

**BROWN UNIVERSITY
SUSTAINABILITY PROGRESS
REPORT**



**OFFICE OF SUSTAINABLE ENERGY AND
ENVIRONMENTAL INITIATIVES,
FACILITIES MANAGEMENT**



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I. Executive Summary

This report delineates the measures taken by Brown University to promote and maintain environmental sustainability both on campus and in the greater community. Through energy conservation, carbon emissions reduction, recycling, and other sustainable practices across various university departments, Brown continues to reduce its environmental footprint in order to preserve natural resources, promote environmental health and help mitigate global climate change.

In the past four years, Brown University has reduced its energy-related carbon footprint by 26.1 percent below 2007 levels as part of an ambitious greenhouse gas reduction plan. This 26.1 percent reduction puts us significantly ahead of the 16 percent reduction goal laid out in the original plan. This rapid reduction was accomplished by switching from carbon intensive Number 6 fuel oil to natural gas at our Central Heat Plant; switching to a new, less carbon intensive electricity supplier; and a continued focus on energy efficiency investments initiated in fiscal year 2008 to help meet future fiscal year reduction targets. Facilities Management's Planning Design & Construction office also implemented multiple projects under the high performance design goals for all new construction, major renovations, and acquired facilities, including a minimum certification of Leadership in Energy and Environmental Design (LEED®) Silver and at least 25 percent better than code in energy utilization.

Under the energy efficiency investment program Facilities Management has 271 projects of various size and scope either completed, in progress, or under development. We have invested an additional \$3.5 million dollars this past year to achieve a total reduction of approximately 3,549 metric tons of Carbon Dioxide Equivalents (MTCDE) through energy efficiency, or 6 percent reduction from fiscal year 2010. Over the life of the program we have invested approximately \$7.6 million dollars for a total reduction of 19,030 MTCDE, or 26.1 percent below fiscal year 2007 levels. To date, our efforts have resulted in a savings of approximately \$1.5 million dollars in annual energy expense.

In addition to the efforts by Facilities Management, many other departments and student groups are working on and off campus to lower our environmental impact and carbon footprint. These include academic and research projects, student initiatives, and departmental waste reduction and responsible purchasing practices.



II. Partner Organizations

A. Ivy Plus Sustainability Working Group

“In April 2007, Yale University’s President Levin invited teams of representatives from the Ivy Plus institutions to gather at Yale to focus on Sustainability and Greenhouse Gas Reduction Commitments. The Ivy Plus Sustainability working group emerged from that initial meeting. The Ivy Plus Sustainability working group is committed to sharing solutions that include the implementation of innovative technologies as well as research and operational methodologies that advance our commitment to greenhouse gas reduction on our campuses. Participants agreed that a unified effort on the part of the leading institutions of higher education to respond to one of the most pressing issues of our time, climate change, is essential. The Ivy Plus group is faced with the opportunity and responsibility to develop cutting edge model operations, engage top scholars, and educate the future leaders on issues of sustainable development and climate change.”¹

B. Emerald Cities Collaborative

Brown is sharing its expertise with the Emerald Cities Collaborative (ECC) and a consortium of Providence businesses, community groups and government officials to create a future in which American Cities such as ours are the greenest and most equitable in the world. “ECC is a national coalition of diverse groups that includes unions, labor groups, community organizations, social justice advocates, development intermediaries, research and technical assistance providers, socially responsible businesses, and elected officials.”²

ECC is “united around the goal of rapidly greening our nation’s central cities and metropolitan regions.” They “envision a future in which American cities are the greenest and most equitable in the world, leading the way to head off global climate change while creating a vital new economic sector.”³

C. Greening the Knowledge District

“Green the Knowledge District (GKD)⁴ is a place-based analysis of the flow of resources and impacts on the environment associated with land development and building operations. Under the leadership of Ocean State Consortium of Advanced Resources (OSCAR)⁵, the initiative

¹ *Yale Office of Sustainability*. @2010-11 Yale University. Web. 19 Sep. 2011.
<http://sustainability.yale.edu/ivy-plus>

² *Emerald Cities Collaborative*, @2010-2011 Emerald Cities Collaborative. Web. 19 Sep. 2011.
<<http://www.emeraldcities.org/>>

³ Ibid.

⁴ Brown Engineering News, 10 Mar. 2011, Web. 23 Sep. 2011,
<<http://brownengineering.blogspot.com/2011/03/greening-knowledge-district.html>>

⁵ OSCAR, 13 Dec. 2010, Web. 23 Sep. 2011, <<http://oscarri.org/2010/12/13/meet-oscar-statewide-institutions-sharing-resources-for-common-good-of-rhode-island/>>



assesses conditions, recommends innovations, and pilots collaborations with the aim of furthering sustainability. Taking advantage of unique characteristics and a window of opportunity for new investments, GKD is generating findings relevant for replication in other areas of the city and state.

OSCAR is a movement of diverse Rhode Island stakeholders contributing resources (subject matter experts, student labor, computing resources, real world knowledge) and innovative thinking to establish an economically sustainable statewide community. The OSCAR action teams cross organizations, disciplines and sectors to address Rhode Island's most challenging problems."⁶

D. Providence Sustainability Roundtable

The mission of the Providence Sustainability Roundtable is to "encourage sharing and collaboration among Providence-based institutions on green initiatives in order to promote environmental stewardship and sustainable practices at home, at work and in the community."⁷ Members of the Roundtable currently include Brown University, Blue Cross Blue Shield of Rhode Island, Citizens Bank, City of Providence, GTECH, Rhode Island School of Design, Textron, United Natural Foods, Gilbane, and Johnson & Wales.

E. Energy Efficiency and Resource Management Council (EERMC)

The EERMC provides "an integrated, comprehensive, public, stakeholder-driven organizational structure to secure for Rhode Island and its people the full supply, economic and environmental benefits of energy efficiency, conservation and resource management."⁸

F. International Sustainable Campus Network (ISCN)

On January 28, 2010, President Ruth Simmons signed the [Sustainable Campus Charter](#). Signatories of the Sustainable Campus Charter become partners of the [International Sustainable Campus Network](#), whose purpose, according to the Network charter, is to enhance universities' commitments to construct, redesign, and organize their campuses in an exemplary and sustainable way, and to include these experiences in the education they provide.⁹

"Universities around the world are already confronting issues of sustainability, both in their laboratories and in their business operations." Simmons said. The charter "will keep these issues in focus and enlarge the community of academic and civic leaders who are productively engaged in the important principles of conservation, sustainability, and environmental health."¹⁰

⁶ K.Shannon (personal communication, September 23, 2011)

⁷ D.McCabe (personal communication, June 22, 2011)

⁸ *State of Rhode Island, RI Energy and Efficiency Resource Management Council*, n.d. Web 19 Sep. 2011 <<http://www.rieermc.ri.gov/>>

⁹ *International Sustainable Campus Network*. Novatlantis. 2007. Web. 19 Sep. 2011. <<http://www.international-sustainable-campus-network.org/>>

¹⁰ Lewis, Richard. "Brown Joins Select Group to Promote Sustainability on University Campuses."



Reports are made available to the World Economic Forum each year. The report charts integrated sustainability progress in individual buildings, campus-wide planning and target setting, and integration of research, teaching, outreach and facilities.



III. Facilities Management: Energy & Emissions

President Simmons announced Brown's first **Greenhouse Gas Goals** on January 24, 2008. The goals are as follows:

For **Existing Buildings**: Reduce greenhouse gas emissions to 42 percent below 2007 levels (equivalent to 15 percent below 1990 levels) for existing buildings. Initial interim cumulative goal of 4 percent per year is in place and monitored annually to meet 42 percent target by 2020.

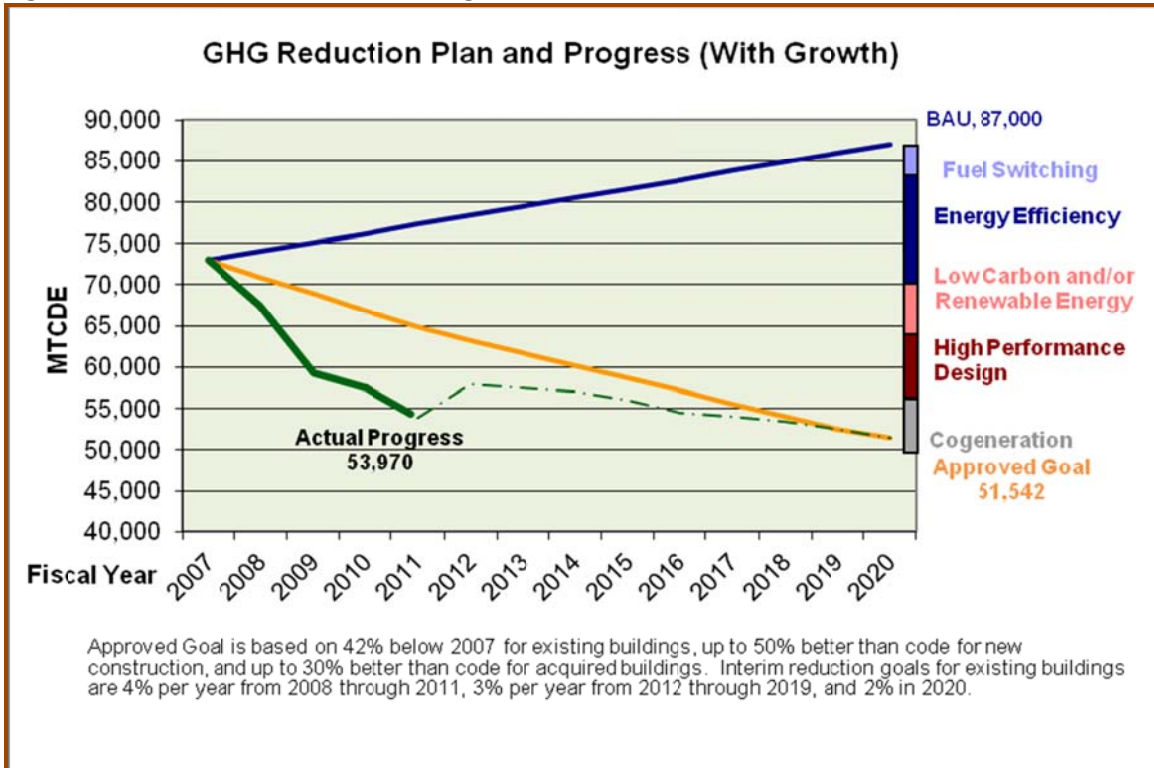
For **New Construction**: Limit greenhouse gas emissions by reducing energy consumption for all newly constructed facilities to between 25 percent and 50 percent below the standard required by state code. New construction will, **at a minimum**, meet a silver standard in Leadership in Energy and Environmental Design (LEED®) certification, furthering sustainability goals.

For **Acquired Buildings**: A reduction of greenhouse gas emissions for all newly acquired facilities by a minimum of 15 percent and as much as 30 percent.



A. Plan and Projections

Figure 1: GHG Reduction Plan and Progress with Growth



KEY:

MTCDE = Metric Tons of Carbon Dioxide Equivalent

BAU = Business As Usual

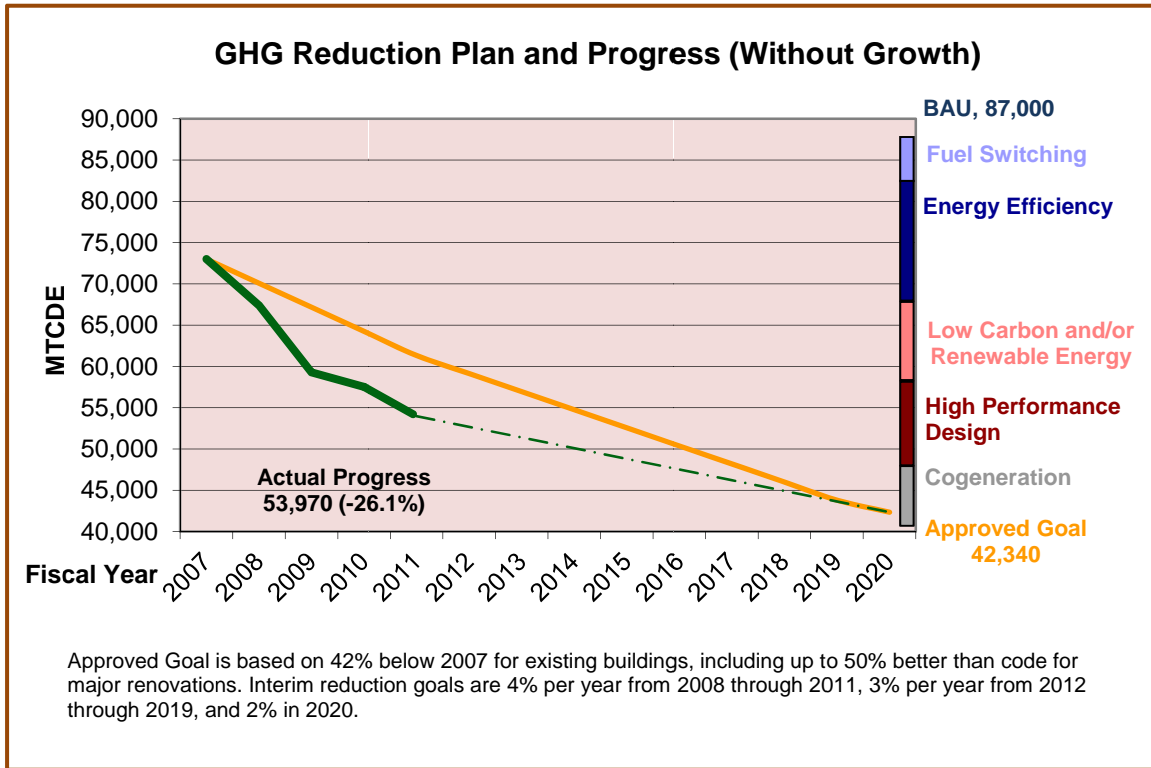
The yellow line represents the level of CO₂ emissions approved by Goals.

The dark blue line indicates the level of CO₂ emissions that would be released if the Goals were not implemented on campus.

The green line indicates the actual decrease in CO₂ emissions since implementing the strategies listed on the right hand side of the chart.



Figure 2: GHG Reduction Plan and Progress Without Growth



B. Progress

1. Existing Buildings (6.4 million sq. ft.): The initiatives, to reduce emissions to meet this goal, are as follows:

a. Fuel Switching from fuel oil to natural gas in the Central Heat Plant when optimal (~5 – 10 percent reduction target). In order to reduce the greenhouse gas emissions of fossil fuels by a minimum of 30 percent starting in fiscal year 2008 and continuing through 2020.

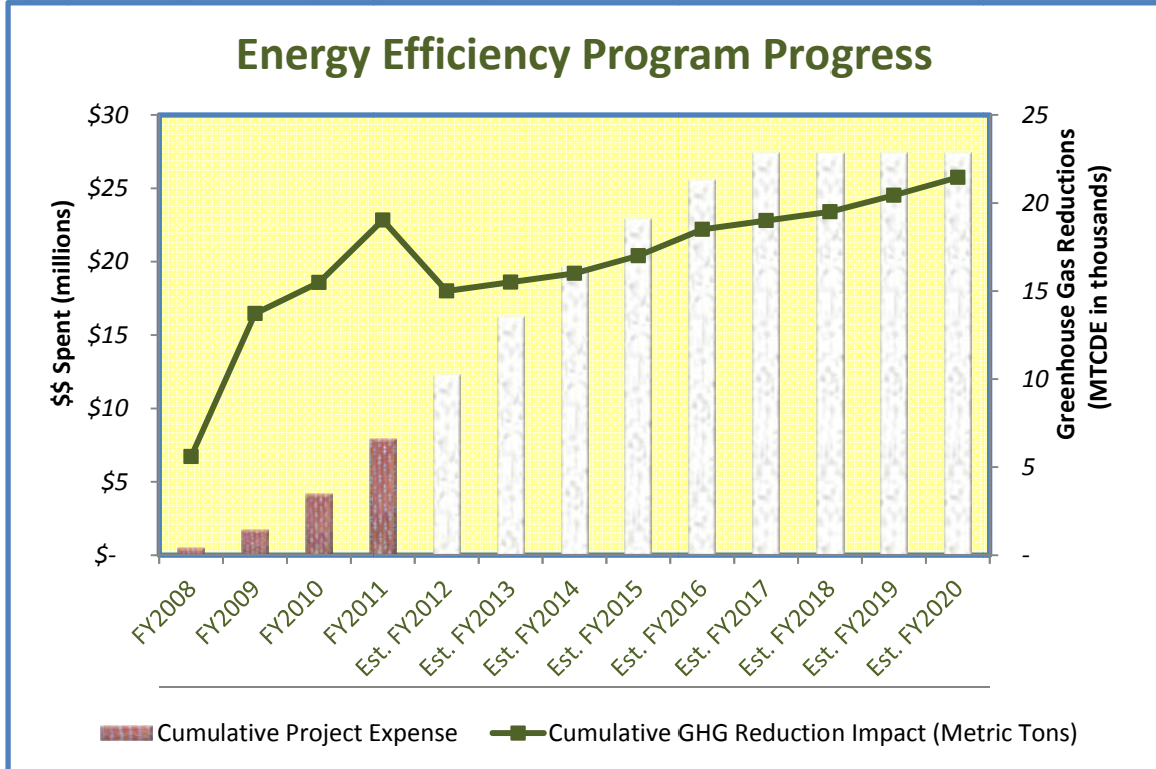
- This goal has been fully implemented and surpasses targeted reduction requirements by successfully implementing a new procurement plan that ensures Brown will be operating on natural gas throughout the entire heating season.

b. In conjunction with the Energy and Environmental Advisory Committee, Facilities Management’s Energy & Environment Office submitted and received approval from the administration for a long-term energy efficiency investment plan to support the greenhouse gas reduction targets by reducing **Brown’s energy consumption by approximately 20 percent** to achieve a 16,000 MTCDE reduction.



- Identified projects to-date: \$25.8 million.
- Progress since inception: For an investment of \$7.6 million dollars to date, Brown saved \$1.5 million dollars in annual energy costs, and reduced its carbon footprint by 19,030 MTCDE, or 26.1 percent.
- Progress during fiscal year 2011 compared to fiscal year 2010: Last year alone Brown invested \$3.5 million dollars, saved \$500 thousand dollars, and reduced our carbon footprint by a total of 3,549 MTCDE through energy efficiency.

Figure 3: Energy Efficiency Program Progress



c. The energy efficiency investments in existing buildings are being achieved by the following initiatives:

1) Steam System Condensate: **Completed Mid Fiscal Year 2009** (\$300,000 in energy savings). During the summer of 2009, 1,400 steam traps throughout campus buildings were replaced to increase the efficiency of the overall heating systems and improve system performance. As part of this project, all steam traps, condensate receivers and return pumps and valves were replaced as necessary. In addition, an annual inspection and repair program was implemented to ensure failed traps are replaced, ensuring an efficient steam and high temperature hot water (HTHW) distribution system operation.

2) Lighting and Lighting Controls. A total of 59 buildings were upgraded in fiscal years 2009 through 2011 with a combined cost of \$2.1 million dollars and an annual savings of \$500,000 for an average payback of four years.



- Completed FY11 (21):
 - Churchill House, 20 Benevolent, Andrews House, 25 George, 5 Benevolent, Hemisphere Building, Main Green Lighting, Dining Services, 37 Manning, Robinson Hall, Marston Hall, 10 Park Lane, 155 George Street, Fox Point Early Education Center, Sharpe House, Grad Center A-E, 70 Waterman, 70 Ship, Brown Office Building, Slater, Hope College.
- Completed FY10 (16):
 - Andrews House, Corliss Bracket, Faculty Club, 8 Fones Alley, Pizzitola (remainder of gym), Lincoln Field Building, 2 Stimson, Stuart Theatre, Maxcy Hall, Shirley Miller House, Prospect House, 295 Lloyd Avenue, 67 and 163 George, Walter Hall, Wilson Hall, John Carter Brown Library.
- Completed Fiscal Year 2009 (22):
 - Pizzitola Sports Center (1st floor gym), Olney Margolies Athletic Center, Power Street Garage, Prince Lab,; Arnold Lab, 55 Power Street, Leung Gallery, University Hall, Alumnae Hall, Steinert Center, Orwig Music Building, Sciences Library, Sharpe Refectory, Geological and Chemical Sciences Building, Dyer House, Nicholson House, Maddock Alumni Center, Hoppin House, Gerard House, Barus Hall, 180 and 182 George Street, Kassar-Gould House.
- Twenty-five buildings are in the process of lighting and lighting control audits. Twenty-five percent of these buildings have completed technical and financial evaluations and retrofitting is in the process of being awarded to contractors. Another 25 percent are scheduled for audits and the remaining 50 percent of buildings are scheduled for completion in fiscal year 2012.

3) Retro-Commissioning (RCx) for Existing Buildings. This program evaluates facilities both from an operational and system design perspective, identifying efficiency opportunities through improving how existing systems are operated and/or through replacement of existing systems or equipment.

- The following buildings have either had assessments completed or are in the process of being assessed by RCx consultants:
 - Bio-Molecular Research (70 Ship Street), 55 Power Street, Barus and Holley, List Art, Meehan Auditorium, Watson/CIT, The Geological and Chemical Sciences Building, W. MacMillan Hall, Pizzitola Sports Center, Sharpe Refectory, Sidney E. Frank Hall for Life Sciences, Olney-Margolies Athletic Center (OMAC), John Hay Library, Graduate Center E, John D. Rockefeller, Jr. Library, Prince Engineering Lab, Bio Medical Center, Marston Hall, Barus



Building, Keeney Quad, Wriston Quad, 295 Lloyd Avenue.

- The following are some of the buildings that will begin the investigation phase in fiscal year 2012:
 - Horace Mann, Salomon, Lincoln Field Building, J. W. Wilson, John Carter Brown Library, Grant Fulton, 180 George Street (Center for Computation and Visualization).

4) Miscellaneous Energy Efficiency Improvements. A number of small to medium-sized energy-efficiency projects were previously identified but lacked funding to move them forward. Since the inception of this funding program, the following projects have been awarded:

- Direct Digital Controls for ensuring heating system switchover via the central energy management system at Facilities Management;
- Sharpe Refectory refrigeration system improvements;
- Rockefeller Library chilled water system optimization;
- MacMillan chiller system optimization;
- Emergency generator response program;
- Minden Hall radiator control system;
- Sharpe urinal replacement;
- Infrastructure to allow 100 percent fuel switching from No. 6 oil to the Central Heat Plant natural gas;
- Solar thermal domestic hot water at the new fitness and swim center;
- Reduce operating system at the Central Heat Plant to decrease environmental footprint;
- Replacing 800 existing shower heads with low-flow shower heads;
- Rockefeller chilled water loop optimization;
- MacMillan chilled-water loop energy optimization;
- Energy evaluation and fuel switch from oil to gas.

5) Lab Assessment. Brown University has over 550 fume hoods in 15 laboratory buildings on campus comprising 1,000,000 sq. ft. Because of the energy intensive nature of fume hoods, laboratory buildings represent 35 percent of Brown's annual utility budget. It is for this reason that Brown decided to focus attention on a three-phase approach to lowering the energy consumption of its laboratories. An initial assessment estimated that savings of 30 percent could be realized through assessing current demand, evaluating current operations, modifying systems, and managing and maintaining efficient operations of laboratories. The Phase 1 detailed assessment and specifications for three of our most energy intensive labs was undertaken in early 2011 and revealed that the potential for aggregate airflow energy reduction was over 74,000 cubic feet per minute and would save Brown up to \$500,000 per year. The Phase II systems optimization and energy optimization is anticipated to begin in early 2012. Concurrent with the initiation of Phase II will be the initiation of a pilot laboratory awareness campaign, where student groups, classroom projects, laboratory occupants, and the Environment Health & Safety



department will work together to certify green laboratories according to a tiered system of behavior-change commitments and changes specific to individual laboratories.

6) Energy Efficiency Opportunities for Major Renovations. There are many instances where, due to budget constraints, many value-adding, energy-efficient upgrades are unable to be funded especially when the latest state-of-the-art equipment costs are above the typical project budgeting practices.

- As part of the energy efficiency investment loan, funds have been made available for all major renovations, additions of new equipment, or replacement of significant energy-using equipment, for increased energy efficiency beyond code requirements when outside of the scope of the project, or when new, innovative technologies can be incorporated into construction.

7) Low Carbon Electricity Supply: In January of 2009, Facilities Management moved from National Grid's "standard offer" electric supplier to a supplier with a much less carbon-intensive electricity supplier.

8) Cogeneration (~5 – 10 percent GHG reduction target): A cogeneration system is one that generates electricity and utilizes the waste heat from this process to produce steam or hot water to heat the campus.

- Current analysis indicates this system is not economically justified at this time. However, if and when regulatory and other cost factors change, we will revisit this opportunity.

9) Dorm Energy Efficiency Project (DEEP): The Energy & Environment Office hired a contractor to conduct a detailed investigation of building and quad-level heating systems in Keeney Quad and Wriston Quad to identify functional deficiencies. The investigation also included engineering of potential capital improvements and a feasibility analysis of a variety of energy savings options, which included conceptual design, savings analysis, and cost estimates. The preliminary report on Diman Hall estimated a potential savings of \$32,000. Implementation of some measures in Diman Hall began in August 2011. In concert with the retro-commissioning of the Quads, strategies meant to support and entice students at Brown to live more sustainably were developed. One strategy that has been implemented is the development of a model "Green Room," with multi-part components, including an interactive website available at the [Brown is Green](#) website that allows students to navigate through a 360 degree virtual [Green Room](#). When they are finished with the video they can download a list of the items previewed in the room which includes where the items can be purchased locally. In addition, two EcoRep volunteers will be living in and tweeting about their experiences with the Green Room and the items identified in the video. The end goal of the project is to demonstrate that small changes in behavior and coordinated communications



efforts can contribute to energy savings beyond the mechanical measures undertaken. Once this pilot project is completed and assessed, it is expected to expand to all dorms undergoing major renovations and general upgrades to heating, plumbing, and envelope improvements.

2. New Construction, High Performance Design and Leadership in Energy and Environmental Design (LEED®)

As Brown University constructs, rebuilds or expands its infrastructure, Facilities Management's Planning Design & Construction office will be required to limit greenhouse gas emissions by reducing energy consumption for all newly constructed facilities to between 25 percent and 50 percent below the standard required by state code. New construction will, **at a minimum**, meet a silver standard in U.S. Green Building Council LEED® certification program. The standards of LEED® certification are silver, gold, and platinum. Brown currently has two types of LEED® projects: New Construction (NC) and Commercial Interiors (CI). Categories in which points are earned are sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and innovation and design. "Projects at Brown which have already achieved LEED®, or are designed and registered to achieve LEED® certification, include:

- a. Achieved Silver:
 - Sidney E. Frank Hall for Life Sciences, (NC, 34 of 69 points), 2009
- b. Achieved Gold:
 - Rhode Island Hall (NC, 40 of 69 points), 2010
- c. Designed to Silver:
 - Aquatics and Fitness Center (NC, 52 of 80+ points)
 - Metcalf Complex (NC, 35 of 69 points)
 - Pembroke Hall (NC, 34 of 69 points)
 - Stephen Robert '62 Campus Center at Faunce House (CI, 33 of 57 points)
 - 315 Thayer Street Dorm (NC, 51 of 80+ points)
 - Miller-Metcalf Dorm (NC, 51 of 80+ points)
 - Hunter Lab (NC, 59 of 80 points)
- d. Designed to Gold:
 - Perry and Marty Granoff Center for the Creative Arts (NC, 45 of 69 points)
 - Medical Education Building (NC, 41 of 69 points)

3. Acquired Facilities (High Performance Design: 15 – 30 percent better than code requirements).

As Brown University acquires and occupies additional buildings, it will decrease their respective carbon footprint through energy efficiency, fuel switching or other available technologies to achieve at least a 15 percent reduction and as much as 30 percent if



financially feasible. All acquired properties will be evaluated for energy improvements as plans for their use are developed.

Note: Overall, high performance design goals are projected to avoid 30 – 40 percent of the increase in greenhouse gas emissions for new and acquired buildings.



IV. Student Groups, Projects, and Initiatives

Many Brown University student groups promote energy and environmental initiatives and have spurred significant progress towards a more sustainable world both on and off campus. A list of these groups is provided in the student section of the [Brown is Green](#) website, and a partial list is provided in this report.

A. Student Groups on Campus

1. *emPOWER* is Brown's student environmental umbrella organization. Its eight member groups include: Bikes @ Brown, BCAF, *Beyond the Bottle*, *EcoReps*, Environmental Events, RISCC, and SCRAP. emPower's common meeting time and collaborative structure creates a strong sense of community among member groups that address a wide variety of sustainability issues. Their weekly e-mail digest provides information about environmental opportunities at Brown and in the community.

a. Beyond the Bottle is an organization working to eliminate the supply and demand of bottled water on Brown's campus. Their work involves coordinating with staff and faculty to find and implement new strategies for providing alternatives to purchased bottled water for daily consumption and at special events and meetings. They also relied heavily on personal outreach to students, faculty, and staff in an effort to foster a community of engaged individuals who choose tapped water over bottled water.

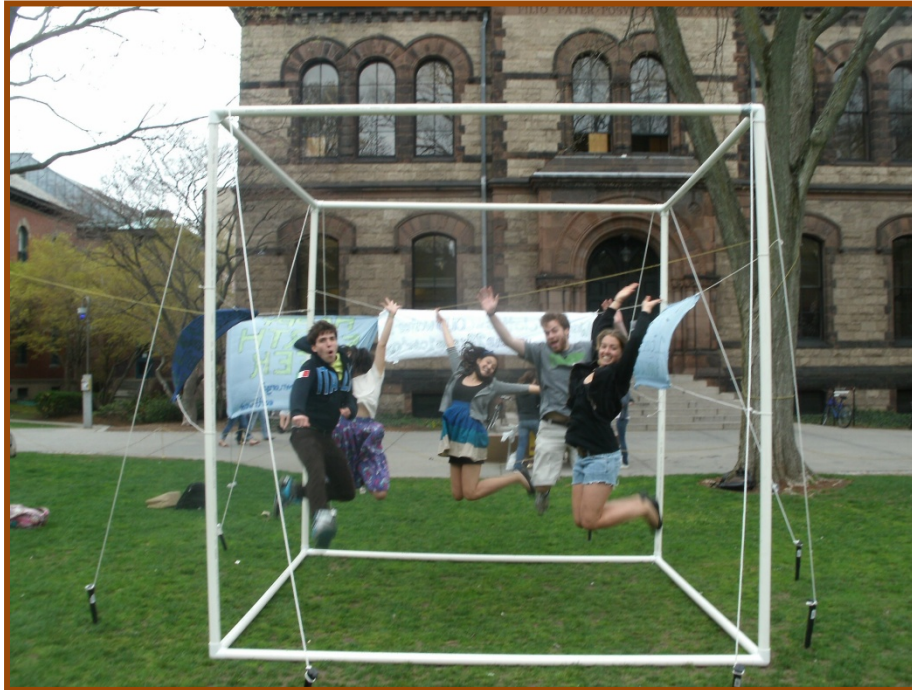
b. Bikes @ Brown: Members of the [Brown Outing Club](#) (BOC) launched a bike-share in the spring of 2009. Their initial investment included three new Schwinn Cruisers and four Mongoose mountain bikes. The bikes are available from an office in the University Student Center and can be signed out for up to two days by students who pay a \$5 yearly membership fee. A \$20 deposit applies, which is returned when the bike is returned.

c. Brown Climate Action Fund is the starting point in gaining the advice and funding associated with Facilities Management's Miscellaneous Energy Efficiency Improvement Opportunities (MEEIO) fund. MEEIO was created to facilitate projects that help Brown decrease its carbon footprint. An example of a successful project includes:

EcoFlow is a group of students dedicated to increasing water conservation and management on campus. A successful past project included upgrading water fixtures (shower heads and faucets) to higher efficiency models. A complete inventory was undertaken in the summer of 2010 by a student intern in which over 800 shower heads were identified to be replaced during Winter Break 2010 and early spring 2011. The lifetime savings from this initiative, paid for by Facilities Management, is estimated to be four million gallons of water.

d. EcoReps are passionate, environmentally-minded individuals who work with Facilities Management to help raise environmental awareness and foster green-living habits among all Brown students. Eight part-time student interns are employed by Facilities

Management, who in turn coordinates the efforts of a large group of volunteers. These volunteers develop and implement creative projects that inspire the Brown community to protect the planet in their everyday actions. They operate on the philosophy that “we can improve the environment by making simple changes in our lifestyles.”¹¹



Past projects include collecting recyclables at football games, transforming a trash room into recycling center through the use of visual arts, handing out CFL light bulbs in dorms. Annual projects include the national **RecycleMania** competition and Clean Break, a move out program. New in fiscal year 2010 and greatly expanded in 2011 was the move-in program, which saved almost 40 tons of cardboard from the landfill through additional collection container placement and an awareness campaign, Brown is Green tours for pre-freshman and a dorm energy reduction campaign.

In academic year 2010--2011 Brown participated in Campus Conservation Nationals **Compete to Reduce** dorm energy competition. During this campaign, a building energy dashboard¹² was tested for eventual campus-wide release. The dashboard allows building occupants to track their own consumption of electricity as well as compare against other buildings across campus. During energy reduction competitions, users can compare their consumption against other participating buildings or other schools across the country.

e. *Environmental Events* hosts events that raise awareness of key environmental issues.

¹¹ Brown EcoReps, n.d., Web 03 Oct 2011, <<http://brownecoreps.com/about/>>

¹²Building Dashboard, Brown University. 19 Sep 2011, Web 19 Sep 2011
<<http://buildingdashboard.net/brown/>>



f. *Student Composting to Rejuvenate Agriculture in Providence (SCRAP)* is Brown's student composting group geared towards increasing composting education, awareness, and practice throughout the Brown and Rhode Island communities. Their mission is to provide students with a campus-wide composting system, thereby completing a zero-waste food cycle throughout Brown's campus. Compost is vital because it not only diverts food from the landfill, reducing methane and other greenhouse gas emissions, but it also can be used as a natural fertilizer, avoiding the need to use heavy Nitrogen-based fertilizers. A 100 percent natural process, composting is an integral part of how we acquire our food and how we dispose of it in a sustainable fashion.

g. *The Sustainability Consulting Partnership (SCP)* is a student organization committed to helping businesses and organizations in the greater Providence area achieve sustainability goals and reduce environmental impact while driving the economic bottom line. The impact of a business on the environment is deeply multi-dimensional and includes its carbon footprint, resource use, waste outputs, site planning, and more. The SCP team works with businesses to develop and implement innovative approaches to their everyday operations. SCP hopes to contribute to the long-term success of the economy, society, and the planet.

2. *The Sustainable Food Initiative (SuFI)* is a student group working with Brown and the community to provide local, organic food options. They do this through managing an on-campus, student-run garden and a community-supported agriculture program (*Market Shares*) in which members pay a share in the spring and receive weekly boxes of fresh, organically-grown, local produce in the fall. They raise awareness about their program through film screenings and promotional events on campus.

In 2009 the Real Food initiative joined SuFI. *Real Food at Brown* is a group of students who assist Brown University with maintaining responsible participation in the local, national, and international food economy. They work to increase Brown's dining purchases of local, organic, and sustainable food and the transparency of its buying practices. They are a local affiliate of the *Real Food Challenge*, a nationwide student movement concerned with an ecologically sensitive, humane, fair and locally grown food system.

3. *Watershed: Journal of Environment & Culture* is a Brown and Rhode Island School of Design publication that explores how people relate to the environment through prose, poetry, art, science, photo essays, journalism, or whatever other creative means are at an artist's disposal. Their guiding question, "What is the natural?" is meant to investigate this relationship. They are a tight-knit publication where members can learn at their own pace the ropes of the publication process.

4. *U.S. Green Building Council Brown University Chapter*. "The Washington, D.C. based U.S. Green Building Council (USGBC) is a 501 c3 non-profit organization committed to a prosperous and sustainable future for our nation through cost-efficient and energy-saving green buildings."¹³ Greater building efficiency can meet 85 percent of future U.S. demand

¹³ Brown University, U.S. Green Building Council Brown University Chapter, n.d., Web 02 Oct 2011 <<http://mygroups.brown.edu/organization/usgbc>>



for energy and a national commitment to green building has the potential to generate 2.5 million American jobs. Established in the spring of 2011 this student chapter has been focusing their efforts on group study sessions in preparation of the Green Associate exam. They plan to continue as a study group, while expanding to facets of green building on campus.

5. *West House* is Brown's Environmental Program House. Fourteen people live in the house during the academic year. Its community includes a total of 32 individuals who are a part of the West House Food Co-operative. The House is open every Friday to the entire community for Open Dinner Night. All food prepared in West House is vegetarian or vegan; and they strive to purchase primarily local, seasonal produce. Each resident also has a house job, with responsibilities ranging from coordinating environmental initiatives to managing the garden and backyard compost system. In the spring of 2010 one of its residents and several of her classmates approached Facilities Management with a plan for making their building more efficient. As a result of that plan, a new boiler with annual fuel utilization efficiency (AFUE) of 95.7 percent was installed in the fall of 2010.

B. Student Groups Working in the Local Community

1. *Community Carbon Use Reduction at Brown (C-CURB)*. With support from the Sidney E. Frank Foundation and the office of the president, Brown provided \$350,000 to support a pilot program designed to reduce greenhouse gas emissions through energy efficiency and education in the greater Providence area. The C-CURB project helps to catalyze local carbon emissions reductions through an investment of financial resources and development of collaborations of community and civic groups with Brown students, faculty and staff on a mix of activities. Projects accomplish the dual goals of helping meet the needs of the greater Providence neighborhoods while reducing greenhouse gas emissions.

a. Completed Projects

1) *Project 20/20* released its final report in April 2010.¹⁴ The project's original goal in April 2008 was to replace the incandescent light bulbs in at least 5,000 low-income households in the greater Providence area while reducing utility costs for these families and greenhouse gas emissions. At the completion of the project, 71,000 compact fluorescent bulbs (CFLs) had been installed in over 5,300 households, resulting in a reduction annually of ~1100 MTCDEs (metric tons of CO₂ equivalents), for a cumulative 4,400 MTCDE reduction over the life span of the bulbs.¹⁵ In total, the project netted annual savings of \$395,000, or \$1.7 million over the life of the bulbs. The annual average savings per household was \$75, or \$321 over the life of the bulbs.

2) *Pump It Up!* aimed to teach automobile drivers how to maintain their tires at optimum air pressure to increase gas mileage in order to use less gas, reducing unnecessary carbon emissions, saves money for Providence residents, and provides local, green jobs by hiring Brown and local high school students to inflate tires.

¹⁴ Fox, David. "Project 20/20 Final Report. 23 Apr. 2010

¹⁵ Emission assumptions based on EPA's 2005 eGRID data and WRI GHG Protocol Initiative



b. Ongoing Projects

1) *Environmental Justice League of Rhode Island* partners with the *State of Rhode Island Office of Energy Resources Weatherization Assistance Program* to install programmable thermostats in Providence homes, saving households an annual average of \$400 on their heating bill.

2) *John Hope Settlement House* The main component of this project involves the design and installation of a transpired wall ventilation preheating system at the John Hope Settlement House, a community support center in Providence. The purpose of such a system is to reduce the heating load of the building (by raising the level of the incoming air via a passive solar system) and thus also reduce the building's carbon footprint.

3) *DoubleGreen Credit Builder Program*, launched by the *Capital Good Fund*, provides financing for low-income homeowners who have little or no credit to pay for small-scale, energy-efficiency projects, which save borrowers approximately \$185 in annual energy bills while building their credit through demonstrated repayment of the loan.

2. *Engineers Without Borders (EWB)* is a group of students and faculty dedicated to using engineering for social and environmental good. To that end, EWB-Brown facilitates working relationships with other groups and communities, in Providence and beyond, to pursue opportunities for socially conscious and environmentally-sustainable design. Current projects include optimizing the efficiency of farming Amaranth in Western Kenya and replacing firewood stoves in Africa with biogas alternatives.

3. *Outdoor Leadership Environmental Education Project (OLEEP)* is a mentoring program for *Metropolitan Regional Career and Technical Center (Met)* high school students. Brown volunteers engage with Met students in one-on-one mentoring relationships, weekly environmental education/science workshops, and camping or backpacking trips. OLEEP strives to foster individual environmental awareness, experiential science education, personal challenge, and leadership skills in Brown and Met students as they learn from each other.

C. Student Groups Working in the Global Community

*Rainwater for Humanity*¹⁶ is a collaborative social enterprise initiated and led by Brown University and Rhode Island School of Design students. Together they developed a system for providing clean, drinkable water to people living in Kerala, India, and they plan to expand to another village in the next year.



¹⁶ Sola, Katherine. "Students working to bring clean water to India", Brown Daily Herald. 20 Oct. 2010. <<http://www.browndailyherald.com/students-working-to-bring-clean-water-to-india-1.2375042>>



V. Campus Waste Management and Reduction Practices

A. Recycling is an important part of Brown culture and is shown through conscious efforts made by the students, faculty, and staff. Individuals are responsible for placing recyclable materials in appropriate collection containers. Building custodians collect the recyclable materials from within buildings and consolidate them at outdoor storage containers from where a third-party vendor picks them up and processes them for delivery to market. The Facilities Management grounds office is responsible for maintaining and collecting the materials from the outdoor waste and recycling barrels in public spaces.

In fiscal year 2011, Brown University recycled 40 percent of its waste as a result of campus initiatives. Combined with construction material, the waste diversion rate is 59 percent; 8 percent higher than fiscal year 2010.

Over 590 tons of curbside recycling was collected across campus. Material includes the bottles, cans, office paper, mixed paper, and cardboard for which there are receptacles found throughout the campus.

New to the recycling program in fiscal year 2010 was the collection of metals and wood. A metals material container was placed on campus in October 2009 and a wood material container was placed on campus in January 2010. Brown diverted 20 tons of additional material from the landfill in the first year of the program, and 12 tons in fiscal year 2011.

B. Composting: Facilities Management recycles yard waste, sending over 83 tons of leaf and yard waste to compost at the Rhode Island Resource Recovery Corporation in Johnston, Rhode Island.

C. Mattress and Furniture Donations: Brown University partners with the [International Recycling Network](#) to donate its used mattresses and furniture. In fiscal year 2011 Custodial Services donated over four tons of mattresses to the relief efforts in Haiti.

D. Books: The library system partners with [Better World Books](#) to dispense unwanted and unneeded textbooks and other collegiate literature for resale. A portion of the proceeds are donated to charities. Books that cannot be sold are donated to soldiers serving overseas and to school programs. The Bookstore continues to work with [One Planet Books](#) to recycle textbooks that no longer have any value in the college market. They provide a bin to collect the books from the students, box them up and send them to One Planet Books. Approximately one ton of books were recycled in academic year 2010/2011. The last two collection drives allowed One Planet Books to plant 778 trees from Brown's recycling revenue. They estimate the planted trees will remove 778,000 pounds (389 tons) of carbon over the next 20 years.¹⁷

E. Year Round Clothing and Miscellaneous Donations: Donation bins are available year round in the vending area of Verney-Woolley and at the Stephen Robert '62 Campus Center. When these bins are full, the contents are donated to the [Furniture Bank](#), which

¹⁷ Souza, S. (Personal Email dated March 11, 2011)



partners with many other local charities to distribute the donated goods. Approximately one ton of goods were donated in fiscal year 2011. In addition, the EcoReps student group hosted a clothing swap in which over 100 pounds of clothing not swapped was donated to the Furniture Bank.

F. Move Out Donations (“Clean Break”): Clean Break is the annual program run cooperatively with Facilities Management’s Custodial Services and Grounds divisions and Energy & Environment offices; Residential Life; Campus Life; and EcoReps. The move-out program encourages departing students to donate their unwanted or unneeded clothing, electronics, food, household items, school supplies, and books to the local community. The fiscal year 2011 program partnered with the Furniture Bank to collect and distribute the goods and with Brown’s solid-waste vendor to provide 100 bins for placement in and around dorms. This year’s effort resulted in the collection of over 17 tons of donated goods.

G. Solar Powered Trash Compactors: In January 2010 a Solar Powered Trash Compactor was installed in front of Sharpe Refectory in an effort to reduce the number of man-hours required to empty trash barrels, reduce the number of bags used, and lower carbon emissions. A 6-month assessment revealed that the unit reduced average trips from five per week to two per week, and frees 28 hours of staff time to focus on other tasks. Three additional units were placed in fiscal year 2011, and are located on the Main Green in front of the Campus Center, Sayles Hall, and the John Carter Brown Library.

H. Electronics (e-waste) Recycling: Brown began e-waste recycling on a small scale in fiscal year 2003, when it collected 9.8 tons of electronics. The program has since been expanded and over 30 tons of electronics in fiscal year 2011 were properly disposed of through secure and environmentally preferable methods with a company that is e-Stewards and National Association for Information Destruction (NAID) certified.

I. Hand Dryers: An assessment of hand dryers conducted during the summer of 2010 determined that they are both a cost savings to the University, more environmentally friendly, and less wasteful than paper towels. As a consequence, new construction projects are required to include hand dryers in the standards and installed where appropriate. A decision matrix was developed for when and where these hand dryers will be placed and a pilot project is underway in the Facilities Management building to test three of the newest models.

J. Paperless Offices and Processes:

1. In an effort to reduce paper consumption Computer Information Services is in the process of moving all the paper-based access forms to an online format. As a result, almost all of their forms are enabled online.
2. The Bursars Office in academic year 2010/2011 discontinued printing of student, faculty, and staff account statements and also started the electronic bill payment



system. All statements are now available online, and payments can be made electronically.¹⁸

3. The Brown University Activities Council, the Undergraduate Finance Board, and the Undergraduate Council of Students collectively agreed to phase out table slips and promote the new online Events Calendar as the central method for advertising events. The decision to cease the distribution of table slips saved the University money and paper. The reopening of the Stephen Robert '62 Campus Center gave students access to more promotional screens, bulletin boards for posters, and a centralized location for event advertising.

4. Academic year 2011 was the first time the Admissions office viewed applications online thanks to their new digital reading process.¹⁹ With up to 30,000 applications per year, that's almost one ton of paper saved each year.

5. In March 2011, the University announced that it would discontinue the publication of course catalogues except to faculty members, academic advisers, and Meiklejohn peer advisers. This change went into effect for freshmen in summer 2010 and to upper-class students effective summer 2011.²⁰

K. Toner Cartridge Recycling: Hewlett-Packard toner cartridges can be returned to them via a postage-paid bag supplied in each box of toner. All other types of toner and ink cartridges can be returned to Office Max via a postage-paid box supplied by them. In fiscal year 2011, Brown returned, to Office Max, 351 toner cartridges. In addition, toner cartridges can be dropped off at the Brown Computer Store on the second floor of the Brown Office Building. At least once each semester an ink cartridge drive is held by a student group or organization who donates the money collected, from turning the cartridges and toner over for recycling, to a designated charity. Last year, the Foundation for International Medical Relief of Children (FIMRC) raised money for free clinics in Costa Rica and Nicaragua.²¹

L. Battery Recycling: Collection boxes for primary single batteries and secondary rechargeable batteries are located at six convenient buildings on campus. When the box is full, the Environmental Health and Safety Department (EH&S) contacts the University's hazardous waste vendor, who picks them up and properly recycles and disposes of them. Approximately one ton of batteries are diverted from the landfill annually in this manner.

¹⁸ Cai, Fei. "Paper cuts: U. continues efforts to become paperless", Brown Daily Herald. 17 Nov. 2010.<<http://www.browndailyherald.com/paper-cuts-u-continues-efforts-to-become-paperless-1.2408231>>

¹⁹ Rosales, Joseph, "Apps up, admissions goes digital", Brown Daily Herald, 18 Nov 2010 <<http://www.browndailyherald.com/apps-up-admissions-goes-digital-1.2410499>>

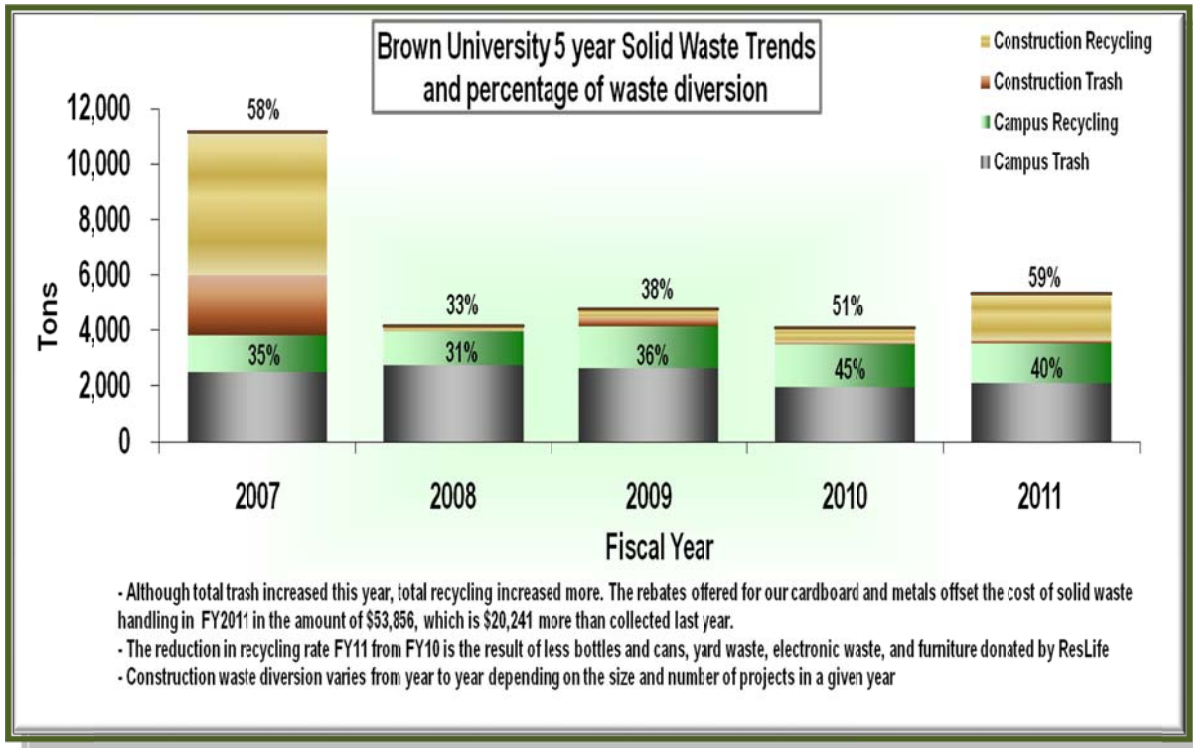
²⁰ Trujillo, Caitlin, "U. to phase out course catalogs", Brown Daily Herald, 01 Mar 2011 <http://www.browndailyherald.com/u-to-phase-out-course-catalogs-1.2500889?utm_source=Sailthru&utm_medium=email&utm_term=Brown_Daily&utm_campaign=Brown_Daily_201131137>

²¹ Morning Mails authored by Tanayott Thaweethai dated February 8, 2011, February 15, 2011, and March 1, 2011

M. Incandescent and Compact Fluorescent Bulb Recycling: Lighting bulbs and ballasts are recycled in one of three ways at Brown: 1) Students and staff can give their burned out bulbs to a custodian, who will store them in a special box located in the building’s storage closet. When the box is full, it is transferred to a centralized location to be picked up and processed by a third party. 2) When Facilities Management’s electrical division is asked to change a bulb that is installed above a certain height or is of a certain type, the burned out bulb is stored in a special box located within the division’s shop. When the box is full, it is transferred to a centralized location to be picked up and processed by a third party. 3) When lighting is upgraded by a contractor, the replaced bulbs and ballasts are provided to a third party to process. By these three methods, Brown recycled 10 tons of bulbs and ballasts in fiscal year 2011.

The following chart illustrates our rate of recycling and diversion activities compared to landfill trash disposal over the past five years:

Figure 4: Solid Waste Trends





VI. Departmental Reporting

A. Transportation Office

Brown University's Transportation Office provides resources and information to the Brown Community promoting convenient, safe, and environmentally friendly ways to move around the campus, to travel to and from Brown, and to reduce traffic congestion on College Hill. The Transportation Office is diligently working to find environmentally friendly and cost-effective means of helping the Brown community find its way from point A to point B. As a result, 90 percent of student trips to and from campus are through alternative transportation.

1. **Public Transportation:** Brown University is making great strides toward increasing the availability of public transportation. With the Rhode Island Public Transportation Authority (RIPTA) U-Pass program in its third year, all Brown University ID holders (faculty, staff and students) may ride any RIPTA bus or trolley free of charge anywhere in the state of Rhode Island.
2. **Zip Cars:** The University has partnered with **ZIPCAR** to offer Brown community members an alternative to driving to campus and currently has 16 vehicles in the on-campus fleet. ZIPCAR is an internet-based service that allows you to rent a car for an hour or two or for an entire day. It is a turnkey program that includes everything—vehicles parked right on campus, online reservation system, gasoline, insurance coverage, and billing. Brown University students, faculty and staff pay an annual \$30 fee. Hourly rates range from \$8.00 to \$10.50 depending on the type of vehicle reserved. Four of the sixteen vehicles are hybrids and 2,400 Brown-related members use them to travel 30,000 miles a month.
3. **Bicycle Stations:** The addition of ten new bike stations began across campus in spring 2011.
4. **Bicycle Sharing:** Brown has bicycle racks in convenient places all around campus, offers bicycle registration to discourage theft, and is working with various civic groups to help promote cycling in the city. Cyclists can also contact **Bike to Brown**, an independent group of cyclists who are interested in all of the aspects of using a bicycle as alternate transportation. Bikes at Brown, a student initiative, launched a bike-sharing program in March 2009 utilizing University funds to purchase three new Schwinn Cruisers and four Mongoose mountain bikes. The bikes, which come with a key lock, are available from an office in the University student center and can be signed out for a day by students who pay a \$5 yearly membership fee.
5. **Alternative Fuel Fleet:** In its fleet of 130 vehicles, Brown has seven 100 percent electric vehicles, five hybrid vehicles, and eight flex-fuel vehicles. The Grounds Division of Facilities Management has been using biodiesel in all of its on-road diesel vehicles since 2006.



6. **Streetcar Line:** In September 2010, public discussions began with the College Hill Neighborhood Association, RIPTA, and the City of Providence to examine the impacts, costs, and benefits of improving transit within the central core of Providence.²²

B. Brown Dining Services (BDS)

BDS is committed to improving the local food system through sustainability initiatives, which work to support local farmers, reduce waste output, and purchase fairly traded and environmentally friendly foods.

BDS's commitment to sustainability includes the following initiatives:

1. **Community Harvest:** The Community Harvest program began in September 2002 as an initiative to increase Brown's support of food producers in the Rhode Island region. Community Harvest is committed to strengthening the local food system through educational programs and special events, as well as by providing a large-scale, steady purchaser for local farms. Since the program began, it has helped run a farmers' market on campus; coordinated an annual local food forum, corn shuck-off, and local dinner; and purchased tons of local products to serve and sell on Brown's campus. In addition, Community Harvest works with students and student groups to help organize harvest crews, farm tours, and other student initiatives focused on developing a strong local food system.

The Goals of Community Harvest:

- Increase student awareness through a variety of outreach methods, including themed special events, harvest crews, farm tours, and farmers' markets.
- Improve the conditions that small, local farmers face each day by providing them with a significant, and permanent, customer dedicated to helping in any way possible to preserve the farmer's way of life.
- Provide fresher and healthier options for BDS' customers through purchasing a variety of local foods, including several from each food group, from local producers.

2. **Farmer Partnerships:** BDS has maintained a committed relationship to the farmers with whom they first forged partnerships, and which endure today. As they aim to expand their local program each year, they have established relationships with many other local farms. BDS works with over 30 local farms/farmers. They also work with many local producers, processors and distributors of local food.

²² Trujillo, Caitlin, "Residents sound off on streetcar line," Brown Daily Herald, 28 Sep 2010 <<http://www.browndailyherald.com/residents-sound-off-on-streetcar-line-1.2344827>>; Providence Core Connector Study, 2010 RI Public Transit Authority, Web. 19 Sep 2011 <<http://providencecoreconnector.com>>; Trujillo, Caitlin, "RIPTA looks at streetcar routes," Brown Daily Herald, 18 Nov 2010 <<http://www.browndailyherald.com/ripta-looks-at-streetcar-routes-1.2407010>>.



3. **The Sustainable Food Initiative (SuFI):** The Sustainable Food Initiative (SuFI) is a student group dedicated to all things food, fair and sustainable. The SuFI managed student garden, just a block or so away from the main dining hall, is a small green space where students plant, water, grow, and harvest their own crops each year. BDS has helped to support the garden through purchases of their harvest.

4. **Farm Fresh Rhode Island:** BDS is a founding partner of Farm Fresh Rhode Island (FFRI), an organization that started in 2004 as a collaboration between the Center for Environmental Studies, the Rhode Island Foundation, the Rhode Island Division of Agriculture, and BDS.

FFRI is a nonprofit organization whose mission is to strengthen the local Rhode Island food system through creating stronger, healthier connections between producers, consumers, and the environment. Currently, FFRI manages eight urban farmers' markets in the greater Providence area, including co-managing with BDS, the market on Brown's campus held Thursdays from 11:00 AM to 2:00 PM from mid to late spring and again from September through November.

5. The **Market Mobile**, a FFRI program, is a centralized distribution method for Rhode Island farmers that began in the winter of 2008-2009. Each week farmers post prices for their available products through a central online price list. Then local restaurants and institutions view the list and place orders. The Market Mobile picks up farmers' weekly deliveries from one centralized location and delivers them according to a scheduled route.

BDS is one of several participating local institutions and assists in supporting the Market Shares program, an on-campus Community Supported Agriculture structured program which purchases directly from Market Mobile.

6. **Local Food Forum:** The Local Food Forum is an annual event hosted by BDS and held on campus. The forum first began in the spring of 2005 in collaboration with FFRI to connect and build networks among those involved in our local food system. The forum enables buyers and producers to better understand each other's needs; and the event attracts over 200 attendees who include local farmers, food producers, restaurateurs, chefs, faculty, staff, students, and other individuals interested in connecting to the local food system.

7. The **Real Food Initiative:** In 2009, BDS took on the *Real Food Challenge*. It began as a grassroots level initiative among a small group of students who were requesting food purchases be traced and tracked based on additional criteria other than just its locale. Two intern positions were created to assist BDS in driving this campaign forward.

Three years later, and as a result of the Real Food Initiative, BDS remains committed to sourcing foods that are local, ecological, fair, and humane. As they continue to work in partnership with manufacturers and distributors to create opportunities, they are tracking to surpass their 2014 goal of 35 percent Real Food.

With 340 other colleges and high schools nationwide, Brown is supporting just and sustainable agricultural systems. Brown is also one of the first institutions in the nation to



pilot the *Real Food Calculator* to track and assess its purchases. To date, BDS has increased its percentage of purchases at the Blue Room to 50 percent Real Food, as an example of its commitment to this initiative.

The Real Food Calculator assists BDS in assessing the criterion of food purchases. Areas of focus to date have been milk, eggs, bananas, fish, shellfish, and coffee.

8. After the Harvest and Waste Reduction Strategies: The After the Harvest (AtH) initiative, as part of Community Harvest, began during Hunger and Homelessness week in 2005. Since 2005, AtH has helped coordinate efforts to both reduce food waste and reroute any appropriate overproduced food to either local hunger relief programs or composting venues.

9. Food donations: Since 2005, BDS has donated over 23,000 pounds of local food to local organizations including The Rhode Island Community Food Bank, Providence Rescue Mission, McCauley House, City Year, and Camp Street Ministries.

10. Oxfam: Each year, BDS collaborates with the student-run, campus group helping to support Oxfam. Each fall, BDS designates a dinner where students can choose to donate their meal plan credit; a portion of their credit is then donated directly to Oxfam. This is a means of increasing awareness around international hunger and a time of reflection.

11. Recycling & Reusables: The Sharpe Refectory recycles over 600 tons of solid waste per year. The entire university is committed to a recycling program where bottles, cans, and mixed paper are separated into designated receptacles found throughout campus.

The dining hall 'to-go' program offers compostable containers, cups and napkins for students looking for a takeout option. These containers are predicted to decompose in about two years.

In the spring of 2010, BDS implemented a reusable to-go container pilot program. The pilot program assisted them in understanding how to best implement the reusable containers on campus, in BDS and within the Brown student body.

Leading up to the start of the pilot program and with the help of its interns, BDS worked to recruit participants. As they asked students for their opinion on switching over to reusable to-go containers, they also encouraged interested students to sign up for the pilot program. BDS invited and accepted students for the pilot program based on how often they eat to-go (signing up those who eat to-go most often first) and finalized their first fifty participants. They implemented the reusable-to-go program in the fall of 2011 as an alternative to the Greenwave compostable containers and are working to increase awareness around reducing the waste into our landfills by utilizing a container which can be re-used, rather than discarded.

In addition, BDS sells reusable mugs and grocery-type shopping bags in its retail units. Beverages purchased in a reusable mug are offered at a discounted price.



12. **Newport Biodiesel:** BDS has partnered with Newport Biodiesel, a local company that takes used fry-oil and turns it into usable fuel for diesel engines and home heating.

Brown's oil is mixed with oil from other local food establishments, which enters a refining process before it is ready to be used as recycled, renewable, and sustainable fuel.

13. **Composting:** Composted produce becomes nutritious food for local pigs and fertile organic compost.

How BDS composts pre- and post- consumer waste:

Pre-consumer waste refers to the organic matter generated in the production and preparation of meals—these are the melon rinds, potato peels, onion skins, and broccoli stalks. Post-consumer waste refers to the food that is left on the tray or plate after consumers have finished their meal. The pre- and post- consumer waste is mixed together and a local pig farmer picks up the food mix which becomes hearty, nutritious food for local pigs.

Full Circle Recycling, a Rhode Island recycling company, diverts around 1,200 pounds of meat scraps per year from Brown's dining halls, which they digest and process into compost.

14. **SCRAP:** Student Composting to Rejuvenate Agriculture in Providence

SCRAP is a Brown University student composting initiative. Working with BDS and Facilities, SCRAP is currently striving to have composting not only in the dining halls but also available to students who live both on and off campus.

Compost is a sustainable process that diverts "waste" food from the landfill and puts it back into the soil. Compost is the decomposition of organic material, specifically of nitrogen (from food waste) and carbon (from branches, leaves, anything "brown" – dry and from nature), to produce a natural, rich organic fertilizer. Decomposition is a natural process; composting is merely speeding up this process. There are many different methods to composting, but the key elements are the carbon and nitrogen. Once you have these, the compost naturally heats up (accelerating the decomposition process); all you have to do is mix it every once in a while so every element breaks down to create beautiful compost.

15. **Trayless Dining:** In October of 2008, Brown Dining committed to trayless dining in its Verney-Woolley (VW) dining hall and eliminated trays at that location entirely.

Trayless dining conserves half of a gallon of heated water per tray. A savings of over 4,800 gallons of water per week and 155,000 gallons per school year has been achieved. Studies have shown trayless dining also reduces plate waste, energy, and chemicals otherwise used to wash trays.

The VW customer counts range from 250 to over 1,000 per meal, depending on the meal course. Trayless dining conserves one third to a half gallon of heated water per person that it would take to wash each of their trays.



After three years of a consistent and successful tray-less program at Verney-Woolley, BDS has been working on an initiative toward trayless dining in the Sharpe Refectory. The layout of the Sharpe Refectory, however, is not as conducive to trayless dining as the Verney-Woolley. BDS conducted a survey in October 2010 to gather feedback on going tray-less in the Sharpe Refectory, and most of the students were open to the choice of going tray-less. Student interns assisted BDS' staff in educating around trayless dining as well as providing education around scraping food scraps to promote composting.

16. Beyond the Bottle, reducing bottled water on-campus:

Beyond the Bottle (BtB) is a movement to reduce the supply and demand of bottled water at Brown that was started by students in February 2008.

At the request of the President's Office, Facilities Management's Office of Sustainable Energy and Environmental Initiatives formed the BtB Committee. The committee was charged with developing policies and goals to support a resolution that was submitted by the student environmental advocacy organization, emPower, and approved by the Brown University Community Council (BUCC). The BUCC Resolution was as follows:

"This body supports the Beyond the Bottle Campaign to provide sustainable alternatives to one-use bottles and urges dining services proactively to provide alternatives to students, faculty and staff. We further move that students, faculty and staff work as soon as possible to the complete elimination of bottled water."

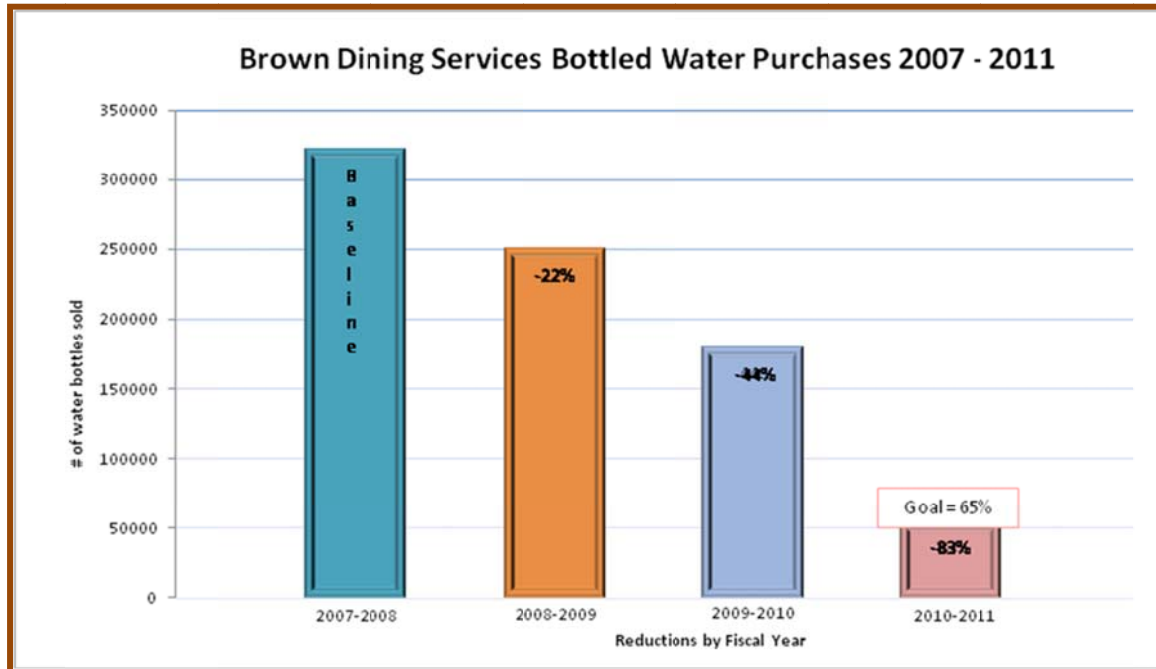
The resulting recommendations submitted to the BUCC on April 22, 2010 were to:

- Reduce purchased bottled water by 65 percent, by end of year, in fiscal year 2011 and by 80 percent, by end of year, in fiscal year 2012.
- Aspirational goal of reducing purchased bottled water by 90 percent, by end of year, in fiscal year 2013.

Since that time, BtB has organized numerous awareness events (movie screenings, taste tests, water carnival, tabling, etc.) and has partnered closely with dining services to increase awareness of this initiative. In the 2010 - 2011 academic year, BDS discontinued the sale of bottled water at all retail outlets, installed hydration stations at Sharpe Refectory and the campus center, as well as other facilities, provided free, re-useable water bottles to all incoming freshmen, and provided free water from a portable hydration station during Commencement. Facilities Management undertook a campus-wide inventory of drinking fountains and sources for filling re-useable water bottles and drafted a new standard and decision matrix for installing hydration stations in new and existing buildings. The inventory is complete and currently is being assessed by a contractor to determine cost of implementation of new and upgraded water fountains.

- As a result of the three-year campaign, bottled water purchases, by Dining Services, have been reduced by 83 percent since the beginning of the initiative in 2008, exceeding the fiscal year 2012 goal of 80 percent one year early.

Figure 5: Bottled Water Purchases



17. Awards, Recognitions, Certifications

- Green Certification, Rhode Island Hospitality Association, 2009 and 2010
- Recognized as 'Friend' of the Rhode Island Food Bank, 2009 and 2010
- The Green Report Card, food and recycling earned an 'A' in 2010 and 2011
- The Princeton Review's Guide to 286 Green Colleges, dining recognized for purchasing local and organic food
- Named a "Cool School" by the Sierra Club, food being a major category of focus

C. Graphic Services

Graphic Services' continues their commitment to sustainability while meeting the graphic design and printing needs of the Brown community.

It has been invested in environmental sustainability for over ten years, when it switched to a new 28" offset alcohol-free press, which uses soy-based inks. Since then, it has moved further in the direction of reducing hazardous waste by moving to a direct-to-plate system five years ago. The new process generates no hazardous waste and the printing plates are recycled. They furthered their commitment by purchasing a second digital press, and no longer utilize offset presses, which translates into compact footprints, chemistry-free imaging, reduced paper waste and waterless printing, which eliminates waste water and significantly reduces volatile organic compound (VOC) emissions. Recently, the Narragansett Bay Commission determined that the University's Graphic Services Department no longer needs a permit since all process wastewater generated from printing equipment was removed as a result of their new digital operation.



Graphic Services attained **Forest Stewardship Council (FSC)** certification in fiscal year 2009 through **Scientific Certification Systems**. FSC paper is derived from forests that have been evaluated for management and activity based on certain criteria and regional U.S. standards. Approximately 90 percent of print jobs utilize FSC paper. Jobs that cannot be performed in-house are sent to FSC certified printers. All waste paper generated by the printing service, as well as outdated printed materials, is recycled back to the paper mills; and the paper they purchase is from mills that harvest paper responsibly and displaces no indigenous people.

Finally, Graphic Services encourages its customers to print responsibly using an on-demand model, which includes printing only what is needed and serves to reduce obsolete materials and paper waste.

D. Purchasing Department

Faculty, staff, and students are strongly encouraged to take a proactive position in identifying and examining opportunities to procure “environmental friendly” materials/equipment. This effort focuses along the complete “supply chain” management process including assessment of alternative materials, vendor sourcing and selection, and ultimate disposal of waste/surplus. A related opportunity to reduce waste on campus includes a requirement for reduced packaging and negotiating a “take back” program for the materials the purchases are delivered in, such as cardboard boxes and wooden pallets.

The materials considered for green purchasing include appliances, cleaning products, computers/electronics, lighting, office supplies, and paper products such as envelopes, notepads, paper towels, napkins, and office paper.

While Brown does not require products to be **ENERGY STAR®** qualified, it is strongly recommended that appliances, building products, computers, electronics, heating and cooling, lighting, fans, and plumbing equipment meet or exceed the **ENERGY STAR®** rating.

Beginning fiscal year 2011, the Purchasing Department required that all Dell, HP, and Lenovo electronics be **Electronic Product Environmental Assessment Tool (EPEAT)** certified.

In order to reduce fuel cost and carbon emissions, the Brown Purchasing Department requested that their office supply contractor reduce deliveries from five times per week to four times per week.

E. Custodial Office

Brown University first began exploring green cleaning products in 2004, when the Facilities’ Management then director of Custodial Services heard about a promising new product on a radio program. After sharing what he had learned with his associate director, they began reaching out to local vendors to change their cleaning agents to more environmentally friendly alternatives.



Brown is committed to keeping abreast of green, sustainable products that do a superior job of cleaning surfaces and removing or neutralizing infectious bacteria. Each product considered for use must meet the dual challenge of being an effective agent with no additional labor required and no damage to cherished historic surfaces. Products are rigorously tested prior to deploying them across campus. If the product passes the testing phase, it becomes a part of our green cleaning arsenal.

The primary benefit of green cleaning is the lower costs and environmental impact from cradle to grave. An unexpected benefit to the program was the reduction of cleaning supply inventory from over 164 items to less than 50 items. This benefit is due to greater inventory control, dual-purpose cleaners, and a streamlined delivery system developed to lower our carbon footprint. Finally, when compared to traditional cleaning products, green cleaning products are formulated to reduce risk to human health. With the exception of the occasional use of bleach, none of the cleaning products used at Brown contain toxic chemicals.



VII. Research and Teaching

Brown University is proud to support a rigorous interdisciplinary curriculum, with over 2,000 courses offered every year from over 40 academic departments. Students at Brown can study energy and environmentally-related material from any vantage point: from the "Renewable Energy Technologies" class in the Engineering department to "Wild Literature in the Urban Landscape" offered by the Center for Environmental Studies. Here are a few of the primary academic departments that host courses on energy and the environment.

A. Center for Environmental Studies

The Center for Environmental Studies (CES) is the hub of environmentally focused academics at Brown. The CES strives to prepare Brown students for lives and careers that demand a thorough understanding of human interactions with the natural and built environment and to contribute in major ways to the solution of significant environmental problems. CES courses cover environmental studies and science topics ranging from green building to coastal ecology, environmental justice, law, and economics.

B. Environmental Change Initiative

Brown's Environmental Change Initiative (ECI) facilitates and promotes interdisciplinary environmental research by sponsoring working groups and interdisciplinary postdoctoral scholars, funding pilot projects, hosting speakers and events, and coordinating awareness of funding opportunities. By connecting faculty and students in multiple departments, ECI supports a broad and ambitious agenda in environmental research at Brown.

The ECI also co-sponsors the Brown Environmental Fellows program with the Center for Environmental studies. Launched in 2010, Brown Environmental Fellows introduces undergraduate researchers to the dynamic interface between environmental scholarship, policy, and practice. Student-faculty-practitioner teams develop research projects to meet shared objectives – directing scientific discovery into channels that will inform current and future management choices. Competitive fellowships fund summer research projects, followed by a practicum in communicating scientific concepts to media, public and policymakers. More info at <http://blogs.brown.edu/bef>

C. The Watson Institute for International Studies

Brown University's Watson Institute for International Studies is a leading center for research and teaching on the most important problems of our time, especially in the areas of global security and political economy and society. Its research aims to improve policies and its use of innovative media engages the broader public in global dialogue.



D. School of Engineering

The School of Engineering is where research, design, and building come together to work for innovation. Engineering students take courses in a variety of subjects, including electricity, materials science, mechanics, and thermodynamics. Engineering students are equipped to work in areas like photovoltaics, wind turbines, biofuels, green building, and more. Faculty members work on the cutting edge of research in their respective disciplines. The research has wide applications in the field of sustainability, from more efficient LEDs to viable and cost-effective carbon sequestration and storage (CSS). Efforts are also active in the areas of grid integrated distributed storage, district level sustainability strategies, and solar thermal for industrial processes.

E. Geological Sciences

Geological phenomena affect our daily lives as well as the future of our planet, whether it is a major earthquake in California or a volcanic eruption in the Pacific Ocean. Fundamental knowledge of the Earth and planetary sciences has direct bearing on matters of urgent interest to the public, policy makers, and other scientists. Our naturally fluctuating climate is being modified by human activities in ways that we don't understand, with consequences that we cannot predict. Geology students will gain a deeper understanding of geological phenomena, which can help them pursue research interests in subjects like environmental geophysics, global climate change, hydrology, and estuarine processes.

F. Center for Energy Research

First announced in June 2009, Brown University is teaming with [Draper Laboratory](#) to become a major player in energy efficiency and smart grid research.

G. Chemistry Department

Chemistry frames much of our understanding of the natural world and continues to deliver technologies that touch nearly every aspect of human life. Research activities in the Department of Chemistry are pursuing new insights into structure, reactivity, and molecular function promising to redefine the frontiers of scientific knowledge. This fundamental research in this department yields knowledge that is the basis for new technologies and methods of practical value. Environmentally minded students with an interest in chemistry can pursue research on fuel cells, hydrogen storage, catalysis, biofuels and carbon dioxide utilization.

H. Physics Department

Physics provides a foundation of crucial ideas for other scientific fields, and many of the underpinnings of modern technology. Research in the field focuses on new phenomena occurring on scales ranging from the subatomic to the cosmic. Many physicists collaborate across disciplines working with biologists, chemists, engineers, geologists, and mathematicians. Physics offers environmentally minded students the opportunity to gain a deeper understanding



of the principles at the core of environmental and climate science. Those interested in renewable energy can benefit from courses on electromagnetism, thermodynamics and the physics of energy. Physics concentrators will also be introduced to nano-science; a field pushing boundaries in order to help solve numerous environmental problems. Brown research teams work on nano-science projects that could lead to new technologies and apply physics principles to climate modeling

I. Biology and Medicine

The Division of Biology and Medicine, or BioMed, is one of Brown's largest and most active divisions, with a mission of understanding and improving the health of humans and their environment. BioMed encompasses the Alpert Medical School, the Program in Biology, and the Public Health Program. Within these larger divisions, students have access to a highly diverse range of departments, many of which focus on environmental themes. In the Department of Ecology and Evolutionary Biology, students can study biological systems on a macroscopic scale, and spend a semester doing hands-on research at the Marine Biological Laboratory in Woods Hole, Mass. Environmental health is an active research area in the public health departments, which study human health interactions with the environment on a population level, as well as the basic science departments, where toxicology and the effects of pollution on the human body are researched. The Division of Biology and Medicine is brimming with opportunities for student involvement. Besides the diverse range of courses, research opportunities for undergraduates are also plentiful.

J. The Superfund Basic Research Program (SBRP)

SBRP is a federally funded program (National Institute of Environmental Health Sciences) designed to address health and environmental issues associated with hazardous waste sites.

Brown's SBRP, "REUSE IN RHODE ISLAND: A State-Based Approach To Complex Exposures," is multi-disciplinary and a research, training and community oriented program aimed at addressing Rhode Island's health and environmental issues. In addition to hard-sciences research, this program also includes a community outreach core that does environmental justice and advocacy work in Providence and across Rhode Island.

K. Center for Environmental Health and Technology

The newly established Center for Environmental Health and Technology (CEHT) at Brown was created as an interdisciplinary science-based and community-active Center that is home to the NIEHS-funded Superfund Basic Research Program (SBRP). The CEHT is intended to build upon this base by catalyzing research that addresses environmental problems across the entire University, facilitating the translation of this research into practical, measurable improvements in environmental health and in the identification and remediation of hazardous environmental contamination in Rhode Island.



VIII. Awards

A. Sustainable Endowments Institute

This Report Card assesses the sustainability commitments and improvements of 300 public and private colleges and universities with the largest endowments. In its most recent edition, Brown was one of only seven colleges to receive an A.

B. Princeton Review

The Princeton Review's scoring is a quantitative and qualitative look at a school's sustainability efforts in areas identified as most important to students. In addition, they consider how the green initiatives enhance students' academic experience and quality of life in ways that merit recognition. In the most recent edition, Brown received a 95 out of 99 possible points.

C. Sierra Club "Coolest Schools"

This survey rates American colleges and universities according to their environmental practices, green initiatives, and caliber of sustainability-oriented education. Schools deemed "cool" are listed in their annual Guide to Green Colleges. Last year, Brown was one of 286 such schools.

D. Community Partner

Brown University received a Community Partner Award from the [Furniture Bank of Rhode Island](#) for their efforts to keep the goods donated by departing students in the local community. In the four years since the program's inception, more than 40 tons of goods were donated to the Furniture Bank to distribute among its 16 participating organizations as needed.

E. International Sustainability Campus Network

This past June, Brown received international recognition for its ambitious carbon reduction goals and the plans and projects that are making those goals achievable. In an [article](#)²³ posted on the International Sustainability Campus Network (ISCN) website, Bernd Kasemir, ISCN Program Manager, explained, “The ISCN Excellence Awards were started in order to recognize outstanding projects in campus sustainability from around the world. ... Over the past few years, it has been a privilege to see the innovative projects that are happening on the campuses of colleges and universities. As these are the places where the next generations of our world’s leaders are educated, their commitment to sustainability will hopefully infuse the students with the same ideas. The winner of this year’s award, Brown University ... demonstrate(s) exactly that high level of commitment.”



²³International Sustainable Campus Network, Web 13 Jun 2011, 20 Sep 2011 <<http://www.international-sustainable-campus-network.org/latest-news/2011-iscn-awards-announced.html>>



IX. Acknowledgments

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Residential Life
Student Activities

FACULTY:

School of Engineering
Center for Environmental Studies

STUDENTS:

Facilities Sustainability Interns
Dining Sustainability Interns
emPower Steering Committee

Volunteers
EcoReps
Orientation and Move-in Volunteers
Clean Break and Commencement Volunteers