

A photograph of a modern University of Pennsylvania building with a large glass facade and a green roof. In the foreground, a wooden walkway is surrounded by lush green plants. A woman with a backpack and a man with a shopping bag are walking on the path. The sky is clear and blue.

UNIVERSITY OF PENNSYLVANIA

CLIMATE AND SUSTAINABILITY ACTION PLAN 3.0

2019-2024





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LETTER FROM PENN PRESIDENT AMY GUTMANN



I am pleased to present the University of Pennsylvania's *Climate & Sustainability Action Plan 3.0*, our roadmap for Penn's next great step forward in environmental sustainability. We launched our first sustainability plan in 2009. Since then, as global environmental challenges have become increasingly acute, we have accomplished much. But more remains to be done. Penn continues to set its sights ever higher, and this newest plan will challenge our ingenuity and commitment as we move purposefully toward our commitment of a 100% carbon neutral campus by 2042.

This is, in a sense, Penn's own moon landing - an enormous challenge of great logistical and technical complexity. In this effort, our greatest asset is the depth of faculty, student, and staff commitment to solving these problems. Just since 2009, we have opened eight new faculty research centers across five schools, each of which focus on some aspect of environmental performance to help meet the global climate crisis.

We are creating new lines of research in energy and data science, which will be housed in buildings that reflect our ambitious sustainability aspirations. Penn students are especially passionate about environmental issues, creating an ever-increasing number of interest groups and clubs to explore issues and advocate for improved environmental performance. We welcome their input and enthusiasm.

I hope you will take time to read through this report carefully. The next five years will see our carbon emissions reduced even further, our campus building efficiency improve, and a sustained effort to invest in environmental improvements through additional retrofits, renewal projects, and expanded recommissioning efforts in our labs, classrooms, and offices. Concurrent with that effort, our waste minimization programs, sustainable purchasing strategies, and expanded transportation options will build on the current success of initiatives already in place.

Penn's leadership sets a national model. Our concern is unflagging, and our commitment is resolute: we are embarking on the next step in addressing the urgent environmental challenges of 2019 and beyond.

INTRODUCTION

Penn's Climate and Sustainability Action Plan 3.0 represents a vision for our university's environmental future.

Penn's remarkable transformation into one of the world's premier teaching and research institutions has been fueled by enormous growth in capabilities, means, and influence. The implementation of President Amy Gutmann's Penn Compact puts the University in a strong position to address the environmental challenges ahead. **Penn will continue to lead through inclusive climate change scholarship, innovative policy formation, and adoption of best practices** to dramatically impact campus efficiency and reduce emissions.

Through deliberate assessment, analysis, and planning, Penn is taking action to mitigate climate impacts, adapt to emerging environmental conditions, and prepare our university—and our students—to lead in a rapidly evolving world. The CSAP 3.0 recommends goals to:

- » **Expand the scope of sustainability research** in Penn's academic centers, and connect students to Penn's abundant resources in this field;
- » **Continue to reduce carbon emissions and explore expanded use of renewable energy** to mitigate the impacts of climate change;
- » **Embrace circular economy principles to reduce waste and single-use products;**
- » **Make sustainable choices in transportation, purchasing, and business operations;** and
- » **Inform, educate, and empower the Penn community** to participate in Penn's climate change and sustainability goals.

Penn has made remarkable progress since the launch of its first *Climate Action Plan in 2009*. Engagement on environmental issues from students and faculty has grown dramatically.

Accurate and timely reporting of key indicators by the Sustainability Office allows Penn's leaders to make informed decisions: improving energy efficiency, reducing carbon emissions, streamlining workflow, managing costs, and prioritizing investment. Highlights since 2009 include:

- » **Expansion of scholarship, research, and course offerings on sustainability**, including 8 new environmentally-focused academic centers;
- » **Building-related emissions reductions of over 27%** - a result of on-campus conservation strategies plus a lower-carbon energy supply;
- » **Certification of Penn's main academic campus as a Level II Arboretum and the adoption of LEED Silver minimum standards;**
- » **28% waste diversion rate** due to innovative purchasing and diversion strategies;
- » **Recognition of individuals and teams across Penn who develop innovative ideas to improve purchasing sustainability;**
- » **Adoption of sustainable options by nearly 50% of all commuting subsidy recipients;** and
- » **Continued engagement and education of the campus community** through social media, newsletters, campaigns, and affinity groups.

Penn's CSAP 3.0 goals will test the ingenuity of the campus community as we continue to reduce our ecological footprint while prioritizing environmental health and resiliency. **The focus is on Penn's 100x42 carbon neutrality pledge**—an ambition worthy of Penn's commitment, and feasible given the University's resources and expertise.

The CSAP 3.0 will translate Penn's ambitions into action and our shared values into accomplishments.

THE PENN CLIMATE & SUSTAINABILITY PLAN 3.0

Executive Summary

The *Climate and Sustainability Action Plan 3.0 (CSAP 3.0)* outlines Penn's goals for improved environmental performance in 2019 to 2024. As with the first two iterations of Penn's *Climate Action Plans*, this plan's five-year horizon ensures both that we hold ourselves accountable for progress, and that we make timely and accurate reports to our stakeholders, including students, faculty, administrators, alumni, and trustees.

The plan that follows is the result of deliberative discussions stretching over 15 months that involved over 180 students, faculty, and staff members of the seven subcommittees of *Penn's Environmental Sustainability Advisory Committee (ESAC)*.

Two aspects of the *CSAP 3.0* are different from Penn's previous two climate plans. The first is the plan's title: members of Penn's ESAC Academic Subcommittee advised that term "sustainability" be included, as many of the areas in which Penn has made progress encompass more than carbon mitigation. Penn's ongoing efforts to reduce waste, make responsible purchasing and consumption choices, and improve options for sustainable commuting have modest impact on carbon emissions, but lead to improved ecological health of our region - clearly a part of Penn's sustainability ambitions. The expansion of our academic offerings, internships, and environmental research also greatly expand Penn's leadership on sustainability - and support for this work is a key feature of the *CSAP 3.0*.

The second difference in *CSAP 3.0* is a result of deeper understanding of the urgency of climate change mitigation. The October 2018 release of the International Panel on Climate Change's *Special Report on Global Warming of 1.5°C* stated that only unprecedented emissions reductions within the next ten years will keep this century's a global temperature rise below 1.5°C. Even a half a degree more of warming would have devastating impacts on our shared environment and on civilization: mass extinctions, drought,

floods, extreme heat, increasingly severe storms, and exacerbated poverty for hundreds of millions of people. Penn's ESAC members, and the entire campus community, is responding by redoubling its efforts to reduce campus emissions, consistent with President Amy Gutmann's *100x42* carbon neutrality pledge—a 100% carbon neutral campus by 2042.

PLAN ORGANIZATION

The *CSAP 3.0* is organized around seven initiatives, each developed by an ESAC subcommittee. Each section begins with the subcommittee's mission statement and an introduction of initiatives' themes, detailing how the work contributes to Penn's sustainability agenda. A chart outlines the five-year goals and respective strategies. Following the goals, each section acknowledges Penn's successes from the previous two climate action plans, including initiatives that have become integrated into Penn's best practices, highlights of key successes, and graphic representations of progress.

Academic goals include:

- » Campus as Lab initiatives;
- » Advancing regional sustainability through faculty leadership and student internships;
- » Improving climate literacy on campus;
- » Expanding tracking and reporting of sustainability majors, minors, and concentrations; and
- » Improving opportunities for cohesive sustainability education at Penn.

Key highlights of Penn's *CAP* and *CAP 2.0* accomplishments in academics include a tripling of courses included in Penn's *Sustainability Course Inventory*, the considerable growth of academic centers focused on environmental issues, and the development of robust programs for undergraduate and graduate/professional sustainability internships and research fellowships.

The Utility and Operations section has a single goal:

- » **Reducing the campus overall carbon emissions, in accordance with Penn’s carbon neutrality target of 2042.**

Highlights of past Utility & Operations work include the development of robust recommissioning programs, vastly improved utility data metering and reporting, and the implementation of the \$200M Century Bond program of lighting upgrades and deep energy retrofits.

The Physical Environment goals include:

- » Updating campus design and management standards to incorporate best sustainable practices;
- » Advancing ecological stewardship of the campus landscape; and
- » Improved environmental performance of Penn’s real estate holdings, including energy efficiency, green leasing policies, and sustainable practices for landlords.

Past highlights include the adoption of LEED Silver standard for capital projects, the creation of Penn’s *Ecological Landscape Stewardship Plan*, and the designation of Penn’s West Philadelphia academic campus as a Level Two arboretum in the international ArbNet Certification standard.

The Waste Minimization and Recycling goals include:

- » Increasing Penn’s waste diversion and minimizing landfill waste; and
- » Supporting the City’s 2035 Zero Waste initiative by registering campus buildings to report waste and recycling data and aligning waste minimization and diversion strategies with those outlined by the city.

Highlights of past work include improved tracking and reporting of waste and diversion, routine recycling of construction and demolition waste, and launching food waste composting programs in local restaurants, academic buildings, and all student cafes.

The Purchasing goals include:

- » Increasing procurement of sustainable food products;
- » Encouraging purchase of low- or zero-emissions vehicles across campus;
- » Evaluating mechanisms to reduce or offset emissions from Penn-sponsored air travel; and
- » Expanding sustainable office equipment leases and purchases.

Past highlights include elimination of cardboard from office product deliveries, the launch of Penn’s Green Purchasing Awards, and integration of sustainability goals within service, purchasing, and procurement contracts.

The Transportation goals include:

- » Creating an accessible, integrated, and multi-modal transportation system for Penn students, staff, and faculty;
- » Supporting an accessible and safe campus for cyclists and pedestrians;
- » Improving efficiency of parking and transportation facilities; and
- » Introducing more electric and low-emitting vehicles into Penn’s fleet.

Past highlights include the development and promotion of incentives for sustainable commuting, adoption of best practices in fleet management, and the development of a robust cycling and pedestrian infrastructure.

The Outreach and Engagement goals include:

- » Expanding and strengthening existing outreach programs; and
- » Engaging with Penn’s leadership to continue to serve as sustainability champions by participating in and promoting sustainability initiatives

Past highlights include the creation and growth of campus engagement programs such as the *Penn Green Fund*, *Student Eco-Reps*, *Staff and Faculty Eco-Reps*, the development of the *Sustainability Coordinator’s Group*, and support for student extracurricular organizations through the *Student Sustainability Association at Penn*.

The Penn Sustainability Office has developed an assortment of campus-wide outreach and education programs, including the *Power Down Challenge*, *ReThink your Footprint*, *Move-In Green*, the *Penn MOVES* recycling program, and the 30x30 nature awareness program.

With the *Climate and Sustainability Action Plan 3.0* as the blueprint, Penn embarks on another five years of environmental leadership. We are responding to today's urgent call for action, guided by a long-term vision and supported by strong commitment from Penn's senior leadership, alumni, students, staff, and faculty. We look forward to your engagement and support for our work and in the challenging journey ahead.

ACADEMICS

MISSION

1. To make climate change and sustainability part of the curriculum and educational experience available to all students, including classroom instruction, extracurricular experiences, and research & internship opportunities;
2. To support faculty teaching, learning, research, and scholarship on sustainability
3. To inform the entire University community of our principles of sustainability and its three key constituent pillars: environmental protection, economic prosperity, and equitable distribution of resources

Introduction

Over the next five years, Penn faculty will **continue to make sustainability scholarship a priority** by expanding and strengthening existing academic programs, identifying opportunities for collaboration, and increasing access for undergraduate, graduate, and professional students to cutting edge research and policy analysis.

For students, Penn's goal is to **increase access to degree programs, research opportunities, career preparation, and educational pathways.**

For faculty, the goal is to **support excellence in scholarship** and improve cooperation and collaboration among departments and academic centers.

For the entire Penn community, the goal is to **expand awareness of critical issues, highlighting Penn's leadership role in creating a more just and equitable local, regional, and global society.**

At the same time, the Sustainability Office will work with select faculty and students to identify and **develop research opportunities that use Penn's campus as a living lab** that, in promoting campus sustainability, have potential broader application beyond campus



GOALS

GOAL	STRATEGY
Support cross-disciplinary research and coordination of work between Schools and Academic Centers.	Work with the Office of the Provost to promote curricular opportunities, coordination of scholarship in Schools and Centers and promotion of majors, minors, and concentrations in sustainability studies.
Support the use of campus-as-lab to promote applied learning	Develop a formal campus-as-lab initiative to merge Penn's operational sustainability goals with applied learning and research for faculty and students.
Support the City's regional sustainability objectives and provide professional development and real-world learning opportunities to Penn students	Formalize a Civic Sustainability Fellowship program to place Penn students in internships with City and regional agencies
Improve the climate literacy of Penn students	Develop a climate literacy assessment of Penn's undergraduate student body and recommendations to strengthen climate change education across the curriculum.
Expand tracking and reporting of student enrollment in sustainability-related majors, minors, and concentrations	Track the number of students enrolled in sustainability-related majors, minors, and concentrations
Improve opportunities for a cohesive sustainability education at Penn	Improve opportunities for a cohesive sustainability undergraduate education by identifying course sequencing and essential early-curricular courses



Students in Byron Sherwood's field biology course study mussels' effectiveness in cleaning the water of the Schuylkill River.



ACCOMPLISHMENTS

Since the launch of the 2009 Climate Action Plan and subsequent *Climate Action Plan 2.0*, sustainability academic programs, centers, and education opportunities have expanded dramatically. There are now over 400 sustainability-related courses offered at Penn; new sustainability-focused academic centers have been established and continue to flourish; and new sustainability fellowships and internships continue to expand and offer new opportunities for students to work with researchers and leading area practitioners.

INTEGRATED BEST PRACTICES FROM CAP 2.0

The undergraduate Sustainability and Environmental Management Minor was launched with the first Climate Action Plan in 2009; **an average of 5 students annually have availed themselves of this minor.**

The *Integrating Sustainability across the Curriculum* program allows undergraduate and graduate students to work directly with faculty on research projects, the creation of new sustainability-themed courses, or upgrades to existing classes to highlight sustainability. **40 students and 74 faculty have participated** since the program launch in 2012, with 20 new and 43 existing classes updated.

Under the leadership of the ESAC Academics Subcommittee, support for student research and internships in environmental management and sustainability has grown significantly.

- » **The Civic Sustainability Fellows program has provided internships with leading regional environmental non-profits and city agencies for students since 2016**, with 6 students acquiring full-time positions with the organizations for which they interned or based on their work at these organizations
- » **Penn Sustainability Research Grants, Penn Undergraduate Research Mentorships, and research grants awarded to Academic Centers have funded 39 students**, providing them an opportunity to work directly with faculty on current environmental research projects.

- » Partner academic programs and centers have included the Penn Program in Environmental Humanities, the Water Center at Penn, the McHarg Center, and the Hayden Scholars Program.
- » Starting in 2018, Penn Sustainability has partnered with the Civic House to create *Alternative Spring Break* programs focused on regional energy and environmental justice issues. **11 students have participated.**

In 2009, the Earth and Environmental Sciences Department offered undergraduate, Masters, and PhD degrees focused on earth science and environmental studies, including one of the oldest Masters in Environmental Studies programs in the country. Since the launch of the Climate Action Plan in 2009, academic programs including the following have been added:

School of Engineering and Applied Sciences

- » Chemical and Biomolecular Engineering Concentration in Environmental Engineering
- » Materials Science & Engineering Specialization in Energy Conversion & Storage
- » Mechanical Engineering & Applied Mechanics Concentration in Energy Engineering
- » Vagelos Integrated Program in Energy Research

The Wharton School

- » Undergraduate Business Concentration in Environmental Policy & Management
- » MBA in Energy, Environment, and Sustainability



Perelman School of Medicine

- » Graduate Medicine Certificate in Environmental Health Sciences

Weitzman School of Design

- » Master of Science in Environmental Design
- » Graduate Certificate in Ecological Architecture
- » Graduate Certificate in Ecological Planning
- » Graduate Certificate in Environmental Building Design

In addition, eight new centers including the following have been established that focus on sustainability, spanning five schools and providing research and learning opportunities for faculty and students.

Weitzman School of Design

- » Center For Environmental Building & Design
- » Kleinman Center for Energy Policy
- » McHarg Center

The Wharton School

- » Institute for Global Environmental Leadership

Penn Law

- » Program on Regulation

School of Nursing

- » Nursing Global Health minor

School of Arts and Sciences

- » Undergraduate Health & Societies Concentration in Environment & Health
- » Organization Dynamics Concentration in Sustainable Development

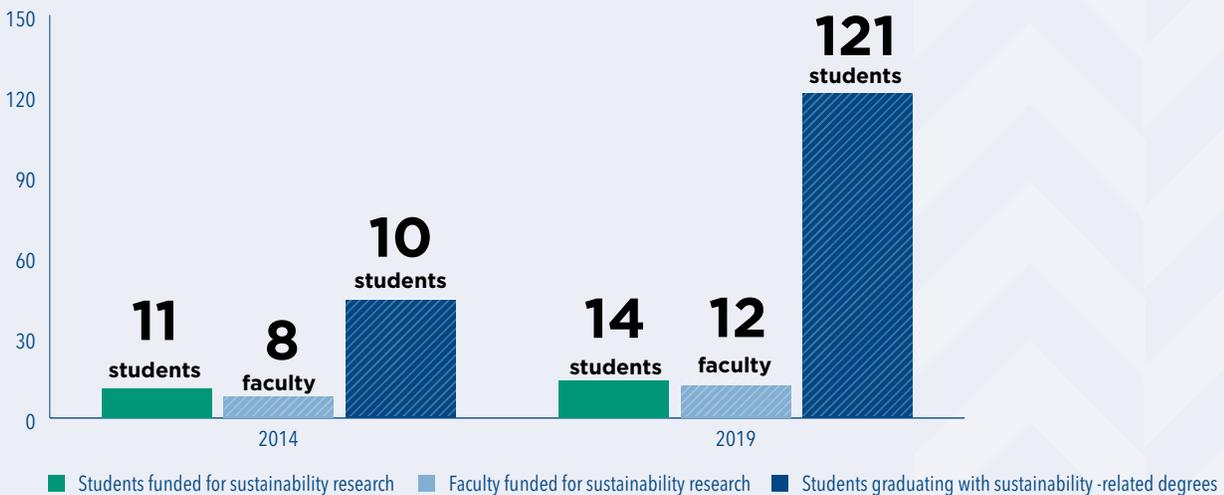
School of Arts and Sciences

- » Penn Program in Environmental Humanities
- » The Water Center at Penn

School of Engineering and Applied Sciences

- » Center for Analyzing Evolved Structures as Optimized Products: Science and Engineering for the Human Habitat

2014 and 2019 | Sustainability funded research, internships and related degrees



The Penn Sustainability Office, in partnership with Schools and Centers, has developed a number of internship programs to expand opportunities for teaching, learning, and researching sustainability among all campus community members. Through these programs, over 63 internships have been funded since 2014, supporting 55 faculty.

UTILITIES AND OPERATIONS

MISSION

To reduce campus carbon emissions and the costs associated with maintaining campus operations by:

1. Adopting best practices in energy conservation through design, operation, and maintenance of both building specific and district energy infrastructure.
2. Exploring and adopting best practices for campus energy procurement.

100 x 42

The University of Pennsylvania has committed to the goal of achieving 100% carbon neutrality by 2042, a goal we call 100 x 42. The Operations and Maintenance Department, within the Division of Facilities and Real Estate Services (FRES), works with the Environmental Sustainability Advisory Committee's Utilities and Operations Subcommittee to identify and execute funded projects that meet this goal.

The Center for Environmental Building and Design in the Weitzman School of Design continues to be an integral partner in developing, evaluating, and managing the carbon inventory for the University – a key aspect of our 100 x 42 goal.

Building on the success of the past 10 years of sustainability at Penn, FRES, the ESAC Utilities and Operations Subcommittee, and School and Center partners will continue to investigate and implement carbon reduction projects across campus.

To that end, the FRES Operations and Maintenance department has begun to investigate options to purchase renewable energy for the University in order to supply carbon-free electricity to all University buildings.



GOALS

GOAL	STRATEGY
<p>In support of the 2042 carbon neutrality goal, reduce Penn's building-related carbon emissions* by 40% by 2024, using 2009 as the baseline year.</p>	<p>Investigate a renewable power purchase agreement (PPA) to reduce Penn's emissions from electricity.</p>
	<p>Understand options available to mitigate emissions from campus steam consumption, including low-carbon steam, alternative heating solutions, and viable offsets.</p>
	<p>Expand School and Center awareness and training sessions through energy data awareness programs and the expansion of Energy Dashboards for FRES O&M and School and Centers.</p>
	<p>Identify and implement approved energy and carbon reducing measures as part of the Enhanced Recommissioning program</p>
	<p>Leverage SCADA capabilities to transition towards a continuous recommissioning O+M process.</p>
	<p>Optimize maintenance activities to improve energy efficiency through pro-active maintenance and recommissioning.</p>

*Building-related carbon emissions are those from electricity, steam, chilled water, natural gas, and fuel oil. For more information, please see the [Glossary](#)



Mark Devlin leads the BLAST team who are measuring how stars form in our galaxy.



ACCOMPLISHMENTS

The *Climate Action Plan 2.0* targeted a 7% reduction in building carbon emissions and 10% reduction in building energy use by 2019, compared to the 2014 baseline, in support of the ultimate goal of carbon neutrality by 2042. As of FY19, Penn has **reduced gross building-related carbon emissions* by 14.8%** (10.7% reduction in total gross emissions towards the 100x42 goal). Net emissions* which include the purchase of steam offsets in FY19, result in a **net reduction of building-related emissions* by 29.6%** (22.3% reduction in net total emissions* towards the 100x42 goal).

CARBON REDUCTIONS SINCE FY14

Gross Building-related Emissions* Change	Total Gross Emissions* Change toward 100x42 goal	Net Building-related Emissions* Change	Net Total Emissions* Change toward 100x42 goal
-14.8%	-10.7%	-29.6%	-22.3%

Despite overall carbon reductions, **absolute building energy use* has increased by 3.0%** (5.0% increase when normalized for weather and growth of campus) since FY14. **When the use of zero-carbon steam* (steam with reduced energy impacts due to offsets; more information on page 17) is included in the analysis, the absolute building energy* has decreased by 20.3%** (24.3% when normalized for weather and growth of campus). Absolute building energy use* (excludes the use of zero-carbon steam*) has increased in part due to the one-time testing and subsequent use of steam-powered chillers for chilled water production and the growth of campus. (Over a half-million square feet has been added to campus, expanding the built area by over 4.5% since FY09.)

While the use of steam chillers results in an increase in absolute building energy* (which excludes the effects of zero-carbon steam* energy) they provide many other benefits, including reduced summer peak electricity use, allowing load shifting from grid electricity to a natural gas cogeneration plant, and affording resiliency by providing Penn with diverse options for campus cooling. Additionally, as the steam emissions are offset, the overall environmental impact is significantly decreased.

The installation of building-level utility meters and the completion of the SCADA system upgrade has improved the capability of building engineers to monitor and assess the energy use of individual buildings in real time, disaggregating total campus energy which includes production and building energy. Historically, these two separate components have not been separately tracked. Careful evaluation of this data has shown that renovations, recommissioning, and other improvements by the FRES Design & Construction and Operations & Maintenance Departments are dramatically improving building performance and efficiency.

INTEGRATED BEST PRACTICES FROM CAP 2.0

Five-year recommissioning cycle

- » This program addresses the 20% of Penn’s building stock that has the highest energy use. These buildings are tuned and evaluated in their entirety on a 5-year basis.

Ten-year recommissioning cycle

- » This program addresses the remaining 80% of Penn’s building stock and recommissions them on a 10-year cycle.

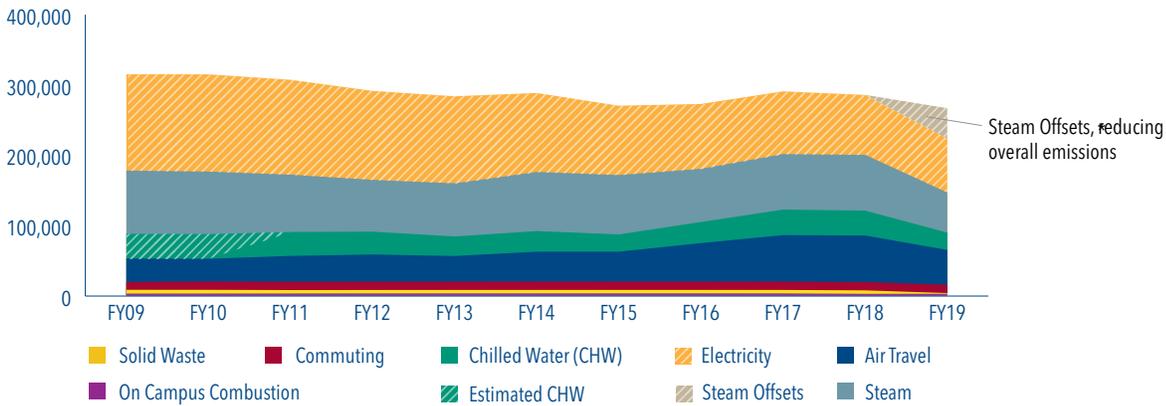
These two programs together have provided an estimated annual savings of 73,300 MMBTU since FY14.

*Please refer to the [Glossary](#) for term definitions and page 17 for more information on zero-carbon steam



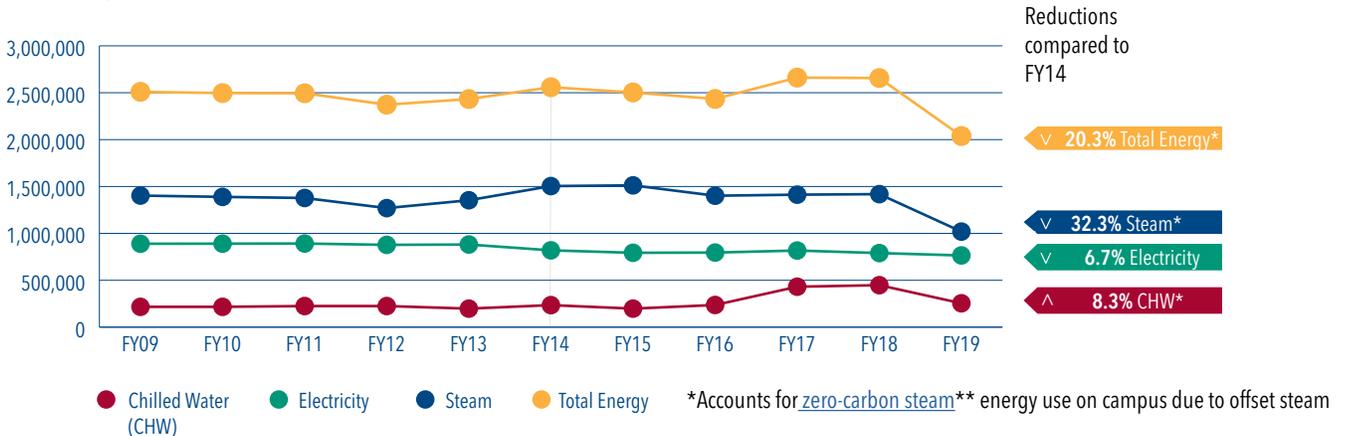
UTILITIES AND OPERATIONS

FY09-FY19 | Carbon Emissions



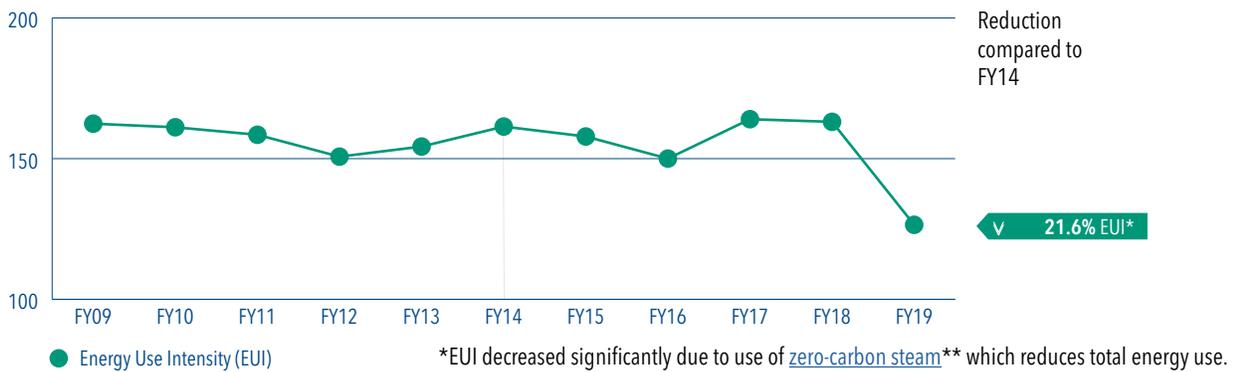
Since 2009, Penn has tracked carbon emissions from Scope 1, 2 and 3 emissions sources as part of the commitment to carbon neutrality by 2042. Scope 1 emissions are direct emissions from on campus combustion and include natural gas, oil, propane, and fleet operations. Scope 2 emissions are indirect from off-campus utilities and include electricity, steam, and chilled water (CHW). Scope 3 emissions are indirect emissions that do not occur as a result of operations and include commuting, waste disposal, and University-sponsored air travel.

FY09-FY19 | Absolute Building Energy Use



Building energy use is the energy required to heat, cool, ventilate, light, and operate buildings across campus. The main sources of energy used in campus buildings are electricity, steam, and chilled water (CHW) which account for over 90% of total campus energy. The sharp decreases in steam and CHW between FY18 and FY19 are due to use of zero-carbon steam** which reduces total energy use.

FY09-FY19 | Absolute Total Building Energy Per Square Foot



Energy use per square foot, or EUI, is a performance metric to understand how buildings are using energy as the campus grows. Tracking this important metric is possible due to the meters installed on all buildings over the past 5 years. EUI does not account for variation due to weather.

**Please refer to the [Glossary](#) for term definitions and page 17 for more information on zero-carbon steam.



KEY SUCCESSES

Century Bond program and associated energy savings

The Century Bond program, established in 2012, earmarked \$200 million for building projects which combined deep energy retrofits and deferred maintenance. This 100-year funding mechanism has been used to upgrade lighting in 45 buildings and for deep and comprehensive HVAC replacements across nine buildings. The nine completed HVAC projects collectively show a 28% decrease in energy use and a 6% decrease in backlog costs—costs associated with building systems that have failed, or are operating at decreased efficiency. The utility costs savings are being re-applied to the program, allowing more projects to be executed in the coming years. More information on complete projects can be found on the [Penn Connects website](#).

Impact on the regional grid

In 2010, Penn entered into a 20-year Steam Supply Agreement with Veolia Energy North America for campus steam. As part of Penn's supply agreement, Veolia was requested to invest \$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.

Waste steam condensate used for cooling

Air conditioning at Penn uses a centralized chilled water plant, which pumps chilled water to buildings across campus. As part of the MOD 7 upgrades, completed in 2016, two new steam driven chillers were installed to provide added cooling capacity, fuel flexibility, cost savings and resiliency. The steam driven chillers are able to use the steam produced as a by-product of electricity generation at Veolia Energy, reducing electrical demand during the cooling season.

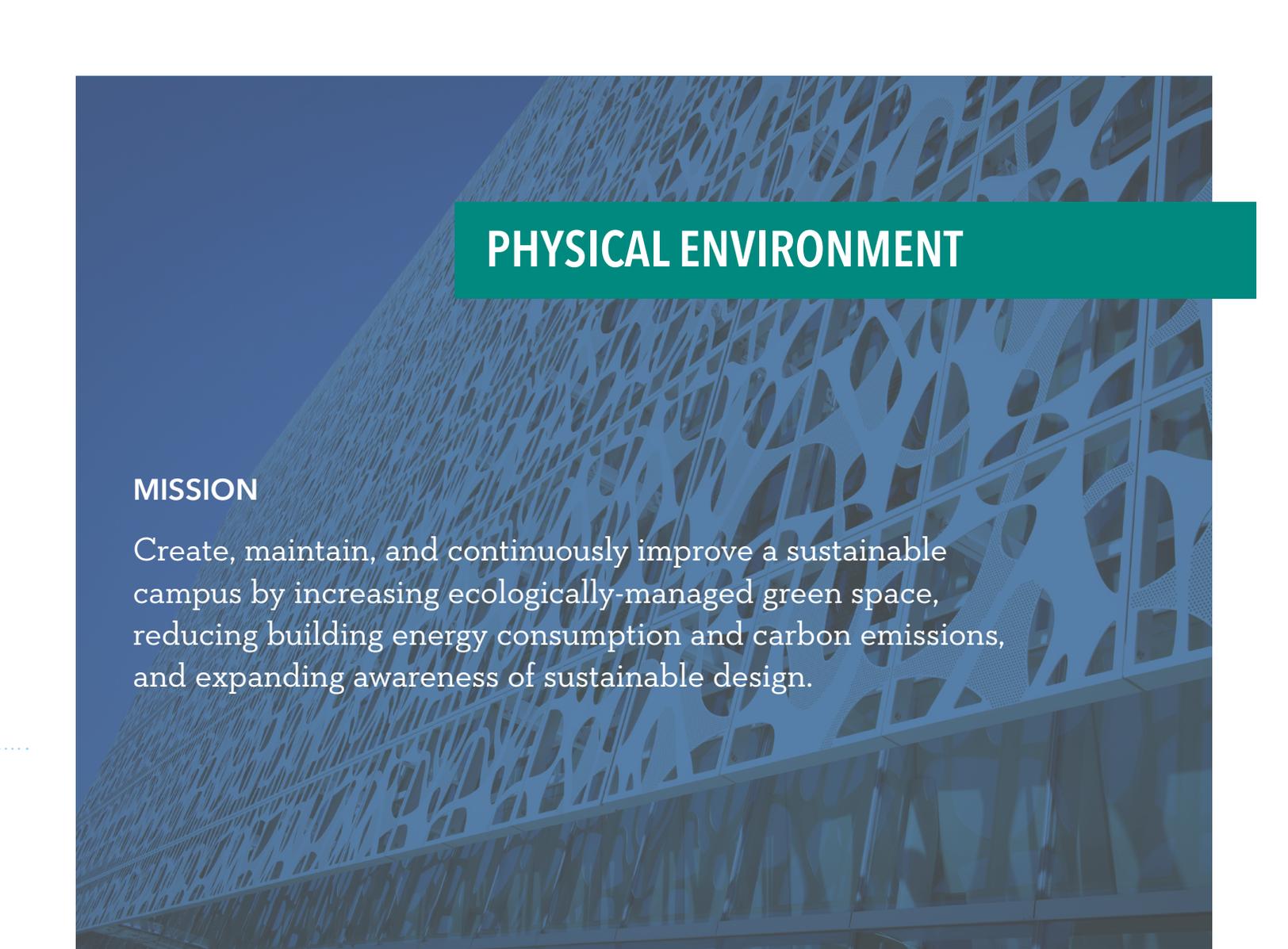
Zero-carbon steam*

In partnership with the local steam supplier Veolia, Penn entered into an agreement to offset* summer steam use in FY19 through the purchase of verified offsets. The 2019 offset purchase resulted in a 33,000 MTCDE reduction in steam carbon emissions for Penn, with the offset payment used to fund the installation of a landfill gas collection and methane-powered electrical generation. Because of the emissions reduction, the steam is also assigned a lower energy value, reducing the amount of energy consumed by campus.

Building utility meters

Among the successes of *Climate Action Plan 2.0* was the installation of building meters for the three main utilities serving each building: steam, chilled water, and electricity. These meters, combined with updates to the Supervisory Control and Data Acquisition (SCADA), system, have provided building engineers and managers the tools to closely monitor building performance. The resulting capabilities cut energy use while improving occupant comfort, reduce maintenance costs, and afford real-time fault detection to effect quick repairs and equipment replacements when necessary.

*Please refer to the [Glossary](#) for term definitions



PHYSICAL ENVIRONMENT

MISSION

Create, maintain, and continuously improve a sustainable campus by increasing ecologically-managed green space, reducing building energy consumption and carbon emissions, and expanding awareness of sustainable design.

Introduction

The *Climate and Sustainability Action Plan 3.0* advances Penn's holistic approach to a sustainable campus by addressing design, construction, and maintenance of our built environment. The focus is on reducing Penn's ecological footprint by adopting best practices for renovations, new construction, and ecological landscapes. The implementation of the *Ecological Landscape Stewardship Plan (ELSP)* will build on landscape best practices and will articulate improved ecological design and management of landscape and open space across campus.

The five-year goals also explore wellness-focused design and commit the University to focus on adaptation planning through peer institution benchmarking and exploration of campus resiliency strategies.



GOALS

GOAL	STRATEGY
Update campus design and management standards and design guidelines	Update Penn's engineering, landscape, and design standards
	Incorporate the Green Guidelines for Renovations into the design standards
Improve Penn's Landscape Ecology Practices	Identify priority areas within the Ecological Landscape Stewardship Plan (ELSP)
	Reduce the number of bird strikes on campus
	Develop performance metrics to track and quantify the impacts of Penn's landscape
Continue to improve the sustainability of Penn's Real Estate Holdings	Continue to emphasize Penn's commitment to sustainability and work with landlords in Penn-owned property to integrate sustainability-related policies
	Continue to integrate green leasing policies for Penn-owned retail and commercial tenants when possible and encourage tenants to integrate sustainability-related policies
	Continue to track energy use and develop metrics to quantify the impact across the Penn Real Estate portfolio
Formalize expansion of Penn's carbon footprint geography to include Morris Arboretum and New Bolton Center	Expand Penn's carbon footprint to include Morris Arboretum and NBC
Integrate best practices in occupant health and wellness to Penn's building standards	Assess opportunities for implementation of WELL Building criteria in new construction and major renovations
Improve water use and management on campus	Minimize potable water use through irrigation and fixture efficiency
	Improve stormwater management tracking, reporting, and verification of infrastructure installation
Improve education around Penn's Preparedness, Resiliency, and Adaptation to Climate Change planning	Aggregate information and develop awareness materials to education the campus community on Penn's work on climate resiliency, adaptation, and mission continuity.



ACCOMPLISHMENTS

Since the launch of Penn's sustainability efforts in 2009, Penn has worked to expand environmental building and landscape design through LEED Silver minimum standards, renovation guidelines, and ecological landscape stewardship.

Fifteen new construction and major renovation projects since 2009 have achieved LEED Gold certification, nine have achieved Silver, and the Horticulture Center at the Morris Arboretum has achieved Platinum. Penn's *Green Guidelines for Renovations* were developed as the standard for non-LEED projects. Penn's adherence to the Philadelphia Water Department's green infrastructure requirements have helped reduce stormwater runoff while providing irrigation for the campus landscape.

In order to more fully document the environmental practices of Penn's satellite campuses, **Penn completed carbon inventories of the Morris Arboretum, the New Bolton Center (NBC), and the Hospital of the University of Pennsylvania (HUP).** As part of these inventories, strategies to improve performance were identified and each organization chose actions to reduce their environmental impact.

- » **The Morris Arboretum** has focused on updating lighting to LED and HVAC equipment, as well as implementing additional ecological landscape management practices.
- » **The New Bolton Center** identified conservation strategies to reduce electricity use through building efficiency methods; methane emissions by adjusting animal feeding schedules; and erosion and sedimentation of the local watershed through a soil conservation plan.
- » **The Hospital of the University of Pennsylvania** is building a new in-patient facility, incorporating best practices for building efficiency and sustainability; they also worked with Student Eco-Reps to document energy efficiency improvements at the hospital, and have added recycling in public spaces and offices.



LEED Platinum Horticulture Center at the Morris Arboretum



INTEGRATED BEST PRACTICES FROM CAP 2.0

Arboretum status

- » Penn's main, West Philadelphia campus is now a certified Level II Arboretum under ArbNet Certification. The Penn Campus Arboretum curates, maintains, and manages a diverse collection of trees, preserving the urban forest for the campus community. The Penn Plant Explorer is an interactive link which allows users to identify and learn about trees across campus, and how they provide environmental benefits as well as research and educational opportunities for students and faculty.

LEED Silver minimum standards

- » The University has adopted a LEED Silver minimum certification for all new construction or major renovation projects. To date, over 25 buildings on the main campus have achieved or exceeded such designation. For a complete listing of all LEED projects, please visit the [Penn Sustainability website](#).

Stormwater management—cisterns and green roofs

- » Penn seeks to improve stormwater management and reduce combined sewer overflows by installing and maintaining green roofs, cisterns, and other infrastructure across campus. Over 34 green roofs and 45 subsurface detention systems manage the first 1.5 inches of water in a high rain event, greatly reducing the amount of water flowing into the Philadelphia sewer system and helping reduce waterway contamination.
- » Penn has converted a number of sidewalks and parking lots to pervious and continuous paving systems, lawns, recreational fields, gardens, and parks. To this end, 28% or 84 of Penn's 299 acre campus is pervious, reducing the amount of water sent to the combined sewer system in a high rain event. For more information on combined sewer systems and Penn's stormwater management, please see [Penn's Stormwater Masterplan](#).

Ecological Approaches to Landscape Design & Management

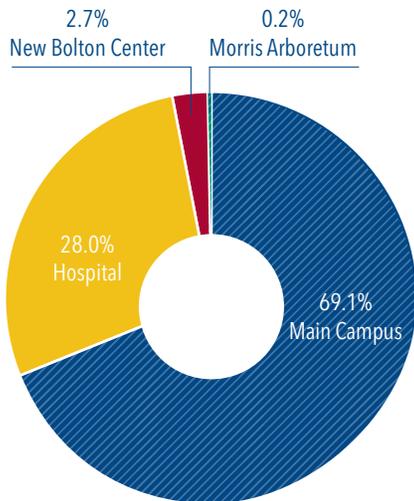
Penn continues to promote biodiversity and ecological environments on campus through such strategies as:

- » Preserving, improving and diversifying the campus landscape for long-term health and resiliency, stormwater management, ecosystem services, aesthetics and well-being.
- » Enforcing landscape design guidelines to include no more than 10% of any one species, 20% of any one genus, or 30% of any one family.
- » Utilizing urban-tolerant, native trees, shrubs and perennials that emphasize spring and fall interest and have high wildlife value.
- » Reducing the use of annuals and increase the number of perennials.
- » Reducing the use of chemicals, landscape waste, mulch and gasoline-power equipment.
- » Managing the landscape more ecologically through the use of organic soil amendments, by leaving leaves in place to improve soil biology, and other natural strategies.
- » Identifying and prioritize areas where lawn is not significant and consider replacing with more diverse and productive plantings.
- » Continuing to encourage locally sourced and responsible use of construction materials in the campus landscape, with an emphasis on reuse of long-lasting materials.



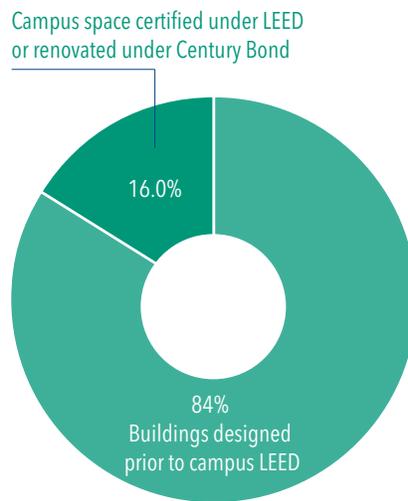
Shoemaker Green, a Sustainable SITES Initiative, was completed in 2012.

Carbon Inventories



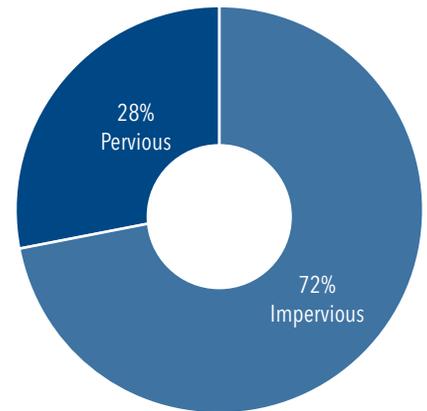
This shows the relative size of the carbon inventories of Penn's main campus as well as the satellite campuses. The main campus located in West Philadelphia has the largest impact, followed by the Hospital of the University of Pennsylvania.

Campus Building Profiles



Percent of campus buildings which were built under LEED certification standards or renovated under the Century Bond program. This highlights the percent of campus building stock which was built prior to modern sustainability considerations.

Stormwater Managed by Campus



Of Penn's main academic campus in West Philadelphia, nearly 30 percent of Penn's 299 acre campus is pervious, helping to reduce the impact of combined sewer overflows by managing stormwater on site and reducing the amount which runs into sewers in high rain events.



WASTE MINIMIZATION AND RECYCLING

MISSION

To increase diversion and minimizing solid waste through community education, strategic purchasing, appropriate infrastructure, and proper disposal, strengthened by relevant and accurate metrics.

Introduction

Since Penn's 2009 *Climate Action Plan*, waste reduction, reuse, and recycling practices have expanded dramatically. **The university now collects over 10 types of specialty waste. Single stream recycling is now standard across the University, with many Schools and Centers offering specialty recycling options including e-waste, batteries, and shredded paper. Composting is standard at student cafes and many restaurants on campus, the Penn Garden, and other community spaces.**

In the face of such steady improvement, recent well-publicized global shifts across the entire recycling marketplace, from global to local levels, have led to a re-evaluation of recycling and diversion practices, putting more focus on holistic waste minimization and diversion approaches.

Waste minimization across the campus depends on an active partnership with Penn Purchasing to minimize the amount of materials brought to campus.

Purchasing Services works closely with Penn's strategic suppliers to help minimize waste and improve sustainability. Among these strategic suppliers are those providing office and laboratory supplies, catering services, and many more high-volume goods and services. By utilizing these suppliers, which are promoted in the Penn Marketplace, Penn's buying community is supporting Penn's overall waste minimization efforts.



GOALS

GOAL	STRATEGY
Increase Penn's overall waste diversion and minimize waste sent to landfill	Improve waste data tracking and reporting
	Evaluate and improve campus infrastructure for waste, recycling, and all diversion streams
	Strengthen education, training, and transparency
	Expand School and Center Surplus Property Programs to a University-wide program
Support regional waste goals	Support the City's 2035 Zero Waste Goal by reporting waste and recycling data to the city and aligning practices.



Student Eco-Reps and volunteers help sort waste at low-waste events to increase recycling and compost, while minimizing contamination.



ACCOMPLISHMENTS

Since 2009, Penn has developed a comprehensive reporting system to track over ten campus waste streams, including single-stream recycling, electronics waste, baled cardboard, shredded paper, and composting – in addition to landfill waste. Using this data, the Sustainability Office developed extensive outreach partnerships to introduce the campus community to best waste management practices, to reduce the purchase of single-use products, and to increase opportunities to reuse or recycle.

In 2014, *Climate Action Plan 2.0* set the goal of increasing the recycling rate* to 30 percent and minimizing landfill waste*; however, due to changes in the recycling industry, Penn has not met this goal and **the recycling rate* is currently 19.6 percent**. While the recycling rate* has fallen, **landfill waste* has decreased by 80 percent due to the use of waste-to-energy (WtE) incineration* and the total diversion rate* is now 28 percent**.

The decrease in recycling rate* is in part due to changes in the global recycling market and the diminishing weight of recyclables due to changes in manufacturing practices. As of FY19, Penn's new waste hauler has been able to increase the amount of recycling recovered due to their state of the art recycling facility.

In an effort to minimize waste sent to landfill, Penn began increased utilization of WtE* for municipal solid waste. **While WtE* reduces landfill waste, it is not included in the diversion metrics per EPA guidelines**. Additionally, to address the air quality issues from trucking waste to the WtE* facility, all trucks which haul Penn's waste comply with 2007 EPA Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements, which are designed to reduce emissions by up to 95 percent and reduce allowable sulfur levels in diesel.

Diversion metrics continue to become more robust. **All Penn Dining Cafés, local restaurants serviced by Penn, and the Penn Garden behind Harrison College House collect compost**. The Penn Garden allows for post-consumer composting by individuals living nearby in College Houses or Greek residences. **As part of the ReThink Your Footprint and Power Down campaigns, nearly 15 tons of e-waste* was collected** across the campus, further increasing the diversion rate*.

INTEGRATED BEST PRACTICES FROM CAP 2.0

Solid Waste Management Working Group

- » The Solid Waste Management Working Group, established in 2014, continues to meet regularly to discuss waste issues. The group works collaboratively with School and Center partners, FRES Housekeeping and Urban Parks, to standardize waste infrastructure campus-wide, improve signage, and encourage best practices.

Construction and Demolition (C&D) recycling on major renovations and new construction

- » All new construction and major renovations track and divert at least 50% of C&D waste as part of LEED requirements.

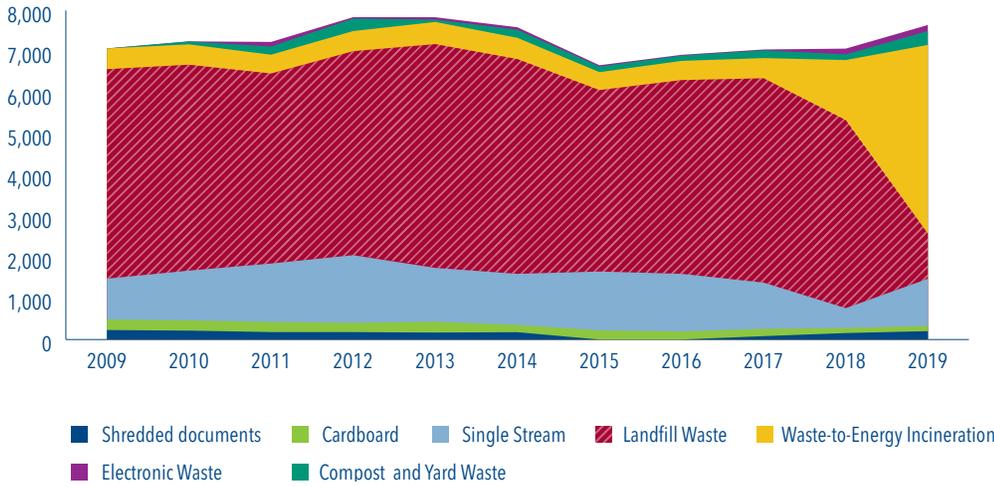
PennMOVES

- » During move out, Business Services collects items students are unable to take home and donates them to the Goodwill, increasing diversion from landfill. During the FY19 Penn MOVES campaign diverted, over 130,000 lbs of material.

*Please refer to the [Glossary](#) for term definitions

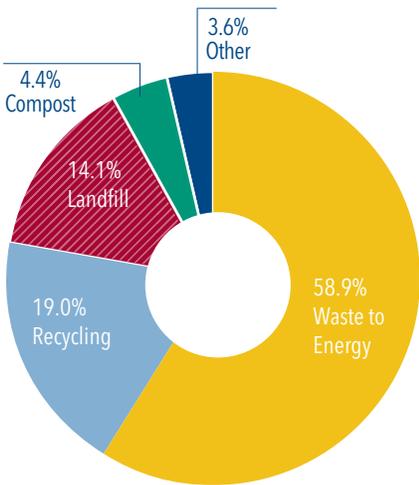


2007-2019 | MSW and Recycling



Penn recycles and diverts a number of material streams, including those that are aggregated through single stream recycling*. While the total amount of material recorded in the stream has declined since FY14, the recycling rate has fallen due to changes in the global recycling industry. At the same time, Penn has been working to increase data and tracking around waste performance.

FY19 | Breakdown in Waste Types



The recycling rate* on campus is comprised of single stream* materials, while diversion is all single stream plus specialty streams like electronic waste and compost. Penn continues to strive to increase the amount of materials recycled or diverted, to minimize the amount of waste sent to landfill.

KEY SUCCESSES

Piloting Diversion

FRES Urban Parks, along with School and Center partners, has investigated different pilots for Styrofoam recycling, wood shipping pallet recycling, and many others. While not all are viable options due to cost and commodity markets, Penn has been able to expand diversion streams through implementation and standardization of some pilots.

Landscaping Composting

FRES Urban Parks, in partnership with the contracted landscape team, composts leaves to create a "compost tea" and replace synthetic fertilizers, reducing the impacts of Penn's landscape and reducing waste sent to landfill.

*Please refer to the [Glossary](#) for term definitions



PURCHASING

MISSION

1. To increase awareness and systemically favor the procurement of environmentally responsible products and options.
2. To engage with suppliers and campus partners to identify and promote sustainable supply chains so as to reduce waste.

Introduction

Penn Purchasing will continue its efforts, in collaboration with School and Center partners, to reduce packaging and shipping waste and increase the number of environmentally friendly products brought to campus.

Penn Purchasing collaborates with units across campus to improve value, sourcing, and performance through contracts, vendor approvals, and management of the Penn Marketplace. **Working with partner Schools and Centers, Penn Purchasing advances campus sustainability through improved communications, dining contracting and food procurement, vehicle purchases, and office furniture.**



GOALS

GOAL	STRATEGY
Increase procurement of sustainable food products	Increase procurement of sustainable food in Penn Dining Cafes
	Improve sustainable catering practices on campus
Encourage purchasing of low- or zero-emissions vehicles	Encourage purchasing of low- or zero-emissions vehicles by establishing a purchasing guide for vehicle purchases
	Expand campus fleet tracking
Evaluate mechanisms to affect Penn's emissions from air travel	Establish a plan to reduce Penn's carbon emissions from air travel
Expand sustainable office equipment purchases, options, standards, and technology	Expand use of auto-replacements to default to more sustainable options in the Penn Marketplace
	Expand use of Managed Print Services to all Schools
	Establish sustainable furniture standards for healthy interiors
	Quantify and communicate Penn's supply chain impact



Houston Market renovations include new and expanded dining options to meet the needs of modern needs and tastes



ACCOMPLISHMENTS

Since 2009, Penn Purchasing has led the effort to standardize sustainability initiatives that reduced packaging waste, recognized green purchasing efforts, and added sustainability language to contracts.

As active members of the *Sustainable Purchasing Leadership Council*, Penn Purchasing has access to resources on how to optimize and influence the environmental and economic life cycle impacts of purchased goods and services. In addition, the Council helps identify existing best purchasing practices, benchmark progress, and recognize leadership in the field.

Leading practices at Penn include the Green Purchasing Awards, now an annual feature of the supplier showcase, improved contract language for consultants and vendors requiring sustainable practices, and improved data tracking and reporting related to University-sponsored air travel.

INTEGRATED BEST PRACTICES FROM CAP 2.0

Integrating Sustainability into Contracts

» Penn Purchasing worked with FRES and School partners to issue a new waste hauling RFP with sustainability as a core aspect. Since the start of FY19, Penn's new waste hauler's state-of-the-art recycling facility has been able to recover a larger portion of recyclable materials.

Eliminating Cardboard from the Delivery Chain

» Penn Purchasing worked with the University's office supplies vendor to reduce the amount of cardboard used in the delivery chain. Rather than supplying individual items in a cardboard box, deliveries are now sent in reusable plastic totes. Penn also established a minimum order value, with discounts for bulk orders, to reduce packaging and emissions from delivery services.

Green Purchasing Awards

» Penn Purchasing now annually recognizes individuals and teams across the University who develop innovative ideas to improve the sustainability of purchasing. Awardees can be found on the [Purchasing website](#).

Partnership with Amazon

» Penn Purchasing worked with Amazon to establish a package center on campus, and is working with students to reduce waste from Amazon shipping and ensure proper disposal of packaging materials.

Ben's Attic

» This online exchange provides a platform for staff to reuse office furniture and supplies rather than buying new. Since 2014, over 500 items have been repurposed.



2018 Green Purchasing Award winner, the Furniture Reuse and Recycling Team developed a system to divert used furniture from landfill for reuse across campus.



KEY SUCCESSES

SPLC award with Wash Cycle Laundry

Penn Purchasing, alongside Wash Cycle Laundry, received the 2017 Leadership Award for Supplier Engagement from the *Sustainable Purchasing Leadership Council*. This award recognizes the collaboration between Penn and Wash Cycle Laundry, an innovative, local, and minority-owned firm that provides job opportunities within in the West Philadelphia community. This partnership stands as an example of a large anchor institution working with a small business for mutually beneficial impact.

Office Depot Special Recognition for Greener Spend Analysis Award

This award recognizes the exemplary efforts specific to analyzing green spend data in order to make long-term sustainable spending decisions. Award winners were selected from among Office Depot's largest customers based on their expenditure on products with eco-attributes such as recycled content, energy-efficiency, and non-toxicity.



TRANSPORTATION

MISSION

To continue to prioritize a pedestrian and bike-friendly campus; encourage the use of local, alternative, and low-carbon transportation options; and promote pedestrian and cyclist safety on campus.

Introduction

Penn Transit's sustainability initiatives will continue to transition from focusing primarily on reducing single-occupancy vehicles to a more holistic approach to transportation. Penn Transit's rich portfolio of programs and initiatives have helped the University increase the number of staff and faculty choosing sustainable commuting options, while continuing to maintain a safe and accessible campus.

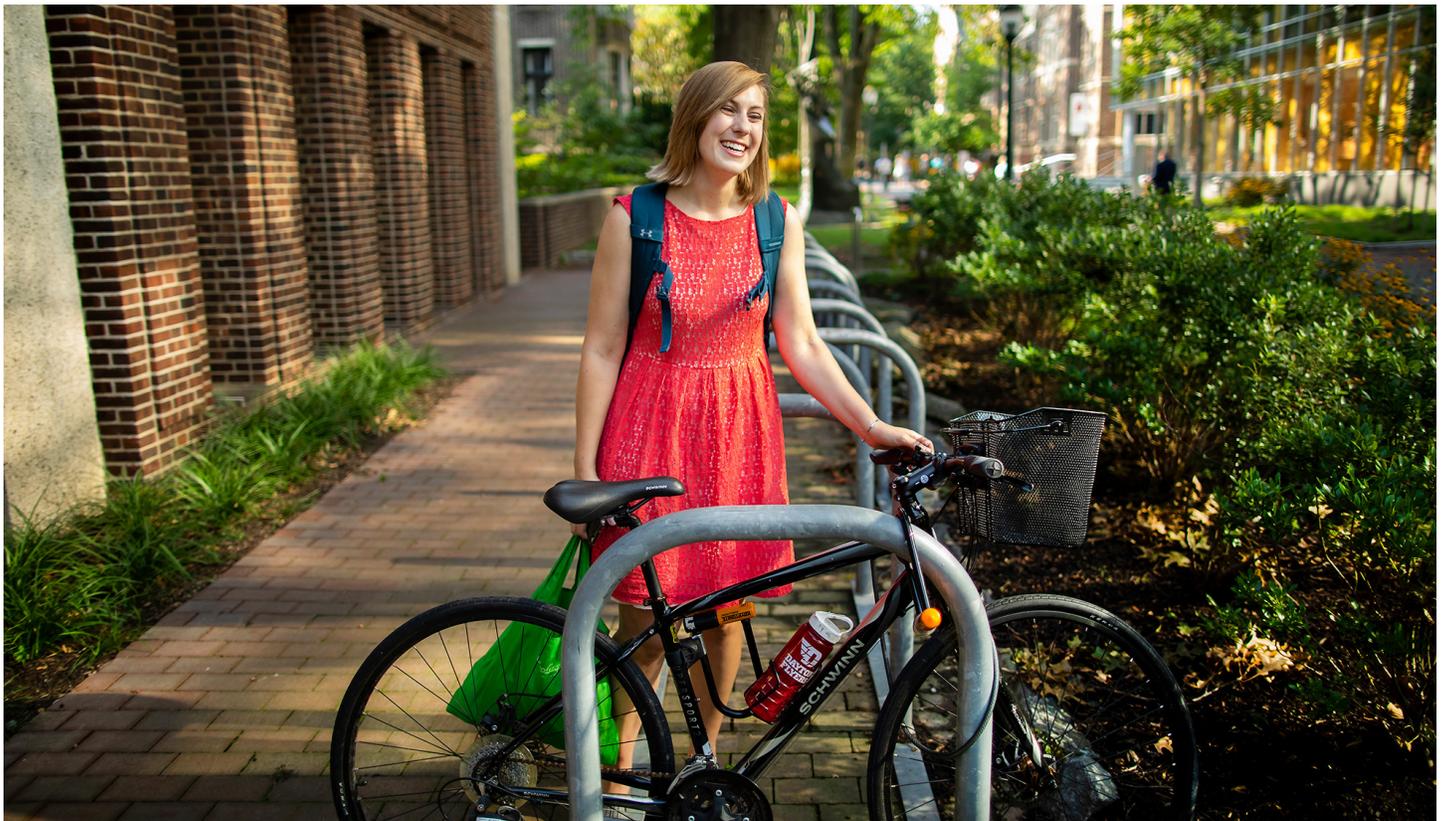
Recent expansion of resources for cyclists include additional bike racks, cycling maps, bike registration services, bike repair stations, as well as a cycling commuter reimbursement program launched in 2017.

The next five years will continue to see promotion of participation in and development of alternative transportation programs. At the same time, Penn Transportation and Parking will look to improve the energy efficiency of parking facilities and work to minimize the environmental impacts of the Penn Transit fleet.



GOALS

GOAL	STRATEGY
A campus supported by an accessible, integrated multi-modal transportation system	Promote incentive programs for alternative transportation, integrate services with other transit providers, and influence local transportation systems
Have an accessible and safe campus for bicyclists and pedestrians	Promote a pedestrian-friendly and safe campus in support of the City's Vision Zero efforts
	Enhance the University's bicycle policies and coordinate initiatives with the greater Philadelphia bike community
Improved energy efficiency of parking and transportation facilities and fleet composition.	Improve energy efficiency in parking facilities operations including infrastructure upgrades, lighting retrofits, and adding four new electric charging stations.



Penn staff member utilizing Penn's commuter benefits for cyclists.



ACCOMPLISHMENTS

Climate Action Plan 2.0 set the goal of enhancing a pedestrian and bike-friendly campus and decreasing the number of single-occupancy vehicle commutes to campus. **As of FY19, 48 percent of faculty and staff who participate in a commuter program commute select sustainable options by cycling, carpooling, or using mass transit.** FY18, the highest year on record for participation in the *Alternative Transportation Initiative*, had 3,707 participants.

Penn Transit's long-standing sustainability programs and initiatives include commuting benefits such as car- and van-pool discounted parking, discounted mass transit passes, emergency ride home services for transit users, and occasional parking pass options to promote reliance on transit. On campus, Penn bus and shuttle routes, walking escort services, and cycling benefits prioritize alternative commuting and support a pedestrian-focused campus.

Penn Transit continues to enrich benefits and encourage use of sustainable commuting—FY17 saw the development of **the Bike Commuter Expense Reimbursement Program which now has over 300 participants.** Penn updated the bike policy in 2014, which incorporates a number of resources and is available on the Facilities website. In addition, there are now six Indego Bike Share locations and four bike repair stations on campus.

INTEGRATED BEST PRACTICES FROM CAP 2.0

Alternative Transportation Initiatives

- » Penn's compact urban campus is well served by an extensive network of subway, bus, regional rail, and trolley lines that are located around the campus where public transit stops are never more than a five-minute walk from any part of campus, allowing staff to take advantage of sustainable commuting.
- » Penn offers several options for discounted pre-tax travel subsidies via SEPTA, PATCO, NJ Transit and Amtrak.

Electric Charging stations in garages

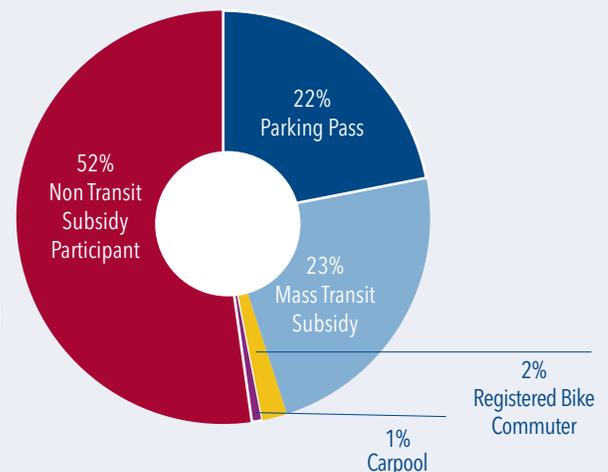
- » Penn Transit has actively responded to demand from the campus community for more electric car charging stations in our commuter lots and parking garages.

Penn Transit maintains a rich portfolio of alternative transportation programs to encourage sustainable commuting and minimize the number of single-occupancy car commutes. Through these programs which include occasional parking, SEPTA subsidies provided by Penn and SEPTA, discounted car- and van-pool parking, and cycling benefits, Penn Transit has been able to increase participation .

Energy Efficiency and improved service in garages

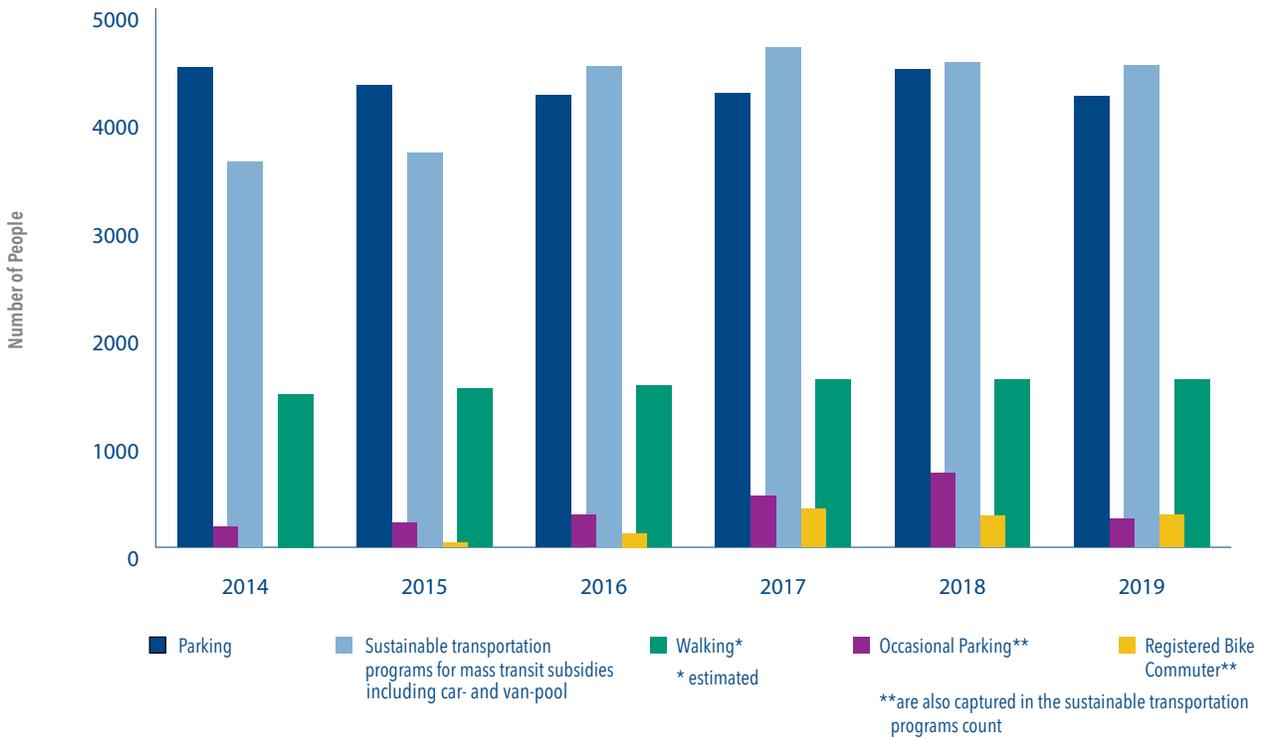
- » Penn Parking Services references the Green Parking Council's Green Garage Standards to ensure adoption of best practices for garage management. Recent renovations have prioritized low-glare, LED lighting for energy efficiency and improved visibility, preferred parking spaces for low-emitting vehicles, and integrated charging stations to support electric vehicle commuters.

FY19 | Transportation Patterns





2014-2019 | Transit Over Time



Over time, Penn Transit has expanded the number of alternative commuting programs, leading to an increase in the number of sustainable commutes. While parking still remains the choice of a large percent of the commuting population, the percent opting into different programs is ever increasing.

KEY SUCCESSES

Bike Friendly Campus USA

» Penn was recognized for its commitment to a bike and pedestrian friendly campus through the *League of American Bicyclists* Bike Friendly University 2018 Silver award. Penn has been a Bike Friendly University since 2014.

Standardized bike racks

» Penn has worked to add new and improve existing bike racks across campus, with over 1,000 spaces added since 2014. There are now more spaces for bicycles on campus than there are parking spaces in Penn's garages and lots.

Commuting Awards

» Penn was awarded the Clean Air Council's 2017 Clean Commute Award for exemplary sustainability in commuting and transit.

This award highlights Penn's efforts to provide employees with sustainable commuting options and commitment to reducing the region's air pollution.

» Penn received the Delaware Valley Regional Planning Commission's 2017 Air Quality Partnership Excellence Award for transit-related efforts to improve air quality. This award celebrates local initiatives and best practices to reduce air pollution in the Greater Philadelphia region. Penn was one of five organizations to be recognized.

» Penn tied with NYU in FY18 for Number One in Transportation in TransitScreen's ranking of the country's most transportation-friendly college campus.

This award ranks the ease by which students can navigate universities without the use of a car.



OUTREACH AND ENGAGEMENT

MISSION

Continue to highlight the urgency of global environmental concerns, while building a holistic on-campus culture of sustainability.

Introduction

The *Climate and Sustainability Action Plan 3.0* aims to strengthen existing programs and develop new initiatives, deepening engagement and accountability across the Schools and Centers. The Penn Sustainability Office will continue to lead the collaborative effort with key campus stakeholders in the EVP Divisions, the Schools, and Centers to develop a comprehensive and strategic communications strategy to engaging students, staff, and faculty.

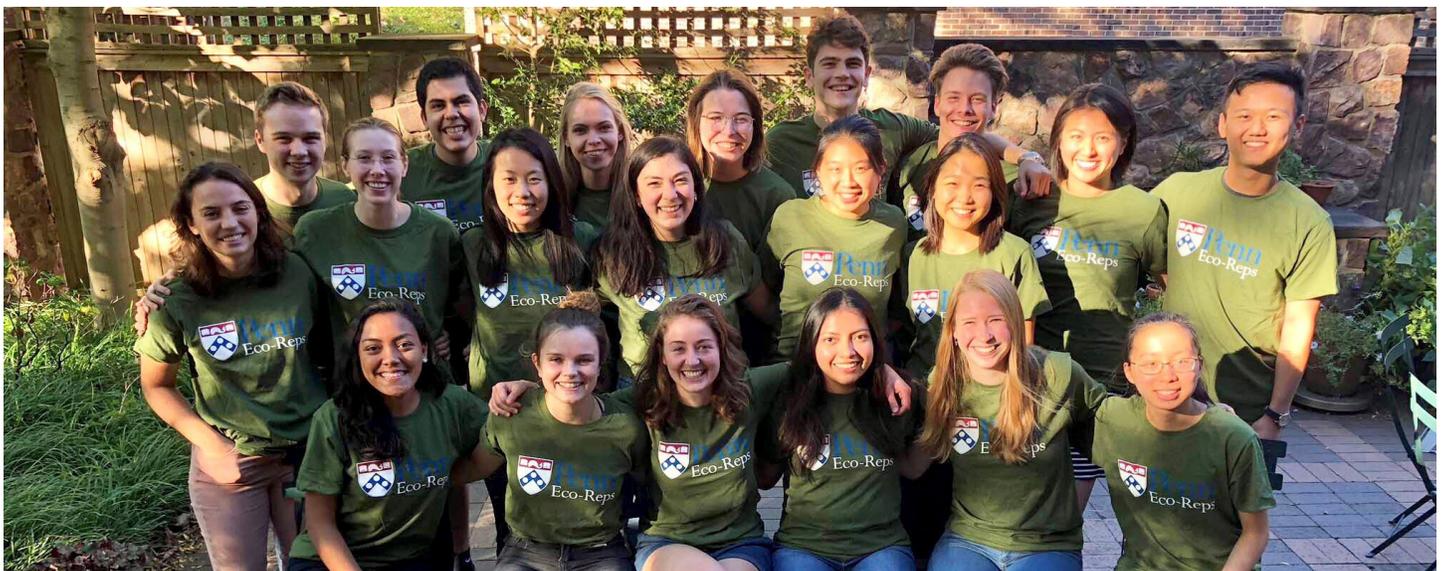
The Climate and Sustainability Action Plan 3.0 will **bring focus in outreach around the topics of Green Labs, Information Systems and Computing, and Wellness among the campus community while continuing to advance marquee programs.**

In addition, through the Outreach and Engagement section, Penn will strengthen and reevaluate communications strategies to advance and better reach the Penn community.



GOALS

GOAL	STRATEGY
Expand and strengthen existing outreach programs	Incorporate sustainability as a formal component of the Wellness at Penn Initiative
	Strengthen the Green Labs Working Group, Green Living, and Green Office programs
	Develop a comprehensive strategic communication plan for sustainability
	Create a Green IT Working Group
	Launch a new sustainability website
Engage Penn's leadership to serve as sustainability change agents	Elevate visibility of sustainability as core priority for employee on-boarding and training
	Develop a Building Administrator Sustainability Subcommittee to improve communication and collaboration for best practices across Schools and Centers



2019-2020 academic year Eco-Rep cohort



ACCOMPLISHMENTS

Since the launch of the first *Climate Action Plan*, outreach and engagement have been core priorities of the Sustainability Office. **Media outreach, including an accurate and informative website, twice-a-year e-newsletters, and an expanded use of social media, have been critical in keeping the campus community and the wider public informed of and active participants in achieving Penn's goals.** These messages have been bolstered by the active support of senior leadership, and by seasonal outreach campaigns such as *ReThink your Footprint*, the *Power Down Challenge*, *30x30*, *Creating Canopy*, *Move-In Green*, and the *Penn Moves* move-out drive.

Simultaneously, we have worked to inform and empower Penn's key sustainability stakeholders through affinity groups such as *Staff and Faculty Eco-Reps*, *Student Eco-Reps*, *School and Center Sustainability Coordinators*, and student extracurricular groups, as recognized and coordinated through the *Student Sustainability Association at Penn*. Recognition programs, such as *Green Living at Penn*, *Green Labs*, and *Green Office* certification programs ensure that the community is aware of and engaged in environmental sustainability at Penn.

Membership in higher education collaborative efforts, including the Ivy+ Sustainability Consortium, Association for the Advancement of Sustainability in Higher Education (AASHE), International Sustainable Campus Network (ISCN), and Second Nature's *President's Climate Commitment* ensure that we are apprised of and contribute to the best practices of our peers in energy management and sourcing, campus operations, high-efficiency building, and green purchasing.

Penn's sustainability outreach programs strive not only to build awareness and to educate the campus community, but also to incentivize the adoption of better practices and empower efforts to drive impactful change. The Penn Green Fund exemplifies the entrepreneurial and inventive spirit needed to address the challenges facing us. **Since 2014, over \$81,000 in grants have been awarded to 14 new Green Fund projects**, to diverse Penn stakeholders including the New Bolton Center, the Perelman School of Medicine, the Center for Technology Transfer, the Morris Arboretum, the Wharton Department of Legal Ethics, and numerous student groups.

HIGHLIGHTED PROJECTS



The Penn Closet, a FY18 Green Fund recipient, is a student run thrift store that hopes to foster an economy of reuse and shared resources.



The Green Labs Certification program helps labs across campus reduce their impact, helping achieve Penn's sustainability goals.



INTEGRATED BEST PRACTICES FROM CAP 2.0

Sustainability Coordinators

Sustainability Coordinators have been established at all twelve schools at Penn, plus key centers such as the Morris Arboretum, the New Bolton Center, and Athletics. The Coordinators share best practices with one another and work with their constituencies to ensure that the Penn community knows the goals of the Climate Action Plan and how to contribute to its success.

Staff and Faculty Eco-Reps

The Staff and Faculty Eco-Reps help keep the larger campus community apprised of the work of Penn Sustainability. Eco-Reps attend monthly meetings to hear updates from the Sustainability Office, Faculty, and outside speakers. Back in their home offices, Eco-Reps are responsible for promoting sustainable practices, creating green teams, and leading Green Office Certification efforts.

Green Office Certification

Green Office Certification recognizes the efforts and actions of staff across the University to improve their operations and activities. Through the four-tiered certification program, offices help reduce energy use, minimize waste, purchase sustainably, and educate staff and faculty on ways to save energy, reduce waste, and make sustainable choices in commuting, consumption, and office management.



Staff Eco-Reps is a peer-to-peer educational program in which any interested staff or faculty member may participate.



The Green Living Certification provides students the opportunity to reflect on their environmental impact and rewards those taking steps to improve the health of our environment.

Student Eco-Reps

Student engagement is a key feature of Penn's sustainability outreach. Founded in 2009, the Student Eco-Reps program has gone through several iterations to engage and educate students, ensuring active participants in Penn's progress toward a greener future.

Green Living Certification

The Green Living certification provides students with an opportunity to reflect on their environmental impact and rewards those who are taking steps to incorporate sustainability into their habits. The Certification is available to students in College Housing, off-campus apartments, and Greek Houses.

Seasonal campus outreach campaigns

The *ReThink Your Footprint* campaign promotes waste minimization efforts by raising awareness of established waste minimization programs and initiatives, inspires students, staff, and faculty to create new activities related to source reduction, reuse and recycling, and encourages everyone to rethink their personal footprint.

The annual *Power Down Challenge* campaign helps educate the campus community about where our power comes from and how to help reduce energy use and cut carbon emissions. The campaign relies on partnerships with the Schools and Centers to spread the word on energy awareness, and on faculty to host Power Down lectures and seminars.



KEY SUCCESSES

Student Eco-Reps

» The program was redesigned in FY16 to be a cohort of 15-20 paid student employees who work on year-long sustainability projects across campus. Since this restructuring, students have worked on over 27 projects in waste minimization, energy conservation, education and outreach, and green purchasing, as well as others.

Green Fund

» The Green Fund review board was restructured in FY17 and now includes representatives from Penn's Schools and Centers. Since the launch of the program in 2009, 59 projects have received an aggregate \$1.24 million in seed funding for innovative ideas



Eco-Rep Project with Penn Relays to eliminate bottle water use by providing recyclable cups of to athletes.

Student Eco-Reps project clients have included the Hospital of the University of Pennsylvania, the Penn Relays, the School of Nursing Dean of Education, Penn Housekeeping, Presbyterian Hospital, and Penn's Urban Parks team. Students work three to five hours a week on year-long projects, presenting their work in the spring to their clients and senior administrators.

LOOKING FORWARD

Today's Penn graduates will enter a world very different than the one that awaited their parents' generation, or even that of a decade ago.

Our global climate is warming more rapidly than in any time in human history,¹ and emerging technologies, shifting demographics, and new political alliances are transforming cultures and economies at an accelerating rate, challenging our ability to react.

Faculty at Penn are engaged in groundbreaking scholarship to understand the processes behind—and implications of—these compounding changes: identifying trends, developing technical solutions, and articulating just and sustainable policy responses.

Putting scholarship to work to address urgent issues is not new to Penn. President Amy Gutmann challenged our university community in her *Penn Compact 2020* to “put knowledge into action for the greatest good; ... to define the future, rather than being defined by it; [and to] pioneer change, rather than merely manage it.”²

Penn's *Climate and Sustainability Action Plan 3.0* realizes this ideal. This comprehensive plan, developed with broad input from students, staff, faculty, and senior administrators, charts a bold and inclusive course for our campus. The proceeding pages guide our community to embrace sustainable practices, reduce our ecological footprint, elevate our academic rigor, and continue Penn's drive toward a carbon neutral campus by 2042.

As a prominent research institution, Penn has an obligation to address generational challenges head-on. President Gutmann's acknowledgment of universities as “engines of knowledge and new ideas”³ highlights our capacity to do just that: act urgently in response to climate change.

The time is now. The October 2018 International Panel on Climate Change's (IPCC) *Special Report: Global Warming of 1.5°C*, states that current anthropogenic global warming is irrefutable, and documents that twenty to forty percent of the global population live in regions that are “already experiencing warming of more than 1.5°C above pre-industrial [levels] in at least one season.”⁴ The most recent IPCC climate models indicate that unprecedented action is needed to limit global temperature rise, calling for “global net anthropogenic CO₂ emissions to decline by about 45% from 2010 levels by 2030...reaching net zero around 2050.”⁵

Penn's *CSAP3.0* meets—and exceeds—these targets. Our faculty, students, and administrators know that the stakes are high. We understand the challenges before us and are dedicating the tools and resources necessary to meet our goals. Penn will continue to be a model for low-carbon efficiency in campus operations and a leader in sustainable academics, setting the standard for local, national, and global environmental stewardship.

¹ NASA: Global Climate Change, Vital Sign of the Planet <https://climate.nasa.gov/evidence/>

² University of Pennsylvania, Office of the President: Penn Compact 2020, Building on a Decade of Progress, <https://president.upenn.edu/penn-compact>

³ Ibid

^{4,5} IPCC Special Report: Global Warming of 1.5°C, issued October 2018, p 12 & 51, https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf

GLOSSARY OF TERMS

Absolute Energy	Energy use which does not account for variations in weather or growth of campus.
Building Energy	Energy required to heat, cool, light, ventilate, and condition building spaces, excluding the energy used on campus for the production and distribution of steam, chilled water, and electricity.
Building-related Carbon Emissions	Carbon emissions from electricity, steam, chilled water, natural gas, and fuel oil
Campus as Lab	A program that integrates student and faculty research with ongoing campus sustainability issues to use the campus as a living laboratory.
Carbon Offset	A carbon reduction mechanism by which an organization's emission of greenhouse gases is effectively reduced by its investment in an equivalent reduction made elsewhere.
Carbon Tax	A fee on the carbon content of fossil fuels
Century Bond	Penn's Century Bond program is a \$300M bond that has a 100-year term, \$200M of which is directed towards projects that combine energy-efficient lighting, HVAC system upgrades, and deferred maintenance.
Design Guidelines	The basic principles that play an integral part in any construction, new development, or renovation. They also outline a design review process.
Design Standards	The requirements and procedures for building components and systems for both renovation and new construction.
Diversion Rate	The amount of waste that has been diverted from landfill through recycling or reuse; excluding materials sent to waste-to-energy incineration.
Enhanced Recommissioning	A Penn program that advances traditional recommissioning by focusing on high energy-using buildings with significant energy-saving potential.
E-Waste	Electronic waste
FRES	Facilities and Real Estate Services
Gross Building-related Emissions	Carbon emissions from electricity, steam, chilled water, natural gas, and fuel oil, excluding the impact of carbon offsets.
Gross Emissions	Carbon emissions calculated prior to reduction due to offsets
Gross Total Emissions	Carbon emissions from electricity, steam, chilled water, natural gas, fuel oil, fleet and equipment, commuting, air travel, and solid waste, excluding the impact of carbon offsets.
Landfill	A site for the disposal of waste by burial.
MMBTU	One million British Thermal Units, which is a unit of measurement for energy.
MSW	Municipal solid waste, more commonly known as garbage or trash.
MTCDE	"Metric Tons of Carbon Dioxide Equivalent," a measurement used to calculate greenhouse gas emissions.

GLOSSARY OF TERMS

Net Building-related Emissions	Carbon emissions from electricity, steam, chilled water, natural gas, and fuel oil, including the impact of carbon offsets.
Net Emissions	Carbon emissions which include reductions due to offsets.
Net Total Emissions	Carbon emissions from electricity, steam, chilled water, natural gas, fuel oil, fleet and equipment, commuting, air travel, and solid waste, including the impact of carbon offsets.
Offset	See "carbon offset" on previous page.
Power Purchase Agreement	A contract between a seller that generates electricity and a buyer that needs electricity
Recycling Rate	The percentage of material that is recycled through Penn's single stream recycling system.
Retrocommissioning	The application of commissioning in an existing building to improve building systems operations.
Single Stream Recycling	Refers to a system in which different recyclable materials (plastics, paper, metals, glass etc.) are placed in the same bin. Once collected, the materials are separated and processed.
Steam Chillers	A machine that uses steam as a fuel source to generate chilled water for cooling and dehumidifying buildings.
Total Emissions	Carbon emissions from electricity, steam, chilled water, natural gas, fuel oil, fleet and equipment, commuting, air travel, and solid waste.
Vision Zero	Philadelphia's task force designed to reduce traffic collision-related fatalities to zero by 2030.
Waste-to-Energy Incineration	The process of generating energy (electricity and/or heat) by incinerating (burning) waste which would normally go to landfill.
Zero-carbon Steam	The energy from steam used in summer University operations which, due to offset purchases and the fact that it is a by-product of electricity generation, is excluded from University energy accounting.
Zero Waste, 2035 City Goal	A long-term goal to eliminate the use of landfills and traditional incinerators by 2035 in Philadelphia.