS Course Design Grant each year to foster the development of seminars that include innovative approaches to sustainability. In 2013, David Grazian, Associate Professor of Sociology, received a BFS Course Design Grant for the seminar, *Where the Wild Things Aren't: Zoos, Science Museums, and the Culture of Nature*. Eric Orts, Professor of Business Ethics and Management in Wharton, and Director of the Initiative for Global Environmental Leadership (IGEL) led the BFS Seminar, *Environmental Management Law and Policy*. Through the award of a BFS Course Design Grant, Dr. Alan Kelly, former

Dean of the School of Veterinary Medicine, developed the course *Veterinary Medicine and Global Food*, which covers the broad topics of food security and included lectures from faculty in seven other schools at Penn.

Faculty Discussion Groups on Sustainability

In spring 2014, the Sustainability Office collaborated with Penn's Center for Teaching and Learning (CTL) to organize two faculty discussion groups on "What It Means to Teach Through the Lens of Sustainability." In particular, the discussion groups considered how incorporating sustainability as an intellectual framework into courses can help shape what and how one teaches. CTL facilitated the discussions with the goal of developing key ideas and/or questions that could be shared with faculty across the University. The aim of these, and future, discussions is to inform and enhance the ability of faculty both to teach sustainability and to teach students how to examine diverse topics through a sustainability lens.

Sustainability Course Inventory

In an effort to make public and centrally available a listing of classes related to sustainability, the *Sustainability Course Inventory* was developed in 2012. Through searching *Penn In Touch*, over 170 courses focused on and related to sustainability were compiled into the on-line inventory. The *Sustainability Course Inventory* is promoted through the Green Campus Partnership website, academic advisors, and the Office of the Provost. The Sustainability Course Inventory is updated on a bi-annual basis.

Sustainability Internships

The Sustainability Office regularly offers student internships during the academic year and over the summer. Student interns help to implement *Climate Action Plan* recommendations and provide valuable student input on Green Campus Partnership initiatives. The Green Campus Partnership has also facilitated the creation of student internships with outside organizations, including the Delaware Valley Green Building Council and the City of Philadelphia's Office of Sustainability. These internships, co-sponsored by Penn academic departments, provide the opportunity for students to apply their coursework outside the classroom on sustainability issues in Philadelphia.

Academics Recommendations

The 2009 *Climate Action Plan* set a goal to make climate change and sustainability part of the curriculum and educational experience available to all Penn students. Over the past five years, the Green Campus Partnership has initiated new programs, collaborated with the Office of the Provost, and expanded opportunities for research and internships all with a primary focus on students. *Climate Action Plan 2.0* expands upon this goal by putting forth recommendations to enrich sustainability resources and opportunities for the larger Penn community, with a particular focus on faculty support. Over the next five years student sustainability programs will continue to grow, complemented by an equally rich portfolio of programs for faculty.

- I. Continue to enhance and promote Penn's signature programs, such as the Vagelos Integrated Program in Energy Research and the newly-established Kleinman Center for Energy Policy. Explore possible areas of collaboration with other current academic programs related to sustainability.
 - a. Expand awareness of the Sustainability and Environmental Management minor through partnerships with Academic Advising Services, all undergraduate schools, and with the College House advising services.
 - b. Revise and expand the *Sustainability Course Inventory* and distribute it to school advisors and College House Deans. Add a "resource directory" of sustainability minors, majors, and programs to the Inventory.
 - c. Encourage students to explore incorporating sustainability into their post-Penn careers by holding career events and inviting recent graduates working in the field to speak to students.
 - d. Analyze the *Sustainability Course Inventory* to categorize what is and is not being taught, compare what is being offered in different universities, and identify any gaps in Penn's sustainability offerings.
- II. Promote existing and new sustainability programs and classes to Penn's undergraduate and graduate student body.
 - a. Expand awareness of the Sustainability and Environmental Management minor through partnerships with Academic Advising Services, all undergraduate schools, and with the College House advising services.
 - b. Produce a weekly e-mail outreach including upcoming campus lectures, films, and other events related to sustainability and encourage recipients to forward to faculty who don't receive it.
 - c. Develop brown bag lunch faculty series to share current work in the field.
 - d. Gain institutional support from the Center for Teaching and Learning, senior faculty, academic leaders, and the Office of the Provost.
- III. Create a Faculty Working Group on Sustainability to provide outreach and support to faculty interested in researching and teaching sustainability.
 - a. Create a Canvas site / blog, linked to the Green Campus Partnership website, for use by faculty teaching sustainability.
- IV. Secure financial support for sustainability research (research stipend, post-doctoral funding, endowed chair, etc.).
- V. Partner with Admissions to promote sustainability to incoming students and include campus sustainability accomplishments in campus literature.
- VI. Establish a Sustainability Speaker Series / Symposium.
 - a. Create an event featuring a high-profile speaker, with sponsorship by senior Penn leadership.
 - b. Create a lecture series throughout the year to provide multiple opportunities for discussion and interaction among faculty, staff, and students. Produce collateral material such as papers, video documentation, etc. from series.
 - c. Partner with the Office of the Provost to tie into the Provost's Theme Year programs.

- VII. Focus on a long-term goal of influencing public policy and corporate/professional/ nonprofit leadership.
- a. Promote faculty leadership among peer institutions, government, and the general public.
 - b. Look for opportunities to feature Penn faculty expertise at public fora, symposia, and conferences.
 - c. Position Penn as a regional/international leader and resource in sustainability.
 - d. Provide opportunities for Penn faculty to take an active role in sustainability-oriented organizations.
- VIII. Create an alumni sustainability network and develop a mechanism to report on the achievements and influence of Penn alumni in this field.



UTILITIES & OPERATIONS

Mission

Promote and adopt best practices in energy management, building and campus infrastructure design, and energy systems maintenance to improve efficiency and reduce Penn's carbon footprint.

Five Year Summary

Carbon Reduction

The 2009 *Climate Action Plan* established a target of 23% reduction in carbon emissions by FY14 relative to the FY07 baseline. As of FY14, Penn has reduced its carbon emissions by 18%. In 2011, the University of Pennsylvania identified the year 2042 as an aspirational goal for achieving climate neutrality.

These results were determined using the Penn Carbon Calculator, which was created through collaboration between Facilities & Real Estate Services and the TC Chan Center, a faculty research and consulting unit located in the School of Design. The Penn Carbon Calculator methodology is based on the framework developed for the Clean Air- Cool Planet campus carbon calculator, and identifies three scopes of campus emissions. Scope 1 considers sources that produce their emissions on campus, such as furnaces and boilers. Scope 2 considers those sources which are used on campus but which produce emissions remotely (such as electrical power used on campus but generated at off-campus power plants). Scope 3 sources of emissions are those activities that take place off campus, such as employee commuting or business travel.

Within each of the three scopes, specific emissions are identified and the level of activity is recorded in consistent units over the year. The calculator determines the emissions from each source within the three scopes by multiplying the magnitude

of each activity by a specific emissions factor to determine the metric tons of carbon dioxide equivalent (MTCDE) for each unit of activity. The contributions from each scope are then summed to produce the carbon footprint for the campus in that year. This methodology relies on relatively few, easily determined inputs that are consistent from year to year.

Metering

With the launch of the 2009 *Climate Action Plan*, Penn began a comprehensive steam and chilled water metering initiative on campus. Not only did the initiative aim to put these meters in a majority of campus buildings, but it also simultaneously implemented new visualization and analysis capabilities of the metered energy data. As of FY14, the metering initiative is 98% complete, with 388 meters installed over the past five years.

Energy Usage & Conservation

As anticipated at the launch of the 2009 *Climate Action Plan*, building-related utility usage remains the campus' largest source of carbon emissions (~85%). The focus on building energy use has resulted in continual refinement of the methods and tools to track and project the energy use of individual buildings, and the accuracy of those projections is dramatically improving as the buildings on campus have, through a multi-year project identified in the 2009 *Climate Action Plan*, been individually metered for steam and chilled water. With meters in place, a body of recorded data can now be accrued, enabling a more accurate evaluation and targeting of buildings for improvement.

The 2009 *Climate Action Plan* set a goal of 17-percent reduction in energy usage by FY14 in comparison

to the FY07 baseline. The first column in the chart below shows the University's energy usage in terms of absolute consumption. The second column normalizes the energy usage, incorporating both the changes in weather year by year and the growth of campus by over one million square feet.

FY14 compared to FY07	Absolute	Normalized
Total Electric Usage	7.7% decrease	11.1% decrease
Total Steam Usage	16.3% increase	0.85% increase
Total Energy Usage	5.1% increase	6.6% decrease

The 17-percent energy reduction by FY14 was one of the most optimistic aspects of the 2009 *Climate Action Plan*, and was based on the assumption that the regular renovations of campus buildings would be thorough enough to include the retrofit of energy systems and frequent enough to achieve the reduction goals. Penn's Energy Management Team at FRES recognized early in the five-year period encompassed by the Plan that these assumptions were too optimistic, including the time required to commence new programs and evaluate results.

The Century Bond Program

The implementation of the Century Bond program will allow Penn to accelerate building renovation programs. This program includes two key components: first, \$300M worth of funds were raised through bond sales in the spring of 2013, and secondly, a rigorous analysis was conducted of Penn buildings and building systems to determine how best to use the available bond funding. The bonds have an interest-only annual payment with a favorable rate that is fixed for 100 years.

Penn's leadership decided to use the bond funding to execute a two-pronged approach focused on energy savings: between eight and ten campus buildings would receive significant HVAC and systems replacements (an investment of about \$190M), and 45 buildings would receive comprehensive lighting upgrades (over \$10M of improvement and replacement). The remaining third of the bond funding is reserved for future strategic projects.

As of 2014, eight total comprehensive system upgrades, with one nearly complete. Preliminary results from initial projects indicate that the program will provide significant energy savings as well as reduced expenses for ongoing maintenance and repair, and Penn anticipates dramatic reductions in emissions in the newly renovated buildings. The Century Bond Projects represent the type of

Penn Carbon Calculator

The Penn Carbon Calculator was designed to determine the carbon footprint for any given year, to record all past carbon footprint data, and to project the University's future carbon footprint. An Individual Building Worksheet was specifically developed for each Penn building and replaced prior projections of the Scope 2 sources of emissions, steam, chilled water, and electricity. While the Calculator is still used to track all historical consumption of these three utilities, the values for future consumption are based on the most recent historical year and then projected and resummed for the individual buildings, for reintroduction into the Penn Carbon Calculator.

Other sources of carbon emissions, such as solid waste generation, fugitive refrigerant gasses, and emissions associated with commuting, are still being projected by the original calculator. These projections are typically based on a simple average annual percent growth based on historical data. Since these sources represent only 15% of the carbon produced by the campus and are less subject to the direct influence of engineering, operations, and maintenance, these sources have not been the focus of investigation and the simpler projection technique has been considered adequate. The calculator also tracks and projects the purchase of renewable energy credits (RECs), which offset the emissions produced through campus activities. Since the University purchases RECs through wind electricity credits, these decrease the Penn carbon footprint, using the same emissions factor used for electricity.

One important projection made by the calculator tracks the changes in the emissions factors associated with each utility. The emissions associated with Penn's electricity and chilled water consumption are in part determined by the sources of the power supplied to Penn's regional power grid. Emissions associated with Penn's steam use are determined by the combustion process at Veolia's co-generation plant. The recent trend for both the regional grid has been toward less carbon-intensive power production; resulting in a significant decline in the emissions produced from these sources. As federal and state standards for our regional power generation shift to require a greater percentage of renewables or a limit on carbon emissions, it is expected that these emissions factors will continue to decline, leading to a general trend of decarbonization across the City and region and a decrease in the University's annual carbon footprint.

renovation work that will be needed over the next few decades to achieve the carbon and energy goals of *Climate Action Plan 2.0*.

Cost-Allocation Model

With completion of the comprehensive metering initiative, Penn Facilities & Real Estate Services began to accumulate sufficient data to initiate plans for direct billing of Schools and Centers based on their actual building-specific energy use, instead of the long-standing method of billing based on estimated costs. Billing using actual steam meter data will begin in FY16 and chilled water meter data will be used starting in FY17, with meter-based billing being phased in over four years for all metered buildings.

Green Power Purchase

Penn continues to be the largest purchaser of Green Power among institutions of higher education, and regularly recognized by the EPA's Green Power Partnership program. In 2013, the University signed a five year contract to purchase over 200M kWh of wind Renewable Energy Credits (RECs) annually. According to the EPA's accounting of voluntary REC purchases, this offsets over 50% of the emissions from Penn's total electrical usage.

Recommissioning

The goal of Penn's Recommissioning Program, established in 2010, is to "tune-up" existing building systems back to the level at which they were designed to operate. The program assesses campus building performance and then recommends targeted maintenance and repair. With the launch of the *Climate Action Plan*, Penn committed to recommissioning the largest 80 buildings on campus at an average rate of eight buildings per year. At the conclusion of FY14, 60 buildings have received one exploratory systems audit and eight buildings have received a second audit for a total of 68 buildings on campus - an average rate of 13 buildings per year.

As a result of the Recommissioning Program, Penn has been able to identify common Energy Saving Opportunities (ESOs) across campus. Many of these ESOs can be applied to all buildings on campus, including items like discharge air temperature reset on air handling units and the adjustment of ventilation rates to current standards. Identifying and addressing recurring ESOs throughout campus has been an important contribution of the Recommissioning Program.

Energy Reduction Fund

The Energy Reduction Fund (ERF) is a revolving fund established in 2010 to support energy-efficient projects on campus. The financial savings generated by utility savings in ERF projects is returned to the fund to finance future projects. The ERF program maintains a database of energy savings projects that are identified, tracked, and prioritized. This database is a valuable tool to determine how available funding should be allocated, what projects are of highest priority, and to strike a balance between funding different types of projects - for example, utility infrastructure projects versus building systems improvements versus building envelope improvements.

Steam & Veolia

In 2010, Penn entered into a 20-year Steam Supply Agreement with Veolia Energy North America for campus steam, representing about 56% of Penn's energy usage. As part of Penn's supply agreement, Veolia invested \$60M to build two new natural gas-fired rapid response boilers. These upgrades, completed in January 2013, improved reliability and reduced carbon emissions more than 25% for all steam users in the region.

Energy Ticker

In 2012, the Penn Institute for Urban Research collaborated with FRES, PJM Interconnection, the Philadelphia Navy Yard, PECO, EEB Hub and DOE Grid Star to develop a real-time energy ticker online to promote energy education and conservation. The energy ticker updates every five minutes and provides the current regional and wholesale price of electricity in the PECO zone - encouraging conservation by making users aware of the costliest energy use times.

T.C. Chan Center Partnership

The T.C. Chan Center for Building and Energy Studies, a faculty-led research group in Penn's School of Design, has had a long history of providing assistance to the University's sustainability efforts. The Center completed the initial carbon emissions inventory for Penn in 2005, and since the launch of the 2009 *Climate Action Plan* has consulted on a variety of energy efficiency projects, including the creation of the Penn Carbon Calculator. In FY14, the Center was commissioned to provide the technical analysis of the building renovation and recommissioning proposals included in this plan, and assisted in the development of the carbon reduction goals. The Center's findings were documented in *Energy, Carbon, and Financial Analysis of Climate Action Plan Scenarios for Buildings*.

Utilities & Operations Recommendations

While the 2009 *Climate Action Plan* attempted to forecast reductions in campus carbon emissions through 2040, these efforts were limited by the lack of precise projections of the expansion and energy demands of the future campus. As a significant evolution in predictive capabilities, *Climate Action Plan 2.0* builds its projections on new tools and techniques introduced by Penn's T.C. Chan Center. The projections below are based on specific building interventions, allowing the forecast model to be built up from a number of discrete, definable building improvements which are each assigned quantifiable anticipated results. The sum of the actions taken across campus are combined to provide an overall trajectory of emissions reductions, relying less on generalized whole-campus assumptions and giving greater validity to the projections.

The carbon reduction goals set forth in *Climate Action Plan 2.0* use FY14 as a baseline, which provides several advantages in terms of the methods used to generate projections. The transition to focusing on individual buildings, and aggregating them together to achieve values for the whole university, greatly improves the accuracy and reduces the number of assumptions needed. This approach also results in a better understanding of the costs and effects of the interventions and allows a detailed scenario to be crafted that meets the specific needs and requirements of the University. One area where this is particularly useful is in determining the financial impact of the goals. By associating reductions with specific actions, better estimates of cost can be generated and metrics developed to determine the return on investment of each project.

Penn's efforts to reduce the energy intensity of campus through the goals outlined in *Climate Action Plan 2.0* recognize that achieving carbon neutrality by 2042 will not be realized through conservation alone. The University will continue to assess options to reduce carbon emissions through the supply of cleaner energy and the use of offsets and the purchase of Renewable Energy Credits (RECs).

I. Energy & Carbon Goals

- a. Total Carbon Reduction in Buildings (absolute)
 - i. 7% reduction by 2019 in comparison to the FY14 baseline
 - ii. 18% reduction by 2042 in comparison to the FY14 baseline
- b. Energy Reduction in Buildings (absolute)
 - i. 10% reduction by 2019 in comparison to the FY14 baseline
 - ii. 27% by 2042 in comparison to the FY14 baseline
- c. The campus will continue to add square footage and weather variability will continue to affect energy usage; so the energy reduction progress will be adjusted for weather and other forms of variability during the reporting period.
- d. *Climate Action Plan 2.0* assumes a 1% growth per year of the central campus as it relates to this goal. Real estate projects (such as the

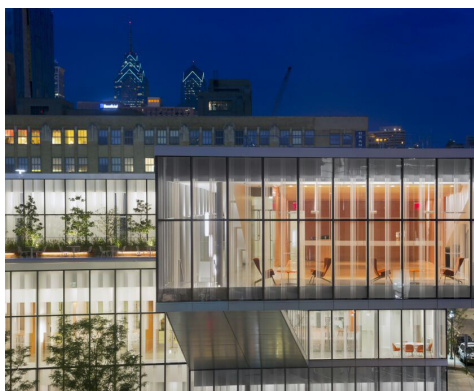
South Bank development), the hospitals, and satellite campuses will not be incorporated, although these entities will document their carbon footprint by 2019 as per the Physical Environment Recommendations in *Climate Action Plan 2.0*.

II. Retrofits

- a. Target the top 20% of the buildings that have the highest energy use, specifically targeting buildings that have the greatest opportunity for savings, will receive a deep energy retrofit by 2042. This represents approximately 45 buildings, including nine Century Bond projects, and is roughly equal to 6.5M square feet.

These deep energy retrofits will bring the energy performance of these buildings to the ASHRAE 90.1 – 2013 standard. Implementing this recommendation results in approximately 215,000 square feet of space per year receiving a deep energy retrofit until 2042. The above 45 buildings are to be recommissioned every five years in addition to the deep retrofit schedule.

- b. Create an energy saving template and apply to the 20% of campus buildings that use the most energy and have the greatest opportunity for savings. This template shall be created by the FRES Operations and Maintenance Energy Engineering team by FY16 to identify actions to be implemented as buildings are renovated.
 - c. Develop an energy reduction plan for all building renovation projects, beginning with basic energy benchmarking for all buildings and leading to energy modeling and analysis of alternatives for major renovations.
- III. Recommissioning
- a. Recommission the top 20% of the buildings that have the highest energy use every five years (see Section II.a under Retrofits).
 - b. Recommission the remaining 80% of campus buildings (approximately 135 buildings) on a ten year basis, provided these building conform to the following criteria:
 - i. Normally occupied,
 - ii. Greater than 10,000 square feet,
 - iii. Connected to Penn's utility system.
 - c. Develop a continuous commissioning program over the next five years.
 - d. Increase Penn's recommissioning effort from approximately 12 buildings per year to approximately 19 buildings per year.
- IV. All buildings shall be metered, and projects should consider adding sub-meters to critical systems. In FY15, FRES will begin sharing building level metering data with Schools and Centers as part of the transition to meter-based billing.
- V. Standards and Additional Recommendations
- a. Perform all renovations consistent with the *Penn Engineering Standards*, which call for energy consumption 30% lower than compliance with current ASHRAE 90.1 standard. This requirement is currently a design guide, but it is recommended as part of *Climate Action Plan 2.0* that this change be a mandatory design standard. Compliance is determined by analysis of the entire building performance, and for assessment of building system components in isolation, such as mechanical equipment or HVAC systems.
 - b. All projects where *Penn's Green Renovation Guidelines* apply must meet *Penn Engineering Standards*.
 - c. If there are situations where these standards cannot be met, then the designers must justify to Penn's Operations and Maintenance Energy Engineering team why and offer alternatives to achieve the desired overall building Energy Use Intensity (EUI).
 - d. Modify the *Instructions to Design Professionals* and/or *Engineering Guidelines* so that all new capital projects are required to meet next generation energy codes: ASHRAE 90.1-2013. This change applies to systems that impact the energy usage of the building. The intent of the energy portion of the design guidelines is that they will always be one level more stringent than the current code requirement.
- VI. Investigate alternative strategies and costs, including additional RECs, to achieve the 2042 carbon neutrality goal.



PHYSICAL ENVIRONMENT

Mission

Create and maintain a sustainable campus by increasing ecologically-managed green space, decreasing building energy consumption, and increasing education and awareness of sustainable design.

Five Year Summary

Penn Connects 2.0

The *Penn Connects* plan, launched in 2006, was a blueprint for Penn's future land use, urban design, and campus development. The updated plan, *Penn Connects 2.0*, released in 2011, encompasses Penn's short and long term planning initiatives through 2030, and builds upon the accomplishments of Phase I. This renewed vision explicitly references Penn's sustainability agenda, and integrates environmental stewardship goals into Penn's overall planning initiatives: "To employ University sustainability goals and objectives to inform future development. In particular, balance new construction with adaptive reuse opportunity."

LEED Buildings

The 2009 *Climate Action Plan* stated that all new buildings would be designed to achieve a minimum LEED Silver Certification. As of FY14, Penn has six on campus LEED Certified buildings and several additional LEED-registered projects in construction, design, or planning. Because *Climate Action Plan 2.0* expands to include the Morris Arboretum and the University of Pennsylvania Hospital System, their recent accomplishments to date are included in the following summary.

The Morris Arboretum Horticulture Center was awarded LEED Platinum Certification in 2011, the highest ranking given by the U.S. Green Building Council. The 20,840-square foot facility provides work space for the Arboretum's horticulture, public programs, and facility staff. The Horticulture Center's sustainable design features are found throughout the building and its site: an efficient ground-source heat pump provides heat and air-conditioning for the building; photovoltaic panels provide on-site generation of renewable energy; green roofs showcase drought-tolerant plants; durable materials and finishes minimize maintenance costs; and cisterns are used to capture rainwater to irrigate the landscape.

The Perelman Center for Advanced Medicine, completed in 2008, houses the University of Pennsylvania Health System's Abramson Cancer Center, radiation oncology, cardiovascular medicine and an outpatient surgical pavilion. The state-of-the-art center received a LEED Silver Certification and remains Penn's largest LEED project to date. More than 90 percent of construction and demolition debris—over 20,000 tons—was recycled. Other important features include the use of recycled materials and regionally manufactured materials to support the local economy and reduce fuel consumption and pollution generated from transportation.

The Lerner Center, home to the School of Arts & Sciences' Music Department, received a LEED Gold Certification in 2011. The existing historic structure was restored while a new addition doubled the size of the building to house faculty offices, classrooms, and practice rooms. The building boasts energy-efficient mechanical systems, recycled and salvaged building materials, quality indoor environments, and a new green cleaning program to ensure that the use and maintenance of the building will meet

sustainability goals in the future. Ninety-five percent of construction debris was recycled or salvaged. The Lerner Center has received numerous awards for design and historic preservation, including a 2010 Pennsylvania Preservation Award for Sensitive and Compatible Design of an Addition to an Institutional Building; a Merit Award for Excellence in Architecture Addition/Renovation from the Society for College and University Planning (SCUP); and a 2010 Preservation Achievement Grand Jury Award from the Preservation Alliance for Greater Philadelphia.

Joe's Café in Steinberg-Hall Dietrich Hall was awarded a LEED Gold for Commercial Interiors Certification in 2011. The café's food-service practices, recycling, composting and chemical-free cleaning were highlighted in the LEED application. The café provides local, organic, and healthy menu options, and diverts 50 percent of total waste from landfills through a combination of recycling and composting, both pre- and post-consumer. Joe's Café is Penn's first LEED Commercial Interior certification.

Constructed under the long arcade on the northern side of Franklin Field, the George A. Weiss Pavilion is a multi-function building that houses a new athletic training center for varsity athletes, a fitness facility for Penn staff, students, and faculty, a study center, and ground floor retail space. The Weiss Pavilion, which opened in 2010, is demonstrative of one of the University's oldest architectural traditions – preservation through adaptive reuse. The Pavilion inhabits the space underneath the double-height arches that support the stadium seating, and connects the interior concourse with the new outdoor east-west exterior pedestrian promenade. The project's innovative combination of sub-grade excavation and structural infill has redefined Penn's hundred-year-old football stadium by adding usable space and a dynamic new north façade without increasing the building's footprint. Weiss Pavilion was awarded a LEED Gold Certification. Ninety-five percent of demolition and construction waste was diverted through salvage, reuse, and recycling of materials, including, for example, the excavated soil from the site which was used in the construction of the adjacent Penn Park. High efficiency fixtures reduce water use in the building and green cleaning practices reduce the need for chemical cleaning products, resulting in better indoor air quality. Preservation Pennsylvania recognized the George A. Weiss Pavilion with a Construction Project Award for Public & Institutional Properties.

Golkin Hall, which achieved LEED Gold status, opened in 2012 and provides increased space in

the Penn Law complex for faculty offices, research centers, administrative offices, student organizations, and classrooms. The building was designed to promote interactions among faculty, staff, and students to foster the cross-disciplinary teaching that is a hallmark of the School. Golkin Hall's two green roofs provide outdoor areas for students, staff, and faculty while improving the urban heat island effect and stormwater runoff. The building earned 11 of 15 possible points for indoor environmental quality because of the design's focus on low-emitting materials, daylighting, and thermal comfort for occupants.

The Arts, Research, and Culture House (ARCH), located at Locust Walk and 36th Street, was constructed in 1929 in the Gothic Revival style. Newly restored, as of 2014, the ARCH serves as another focal point for student activities and gathering place for the Penn Community. The ARCH, targeting LEED Silver, is home to three cultural resource centers: La Casa Latina, Makuu, and the Pan-Asian American Community House. These student-focused centers share the building with the Center for Undergraduate Research and Fellowships, a new café, lounges, study spaces and a high-tech multi-use auditorium/classroom. The auditorium seats 150 and is a versatile space that can be used as an active learning classroom, a theater, rehearsal space, or a banquet hall.

The School of Medicine's Smilow Center for Translational Research is home to research initiatives that integrate a range of biomedical disciplines to achieve advances in the understanding of disease and the development of new therapies. In addition to providing space for interdisciplinary research, the building's close physical proximity to Penn Medicine's patient-care facilities in the new Perelman Center for Advance Medicine and the Roberts Proton Therapy Center facilitates the exchange of ideas among clinicians and researchers on new discoveries, techniques and technology. The 500,000 square foot Smilow Center for Translational Research is pending LEED Silver certification in 2014.

The Krishna P. Singh Center for Nanotechnology is the newest LEED Certified building on campus, receiving its Gold Certification in 2014. This premier facility for advanced research, education, and innovative public/private partnerships in nanotechnology features high-efficiency mechanical and electrical systems that operate at 14% above industry standard, plumbing fixtures that reduce water use by 30%, and advanced stormwater management features, including green roofs and underground cisterns. Regionally manufactured and



extracted materials, as well as materials with recycled content, were installed throughout the project. Natural daylight floods the building, reducing the need for artificial fixtures in many of the study and work spaces.

The Wharton School's Steinberg Hall-Dietrich Hall West Tower Entrance addition received LEED Gold Certification in 2014. The 15,000-square-foot addition includes two high-occupancy classrooms and creates a new main entrance with a plaza. The building's green roofs manage stormwater runoff and high-efficiency mechanical, lighting and ventilation systems help to reduce energy consumption.

Penn Park

Penn Park's 24 acres of athletic fields, tennis courts, and ballfields added 20% more open space to campus when it opened in 2011. The former industrial site now houses Penn athletics and recreation facilities among a variety of passive recreation spaces, walkways, elevated bridge connections, and meadows planted with native grasses and over 600 trees. A 2M gallon cistern is located at the heart of the site to capture and reuse stormwater. No synthetic chemicals or fertilizers are used in Penn Park, nor is salt used, to maintain the pH of water in the cistern. Penn Park is the highpoint of the *PennConnects* plan, linking the campus to Center City Philadelphia with a beautiful, public open space adjacent to the Schuylkill River.

Shoemaker Green - Sustainable SITES

Shoemaker Green is the latest major component of the east-west connection between the central campus and Penn Park, serving as a continuation of the Locust Walk / Smith Walk corridor. The site is framed by two of the University's most iconic athletic facilities, the Palestra and Franklin Field, and serves as the

front door to these historic structures. The design of Shoemaker Green is layered with sustainable design features, including porous paving, native plantings, two rain gardens, and high-efficiency lighting. Stormwater is captured from the site and surrounding rooftops and collected for reuse in a 20,000 gallon cistern underneath the site.

Shoemaker Green was selected as a pilot site for the Sustainable SITES Initiative, the nation's first rating system for green landscape design, construction, and maintenance. Shoemaker Green received a Two Star Certification from the Sustainable SITES program one year after its opening in 2013. As a pilot site, the Shoemaker Green project provided the Sustainable SITES program valuable feedback on the developing program's scoring criteria and direction of future certifications. Because the program's rating system emphasized consideration of landscape maintenance practices, participation in Sustainable SITES has already influenced Penn's approach to the entire campus. The Green has proven to be an enormously popular gathering space on campus, and was the first and only landscape project to receive the Delaware Valley Green Building Council's Groundbreaker Award in the fall of 2014.

Kane Park

Kane Park, the triangular park at the juncture of 33rd, 34th, and Spruce Streets, opened in June 2013. The project converted an asphalt parking lot into a public green space for the enjoyment by Penn community and campus visitors. The park features benches, lighting, seasonal plantings, street trees, decorative paving, and a lawn area. Sustainability features include 21 total trees planted, over 300 shrubs, 400 grasses, 1300 daffodils, and 8000 perennials providing seasonal beauty. At this location, existing subsurface

conditions were found suitable for stormwater infiltration, and the site meets the City's Stormwater Regulations by capturing stormwater on site and filtering it into the groundwater.

LEED for Existing Buildings: Operations and Maintenance Pilot

The 2009 *Climate Action Plan* recommended a pilot project to investigate the applicability of LEED for Existing Buildings Operations and Maintenance (EB/OM) across campus. The Wharton School's Huntsman Hall, a 324,000 square foot facility that opened in 2002, was selected for a pilot study of the applicability of LEED EB/OM. Almost two years of analysis and targeted interventions were at the core of this pilot, which collectively revealed that the building, given its unique program and configuration, could not reasonably be retrofitted to achieve or maintain the energy reductions required to achieve LEED EB/OM certification at that time. However, the detailed assessment of Huntsman's operations, systems management, recycling, cleaning techniques, and occupant behavior resulted in the richest analysis to date of any Penn building's maintenance and operational practices. The results of the study provided a guide for numerous opportunities to improve the building's performance, operational efficiencies, and occupant satisfaction. Specific outcomes included implementation of lower toxicity, green cleaning practices; enhanced recycling opportunities (including composting of paper towels from restrooms); installations of water bottle fillers to reduce waste from disposable bottles; enhanced building systems management to conserve energy; and adoption of more sustainable commuter choices by occupants. These practices and other lessons learned continue to be shared across campus to great effect.

Green Guidelines for Renovations

As part of a *Climate Action Plan* recommendation, a LEED CI pilot was completed on the Towne Building in Spring 2010, in which a "typical" renovation project was evaluated to determine if the pursuit of LEED-CI would have improved its sustainability outcomes, and to evaluate the potential for applying LEED CI strategies to campus renovations more broadly. Following the Towne Building pilot, representatives from Facilities & Real Estate Services, Business Services, and several Schools and Centers participated in a full-day charrette to assess the Towne pilot and provide input on the development of sustainability standards and/or guidelines for renovation projects. It was recognized that such renovations, while not as visible as new construction, made up by far the

greatest number of design and construction projects carried out across campus in any given year.

This exercise led to the development of the *Green Guidelines for Renovations*, which addresses the sustainability requirements for small and medium-sized campus construction projects. The *Green Guidelines for Renovations* requires most renovation projects over 10,000 sq. ft. with a project budget over \$7M to pursue LEED for Commercial Interiors, and that smaller renovations follow the *Green Guidelines for Renovations*. These new guidelines ensure that best environmental design and construction practices are adopted on the majority of campus projects without the administrative burden of the formal LEED submission process.

Stormwater Master Plan

In 2013, Penn completed a comprehensive *Stormwater Management Master Plan* for the campus. The Plan included an assessment of all pervious, impervious, and landscaped surfaces on campus and provided an estimate of total stormwater generated within Penn's 280-acre landscape. The plan provided site-specific examples of best practices for stormwater management, including cisterns, bioswales, rain gardens, green roofs, and permeable paving. The Master Plan also includes an Operations and Maintenance Manual for existing stormwater management systems on campus.

Sustainable Landscape Practices

Building on the experience of the Sustainable SITES Initiative at Shoemaker Green, sustainable landscape practices have been adopted for implementation across campus. These practices have had a number of significant impacts: reducing the amount of chemical fertilizers used on campus; eliminating the use of herbicides and pesticides except to treat spot outbreaks; adoption of new native species planting standards; and the reduced use of grass as a groundcover. Penn's Urban Parks maintenance teams now treat campus meadows, grass, turf, and plants with "compost tea," an all-natural amendment that improves soil and vegetation health and discourages weed growth and pest infestation. The compost tea is brewed on campus from compost and leaves and lawn clippings from campus. Biological integrated pest control practices are also used in Penn Park and Shoemaker Green. In fall 2013, staff, faculty and students joined the Penn Park maintenance team to release 30,000 ladybugs to control an aphid infestation on catalpa trees. Praying mantises have also been released on campus to help control damaging insects, further reducing systemic pesticide application.

Physical Environment Recommendations

Many of the initiatives and guidelines launched in the 2009 *Climate Action Plan* focused on new construction on Penn's campus. Recommendations included in *Climate Action Plan 2.0* represent a more holistic approach to Penn's physical environment by addressing renovation projects and ecological landscape practices. In addition, *Climate Action Plan 2.0* extends the Plan's geography from the core academic campus, to more fully reflect the full range of the University's built assets.

I. New Construction

- a. Continue to pursue LEED Silver Certification for all new construction, with focus on "Penn plus" credits. The "Penn Plus" credits are oriented around the University's sustainability goals for energy performance, water conservation, and indoor environmental quality.

II. Green Guidelines for Renovations

- a. Introduce the *Green Guidelines for Renovations* to provide direction on Penn's renovation work. Projects that meet all five of its criteria are to consider design, construction and certification of the project to a minimum Silver Level under LEED for Commercial Interiors (CI). The decision to pursue LEED CI when a project meets the threshold criteria outlined in the Guidelines will be made by the project team in consultation with School/Center leadership prior to the issuance of a Request for Proposal to design consultants. More detailed project sustainability goals are to be defined during the project kick-off meeting. For those renovation projects under \$7M and smaller than 10,000 sq. ft, the renovation must follow the *Green Guidelines for Renovations* – a compilation of best practices drawn from experience across campus.
- b. With the launch of the *Green Guidelines for Renovations*, a recommendation from the 2009 *Climate Action Plan*, a thorough roll-out plan to all related stakeholders will ensure the guidelines are thoroughly institutionalized.

III. Sustainable Landscapes

- a. Develop an *Ecological Landscape Stewardship Plan*, building on the experiences emerging for the design, construction and maintenance of Penn Park and Shoemaker Green (in

particular, participation in the Sustainable SITES Initiative), that aims to minimize chemical use, encourages only organic soil amendments, more sustainable plantings, and compost all organic matter by 2019. This proposed plan will be undertaken through a series for pilot studies, and will:

- i. Assess current landscape management needs and practices and identify areas for improvement.
 - ii. Develop comprehensive management and monitoring plan for existing landscapes.
 - iii. Reduce landscape waste and power equipment use on campus.
 - iv. In addition to Penn's existing leaf composting site, create an organic recycling site by 2018 so that all organic materials can remain on-campus.
 - v. Gather data in specific areas on campus to assess impact and provide input for campus-wide best practices in landscape maintenance.
 - vi. Create performance benchmarks.
- b. *Water Conservation & the Penn Stormwater Master Plan*
 - i. Continue to improve stormwater management through the use of pervious/permeable paving systems and reclamation of water through plantings and infrastructure.
 - ii. Institute a regular maintenance schedule to identify leaks and improve Penn's existing irrigation system to conserve less water.

- c. Promote biodiversity and ecological environments on campus through the following strategies:
 - i. Strongly encourage, maintain, and respect existing urban forest during construction projects.
 - ii. Revise design guidelines and landscape standards so that new landscape projects will have no more than 10% of any one species, 20% of any one genus, or 30% of any family.
 - iii. Improve natural habitats for native flora and fauna.
 - iv. Explore implementation of advanced glazing on all new and renovated structures to reduce bird strikes and protect native species.
- d. To encourage locally sourced and responsible use of construction materials on campus, the design and maintenance of Penn's landscape will:
 - i. Re-use and recycle existing materials whenever possible,
 - ii. Source material locally, and
 - iii. Encourage use of long-lasting materials.

IV. Partnership with Development and Alumni Relations

Collaborate with Development and Alumni Relations to identify possible fundraising and development opportunities related to sustainability initiatives in capital projects and across campus.

V. New Geography

The geography of *Climate Action Plan 2.0* is broadened to more fully include the full extent of the University's built assets. Many of these locations have already implemented a robust variety of initiatives related to energy conservation and environmental sustainability. Including them in *Climate Action Plan 2.0* recognizes the good work that has been taking place in parts of the University that were not included in the 2009 *Climate Action Plan*, while also providing recommended future goals.

- a. The University of Pennsylvania Health System
 - i. *Inventory of Ongoing Practices*: Document current state of UPHS environmental sustainability efforts to institutionalize best practices and build upon past successes, including LEED Certifications obtained, transportation, recycling, energy conservation, etc.
 - ii. *Emissions Inventory*: The University of Pennsylvania Health System will develop a carbon footprint for the Hospital System, beginning with The Hospital of the University of Pennsylvania and Presbyterian Hospital. The carbon emissions calculations will be carried out using a methodology that allows for a straightforward comparison to the University's emissions as developed for the 2009 *Climate Action Plan*.
 - iii. *Capital Investment Guidelines*: Evaluate and select appropriate sustainability benchmarking system(s), in particular LEED for Healthcare and/or Green Guidelines for Healthcare.
 - iv. *Leadership Opportunities*
 - 1. Explore the possibility of adding a University of Pennsylvania Health System Sustainability Coordinator position to guide current and new sustainability initiatives.
 - 2. Identify research and administrative centers within the University of Pennsylvania Health System (for example, the Center for Toxicology) that through their missions and in their ongoing work offer opportunities to educate the University community about the link between healthcare and environmental sustainability.
 - 3. Investigate and implement as appropriate connections with the FY15 Academic Theme Year "Year of Health" as a starting point for outreach.
 - v. *Timeline and Schedule*: Define schedule and resources required to implement this plan and further UPHS' sustainability initiatives.

b. Morris Arboretum

- i. *Inventory of Ongoing Practices*: Document current state of the Morris Arboretum's environmental sustainability efforts to institutionalize best practices and build upon past successes, including landscape management, horticulture, the construction and operation of a LEED Platinum building, academic programs and community outreach and engagement.
- ii. *Emissions Inventory*: The Morris Arboretum will investigate the development of a carbon footprint. The carbon emissions calculations will be carried out using a methodology that allows for a straightforward comparison to the University's emissions as developed for the 2009 *Climate Action Plan*. This will include goals for increasing heating and lighting efficiency. Set priorities based on cost effectiveness.
- iii. *Leadership Opportunities*: Explore the possibility of adding a Morris Arboretum Sustainability Coordinator position to guide current and new sustainability initiatives.
- iv. *Education*: Identify opportunities to further engage and educate the University community and the broader public about the Morris Arboretum's portfolio of programs and efforts around sustainable landscapes, trees, and horticulture.
 1. Investigate and implement as appropriate connections with the FY15 Academic Theme Year "Year of Health," with a specific focus on the connection between health and wellness and nature.
 2. Timeline and Schedule: Define schedule and resources required to implement this plan and further the Morris Arboretum's sustainability initiatives.

c. New Bolton Center

- i. *Inventory of ongoing practices*: Document current state of the New Bolton Center's environmental sustainability efforts to institutionalize best practices and build upon past successes, including landscape management, recycling, energy conservation, open land conservation, animal husbandry, etc.
- ii. *Emissions Inventory*: The New Bolton Center will explore the development of a carbon footprint. The carbon emissions calculations will be carried out using a methodology that allows for a straightforward comparison to the University's emissions as developed for the 2009 *Climate Action Plan*.
- iii. *Ecological Stewardship Plan*: Establish an Ecological Landscape Stewardship Plan for the New Bolton Center that creates more sustainable management practices and promotes healthier landscapes and a more diverse local ecosystem.
 1. Assess current landscape management needs and practices, identify areas for improvement, and institutionalize best practices.
 2. Develop comprehensive management and monitoring plan for existing trees and landscapes.
 3. Assess the use of synthetic chemicals and other toxic materials in the campus landscape, with the goal to reduce/eliminate synthetic chemicals and toxic materials through investigation of alternative methods for weed and pest control.
 4. Focus on improved habitat quality and biodiversity in the campus landscape.
 - a. Improve natural habitats for native and adaptive flora and fauna.
 - b. Increase perennial plantings, meadows and woodlands.
 - c. Create performance benchmarks.

iv. *Leadership Opportunities*

1. Consider the possibility of adding a New Bolton Center Sustainability Coordinator position to lead the New Bolton Center Green Team and oversee existing and future sustainability efforts.
2. Formalize information sharing between the West Philadelphia campus and New Bolton center

v. *Timeline and Schedule:* Define schedule and resources required to implement this plan and further the New Bolton Center's sustainability initiatives.

d. Leased Space and Real Estate practices

The *Climate Action Plan 2.0* aims to build upon and institutionalize sustainability goals for Penn's leased space and real estate projects.

- i. Explore formalizing the requirement for all new development on Penn owned land to be LEED Silver minimum.
- ii. Continue to modify Penn's leasing policies to include a commitment to environmental sustainability.
- iii. Integrate green leasing policies into agreements to encourage energy conservation, waste minimization, and improved indoor environmental quality in leased space.

iv. Identify and refine sustainable design considerations for the Pennovation Center at South Bank, a campus annexation across the river and to the south of the greater University of Pennsylvania campus. Capitalize on the site's opportunity to revitalize the premises to fulfill the needs of cutting edge innovative technologies while sustainably revitalizing the existing context and history of the site and building infrastructure. In order to accomplish these aspirations, the project will utilize a variety of metrics to achieve its goals and targets. First, following the guidance of *Climate Action Plan 2.0*, the Pennovation Center building renovation will be certified under the LEED for New Construction and Major Renovation system. The goal is to achieve a minimum of Silver under LEED BD+C v3.

e. Over the next five years, the Penn Sustainability Office will engage with the Health System, the Morris Arboretum, the New Bolton Center, and Penn Real Estate Services to provide guidance and advice as they identify their carbon emissions and develop plans to enhance their overall environmental sustainability.



WASTE MINIMIZATION & RECYCLING

Mission

Improve Penn's environmental performance by minimizing solid waste through community education, strategic purchasing, appropriate infrastructure, and proper disposal, strengthened by relevant and accurate metrics.

Five Year Summary

Recycling at Penn

When the 2009 *Climate Action Plan* was launched, Penn had the capacity to only recycle plastics #1- #3. In 2010, Penn's recycling vendor began accepting all plastics, #1- #7. As part of a strategy to maximize participation, Penn began its transition to single-stream recycling. At Penn, single-stream means that paper, cardboard, all plastics, glass, and metals can be placed in the same bin for recycling across campus.

In 2014, the University's continued commitment to waste minimization and recycling efforts is highlighted by the expansion of composting on campus, renewed efforts by Penn Purchasing to reduce packaging waste and to purchase products made with recycled materials, and the creation of several new recycling centers to meet the needs of specific schools.

In 2012, the School of Engineering and Applied Science (SEAS) responded to the growing demand for recycling by using a Penn Green Fund grant to convert an existing trash room into a multi-material recycling center in the Towne Building. The SEAS Recycling Center, Penn's first, provides a system for collection of non-traditional items, including compact fluorescent light bulbs, ink and toner cartridges, electronic waste, pens and markers, and batteries, as well as traditionally recycled materials such as cardboard, paper, metals, and plastics.

Following the success of the SEAS Recycling Center, the Perelman School of Medicine opened a recycling room in Fall 2013. This room provides a single location to recycle batteries, phones, toner cartridges, pens, hardcover and softcover books, paper, and single stream materials. The recycling room allows the school to consolidate collection of recyclables and identify the quantity generated.

The 2009 *Climate Action Plan* set a goal of a 40% recycling rate by 2014. Penn's current recycling rate of commingled materials is 24%. When food waste for composting, e-waste, and other non-traditional recycled waste streams are included, the rate is about 26%. More significant than the increase in the recycling rate has been Penn's continued reduction of landfill waste. Between FY07 and FY13, landfill waste dropped from about 6200 tons to about 5500 tons – almost a 10% reduction of waste going to landfills. The focus on use of reusable, durable products and reduced waste from packaging, shipping, and delivery will continue to reduce landfill waste at Penn, and may be a fundamentally more meaningful metric than recycling.

Construction & Demolition Waste Recycling

Facilities & Real Estate Services' Small Projects Group uses a Philadelphia-based company to outsource its construction and demolition waste recycling. On average, more than 80% of all such waste hauled from Penn's campus is diverted from the landfill. Metal, lumber, plastics, cardboard, drywall, siding, wiring, carpet, and more, are sorted and recycled. Projects include single-room renovations to multi-million dollar capital projects, such as the Golkin Hall and the Singh Center for Nanotechnology.

Composting

Since composting efforts at Penn began in 2010, food waste collection and recycling has expanded to several locations on campus, including all campus dining halls and Joe's Cafe at Steinberg Dietrich Hall. The nature of all-you-care-to-eat student cafes demands that an abundance of dining selections are available for all diners, and composting remains an important strategy to avoid landfilling food waste. Through careful management, Penn's food service provider works hard to minimize the generation of food waste; both kitchen waste and post-consumer waste is collected for shipping to an off-site Recycling Center for conversion into compost.

Across campus, there has been growing interest in composting, reflected in the following successful projects:

- 2009: Mayer Hall initiated composting from student suites by providing an outdoor bin for residents' food waste.
- 2010: Through the implementation of a Green Fund grant, the Annenberg Public Policy Center implemented on-site composting in a worm bin for food waste and leftovers from staff meals.
- 2011: The Women's Center installed a garden compost bin to collect food waste from its eco-kitchen, which is used by staff, guests and resident scholars, and students for daytime, weekend, and evening events throughout the year.
- 2012: The first zero waste basketball game at the Palestra occurred. All products sold were either recycled or composted.
- 2012: At the Moravian Court Recycling Center, a BiobiN container was installed to collect up to 10 tons of food waste from eight restaurants and the 34th & Walnut Penn Food Court.
- 2013: The Penn Museum started composting food waste from its cafes and events through a Green Fund grant.
- 2013: The School of Arts & Sciences launched composting at Williams and Claudia Cohen Hall by collecting paper towels and food waste for shipment to an off-site Compost Center.
- 2013: The Office of Development and Alumni Relations commits to making the QuakerFest Picnic during Homecoming a zero waste event,

with all waste and leftovers being composted or recycled.

- 2014: Alumni Weekend's main picnic was zero waste.
- 2014: The Law School begins collecting compost items in its courtyard to make the process more accessible to students, staff and visitors.
- 2014: The Office of the President commits to zero waste for all for their sponsored events.

Waste analysis at Penn's college houses and campus buildings has determined that as much as 30% of Penn's waste is comprised of organics. Focus on recovering this material and keeping it out of the landfill will significantly reduce carbon emissions from campus, while cutting cost and improving the region's environment.

Waste Audits

Conducting waste audits on representative campus buildings has become a useful tool in assessing ways to increase the campus' recycling and diversion rate. Since 2009, six buildings, ranging from lab buildings to classroom buildings, have been audited to identify issues and evaluate opportunities to improve the waste stream. Feedback from these audits not only helps improve the individual building's performance, but of other similar buildings on campus. Waste audit results have led to new physical and operations refinements such as recycling signage in buildings, loading dock reconfigurations, and bin relocations and replacements.

Solid Waste Management Plan

Facilities and Real Estate Services commissioned a comprehensive *Solid Waste Management Plan* for the University in 2012, working with representatives from Schools and Centers, students, FRES Operations & Maintenance Staff, and the Sustainability Office to assess Penn's existing practices and create a plan for improvement. The consulting team and Penn participants began by documenting Penn's existing conditions and practices, discovering, for example, over 100 different types of waste receptacles in use on campus and over 30 different types of signage. Ongoing work included stakeholder interviews and workshops, culminating in the completion of the *Solid Waste Management Plan* in June 2013. The plan offers 30 recommendations for University-wide implementation, including:

- Increasing Penn's waste diversion rate.

- Improved operational efficiency in separating and handling waste.
- Piloting new practices, such as composting in classroom and office buildings.
- Increasing the efficiency and ease of Penn's waste management systems.

To assist with implementation of the Plan, a Solid Waste Management Working Group was formed with stakeholders from Facilities & Real Estate Services and School and Center representatives. The Working Group meets bi-weekly and continues to review and modify the plan as it is implemented. One year into the implementation of the *Solid Waste Management Plan*, results include:

- New standards for arranging trash, compost and recycling containers in clusters to promote ease-of-use.
- New signage and pictograms for recycling, compost, and landfill.
- Pilot programs for composting in several different Centers and Schools.
- New standards for recycling batteries and light bulbs (considered a special form of hazardous "Universal Waste.")
- New requirements for Penn's on-campus food vendors to reduce waste generated in their operations.
- New standards for events over \$1,000 in catering to generate significantly less waste and improve recycling and composting efforts across the University.

Dining's Green2Go Program

In 2013 Penn Dining introduced the "Green2Go" Program in residential dining cafes on campus to reduce the usage of disposable to-go containers. The program replaces disposable food containers with reusable eco-containers for students who use the dining halls in 1920 Commons, English House and Hill House. The microwave-safe, anti-microbial containers are used to take food out and are then returned at the next visit. At the end of their usable life, the containers can be recycled. Students on a dining plan are automatically eligible to participate, but they must register and get a key2green key tag. Once students are finished, they simply return the rinsed container to one of the three participating dining cafes and exchange it for another or for a key tag.

The program was completed through the support of a Green Fund grant. The University's food service provider seeks to eliminate by more than two-thirds the number of disposable clamshell containers that end up in the waste stream at Penn. In the first Academic Year of operation, the program resulted in a 99.3% reduction in disposable takeout containers used in the residential dining facilities. In Academic Year 2014-2015, all dining plan participants were also provided with reusable to-go utensils, with the expectation of seeing similar reductions in the use of to-go utensils.

Zero Waste

Zero waste events strive to divert more than 90% of waste from landfill and are quickly becoming the norm on Penn's campus. The Green Campus Partnership developed a *Zero Waste How To Guide* in 2013 to provide step-by-step instructions on how to achieve zero waste at any scale event, from department wide gatherings to small staff meetings to lunchtime seminars.

Zero waste events create awareness on waste minimization issues and advance the University's existing composting and recycling efforts to include one-time events on campus that usually generate large amounts of waste.

For example, QuakerFest, the annual picnic/tailgate event before the fall homecoming football game, was held as a zero waste event for the first time in 2013. All serviceware and flatware were compostable. Student volunteers were on hand to guide attendees about what waste was placed in which bin. Abundant signage also helped steer QuakerFest's 1,400 attendees in the right direction. The result of this effort was that 94% of waste from QuakerFest was diverted from the landfill. In addition, Alumni Relations and the Sustainability Office again partnered to make the Alumni Picnic, held in May 2014 with over 2,000 attendees, a zero waste event.

Other Schools and Centers are learning from these initiatives and formalizing zero waste events within their operations. In FY14, the School of Arts & Sciences and Wharton each held zero waste staff appreciation events with great success. Additionally, Athletics Eco-Reps helped to facilitate a zero waste basketball game at the Palestra in February 2014, and Penn Green students helped facilitate a zero waste Welcome Back BBQ, the first such event hosted during Move-In.

The *Zero Waste How-To Guide* was presented at a zero waste informational luncheon, held during the

summer of 2014, to reach event planners from all of the University's Schools and Centers. The goal of the luncheon was to demonstrate the accessibility of zero waste strategies to events and activities of diverse size, location and scope.

Ben's Attic

Ben's Attic is an online exchange site for surplus Penn property that provides an easy and sustainable way to find a new use for items that are no longer needed by University departments, such as equipment, furniture and supplies. The site was launched in 2010 and was created in response to customer requests and in support of the *Climate Action Plan* goal of minimizing waste.

Since its launch, the Department of Purchasing Services has completed major improvements to Ben's Attic. These enhancements were made possible through a Green Fund Grant and are based on feedback and surveys conducted in Spring 2013. The new features are designed to make Ben's Attic more effective and increase the number of items being repurposed, thereby sending fewer items to landfill.

Sustainable Purchasing

Purchasing Services seeks to increase awareness and enable the purchase of products with a reduced or minimal (ideally zero) environmental impact as compared to other similar products. The University's preferred suppliers, in particular Penn Marketplace participating suppliers, are encouraged to include products that promote environmental stewardship in their online product catalog, and Penn faculty and staff members are empowered to select environmentally friendly products for their purchase requirements.

Purchasing joined the Sustainable Purchasing Leadership Council in 2014. The Council is a non-profit organization whose mission is to support and recognize purchasing leadership that accelerates the transition to a prosperous and sustainable future. The Council's programs and community of practice will help institutional purchasers to: prioritize opportunities to influence the social, environmental and economic life cycle impacts of purchased goods and services, identify existing leadership standards and approaches that address these priorities, benchmark progress toward goals, and receive recognition for advancement.

Office Depot, the University's office products business partner in collaboration with Telrose Corporation, supports Penn's Green Purchasing Initiatives by sponsoring a "Faculty, Staff, and Student Personal

Purchase Program," "Office Products Customer Advisory Committee," School and Center "Lunch & Learn" sessions, and Penn-specific Office Depot promotions through the Supplier Showcase.

In 2010, Penn required all purchase orders issued to have a minimum order value of \$25, combining over 6,000 purchases into larger orders in the first year and eliminating the environmental impact of making many small deliveries. In 2011, the University expanded this effort to include a series of new initiatives aimed at decreasing the impact of purchasing practices. Office supply orders weighing less than 20 pounds transitioned to delivery in paper bags rather than corrugated cardboard cartons, and were transported to Penn in reusable delivery totes that are returned for reuse. Through this process, many tons of cardboard delivery boxes and the associated carbon emissions were eliminated.

Additionally, Purchasing's Green Alternatives Program allows customers to view on line environmentally preferred alternatives to products they normally purchase. These products are signified on the Purchasing website by a green banner in the product description. Easy to read, side-by-side comparisons show the requested item and the more environmentally preferable alternatives and allow customers to easily compare product and price, keeping with the Penn strategy that when given the choice, the community will select the sustainable option.

Managed Print Services

The Managed Print Services (MPS) Program provides members of the Penn community access to the latest print technologies, high quality printer maintenance services and supplies, and the best overall office printing value, all while dramatically reducing paper usage, electrical consumption by printers, and waste generated by inefficiently used toner and ink cartridges. In 2013, Purchasing Services launched the program in three Schools and two Departments:

- School of Veterinary Medicine
- School of Dental Medicine
- Annenberg School for Communication
- University Lab Animal Resources
- School of Arts & Sciences, Chemistry Department.

Prior to implementation, an extensive survey of office printing practices and costs was completed. Across the initial schools participating, a remarkable average of 1.5 printers per employee was discovered, with a similar average of 1.5 local printers for every networked device. The total cost for the 600 existing inventory of printers identified was over \$309,000 a year, an average of more than \$500 per year per print device. Penn currently has over 20,000 print devices on campus, so the aggregate cost of office printing at the university is likely around \$10M annually.

For the participating Schools and departments, phase one of the MPS implementation has yielded significant savings of up to \$310,000, or an estimated 23% cost reduction — without removing any printers but by simply from shifting supplies/services to more efficient suppliers and right-sizing the existing printer fleet.

Additional Green Product Categories

In addition to the specified program outlined previously, Purchasing also promotes waste management and recycling by promoting sustainable practices in the following categories:

- Catering (A list of Caterers using biodegradable flatware/cups, etc.)
- Lab Supplies & Services
- Laundry Services
- GreenGlo Safe DNA Dye
- Breakroom Supplies
- Water Filter Systems
- Copy Paper
- Business Cards and Stationary
- Maintenance, Repairs & Operations
- Janitorial Supplies

PennMOVES

Since 2008, Business Services has operated PennMOVES, a year-end student move out program, cumulatively collecting over a half-million pounds of clothing and household goods that Penn students were unable to take with them when they left campus. Rather than ending up in the landfill, these items are collected and donated to Goodwill, where they are sold to the local community. On average, over 45 tons of clothes, shoes, furniture, kitchen equipment and school supplies are collected each year. In addition, PennMOVES has addressed the collection and reuse or recycle of non-perishable, unopened food, and e-waste.

College House Student Eco-Reps help promote PennMOVES within each college house, telling students what, where, and when to donate their unwanted belongings. Where possible, indoor locations are identified for students to drop off donations, and Eco-Reps assist Residential Services in bringing them to the nearest collection site.

In 2014, the College House Eco-Reps coordinated an expanded “Move-Out Bag” program with the help of RAs and GAs. This program involves providing trash and recycling liners to each room for the residents to use during Move-Out, with House-specific instructions about how and where to properly dispose of reusable goods, recycling, and waste.

Waste Minimization & Recycling Recommendations

The waste and recycling recommendations included in the 2009 *Climate Action Plan* hinged upon increasing the current options for recycling and reuse. Today, the campus provides options for expanded recycling, composting, and other streams. Education and metrics are key components of the recommendations included in this section. With expanded opportunities to reuse or recycle waste, a commitment to education and clear signage must follow. New in *Climate Action Plan 2.0* are explicit goals about purchasing as Purchasing Services has developed a rich toolkit to educate members of the Penn community on how strategic purchasing can contribute towards reducing the campus' ecological footprint.

- I. Recycling & Source Reduction Goals
 - a. Continue to reduce overall Municipal Solid Waste;
 - b. Increase recycling rate, currently at 24%, to 30% by 2019
- II. The University will complete the implementation of the *Solid Waste Management Plan* developed in 2013. As part of this implementation, the following goals will be explored:
 - a. Create and implement a data reporting tool to track waste diversion metrics.
 - b. Investigate appropriate staffing for achieving goals of the plan.
 - c. Increase participation of all key stakeholders at the University.
 - i. Designate an individual in each school/Center/Division who will engage with the Solid Waste Working Group;
 - d. Standardize successful pilot programs, such as single stream compaction units.
 - e. Improve and expand composting operations on campus.
 - f. Implement and/or pilot standard operating procedures developed as part of the *Solid Waste Management Plan*.
 - g. Continue to codify and regularize signage, graphics and communications tools related to waste minimization & recycling.
- III. Expand recycling & reporting of construction debris (C&D) for all construction and renovation projects across campus.
 - a. Embed required C&D recycling through a certified debris recycler in contract language.
- IV. Increase the number of zero waste events held by schools, centers, and departments
 - a. Develop thorough resources about hosting zero-waste events for the Green Campus Partnership website.
- V. Purchasing
 - a. Deliver Green Purchasing Solutions
 - i. Utilizing Purchasing's "playbook" approach, each purchasing category manager will identify green purchasing opportunities in his or her spend category, and require strategic suppliers to report on green initiatives and opportunities at each quarterly business review.
 - b. Recognizing Green Purchasing Champions
 - i. Develop a recognition program to identify and reward green purchasing among our University buyers.
 - c. Modernizing Supplier Contracts
 - i. Partner with the Office of General Counsel to update existing contract and Request for Proposal language to incorporate sustainability.
 - d. Connect with Industry Leaders
 - i. Continue to actively participate in the *Sustainable Purchasing Leadership Council* to share best practices with industry colleagues and identify those to be considered at Penn.



TRANSPORTATION

Mission

- Emphasize and plan a quality pedestrian campus environment,
- Encourage use of bicycling and public transportation for commuting, and
- Provide safe, efficient local transportation services for the University community.

Five Year Summary

Sustainable Transportation Initiative

Penn's Sustainable Transportation Initiative was launched in 2010 in support of Penn's *Climate Action Plan's* goal of lowering the University's carbon footprint. The focus of the Initiative is developing and expanding sustainable commuting options for members of the Penn community. The Department of Transportation and Parking has implemented over a dozen new programs or service enhancements designed to provide faculty, staff and students with more choice, greater flexibility in their commuting options.

The 2009 *Climate Action Plan* set a goal that over half of the University population will use alternative transit by FY14. In 2007, 40% of the Penn community used alternative transit to commute to campus. It is currently estimated over 50% use alternative transit.

Bike Planning Committee

In 2013, The University Council's Standing Committee on Facilities and Campus Planning identified the need to advance discussion on biking issues. The resulting Bicycle Planning Committee was formed in Spring 2013, consisting of stakeholders across the University including the Division of Business Services, Facilities and Real Estate Services Division, Public Safety, Student Health Service, PennCycle, and University

Bike Collective. The committee is charged with standardizing information and policies on campus bicycling issues.

Since its creation, the Committee updated and published a new formal bike policy addressing current bicyclist and motorist concerns, standardized guidelines for bike corrals and other infrastructure, and prioritized maintaining key bike paths adjacent to campus construction sites. The Committee provides broad community input on biking accommodation and accessibility and has been working to identify locations on campus for the City of Philadelphia's planned bike share program. The Committee recently completed an online dynamic map with layers showing bike lanes, bicycle corrals, and bike repair stations around campus (www.facilities.upenn.edu/maps). In addition, the committee created a single webpage (www.upenn.edu/biking), which lists all the resources on campus for cyclists, including safety tips, information on bike registration, and the Penn bike helmet reimbursement policy, among other resources.

Bicycle Resources on Campus

Since 2009, Penn has nearly doubled its bicycle parking capacity, now totaling approximately 5,050 individual bicycle parking spaces. Penn continuously upgrades existing racks and focuses on creating centralized bicycle parking areas or corrals in high-use areas accessible to City bike lanes. These corrals are designed to provide parking for occupants and visitors of nearby buildings, and include the University standard stainless steel u-racks, improved lighting, and security cameras. In accordance with the bike policy, corrals are placed wherever possible at the perimeter of the campus to discourage bicycles within the campus pedestrian core. The intent is to have a bike corral located within 100 yards of every campus facility.

To further the goal of reducing single occupancy vehicle travel to Penn as part of its Sustainable Transportation Initiative, Penn's Business Services Division has provided two bicycle repair stations near areas of high bike storage concentration. These bike repair stations were funded through the Green Fund and provide a valued amenity for the biking community. One repair station is located between the parking garage at 38th and Walnut and Pottruck Gym, and the other near the bike corral by the Chemistry building on 34th and Spruce Street. The free bike repair stations include tools to change a tire, instruments to adjust the seat and brakes, and a self-service air pump.

Car Share

In 2008, Penn partnered with PhillyCarShare, a local non-profit founded by Penn alumni, to become the largest North American university car share partnership. With over 30 cars within a ten-block radius of campus, these cars, rented by the hour, offer students, faculty, and staff the mobility of their own car without the cost. The membership of this service reports owning 10,000 fewer cars than they would otherwise. As part of this partnership, Penn staff receives discount rental rates. In August 2014 PhillyCarShare changed its name to Enterprise CarShare, now a for-profit company, and continues to provide similar services, maintaining its commitment to the community and the environment.

Penn has also contracted with Zipcar to provide members of the Penn community with the convenience of driving a car without owning one. Zipcar, the world's largest car sharing service, offers over 30 different makes and models, which can be rented by the hour or by the day, and provides discounts to Penn students, faculty and staff. Gas, insurance and up to 180 miles of driving is included with each 24-hour reservation.

Penn Parking Services also installed electric charging stations at the lot on the corner of 34th and Chestnut Street, which are available to permit holders and transient parkers via a subscription service operated by Blink.

Vanpool

As part of Penn's Sustainable Transportation Initiative, Penn Transportation and Parking has partnered with vRide, a national leader in vanpooling and sustainable transportation, to expand vanpooling options to Penn faculty and staff. The vans operate throughout the region, including Pennsylvania, New Jersey and Delaware, and offer a reliable, affordable and sustainable way to commute to campus. Depending on pickup locations and the number of

riders, the average cost of participating in a vanpool is between \$100 and \$150 a month. Riders generally meet at a convenient spot near their residences and are brought directly to campus.

Carpool

Penn Parking encourages carpooling to reduce the number of single occupancy vehicles on campus. Current Penn Parking permit patrons can take advantage of discounts based on occupancy and location choices by teaming up to form a carpool. Registration is on an annual basis and each carpool member receives a pre-tax deduction via payroll. Carpool discounts are as follows: 25% for a two person carpool; 50% for a three person carpool; 75% for a four person carpool.

Penn Commuter Options

Penn Parking Services provides information to Penn faculty and staff on public transportation options in the Philadelphia area. To encourage the use of public transportation, Penn offers discounted options and/or pretax benefits through programs such as the Commuter Pass Program (COMPASS), TransitChek®, PATCO Freedom Pass and NJ Transit. All programs are available to full-time University faculty and staff, who do not participate in the parking permit program. Penn also offers discounts to students for SEPTA through the Penn Pass program and NJ Transit.

Occasional Parking

Designed to allow commuters who normally use public transit, vanpooling, carpooling or biking as their primary commute mode to be able to drive to campus when necessary, Penn Parking offers Occasional Parking and the Emergency Ride Home Program.

Occasional Parking is available at Penn Park and provides two free uses per year with up to 10 additional uses, priced at 50 percent of the daily maximum rate.

Emergency Ride Home

Penn Transportation and Parking promotes a transportation alternative that members of the University community can use when they have an emergency at home. The Emergency Ride Home (ERH) safety-net program targets commuters working in southeastern Pennsylvania who carpool, vanpool or use public transportation on a regular basis. In the event of an unexpected personal or family emergency or illness, unscheduled overtime, or if the regular ride home is not available for certain reasons, registered commuters are provided with a free ride to home, their car or to the place of the emergency.

Funded and administered through the Delaware Valley Regional Planning Commission (DVRPC), the ERH program enables registered participants to use this service twice a year, and be reimbursed up to \$50 per trip. The program is designed to take the worry out of ridesharing or taking public transit by ensuring the availability of transportation in case of an emergency or working late.

Propane Fueling Station

Penn Transit Services installed a 1,000-gallon liquid propane fueling station at Penn's South Bank campus to provide an onsite fueling station for Penn's fleet of propane-powered shuttle vans. Propane is cost efficient and environmentally preferable to gasoline, producing 30-90% less carbon monoxide and half the toxins and smog of gasoline-powered vehicles. Additionally, more than 90% of locally available propane is domestically produced, making it more readily available than most other alternative fuels.

Penn's facility is the only privately owned propane-fueling station in Philadelphia. Penn Transit plans to retrofit more of its existing fleet to utilize propane fuel over the next five years, to help further reduce Penn's carbon footprint and operating costs. Additionally, Penn Transit staff can help other University departments convert their vehicles to propane, which they can fuel on campus, enabling them to reduce fueling costs.

Low Emission Vehicle Parking

Penn Parking Services designated five-percent of its garage parking spaces for Low Emitting Vehicles. This effort was designed to support members of the Penn community who choose to drive low emission vehicles and to support Penn's goal to increase the number of LEED certified buildings on campus. The low emission vehicle parking spaces are located near the entrance, exit or elevators of parking garages and are available to qualifying low emission and/or fuel-efficient vehicles until 10:00 a.m. each day. After 10:00 a.m., other permit holders or paying visitors can make use of these spaces.

Additional Transportation Options

- LUCY (Loop through University City)®

LUCY is a shuttle operating Monday through Friday, from 6:10 a.m. until 7:00 p.m., between 30th Street Station and University City. Supported by Penn, managed by the University City District and operated by SEPTA, LUCY helps members of the University community ease their commutes. Rides are free for holders of a valid PennCard. Schedule and route information is maintained by the University City District.

- Penn Transit Services

Penn Transit Services, the University operated transportation system, provides shuttles and buses that offer safe and efficient travel to, from and around campus. The service is free for holders of a valid PennCard. When used with other options throughout University City and with specified service boundaries that extend into Center City, riders can utilize an integrated transit system that is accessible year round, eliminating a need to have a car on campus.

- Penn-Drexel Bus Share

Penn has partnered with Drexel to allow Penn students, faculty and staff unlimited use of the Drexel Bus service across its three campuses - University City Main Campus, Center City Hahnemann Campus and the Queen Lane Medical Campus, at no charge with a valid PennCard.

Transportation Recommendations

Many of the recommendations included in the 2009 *Climate Action Plan* were oriented around reducing single-occupant vehicle trips to campus. Since the launch of the plan, Penn Transit has created new programs and/or developed new initiatives to achieve this goal. While included in the first plan, bicycle safety and access receive a reinvigorated and expanded emphasis in *Climate Action Plan 2.0*.

- I. Continue to enrich and develop the Sustainable Transportation Initiative's current and future programs.
- II. The University will complete the development of the *University Bike Policy*, updated in 2014. The purpose of the Bike Policy is to:
 - a. Enhance pedestrian and rider safety;
 - b. Ensure safe ingress/egress to and from all University facilities;
 - c. Reduce bicycle thefts; and
 - d. Encourage bicycle registration.
- III. Create a centralized online resource on campus for bicyclers, including bicycle rack maps, the University Bike Policy, bike lane maps, etc.
- IV. Continue to replace older bicycle racks with University standard bike racks.
- V. Expand the number bike repair stations on campus.
- VI. Investigate developing a membership to Penn gyms specifically for bicycle commuters to be able to access shower facilities and lockers.



OUTREACH & ENGAGEMENT

Mission

Build a culture of sustainability that informs all constituents of University life.

Five Year Summary

Student Eco-Reps

Established in 2009, the Student Eco-Reps program has flourished in the student community at Penn. The program has grown from 27 students in three College Houses to 53 students in all 12 College Houses, Athletics, and Greek Communities. Over the past five years the program has become formalized with the creation of a student Executive Board, which in turn has helped to further define roles for Eco-Reps within their communities. Student Eco-Reps are trained in various environmental issues— energy conservation, waste minimization, recycling, water conservation, alternative transportation, and consumer choices— and serve as peer educators in their college houses and throughout campus.

One of the signature components of the Eco-Reps program is an annual large-scale environmental service event. Both a team-building activity and a community service event, this initiative encourages students to connect with local organizations to improve sustainability throughout the region.

- The first such service event in 2011 was with the Schuylkill River Development Corporation (SRDC) along the Gray's Ferry Crescent. Eco-Reps planted trees along the new Schuylkill River Trail in addition to helping with general trail management.
- In 2012, Eco-Reps spent a day pruning trees, weeding flowerbeds and planting seeds at

Woodland Cemetery, a National Historic Landmark in West Philadelphia.

- Bartram's Garden, also a National Historic Landmark, hosted the large-scale service event in 2013. Students from John Bartram High School joined with the Eco-Reps for this event through their partnership with the Netter Center for Community Partnership. Students helped with plant management, composting, mulching and garden beds preparation for planting. The 2013 service event was held in conjunction with the global Green Apple Day of Service, organized by The Center for Green Schools at the U.S. Green Building Council (USGBC).

During the academic year, Eco-Reps organize various events and awareness campaigns to energize their communities about environmental sustainability. These events include waste audits, environmental movie screenings, faculty speakers, and zero waste events.

The Athletics Eco-Reps program, started in 2012, allows student athletes to bring environmental sustainability to athletics at Penn. Two of the Athletics Eco-Reps' signature efforts to date have been zero-waste basketball games at the Palestra and greening the Penn Relays. Building upon two years of groundwork to reduce the Penn Relays' environmental footprint, Eco-Reps coordinated 40 volunteers over three days to staff an outreach table, hosted an educational sustainability trivia and an Instagram photo contest in 2014. In addition, Eco-Reps coordinated a water refill station, reducing bottled water consumption during the Relays.

Athletics Eco-Reps have organized two zero-waste basketball games in 2013 and 2014. At the Penn vs.

Harvard Basketball game in February 2014, Athletics Eco-Reps helped divert over 90% of the waste from the landfill through recycling and composting, working with Facilities, the food vendor and Athletics Administrators.

In 2013, Penn became a member of the Green Sports Alliance (GSA). GSA is a non-profit organization that helps sports teams, venues, and leagues enhance their environmental performance. Through communication and networking with other members of GSA, Penn has received guidance on developing athletics sustainability initiatives. The Penn Quakers is not only the first member of the Ivy League, but also the first university on the East Coast to join GSA.

Staff & Faculty Eco-Reps

The Staff & Faculty Eco-Reps program was started following the launch of the 2009 *Climate Action Plan* and has developed into a robust outreach program to staff and faculty. The program has grown from approximately 30 members in 2010 to 102 in 2014. Staff & Faculty Eco-Reps represent offices with over 1400 staff members in all Schools at Penn. Once a month, Eco-Reps gather to share best sustainable practices and hear sustainability presentations from the Sustainability Office and guests from across campus and the City.

Eco-Reps are equipped with the tools to implement change, spreading awareness of important sustainability issues and conservation strategies in their respective offices and departments through projects, events, and creative informational campaigns. Examples include:

- Eco-Reps regularly receive presentations about energy conservation at home and on campus, how to host zero-waste events, and University transportation and purchasing initiatives.
- In 2013 and 2014, Eco-Reps participated in the 30x30 Challenge, a program designed to encourage participants to engage in outdoor activities for 30 minutes for 30 days. The Green Campus Partnership organized outdoor events, such as campus tours, BYO picnic lunches, and park walks during the 30 day period.
- The Office of the University Architect has led tours of new LEED buildings and sustainable landscape projects, highlighting sustainable design features.
- In 2014, Eco-Reps read Michael Pollan's *The Omnivore's Dilemma* and held a discussion food systems and local food.

School & Center Sustainability Coordinators

One indicator of the growth of Penn's environmental commitment has been the appointment of School and Center sustainability coordinators. To date, seven School/Center sustainability coordinators have been appointed: Perelman School of Medicine, School of Engineering & Applied Science, School of Arts and Sciences, the School of Veterinary Medicine, The Wharton School, School of Social Policy & Practice, and The Law School. At monthly meetings with Penn's Sustainability Office, the group discusses best practices and shares new project ideas across Schools and Centers. Many of the prominent sustainability-related pilots have been led by these Sustainability Coordinators, such as deskside recycling, school-wide battery recycling, and examination of the benefit of applying LEED's EB/OM protocols to an existing building.

PennGreen

PennGreen is a pre-orientation program centered on environmental sustainability. About 40 incoming freshmen are accepted into this program, which requires them to arrive on campus four days early to learn about Penn's *Climate Action Plan* and gain an insight into current work in sustainability at Penn and in the City of Philadelphia. In previous years, PennGreen students toured Penn Park and new LEED buildings on campus, and met with leading sustainability faculty and environmental professionals working in Philadelphia. In and around Philadelphia, the students toured materials recycling facilities, an industrial composting center, urban farms, and were acquainted with Philadelphia's extensive park system. PennGreen is led by upper-class students who are members of various environmental groups on campus or have contributed in some way to environmental sustainability at Penn.

Move-In Green

Since its launch in 2011, the Move-In Green engagement program has grown to become an integral part of the annual student move-in process. Students apply each spring to be chosen as leaders or volunteers for Penn's only move-in program dedicated to environmental sustainability.

One of the key components of the program is to assist recycling management in all eleven College Houses during move-in. Volunteers and leaders assist by breaking down cardboard boxes, handing out recycling and trash bags, and explaining to students and parents how to separate their waste on campus. Move-In Green also encourages new and returning

students to think critically about what it means to live sustainably. At outreach tables, Move-In Green volunteers and leaders distribute promotional items and inform new and returning students about how to get involved in Penn's environmental sustainability initiatives.

In the last two years combined, Move-In volunteers and leaders helped recycle approximately 50 tons of cardboard. In 2013, volunteers at the outreach tables distributed a record amount of 2,000 compact fluorescent light bulbs for use in personal desk lamps. During the 2014 move-in, Move-In volunteers helped staff several zero waste events, including PennFest, one of the large freshman dining events during New Student Orientation.

Green Living

The Green Living Certification program was launched in the fall of 2013. The program certifies and rewards residents living on-campus for making choices that reduce their everyday environmental impact. As Penn's first environmental certification program aimed at rewarding students' personal behaviors, the program supports behavior change and a culture of sustainable living on campus. Certified students receive a Gold, Silver, or Bronze decal for their College House door celebrating their accomplishment.

In its first year, over 160 residents became certified. Feedback gathered from a survey and interviews indicated that Green Living's main goal—raising awareness about aggregate effect of personal lifestyle choices --was achieved as participants said they learned new ways to reduce their environmental impact. Participants also felt reaffirmed and rewarded for already having environmentally conscious behaviors, and for being educated and informed about how to further refine their behaviors.



Green Office

Offices represent a significant portion of campus energy and resource use, as well as waste production. The Green Office Certification program, launched in 2012, is one of the Sustainability Office's most highly visible and fastest growing programs. By recognizing the efforts of staff and faculty to green their daily activities through the Certification, the program both incentivizes sustainable behavior and educates entire offices in best practices for conservation, waste minimization, and environmental awareness.

The Green Office Certification is organized into seven sustainability categories including waste, purchasing, energy, water, indoor air quality and human health, transportation and involvement. Offices earn points by completing specific sustainability actions, which are assigned point values based on their impact and level of difficulty to implement. Some actions can be implemented at no cost while others may have a cost associated with initial implementation, but result in operational savings over time. Certified green offices receive a framed certificate celebrating their achievement, and are acknowledged on the Green Campus Partnership website and other publications for their positive contribution to sustainability at Penn.

In the two years since the introduction of Penn's Green Office Certification program, 71 offices have been certified, covering more than 1,400 employees. Of these, four offices have achieved Level 4 Green Office, the highest level, meaning they have invested a substantial amount of time, effort, and often budget, in bringing and maintaining environmentally sustainable practices into their day-to-day operations.

Feedback on the existing Green Office Certification program was gathered from key staff in Purchasing, IT, Transit and a focus group of sustainability



coordinators and leaders in certified offices; and improved actions are included in the updated Green Office 2.0. This program will be used for new certifications, as well as offices that will apply for re-certification, giving them the opportunity to challenge themselves to find new ways to be 'green'.

Power Down Challenge

The Power Down Challenge is an annual energy reduction competition hosted by Penn's Green Campus Partnership. During the competition, residents and occupants in participating buildings are challenged to reduce their electricity usage and play a role in Penn's energy conservation initiatives.

The competition began in 2009 as a way to promote energy conservation among students within College Houses including Hill, Kings Court English, and Rodin. It challenged residents to unplug their devices before leaving for winter break and to commit to the effort by signing a "Power Down Pledge." The College House with the greatest participation, Hill College House, received a prize upon the residents' return from Winter Break.

Since 2009 the Power Down Challenge has expanded to include all College Houses, Sansom Place and many academic campus buildings, and has shifted focus from cutting energy consumption during the winter break to reducing energy use during occupied periods. The 2014 competition was extended to four-weeks and included additional award categories. Buildings were ranked based on the percent reduction in daily kWh usage as well as gross kilowatt-hour reduction over the course of the competition. This resulted in four winners, two from the College House category and two campus buildings, competing under criteria accommodating the differences in age, size and use of buildings. The 2014 competition also used newly installed, remote-reading meters in

College Houses and academic buildings to increase the frequency of feedback to building occupants. The intent was for participants to use the metering data to educate building occupants, promote energy conservation, and help realize significant utility savings over the course of the four weeks.

The Challenge has seen many buildings successfully reduce their electric consumption by as much as 20% during the competition and aims to get participants to build upon that experience and adopt energy conserving practices that will continue year round.

ReThink Your Footprint

In 2008, Penn began to participate in Recyclemania, an annual national competition among campuses where the main gauge of success is the amount of materials each university can collect in recycling bins. By 2013 Penn's efforts in environmental sustainability had outgrown the competition limitations and the ReThink Your Footprint campaign was initiated in Fall 2013 to replace it. The new program broadened Penn's approach to include educational messaging about reducing overall waste and better management of all kinds of solid waste. The first annual event culminated with a three-week awareness campaign designed to engage the entire Penn Community. While recycling remains a component of the ReThink Your Footprint campaign, practices contributing to source reduction and reuse of materials now share the headlines.

In support of Penn's *Climate Action Plan's* goals in the area of waste minimization, an assortment of initiatives, events, presentations, and other forms of outreach took place during the first annual ReThink Your Footprint campaign to share information on source reduction, reuse, and recycling. Known as "ReThink Happenings," the initiatives and activities that were part of ReThink were promoted and shared



Green Fund Projects

Clockwise from top: Penn Garden, Going Greener - Morris Arboretum Bus Trips, PennCycle, Ozone Washing Machines at Pottruck, Worm Composting at Annenberg Public Policy Center



on social media, in addition to being posted on the Green Campus Partnership website. ReThink Your Footprint will continue to be a part of the Green Campus Partnership's portfolio of programs to enhance environmental sustainability on campus.

Green Fund

Initiated in 2009, the Green Fund has seeded innovative ideas in environmental sustainability from Penn students, faculty, and staff. Funded by the Division of Facilities and Real Estate Services, the Green Fund welcomes ideas from all members of the Penn community about ways to improve Penn's environmental performance and reduce campus emissions by providing one-time grants up to \$50,000. Participating projects support goals and objectives of the University's *Climate Action Plan*.

Applications are accepted biannually in the spring and fall and are considered by the Green Fund Review Board, a group of nine individuals from the Penn Community representing students, faculty, and staff. Since its inception, the Green Fund has supported more than 49 projects, and continues to provide the opportunity to realize innovative project ideas on sustainability issues. A snapshot of funded projects is listed here:

- Hand Dryer Pilot Project in Ware College House:* Replaced paper towels with hand dryers in 20 bathrooms in Ware College House as a pilot. The goal of the project was to pilot the feasibility of replacing paper towels with hand dryers, save money, and conserve paper.
- Ozone Washing Machines at Pottruck:* Installed high-efficiency ozone washing machines at the Pottruck Health and Fitness Center, replacing eight-year-old traditional washing machines that use standard hot water, detergent, and bleach. Ozone washing technology is a proven cost-saving and environmentally beneficial process, operating on cold water only, reducing detergent needs by 90%, and cutting drying time.
- GreenVote:* Conceived during the 2013 Penn Apps hackathon, GreenVote is a smartphone app designed by three Penn undergrads that collects real-time thermal comfort data of occupants in Penn buildings. GreenVote was piloted in SEAS and Wharton buildings over a one-year period.
- Organic Compost Tea Program:* Purchase and installation of a compost tea brewing system, and the equipment and training necessary for the implementation of a Sustainable Landscape Management program for the Morris Arboretum.
- Penn Sustainability Review:* Supported the establishment of a peer-reviewed undergraduate journal on sustainability. The Penn Sustainability Review (PSR). PSR is a student-run online and print publication featuring sustainability-related opinion editorials, leadership interviews, and academic papers.

Creating Canopy

Through partnerships with Philadelphia Parks & Recreation and the Pennsylvania Horticultural Society, Facilities and Real Estate Services has sponsored the distribution of over 500 free yard trees, along with tree planting and care information, to homeowners of the University community over the last three years.

Penn partnered with the City's Parks and Recreation Department to distribute free trees on a first-come, first-served basis to faculty and staff homeowners who live within the city. These Penn employees helped to increase the City's tree canopy by planting and maintaining the free tree in their yard as part of Mayor Michael A. Nutter's *Greenworks* plan.

In 2012, the Creating Canopy program was extended to include faculty and staff who live in surrounding suburbs, through an additional partnership with the Pennsylvania Horticultural Society and its Plant One Million campaign.

Class Tree Program

Since 2008, a tree on campus has been planted in honor of each graduating class as part of the Penn Class Tree program. Wharton alumnus Bill Hohns is the sponsor of the Penn Tree Program. Every year, the Morris Arboretum, in consultation with the University Landscape Architect, provides graduating students with a selection of three specimen trees. The graduating class votes to choose which tree will become their Penn Tree. The classes of 2012 and 2013 dedicated a Yellowwood and a Chestnut Oak, respectively, as their Penn trees, and Penn's Class of 2014 selected a White Oak to be planted on College Green.

Communications

Sustainability marketing goals were defined in 2009 and a robust communications plan was designed to engage, motivate, and educate the Penn community while reporting on the University's progress on its commitment. It has enhanced outreach efforts through the creation of a Green Campus Partnership (GCP) brand identity, website, e-newsletter, advertising, media relations, and a growing social media presence.

The GCP website (www.upenn.edu/sustainability) has become the central tool for sustainability communications. It functions as a library of "green" resources, a promotional tool for upcoming events and campaigns, and a repository for program information. The site offers a dynamic and engaging home page, news items from across the University, weekly content updates, links to social media, and highlighted ways to participate. The site consistently tracks between 5,000 and 7,000 unique visitors per month, depending upon the time of the academic year. An email newsletter, *Red & Blue On College Green*, has also been produced on average 4 times per year, and is distributed to a list that has grown from approximately 2,000 subscribers to nearly 7,000 people. This publication highlights university-wide programs in each of the *Climate Action Plan* themes, and covers activities of interest to students, faculty, staff and the surrounding community.

In addition, an ever expanding presence on social media to share timely items and stay connected has proven the most pervasive and effective tool to communicate news and campaigns with Penn students especially. In just the past year, social media activity has grown on the GCP Facebook and Twitter accounts by 30-50% respectively. Finally, media coverage of sustainability initiatives, events, and milestones has been very strong over this five-year period, with significant recognition and coverage generated through hundreds of stories by Penn publications, local, regional, and national media outlets.

Outreach & Engagement Recommendations

While a specific section dedicated to outreach and engagement was not included in the 2009 *Climate Action Plan*, this theme has developed a far-reaching set of programs and initiatives aimed at engaging the entire Penn community around environmental sustainability. The *Climate Action Plan 2.0* formalizes these initiatives and sets concrete goals for the next five years.

I. Student Engagement

- a. Sustain a vibrant Student Eco-Reps program in College Houses, Greek chapters, and Athletics that fosters a culture of sustainability among students on campus.
- b. Establish twice a year formal update meetings with Student Sustainability Association at Penn (SSAP) (student umbrella group) to refine programming and identify opportunities for collaboration.
- c. Investigate the development of a committee which enhances the collaboration between the Green Campus Partnership and the Division of the Vice Provost for University Life, specifically the Office of Student Affairs and the Cultural Resource Centers.

II. Staff & Faculty Eco-Rep Program

- a. Maintain a dynamic and pervasive Staff & Faculty Eco-Rep program that serves as a key sustainability information source for University staff and faculty.

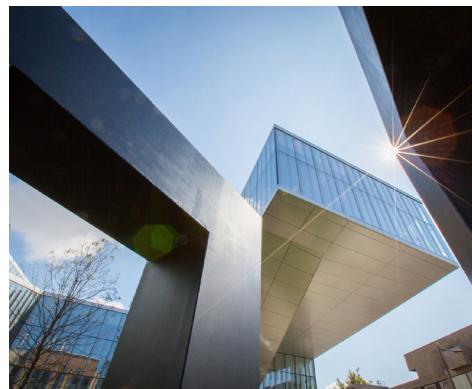
III. Green Office

- a. Increase the percentage of offices certified under the Green Office Certification Program. Goal of 30% of Penn staff working in certified offices by 2019.

IV. Green Fund

- a. Restructure the Green Fund with direction from the Green Fund Review Board.
 - i. Shift from capital intensive infrastructure and building improvement grants to operational and education-oriented grants, while providing information on the Energy Reduction Fund, Facilities Renewal Fund, and Century Bond funding mechanisms to applicants interested in projects over \$30,000.
 - ii. Provide more frequent, targeted grants to students, staff and faculty by introducing a rolling application program and monthly awards for grants under \$7500.

V. Work with School and Center senior leadership to encourage and expand School/Center Sustainability Coordinator roles to all Schools and Centers at Penn.



LOOKING FORWARD

This year marks a major milestone in Penn's ongoing transition to a greener university. Significant progress has been made on all of the initial goals from the 2009 *Climate Action Plan*, and some have been greatly exceeded. In each initiative there have been noteworthy successes, owing to the dedicated efforts of countless members of Penn's Schools, Centers, and administration.

Climate Action Plan 2.0 is a truly collaborative effort, born from the continued enthusiastic engagement of Penn's students, staff, and faculty. The plan's commitments demonstrate that a culture of sustainability has taken hold at Penn: our collective community is seeing that progress can and must be made to further our environmental goals. Our achievements thus far give us the confidence that we are on the right path, and the courage to continue to challenge ourselves to attain greater success in coming years.

Penn is not a fragile organization, and its leadership understands that now is not the time for timid steps. Bold progress in complex organizations can only arise in an environment that anticipates and welcomes change. We know that our path is ambitious; we expect to face struggles and encounter setbacks -

but we acknowledge that as a leader in higher education and in the larger culture, Penn has a responsibility to take risks, ask difficult questions, and put our highest values into practice. Penn has always been at the vanguard of societal change, and our response to today's environmental challenges will be no different.

The past five years of hard work, explorations, and accomplishments have given rise to transformative policies and have impacted every aspect of Penn's operations. Yet the heart of our efforts remains our institution's untiring dedication to excellence in teaching, learning, and research. The future will be shaped by those best equipped to meet its challenges, and Penn remains committed to preparing our graduates not only through the most rigorous academic and research training, but also by demonstrating the highest environmental commitment throughout every aspect of our operations. This spirit of inquiry, experimentation, and excellence that imbues Penn's faculty and students remains the bedrock of our sustainability efforts, and our greatest asset as we move confidently into the future.