

# The Princeton University Sustainability Plan

## Princeton's Commitment

The impacts of human activities since the Industrial Revolution are disrupting our global climate, and scientists counsel us that corrective action must be taken within the decade to prevent serious consequences. Attaining a sustainable global environment requires rigorous reevaluation of our energy policies and practices, transformational leadership, creative technologies, and substantial changes in human behavior.

The University, with its 380-acre main campus, more than 160 buildings, approximately 7,100 students, and 5,400 employees, has a significant environmental imprint. That fact alone would justify our developing a comprehensive strategy to minimize our environmental footprint. However, as a major research university with a distinguished faculty committed to studying and finding solutions to the global climate problem and environmental degradation, Princeton has a responsibility to shape the national sustainability agenda and to promote environmental leadership on its campus. Moreover, the University has an additional responsibility to prepare its students to do their part to protect the planet's natural resources for future generations.

As important as it is for Princeton to reduce its own impact on the environment, the most fundamental contribution that the University will make to the future wellbeing of the planet will come from the research of our faculty and students that creates a path for environmental progress and alternative energy sources. It is for this reason that a central element of Princeton's commitment to sustainability and one of the highest priorities in the *Aspire* Campaign is to invest \$325 million in teaching and research to stimulate fresh collaborations and propel inventive thinking on urgent questions related to energy and the environment.

What links these imperatives together is the opportunity for the campus to serve as both a model for advanced sustainability practices and a laboratory for students and faculty to test new ideas and approaches. The campus-as-laboratory theme leads us to focus on strategies that decrease the University's environmental footprint in measurable ways, rather than the purchase of offsets or the investment in off campus strategies.

The University has a history of adhering to high environmental standards in its operations, in offices ranging from facilities and dining services to purchasing. Faculty are engaged in research into all aspects of climate change and energy use. Students have demonstrated interest and commitment, reflected in a broad range of initiatives and activities. We believe the time has come to articulate a comprehensive set of sustainability goals and to call upon all members of the University community, both individually and collectively, to help Princeton play a leading role in what will need to be a global effort to achieve a sustainable future for everyone.

## The Nature of the Plan

The premise of this plan is that Princeton must ensure that its physical campus and the experience it provides for its students, faculty, and staff reflect and respect sustainability principles. The plan proposes aggressive but achievable goals in three priority areas: **Greenhouse Gas Reduction; Resource Conservation; and Research, Education, and Civic Engagement.** It outlines strong action in the University operations, in complement with academic and research initiatives, in offices across the institution. The plan deliberately resists the trend toward symbolic gestures that are not likely to lead to substantial improvement in performance and community awareness or that shift the focus away from meaningful actions to reduce environmental impact. Instead, it takes a principled approach to reducing negative impacts – selecting specific objectives in areas in which Princeton can achieve real and measurable progress. The strategies proposed in the plan are tailored to the buildings, energy infrastructure, and academic and social environment that are particular to Princeton.

The plan builds on a legacy of environmental stewardship at Princeton. For example, the University's program of tree planting and replacement has been a hallmark of the institution since President James McCosh directed the planting of numerous young trees. Many of the University's trees and other plantings have been sustained by underground cisterns that were designed to collect rainwater by Beatrix Farrand, the University's landscape architect from 1913-1943. Farrand's innovative work set an early precedent for water conservation and management practices that are now being implemented as part of the current campus plan.

With the installation of a cogeneration facility in 1996 and a 2.6 million gallon chilled water storage tank in 2005, the Princeton campus has one of the nation's most efficient and cost-effective central power facilities. The plant provides the vast majority of the University's heating and cooling needs as well as almost 50% of its electrical demand. It earned a 2007 EPA Energy Star Award in recognition of its initial reduction of 18,000 metric tons of carbon dioxide emissions. The University also draws upon a 100-well geothermal system which heats and cools 207 apartments in the Lawrence complex, and it is installing a 400-kilowatt solar array on an off-campus storage facility.

In 2002 President Shirley M. Tilghman established the Princeton Environmental Oversight Committee (now the Princeton Sustainability Committee (PSC)), consisting of students, faculty, and staff, to identify means to improve the University's environmental footprint. Since then, we have come to realize that while our individual environmental projects have been successful, exemplary campus stewardship and preparing our students to be informed and engaged environmental citizens require a comprehensive plan. To that end, in 2006 the committee established ten working groups that assessed existing stewardship initiatives and potential opportunities across the institution. Informed by this University-wide assessment, the Princeton Sustainability Plan aggressively addresses the institution's environmental impacts in measureable ways that can be tracked by the PSC and the Office of Sustainability.

## **Sustainability Goals and Strategies**

### **Greenhouse Gas Reduction**

There is scientific consensus that human-caused carbon dioxide emissions are significantly damaging our environment. The plan's goal is to reduce campus emissions to 1990 levels by 2020 without the purchase of offsets. The strategies supporting this goal must focus primarily on our already very efficient central plant and the buildings which it heats, cools and electrifies (which accounts for approximately 85% of the University's emissions) as well as purchased power and increasing efficiency of new construction and renovated facilities. Transportation also must be addressed as it accounts for the second largest source of campus emissions. Achieving this goal will prevent 75,000 metric tons of carbon dioxide from entering the atmosphere in 2020 and in each subsequent year – yielding the highest direct environmental impact of any objective in the plan.

#### **1. Utility Emissions Reduction**

The following goal applies to the central plant facility and purchased power as well as to increasing the efficiency of our new construction and renovated facilities.

##### **Goal**

- **Decrease campus carbon dioxide emissions to 1990 levels by 2020.** This goal is fully in alignment with the State of New Jersey's energy master plan and is both principled and ambitious. First, Princeton aspires to achieve the reduction to 1990 emissions levels through activities on our campus rather than through off-campus "offsets." Second, we propose to achieve this goal after having added approximately 1.5 million square feet to the campus since 1990 and even as we now add approximately 2 million gross square feet of new construction over the next ten years. Finally, our emissions goal has an end date of 2020. We have not set an additional goal for 2050. Given the likelihood that unforeseen technologies will emerge over the next 20 years that will have a significant impact on greenhouse gas emission, and with this new information, our successors will be able to determine a new goal that continues our aggressive approach to a sustainable future.

##### **Strategies**

- Apply alternative technologies and alternative fuel options to decrease emissions from the central power facility.
- Expand energy conservation through retrofits in existing buildings across campus.
- Design new construction and renovations to use 50% less energy than required by current energy code. Included in this strategy is a commitment to design all projects to at least a LEED Silver equivalency.
- Include experience in leading-edge sustainable design as a criterion for the selection of architects.
- Apply an internal voluntary "CO<sub>2</sub> tax" when conducting financial cost-benefit analyses used to determine whether to undertake more energy efficient designs and technologies.

At present, when the Facilities Department conducts its analysis to determine whether to invest in a conservation effort, it calculates the benefit of each conservation effort by using the projected cost of the relevant energy source. We adopt the measure when this avoided cost justifies the cost of undertaking it. We now plan to add a voluntary “tax” based on average market values (which at present are between \$30 and \$40 per metric ton of projected carbon dioxide emissions) when we calculate the avoided energy cost. By applying this “tax,” the University will place a monetary value on our environmental impact, which in turn will increase the “savings” that we would achieve by undertaking the project. This will lead us to adopt more costly energy-efficient designs and technologies than we would have approved in the past, and will accelerate our progress toward reducing campus emissions to 1990 levels by 2020.

***A note about offsets:*** The above strategies do not include the purchase of offsets or other off-campus projects. Purchasing offsets, in essence, gives the purchaser the right to continue emitting greenhouse gases; in theory, the money expended to purchase the offsets would pay the costs of reducing emissions elsewhere in the world. We have two reasons for regarding this as an unsuitable long-term strategy for Princeton. First, knowledgeable observers have suggested that many payments for offsets never actually get used to pay for environmental improvements. In other cases they pay for improvements which would have been undertaken even in the absence of the offset payment (because they were economically efficient). In either of these scenarios, the offsets have little (or no) impact on the emission of greenhouse gases.

Second, even if we could be confident that offset payments would be used for their intended purposes, we do not believe that purchasing offsets is a viable long-term response to global warming. It is not enough to offset emissions; there needs to be a reduction in emissions, and to reduce them, some actors must reform their own behavior rather than pay others for the privilege of continuing to pollute. Consequently, the use of offsets or other off-campus projects is not proposed at this time, although the use of off-campus opportunities could be considered in future years if their quality and reliability improve significantly.

We believe that we have a responsibility to look for ways to achieve environmental improvements in our own operations. Because this campus-based goal depends on the emergence of new technologies, innovation with existing technologies, and behavioral change, we cannot know precisely the means by which we will achieve it. We believe that by serving as a laboratory for the development of new technologies and practices we not only contribute to and exemplify the range of behaviors needed to achieve a sustainable society, but we also involve our students in ways that will train them to be good environmental citizens in the future.

## **2. Transportation**

Transportation accounts for the second largest source of the campus emissions footprint. Princeton transportation initiatives can serve as a model for the region, by fostering and rewarding responsible transportation habits among its community members. The goals in this category apply to vehicles commuting to campus and the campus fleet.

## **Goals**

- **By 2020, decrease by 10% the number of cars commuting to campus** on a daily basis, thereby reducing greenhouse gas emissions and parking demand.
- **Reduce emissions related to the campus fleet.**

## **Strategies**

- Provide financial support for commuter use of public transportation.
- Enhance the campus shuttle system and link it with local and other institutions' operations.
- Develop ride share and/or shuttle transit programs.
- Increase controls in the existing parking system.
- Encourage walking and biking as a mean of commuting through incentives, enhanced bike lanes and walking paths, and the establishment of bike storage and repair facilities.
- Develop telecommuting policy for University employees.
- Replace retired campus fleet vehicles with appropriate zero or low-emission vehicles.
- Increase use of videoconferencing in meeting and communicating with geographically distant individuals.

## **Resource Conservation**

Princeton has a history of institution-wide resource conservation with initiatives such as the early adoption of 100% recycled paper and dining services' aggressive purchase of sustainable food. Even though the largest campus impact of the plan will come from decreasing greenhouse gas emissions, the University aims to continue its leadership in conserving resources. This plan identifies conservation initiatives in multiple University operations.

### **1. Storm Water Management and Domestic Water Conservation**

The campus landscape is a critical part of the University's commitment to responsible environmental stewardship. Princeton has a legacy of landscape planning that is sensitive to water-use, chemical inputs, and maintenance costs. The Princeton Sustainability Plan preserves and builds on that legacy to ensure that the campus continues to serve as a model for development during a period of growth. Consistent with our Campus Plan, the Sustainability Plan also proposes an ambitious program of storm water management that both reduces demand for water and helps to preserve the regional watershed.

As for domestic water usage, New Jersey frequently suffers from both surface-water and groundwater drought conditions. The Princeton Sustainability Plan would position the University at the forefront of domestic water conservation initiatives in the region and demonstrate strategies that we hope will be emulated by others.

## Goals

- **Apply an integrated landscaping approach** that recognizes vegetation, soils, pavement systems, and storm water management as interlinked, and helps to restore the quality and capacity of the regional watershed.
- **Minimize use of potable water for irrigation**, increase water retained for beneficial purposes on campus, and improve the quality of water outflow.
- **By 2020, decrease personal water use by 25% below 2007 levels per student** through the use of conserving technologies and community education.
- **Reduce water use for infrastructure** to the maximum extent possible.

## Strategies

- Implement sustainable design principles and innovative site design techniques to all future projects to minimize adverse environmental impacts on ecologically sensitive areas and the regional watershed.
- Build new projects on sites that have already been developed wherever possible and create additional “green space.”
- Reduce storm water runoff through on-site mitigation techniques such as rain gardens or green roofs, when appropriate.
- Install rainwater storage and reuse systems in new construction projects and major renovations when possible.
- Minimize irrigation through the use of drought resistant plantings and properly selected soils.
- Reduce the total square footage of impervious surface area on campus by building structured parking facilities.
- Install low flow shower heads and aerators in 20% of all fixtures by 2008 and 95% by 2009.
- Upgrade toilets and urinals to low flow models by 2020.
- Reduce lab water use by installing efficient appliances and closed circuit water cooling systems.
- Distribute information to the campus community that encourages efficient water usage.

## 2. Solid Waste and Green Cleaning

Each of us is responsible for about 4.6 pounds of solid waste every day, for an annual total of 251 million tons for the nation in 2006. More than half of that volume ends up in landfills. Recycling reduces the emission of greenhouse gases and water pollutants, conserves resources, and reduces the need for new landfills and incinerators. Also, many traditional cleaning products contain ingredients that can have adverse effects on custodial staff, students, faculty, and the environment. The Princeton Sustainability Plan proposes strategies for improving recycling performance as well as the “greening” of our cleaning services

## Goals

- **Increase household recycling percentage** from 2007 rate of 38% of all recyclable materials to **50% by 2012.**

- **Recycle at least 95% of all eligible materials from demolition and construction waste, starting immediately.**
- **Convert to 100% Green Seal or equivalent cleaning products by 2009.**
- **Complete transition to 100% recycled disposable paper products by 2009.**
- **Reduce the use of disposable paper products.**

#### **Strategies**

- Install multi-function recycling receptacles in all dormitories, classrooms, conference rooms, labs, appropriate common spaces, and athletic venues.
- Increase amount of academic year-end donations and recycling options.
- Require the recycling of at least 95% of all eligible materials from demolition and construction waste as part of construction contracts.
- Enhance surplus program to reduce solid waste and University purchases.
- Implement pilot test for full line of green cleaning products in 2008 and convert housekeeping to new green products in 2009.
- Implement 100% recycled hand towels in all existing towel dispensers by FY09, with evaluation of other hand-drying options starting immediately.
- Implement conserving dispenser technology for disposable paper products.
- Create incentives for students, faculty, and staff to refrain from excessive paper usage in campus printing facilities.
- Strengthen student Ecology Representative (Eco-Rep) program.

### **3. Purchasing Goods, Services, and Food Products**

Princeton has adopted aggressive green purchasing goals and continues to expand its programs to influence the market and meet Princeton's environmental stewardship goals. Princeton also recognizes that the purchase of sustainably-produced foods reduce the institution's carbon footprint by requiring less fossil fuel, and improve ecosystem health through environmentally friendly farming methods.

#### **Goals**

- **Maximize number of purchasing contracts for "green" goods and services.**
- **Significantly increase the percentage of sustainably-produced food items from the current base of 20%, based on careful assessment**
- **Enhance efforts to interest the campus community in sustainably-produced food products.**

#### **Strategies**

- Develop a *Life Cycle Assessment* (LCA) program through better management of the product supply chain.
- Establish further alliances with purchasing cooperatives to combine purchasing power which will affect market changes and reduce the collective environmental footprint.
- Require purchase of *Energy Star* appliances whenever available.
- Maximize use of eco-friendly and low volatile organic compound building materials.
- Pursue additional sustainable paper products, work with vendors to maximize toner/ink cartridge recycling, and increase bulb/lamp recycling.

- Fund the research required to identify sustainable food for purchase and enhance food offerings.
- Educate the campus community concerning the environmental, social, and economic impact of their food choices in order to decrease their demand for non-sustainable food.

## **Research, Education, and Civic Engagement**

While the University is committed to aggressively pursuing improvements in the sustainability of its operations, its potential global impact lies in research and education. The University's faculty is uniquely positioned to advance research and public discourse on environmental, ecological, social, and economic sustainability. Faculty research and teaching, including initiatives that engage the campus as a laboratory for new ideas, will reap exponential environmental benefits that investments in our institutional operations alone cannot hope to achieve. Indeed, investments in research and education are arguably the most effective way that a University like Princeton can use its resources to solve the problem of global climate change.

### **1. Research and Education**

The Princeton Sustainability Plan proposes support for research, student projects, and staff initiatives that use the campus as a dynamic hands-on laboratory for studying and testing innovative approaches to sustainability. Students involved in sustainability research and other environmental initiatives will be prepared for lives of leadership and active civic engagement in a time when such engagement is critical to achieving a sustainable future.

#### **Goals**

- **Broaden interdisciplinary participation** among faculty and students in environmental, social, and economic research and problem solving, artistic expression, and communications relating to sustainability.
- **Facilitate and advance connections between faculty and graduate student research and undergraduate education related to sustainability.**
- **Increase graduate student and undergraduate research opportunities** that incorporate links between the local campus environment and global sustainability issues.

#### **Strategies**

- Engage faculty with interests in sustainability, including future faculty who will be recruited as part of the Engineering and the Environment initiative in the *Aspire* Campaign.
- Support research initiatives that capitalize on the campus environment through the Princeton Environmental Institute, the Woodrow Wilson School of Public and International Affairs, the School of Engineering and Applied Science, the School of Architecture, the Department of Ecology and Evolutionary Biology, and other departments.

- Provide funds for the development and ongoing support of courses in fields that include themes or apply scholarship and research related to sustainability.
- Support junior independent work and senior theses that enhance undergraduate education and research in sustainability.
- Support graduate fellowships that relate to campus-based projects and/or foster collaboration with undergraduates on sustainability research and projects.
- Support independent graduate and undergraduate student research relating to campus-based sustainability projects.

## 2. **Civic Engagement**

Princeton strives to educate future leaders to be exemplary citizens in the nation's service and in the service of all nations. There are few efforts more aligned to this mission than the pursuit of global sustainability and it is an effort with ties to every discipline. The Princeton Sustainability Plan aspires to provide all members of the Princeton community with a sense of how their personal commitments and choices can contribute to progress toward a sustainable future. It does this through formal and informal multi- and cross-disciplinary education programs, outreach efforts, and collaborative initiatives among departments, both academic and operational.

### **Goals**

- **Expose all Princeton University undergraduate and graduate students to principles of sustainability.**
- **Develop leaders in sustainability among students, staff, and faculty.**

### **Strategies**

- Train residential/campus life staff to engage the entire student body in sustainability issues and responsibilities, utilizing the Eco-Rep program structure.
- Promote sustainable practices among University community members through education and by example.
- Support student sustainability initiatives.
- Establish research apprenticeships and internships for graduate and undergraduate students in the Office of Sustainability to work on advancing the objectives of this plan through research and innovation, monitoring progress, and measuring results.

## 3. **Communications**

Communications is an essential tool for engaging the community, encouraging leadership, and sparking creative action. There is an increasing recognition that much of the educational value of sustainability initiatives is lost if the story is not told in a compelling way. Motivating engagement in sustainability depends on communicating both the challenges we face and the opportunities that are available to help address them. The Princeton Sustainability Plan proposes to engage the community, including students, in telling its story.

### **Goals**

- **Expand the discourse about sustainability on campus, in the local community, and across the nation.**

- **Instill in students an awareness of their responsibilities as global citizens.**
- **Increase public recognition of Princeton as a leader in sustainability.**

### **Strategies**

- Increase the visibility of sustainability initiatives in Princeton University publications.
- Create media projects drawing on student experiences.
- Develop a dynamic sustainability website.
- Distribute a newsletter and other promotional materials in collaboration with allied academic programs.
- Place signs at appropriate places on campus to inform the community about sustainability initiatives relative to certain spaces or services.
- Cultivate closer relations with external media on environmental issues.

### **Measuring Progress**

The Princeton Sustainability Committee has developed specific metrics for each of the plan's goals – from metric tons of campus-emitted carbon dioxide, recycling rates, and a program to assess the long-term health of the landscape to levels of enrollment in environmental courses, number of student environmental initiatives, and extent of independent research focused on environmental themes. Going forward, the committee will monitor the plan by setting annual goals and will regularly update the plan by incorporating new knowledge and technologies. An annual sustainability report will be produced to measure progress against these metrics.

### **Conclusion**

The Princeton Sustainability Plan builds on a long tradition of stellar campus stewardship guided by values that have come to be recognized today as sustainability principles – conscientious use of resources, thoughtful regard for the environment, and innovative use of materials and technologies. It applies these principles to the challenges of our time in ways that are ambitious and achievable, and that will allow Princeton to play a more visible leadership role in support of environmental sustainability as it conducts its operations, supports its faculty, and prepares its students to make their own contributions to a sustainable future.