



BROWN



SIXTH ANNUAL 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 six years, Brown University has reduced its energy-related carbon footprint by 30.6 percent below 2007 levels as part of an ambitious greenhouse gas reduction plan. This 30.6 percent reduction puts us significantly ahead of the 22 percent reduction goal 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; and a major 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 requirements than code in energy utilization.

Under the energy efficiency investment program Facilities Management has 387 projects of various size and scope either completed, in progress, or under development. Over the life of the program we have invested approximately \$18.6 million dollars for a total reduction of 22,366 metric tons carbon dioxide equivalent (MTCDE), or 30.6 percent below fiscal year 2007 levels in our existing buildings. To date, our efforts have resulted in a savings of approximately \$3.3 million dollars in annual energy expense.

It is important to note that this has been achieved even while we added substantially to the energy density of our existing buildings, such as the addition of a High Performance Computing Lab, Metcalf Complex expansion, and mass spectrometer at Geo-Chem to name a few. We have had to offset this increase in energy use by additional energy efficiency investments. Since the program's inception in 2008, we have added systems equivalent to 6,000 MTCDE, or 8.2 percent of our 2007 baseline. Going forward, challenges remain to enable us to identify and implement additional projects to offset this growth to existing space with the current investment return requirements.

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. Fiscal Year 2013 Highlights

Sustainability Strategic Planning (page 5)

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III. Sustainability Strategic Planning

In March of 2011, undergraduate students presented a [proposal](#) to the Brown University Community Council encouraging the University to develop a Sustainability Strategic Plan. The Sustainability Strategic Planning and Advisory committee (SSPAC) was convened by the Provost's office in Fall 2012. The group was charged with creating a draft proposal, for consideration by the Provost and the President, for a Sustainability Strategic Plan for Brown University. This plan would build on our [past successes](#) by expanding the scope of our current sustainability efforts and setting new goals regarding resource management, academic integration, community coordination, and community outreach. The committee worked to identify and set practical goals in each of these areas. The committee was also responsible for proposing an accountability mechanism to increase the likelihood that these new goals will be reached. A successful Sustainability Strategic Plan would provide a framework for the evaluation and implementation of individual projects that seek to decrease the University's environmental impacts, promote community engagement, and create a living laboratory on campus to inspire increased innovation and excellence at Brown.

The committee considered questions such as how can we expand on existing goals and programs that have been successful? How can we create a robust structure for collaboration, accountability and public awareness? How can we use campus and community sustainability efforts to prepare students to address critical issues of our time such as climate, energy, and environmental justice? Which facets of sustainability best fit Brown's culture and research strength? How can Brown develop these areas to become a global leader in sustainability research and practice?

The committee identified priority areas in which Brown can develop robust goals and reporting mechanisms. These will be incorporated into a larger plan, which will include key values and implementation ideas. The committee shared the priority areas with the Provost, President and Brown community in December. An [interim report](#), including a prioritized set of recommendations, was presented to the Brown University Community Council (BUCC) and the Corporation in Spring 2013.

The committee recommended that Brown build on its past success in reducing greenhouse gas emissions and implementing other sustainability goals through an ongoing planning process that makes sustainability a strategic priority of the University. The University should re-imagine the Brown campus as part of an eco-district: a conceptual framework that considers water, transportation, air and energy in planning and design decisions at multiple levels, from individual buildings to the whole campus and the surrounding community. Brown's goals and progress in this area should be captured in a comprehensive, accessible, and enduring data repository with a reporting interface for a set of key sustainability indicators that show the campus as a holistic and interconnected system. Brown should seek to carry interdisciplinary research on sustainability issues beyond the classroom and laboratory, into the world through



mutual beneficial collaborations with campus operations and partners in the surrounding community.

Following the presentation to the BUCC and Corporation, the SSPAC was charged with forming working groups to identify key sustainability metrics and indicators, and create a “State of the State” report outlining what metrics are currently being collected and what metrics we should begin to collect. As working group members engage in this research, they will brainstorm and identify compelling projects and tactics that have quick paybacks, clear savings over time and/or clear benefits to the safety and health of the Brown community. These compelling projects will be developed into proposals for short and longer term pilot projects as appropriate. Finally, the working groups will use the metrics they have developed to propose a series of big-picture goals to present to University leadership. These goals will be proposed in Spring 2014.



IV. Community Partners

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 Working 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 Brown University will host the annual meeting of the group in early May 2014.

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.

C. 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. Members of the roundtable currently include Blue Cross Blue Shield of Rhode Island, Brown University, Citizens Bank, City of Providence, DryVit, Environmental Justice League of Rhode Island, Gilbane, GTECH, Hasbro, Hinkley Allen Snyder LLP, Johnson & Wales University, LifeSpan,

¹ *Yale Office of Sustainability*. @2013 Yale University. Web. 03 Sep. 2013.

<[<http://sustainability.yale.edu/people-partners/strategic-external-partnerships/ivy-plus>>](http://sustainability.yale.edu/people-partners/strategic-external-partnerships/ivy-plus)

² *Emerald Cities Collaborative*, @2010-2013 Emerald Cities Collaborative. Web. 03 Sep. 2013.

<[<http://emeraldcities.org/cities/providence>](http://emeraldcities.org/cities/providence)



National Grid, Providence College, Rhode Island Hospital, Rhode Island School of Design, Textron, and United Natural Foods.

D. 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.”³ Brown’s Director of Sustainable Energy & Environmental Initiatives is a council member representing all large commercial and industrial energy consumers.

E. International Sustainable Campus Network (ISCN)

On January 28, 2010, Brown University 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.⁴

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.

In June 2011, Brown received international recognition for its ambitious carbon reduction goals and the plans and projects that are making those goals achievable. In an article⁵ 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.”

³ *State of Rhode Island, RI Energy and Efficiency Resource Management Council*, n.d. Web 03 Sep. 2013 <<http://www.riermc.ri.gov/>>

⁴ *International Sustainable Campus Network*. Novatlantis. 2013. Web. 03 Sep. 2013. <<http://www.international-sustainable-campus-network.org/>>

⁵ *International Sustainable Campus Network*, Web 13 Jun 2011, 03 Sep 2013 <<http://www.international-sustainable-campus-network.org/latest-news/2011-iscn-awards-announced.html>>



V. Facilities Management: Energy & Emissions

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

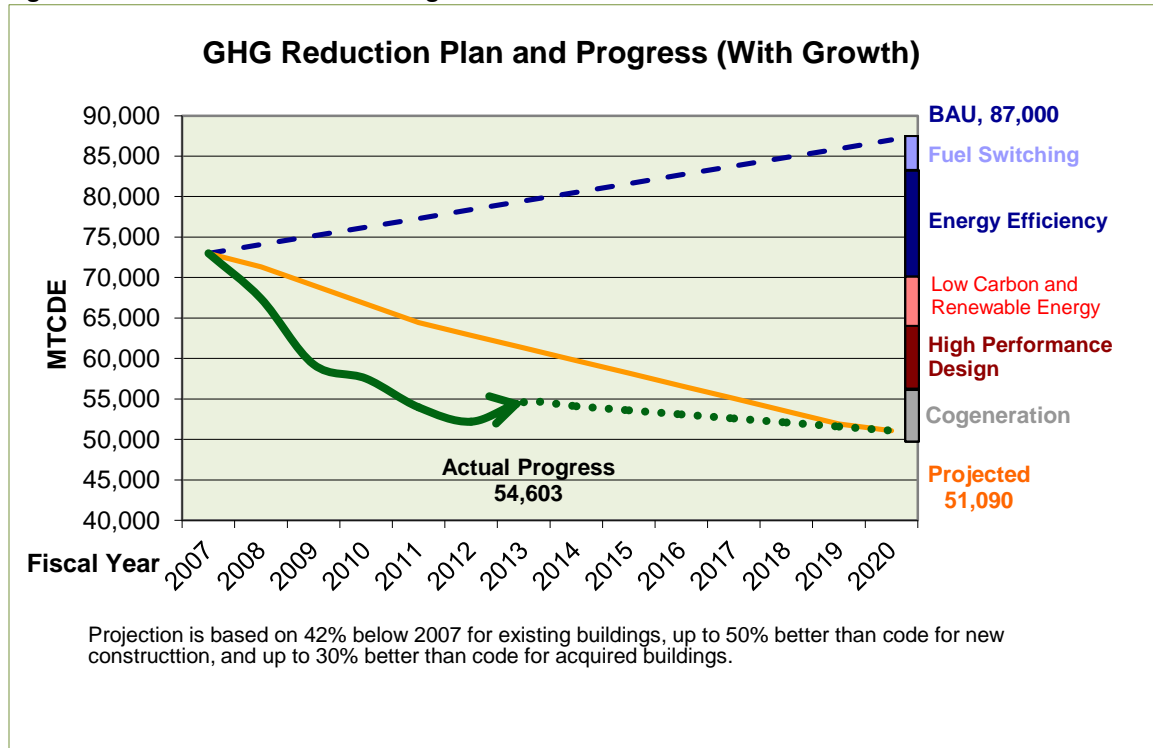
For **Existing Buildings**: Reduce greenhouse gas emissions to 42 percent below 2007 levels (equivalent to 15 percent below 1990 levels) for existing buildings.

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

“With Growth” = newly constructed buildings post 2007

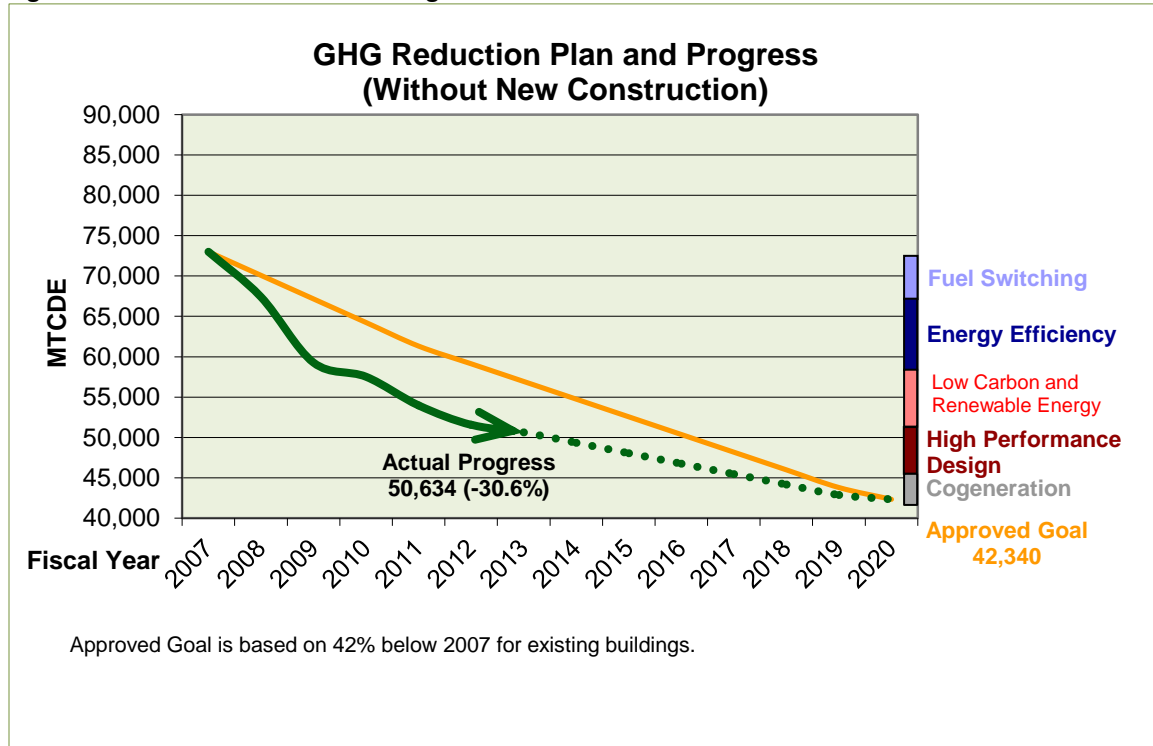
The yellow line represents the projected level of carbon dioxide (CO₂) emissions reduced over time through the strategies listed on the right side of the chart and described in the report below.

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

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



Figure 2: GHG Reduction Plan and Progress Without New Construction



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.

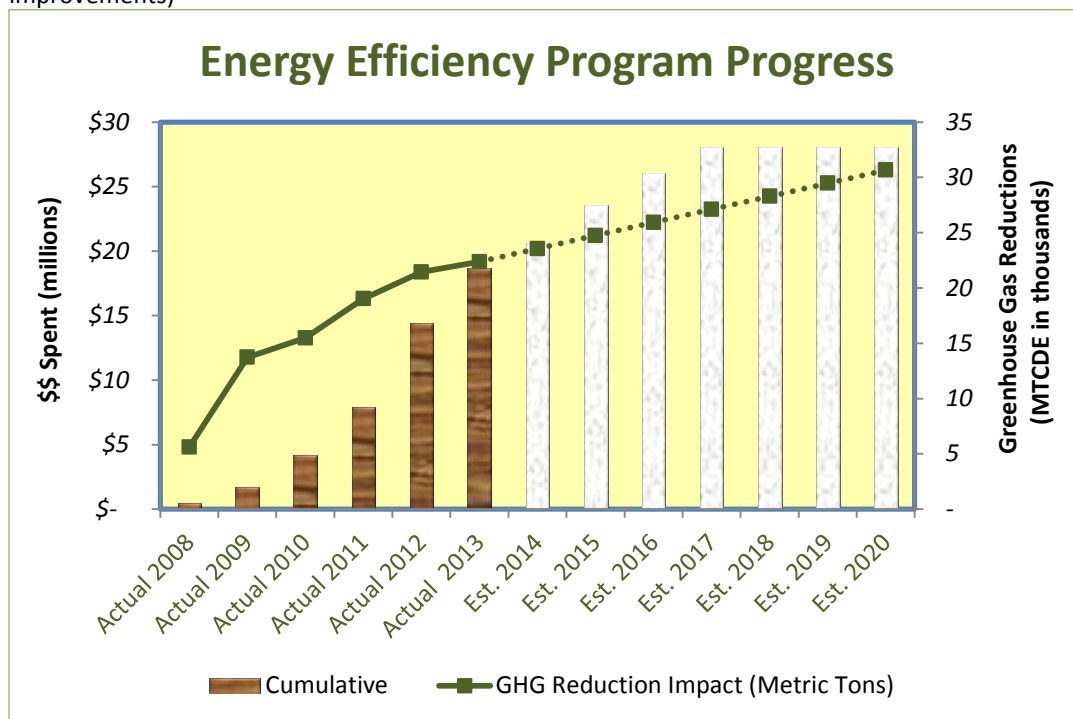
- This goal has been fully implemented and surpasses targeted reduction requirements by successfully implementing a new procurement plan that ensures Brown will be operating on natural gas throughout the entire heating season.

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: \$29 million.
- Progress since inception: For an investment of \$18.6 million dollars to date, Brown saved \$3.3 million dollars in annual energy costs, and reduced its carbon footprint by 22,366 MTCDE, or 30.6 percent.
- Last year alone Brown invested \$4.2 million dollars.

Figure 3: Energy Efficiency Program Progress (GHG reductions include all energy-related GHG improvements)



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, over 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. As a direct result of annual inspections, 120 steam traps were rebuilt in the fall of 2012 and saved the University almost \$60,000 in energy costs.



2) Lighting and Lighting Controls: A total of 91 buildings were upgraded in fiscal years 2009 through 2013 with a combined cost of \$2.8 million dollars and an annual savings of \$600,000 for an average payback of 4.7 years and an internal rate of return of 19.5 percent.

- 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, Kassas-Gould House.
- 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 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 FY12 (24):
 - Barbour Hall, Brown Street 068.5, Brown Street 070, Buxton House, Caswell Hall, Chapin House, Diman House, Emery Hall, Feinstein, Giddings House, Goddard House, Harkness House, Hegeman Hall, J. Walter Wilson, Lippitt House, MacFarlane House, Marcy House, Olney House, Partridge Hall & Annex, Perkins Hall, Rockefeller (John D., Jr.) Library, Salomon Center for Teaching, Sayles Hall, Sears House
- Completed FY13 (8):
 - Marston Boat House, Power Street Parking Garage (upper level), Prince Engineering Lab, Wayland House, Wilbour Hall, Young



Orchard 2, Young Orchard 4, Young Orchard 10

- One (1) building has completed technical and financial evaluations and retrofitting is in the process of being awarded to contractors for completion in fiscal year 2013.

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 thirty-one (31) buildings have concluded all phases of RCx (investigation, review, approval, and implementation of the corrective action indicated):
 - Barus & Holley, Brown Office Building (disconnect wiring to transformer), Buxton House (boiler), Chapin House (condensing hot water boiler), Diman House, Geo-Chem Building (heat recovery), Goddard House (condensing hot water boiler), Graduate Center E (conversion to variable air volume, heating and domestic hot water system upgrade), Harkness House (condensing hot water boiler), J. Walter Wilson (condenser water pump variable frequency drives), John Carter Brown Library (close summer steam valve), List Art, MacMillan Hall (control ventilation and upgrades), Marcy House (condensing hot water boiler), Maxcy Hall (building automation system, insulation, set points), Meehan Auditorium (compressor rebuild), Olney House (boiler), Olney-Margolies Athletic Center (repair dampers, install variable frequency drives), Pizzitola (pneumatic controls, refurbished and expanded heating, ventilation, and air conditioning equipment), Rockefeller Library (reprogrammed induction units), Salomon Center for Teaching (air sealing), Sayles Hall (improve building envelope, repair steam leak), Sears House (condensing hot water boiler), Sharpe Refectory (direct digital controls on air handler Unit 1, kitchen exhaust, air handling Unit 1 condensing unit, steam valve control, air handling unit upgrade), 70 Ship Street (program discharge air temperature reset, tower-free cooling), Sidney E. Frank Hall for Life Sciences building (heating, ventilation and air conditioning occupancy sensors, upgrade terminal boxes, waterside economizer), Vartan Gregorian Quad A (weather stripping, insulation, water conservation, humidity sensor), Watson Center for Information Technology(CIT), Watson Institute (control upgrades, test and balance, enforce



set points, chilled water variable flow pumping), Wayland House (boiler), and Wilson Hall (envelope improvements, insulation, water conservation, cooling fan tower optimization)

- The following twenty-seven (27) buildings have concluded the investigative phase and implementation of select measures has been approved:
 - Barbour Hall, Bio Medical Center, 70 Brown Street, Caswell Hall, Central Heat Plant, Geo-Chem (chilled hot water), 182 George Street, Graduate Center E, Grant Fulton, Horace Mann, John Carter Brown Library, Littlefield Hall, Lyman, Machado House, Morris Hall, Pembroke Hall, Perkins Hall, Pizzitola, Rockefeller Library, Salomon Center for Teaching, Sayles Hall, 70 Ship Street (EnerNOC), Slater Hall, Smith-Buonanno Hall, Stephen Robert '62 Campus Center, Verney Woolley Hall, and Young Orchard.
- The following twenty-one (21) buildings have completed the investigative phase and are pending review and approval:
 - Barus Building (programmable thermostats, heating, ventilation and air conditioning system, direct digital controls, insulation, storm windows, control chilled water flow), Bio Medical Center (co-generation), 70 Brown Street, Brown Office Building (chilled water loop), 182 George Street, Graduate Center A, Graduate Center E (upgrade or convert chiller), Grant Fulton, Hegeman Hall, Hope College, Horace Mann House, Lincoln Field Building, List Art (retiring the old chiller), 295 Lloyd Avenue (new building automation system, window tinting), Lyman Hall, Marston Boat House, Marston Hall (adding two heating zones, water conservation), Salomon Center for Teaching (add night setback, expand building automation system, extend relief air ductwork), 70 Ship Street (modify exhaust fan operational sequence), Vartan Gregorian Quad A (coolers, chiller plant optimization), and Wilson Hall.
- The following eighteen (18) buildings have begun the investigative phase:
 - Champlin Hall, Emery Hall, Graduate Center B, Graduate Center C, Graduate Center D, J. Walter Wilson, MacMillan Hall, Marston Boat House, New Pembroke 1, New Pembroke 2, New Pembroke 3, New Pembroke 4, Pembroke Hall, President's House, Sciences Library, 70 Ship, Sidney E. Frank Hall for Life Sciences building (upgrade chiller controls), and Smith-Buonanno.



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 for many independent smaller buildings;
- Sharpe Refectory refrigeration system improvements;
- Rockefeller Library chilled water system optimization;
- MacMillan chiller system optimization;
- Emergency generator demand 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;
- Hybrid solar thermal domestic hot water and photovoltaic electrical generation at the Nelson Fitness Center, Katherine Moran Coleman Aquatics Center and Zucconi Strength and Conditioning Center;
- Reduce operating system pressure at the Central Heat Plant to decrease environmental footprint;
- Replace 800 existing shower heads with low-flow shower heads in the dorms; energy evaluation and fuel switch from oil to gas in eight (8) smaller independent buildings;
- LED bulb replacements at Alumnae and University Halls;
- Consolidation of energy intensive equipment at Arnold Lab.

Lab Assessment: Brown University has over 550 fume hoods in 15 laboratory buildings on campus comprising 1,000,000 square feet. 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 up to 30 percent could be realized through assessing current demand ventilation, 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 the potential for savings of up to \$500,000 per year. The systems optimization and energy optimization in 2012 was conducted concurrent with a behavior pilot program undertaken by a small group of undergraduate students, the Energy & Environment Office, Environmental Health & Safety, and laboratory personnel to facilitate the development of a green lab program. The Green Labs Program is discussed more at length in section 11).



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 for a campus-wide system. However, recent regulatory changes make these systems economical for many of our research buildings that have year round thermal needs; and we are currently evaluating this option.

9) Dorm Energy Efficiency Project (DEEP): In the spring of 2011, Brown began a pilot program using an integrated approach to improve energy efficiency in residence halls on campus. During the Dorm Energy Efficiency Program (DEEP) pilot, Facilities Management provided efficiency upgrades to a targeted dorm while simultaneously educating its residents about the upgrades to their building and the personal choices they can make to save energy. Residents were provided with tools to facilitate adoption of energy conserving behaviors. DEEP has three parallel goals: 1) to reduce energy consumption while, 2) increasing student comfort, and 3) providing students with energy conservation skills and habits that will help them to live sustainably both on campus and beyond their time at Brown. Facilities used energy use data, open-window observations, and a student attitudes and awareness survey as success metrics for the program.

The pilot was a clear success. During Phase 1 of DEEP, a number of retrofit measures were implemented in Diman House (pilot dorm) including LED lighting, building envelope improvements, and individual heat control in each dorm room, among others. These upgrades have resulted in a 58 percent reduction in thermal energy use when compared to Olney House (control dorm). Replacement of dorm



room lighting has resulted in a 16 percent reduction to date in total electric consumption.

Along with these infrastructure improvements, Facilities worked with consultants and student EcoReps to develop a plan that would engage, educate, and increase the pro-environmental behaviors of the residents in the building. This outreach campaign focused on three key pro-environmental behaviors: 1) Keeping your windows closed when the heat is on, 2) Using your individual heat control, and 3) Calling Service Response to fix any problems with your heat. EcoRep volunteers collected data on the number of open windows in Diman and Olney as proxy data for the effectiveness of the outreach campaign. Facilities also worked with consultants to develop an awareness and attitudes survey to set a baseline for future behavior projects. This data was also used to compare students living in Diman, who had received targeted outreach, with the average awareness level across campus. Some of the key findings of this survey are displayed in the paragraph below. Total dollars spent to date on this program is \$4.4 million and energy dollars saved is \$528,000.

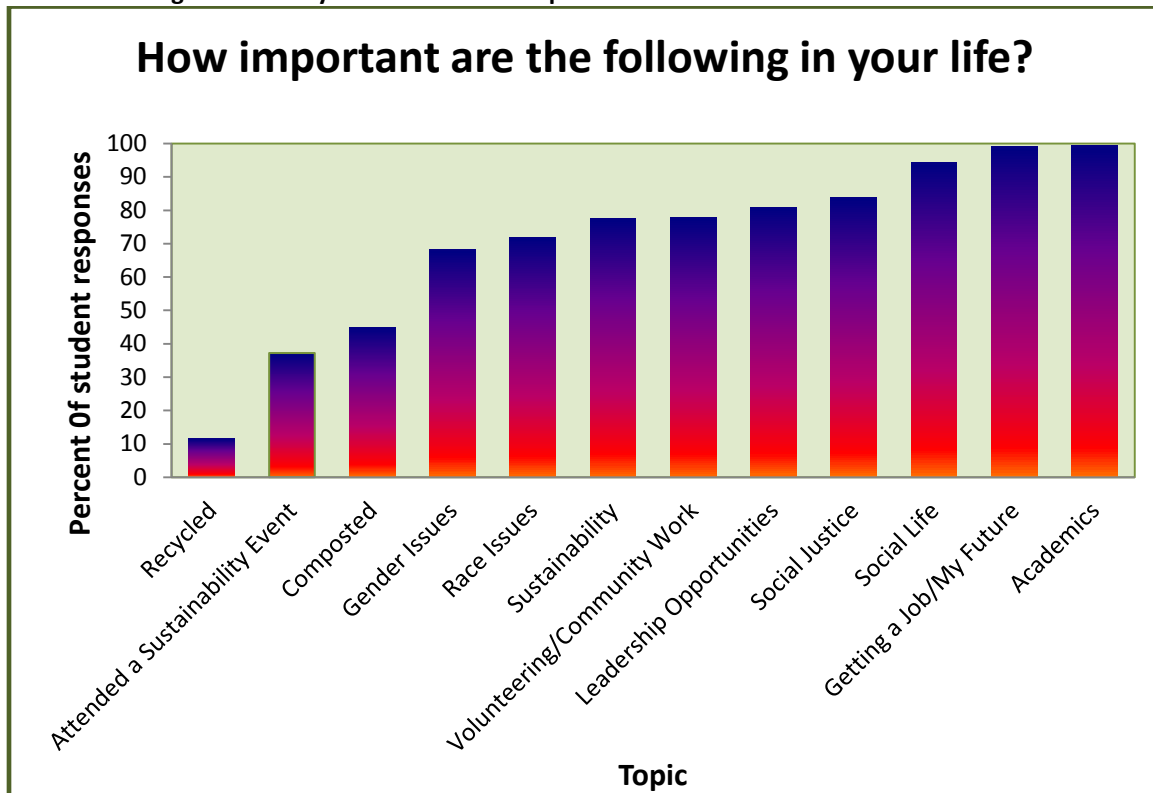
10) Attitudes and Awareness Study: The second year of the study was to compare responses to the 2011 version of the survey with the aim of establishing patterns of increased student awareness as well as illustrating missed opportunities in certain educational areas. The original survey measured climate knowledge, attitudes and behaviors among Brown University students. The survey results are beneficial both towards setting themes for future programs as well as defining areas of potential financial conservatism through targeted behavioral change (i.e., turning lights off in dorms).

The survey was presented to all students via Morning Mail from Facilities Management in April 2013. We received 761 responses⁶. The survey asked questions regarding pro-environmental attitudes, perception of self-efficacy, and awareness of sustainable behaviors and programming. The survey used closed-ended questions: multiple choice, categorical, and likert scale. Demographic information such as gender and class year was also collected. Students were incentivized to take the survey by the chance to win a \$100 Amazon.com gift card.

⁶ Results based on a relatively equal distribution of responses from classes with a wide array of academic concentrations.

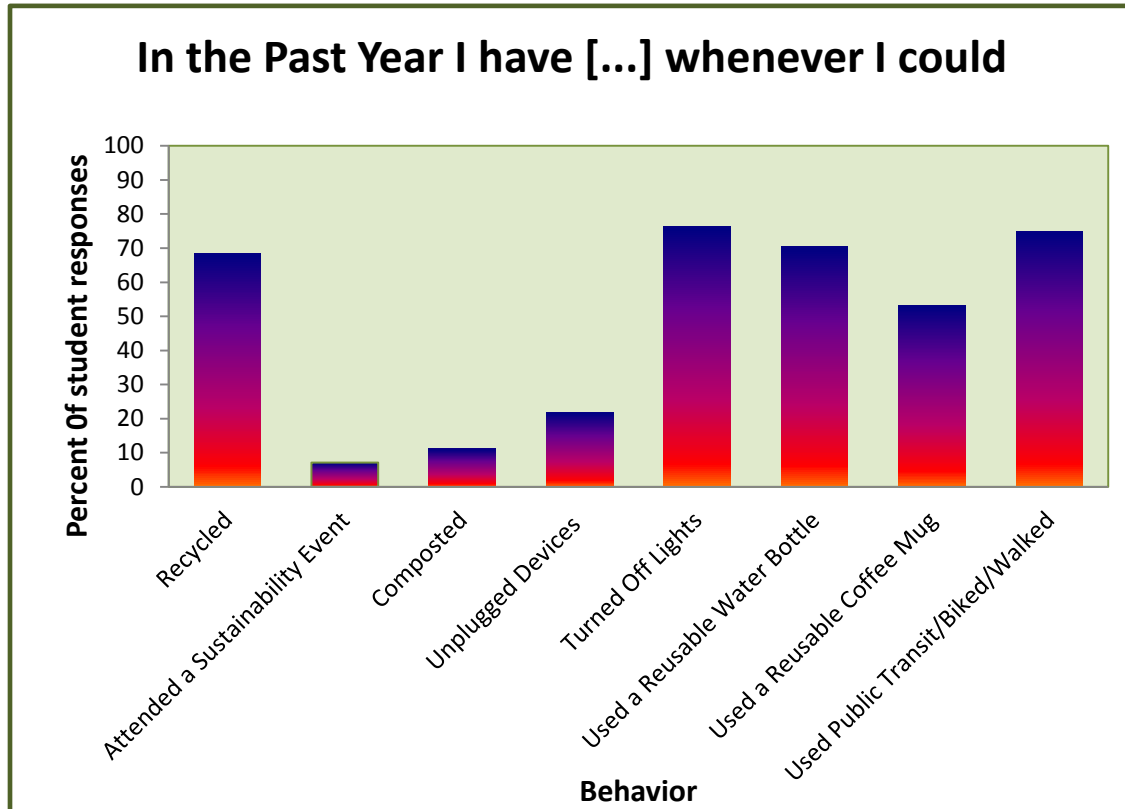
Key Findings Year Two:

Figure 4: Survey Results – what’s important to our students



- When asked as to the importance of the environment in students’ lives, the total percentage increased by 2 percent (from 83 percent in 2011 to 85 percent in 2013).
- 73.5 percent of students have heard of, or were involved with, the EcoReps program (a 7.5 percent increase from 2011).
- 50.5 percent of students are aware of Brown University’s commitment to reducing its greenhouse gas emissions by 42 percent by 2020. This is up 43.2 percent of students polled in 2011.
- In 2011, 48 percent of students opened their windows in the winter. Under the DEEP program, this number dropped to 33 percent, representing a marked improvement.
- 46 percent of students agree that they fully understand the recycling system at Brown.
- 87 percent (compared to 78.5% in 2011) of students believe that they can make choices that positively impact the environment; however, only 37 percent of students feel that Brown University is a leader in sustainability.

Figure 5: Survey Results – sustainability behaviors



The recommendations developed from the comparison of academic year 2012/2013 to 2011/2012 are to:

- harness student awareness of *individual responsibility* to better engage them in Brown's sustainability mission.
- better publicize our high-level efforts to *students* to bolster Brown's image as a leader among its peers.
- better educate the student body on the importance of composting.
- focus efforts on gaining broader attendance of students at sustainability-themed events
- make the recycling system better understood since 54 percent of students feel neutral about or disagree that they understand the recycling system at Brown.
- market events to students in courses with a direct focus on the environment and sustainability as well as engage the faculty in an effort to transform the campus into a 'Living Lab.'



11) Green Labs: During academic year 2012/2013, the Energy & Environment office partnered with consultants to work with Brown's Bio Med Facilities Planning & Operation and Environmental Health & Safety (EH&S) staff to facilitate the development of a Green Lab Program. The Green Lab Program includes two components: practices and policies that can be implemented across campus through EH&S; and a specialty behavior pilot program designed and implemented in the Sidney E. Frank Hall for Life Sciences Building. The development, implementation and evaluation of this program will provide the framework for a possible expansion of Green Lab Behavior Programs across campus.

The development of a Green Labs Program began with a series of meetings designed to discuss policies currently in place, the creation of strategies to develop a baseline for building energy use and occupant behaviors and attitudes, and to understand the desired outcomes of each stakeholder.

When the meeting series was concluded a walking focus group was facilitated with key stakeholders of Brown's Sidney E. Frank Hall for Life Sciences to understand what behaviors are currently taking place in the buildings, what are the barriers to new behavior development, and what other opportunities for energy savings and waste reduction may exist.

With the information obtained during the meetings and the walking focus group evaluation, a "best-in-class strategies" document was developed which included a review of the initial walking focus group evaluation, research by the consultant on best-in-class Green Lab Programs such as Labs 21, and program design, including the initial Sidney E. Frank Hall for Life Sciences pilot, and considering the needs and requirements of all labs on campus to plan for scalability across campus.

Based on the findings from the walking focus group, a pilot behavior program was developed to target key occupant behaviors that could reduce energy, waste, and/or water use in the Sidney E. Frank Hall for Life Sciences building. The two key behaviors, which will be targeted in the pilot, are reminders to shut fume hood sashes and turning equipment off when not in use. "Shut the Sash" reminders will be placed on the side of fume hoods by EH&S, who will also cover this topic during lab safety training. Stoplight stickers will be employed to encourage lab users to turn off equipment that might otherwise be left on and protects research by ensuring that equipment that is being actively used is left on.



Figure 6: Stoplight Stickers



- A red 'stop' sticker placed on equipment means that this equipment should stay on at all times.
- A yellow 'caution' sticker placed on equipment means that lab users should contact the person whose name is written on the sticker before turning off equipment.
- A green 'go' sticker placed on equipment means that it can and should be turned off when not in use.

During the academic year 2013/2014 the Energy & Environment Office, their consultant, EH&S, and the Bio Med Facilities Planning & Operation staff will evaluate the behavior program at Sidney E. Frank Hall for Life Sciences. The impact of the program will be monitored and suggestions for next steps to implement the program in other labs across campus will be developed.

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 can be viewed at the interactive [campus map](#) and include:

- Achieved Silver:
 - [Sidney E. Frank Hall for Life Sciences](#), (NC-v2.1), 2009
 - [Metcalf Complex](#) (NC-v2.2), 2013
- Achieved Gold:
 - [Rhode Island Hall](#) (NC-v2.2), 2010
 - [Stephen Robert '62 Campus Center](#) (CI-v2.0), 2011



Medical Education Building (NC-v2.2), 2012

Perry and Marty Granoff Center for the Creative Arts (NC-v2.2), 2012

c. Designed to Gold:

315 Thayer Street (NC-v3)

Aquatics and Fitness Center (NC-v3)

Hunter Laboratory (NC-v3)

Miller and Metcalf Residence Halls (NC-v3)

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 a 30 percent reduction 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.



VI. 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 nine member groups include: [Beyond the Bottle](#), Bikes @ Brown, Brown Climate Action Fund (BCAF), [EcoReps](#), Rhode Island Student Climate Coalition (RISCC), Brown Divest Coal, Solar Decathlon, SCRAP and the Sustainable Food Initiative (SuFI). emPOWER's common meeting time and collaborative structure create 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 tap water over bottled water.⁷

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. Since the initial investment, they have grown their bike-share to a total of 30 from which to choose. The bikes are available from an office in the University Student Center and can be signed out for one week with no membership fee and no deposit. Fees apply in the cases of late returns, no returns, or damages. Bikes@Brown hosts monthly bike rides which meet at Faunce Arch and ride to different meet-up spots in the city.⁸

c. Brown Climate Action Forum (BCAF) 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. Students work closely with Facilities Management and a sustainability intern to determine the resource savings potential (and implementation costs) of student ideas and to help guide effective ideas through implementation. Examples of past and current projects include the replacement of 800

⁷ Storey, A. (Personal email dated August 25, 2013)

⁸ Dang, M. (Personal email dated September 11, 2013)

shower heads with more efficient fixtures 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 both hot and cold water. Also as a result of a BCAF analysis, the beverage contract signed, during spring 2012, includes an energy and environment clause that old, underutilized, and inefficient vending machines be removed or replaced with less energy-intensive equipment. BCAF students are currently researching wider implementation of hand driers to reduce paper towel use and waterless and/or low-flow urinals in heavy traffic areas on campus.

BCAF has expanded into sustainable infrastructure projects, such as recycling. They are improving recycling in the satellite eateries on campus and have recently partnered with the Thayer Street District Management Authority and Go Green Recycling Solutions to bring on-street recycling to Thayer Street.⁹

Figure 7: Divest Coal members



d. The **Divest Coal** Campaign was formed in academic year 2012/2013. They are calling on Brown University to divest from the 15 largest coal companies in the United States. They believe it contradicts the values of our University to invest in companies that perpetuate global climate change and precipitate severe health impacts at every stage of coal production and burning. They are asking Brown to take the step to divest from the 10 largest coal-burning utilities and 5 largest coal-mining companies.

⁹ Baum, J. (Personal email dated August 23, 2013)



Since their campaign started in the fall of 2012, the Brown University community has shown strong support for divestment. More than 2600 people have signed their petition, including hundreds of alumni, faculty and staff. The Undergraduate Council of Students voted to support coal divestment in March of 2013, and the Advisory Committee on Corporate Responsibility in Investment Policies, the official University body devoted to overseeing the endowment, has made a formal recommendation that the University divest.¹⁰

e. **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. Facilities Management hires four (4) sustainability interns and four (4) Area EcoReps, who coordinate the efforts of a large group of volunteers. These volunteers develop and implement creative projects that inspire the Brown community to protect the planet through their everyday actions. They operate on the philosophy that we can improve the environment by making simple changes in our lifestyles. Some of the events they participated in or led include:

Better World by Design: EcoRep volunteers help divert the amount of waste from the conference that ends up in landfills by monitoring the compost, recycling and trash bins present. Their goal is to help people learn what can and can't be recycled/composted.

EcoRep Symposium: Brown hosted EcoReps from over a dozen schools for panels, presentations and networking.

Green Room Certification: The program grew from the DEEP initiative, and included events for sustainable students to network, exchange "green" advice, and work to encourage their friends and peers to get their rooms certified and live in a lower impact manner.

Game Day Recycling: The purpose was to promote recycling and environmental awareness as it applies to Brown home football games. They also promoted and publicized the group by setting up EcoReps HQ for parents, alumni, and students who have questions about who they are and what they do.

America Recycles Day: The group held a trash sort to raise awareness about the contamination of trash in recycling containers and the amount of recyclables found in the trash.

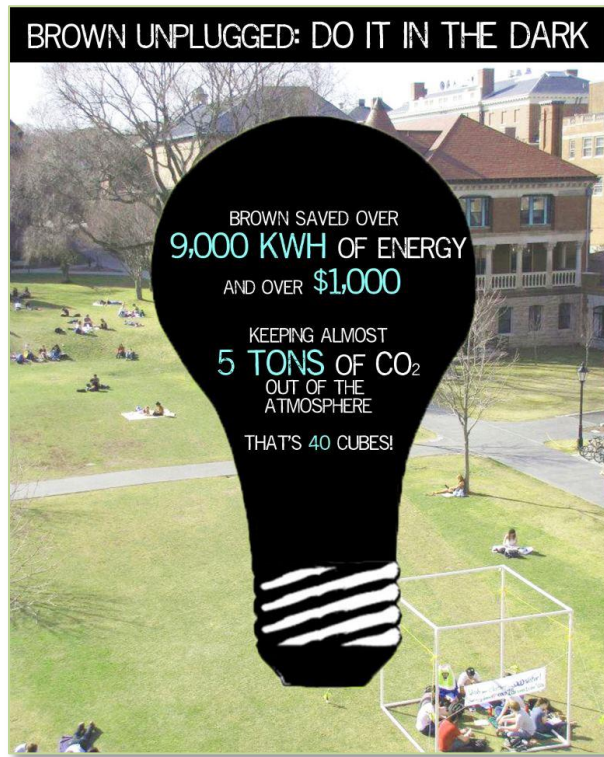
¹⁰ Culhane, T. (Personal email dated September 12, 2013)

Figure 8: Trash sort results



Brown Unplugged: In the spring of 2013, Brown participated in the Campus Conservation Nationals *Compete to Reduce* dorm energy competition for the third year in a row. EcoReps developed innovative programming and events that encouraged students to save energy and highlighted the *Brown Building Dashboard*. The dashboard allows building occupants to track their building’s 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. The 2013 competition, branded Brown Unplugged: “Do it in the Dark”, spurred students to reduce their energy use by over 9,000 kWh saving approximately \$1,000 and keeping over 5 metric tons of carbon dioxide out of the atmosphere while improving awareness of sustainable living practices.

Figure 9: Brown Unplugged results



Clean Break: The purpose of Clean Break is to reduce the tons of waste sent to the landfill during move-out. Volunteers also distribute water during baccalaureate and commencement to reduce the consumption of single-use bottled water and promote Beyond the Bottle.

f. *Green Events:* This group got its start as a final project for an environmental stewardship class in Spring 2012. When the class ended, two of the members recruited the EcoReps to help them apply green event strategies for the Better World 2012 conference. After the conference, an expanded group of students continued to work on developing new tools for greening events, including a checklist and guide.¹¹ Green Events continues to be a student-driven initiative to promote and facilitate sustainable event planning at Brown University. They support the growth of Brown's environmentally-friendly culture by providing the resources to make the adoption of eco-conscious practices an easy action. Green Event Certification provides a simple framework for reducing waste, lowering our carbon footprint, supporting local businesses, and educating consumers. Green Events is supported by the Energy and Environmental Office in the Department of Facilities Management. Brown Green Events

¹¹ Lohmeier, A. (Personal email dated September 6, 2013)



has piloted its certification process at six events, ranging from small meetings to large multi-day conferences. So far, Brown Green Events have donated over 423 pounds of food, collected over 1125 pounds of recyclables, and composted over 3373 pounds of post-consumer food waste.¹²

g. Rhode Island Student Climate Coalition (**RISCC**) is a statewide alliance of students and youth working for a clean, safe, and just future for all. In addition to the chapter at Brown, there are also chapters at other Rhode Island colleges and universities. RISCC is a political action group that fights climate change through creative projects and lobbying. They host activism training, organize actions related to local and national climate policy in Rhode Island and Washington DC, and work to increase commitment to climate justice in the local community. In the 2012/2013 school year, RISCC focused lobbying efforts on building a sustainable transit system by ensuring stable funding for Rhode Island Public Transit Authority. RISCC also worked on some national energy policy issues, including collaborating with the Rhode Island Sierra Club to facilitate the participation of over 200 Rhode Islanders in the Forward on Climate rally against the Keystone XL pipeline in Washington DC and staging letter writing campaigns related to policy issues such as offshore drilling and energy infrastructure.

h. Solar Decathlon: **Techstyle Haus** is a joint project between students from Brown University, the Rhode Island School of Design (RISD), and the University of Applied Sciences Erfurt, Germany (FHE) to design and build a unique, solar-powered house for the Solar Decathlon Europe (SDE) competition. Through emphasis on synthesizing a high-design, low-cost concept, they hope to introduce the foundation for an innovative sustainable community to Versailles in 2014. The Solar Decathlon Europe is an international competition that challenges twenty collegiate teams to design and build sustainable homes powered exclusively by solar energy. The 2014 SDE will take place in Versailles, France and will host teams from sixteen countries and four continents. Ten categories including innovation, sustainability, and architecture will be used to evaluate each house during the competition.

The project will approach the competition from the cutting edge of building science by incorporating textiles into the interior and exterior walls of the house. By choosing to work with textiles, they are challenging conventional architectural practices and reimagining the building process from the ground up. Techstyle Haus will encourage its occupants to engage in healthy and sustainable living habits within both the home and its surrounding community through the use of compelling, positive feedback responses and an emphasis on living playfully. In addition, Techstyle Haus will be designed to combine into multi-unit complexes and neighborhoods.¹³

¹² Kirsch, A. (Personal email dated August 31, 2013)

¹³ Lubin, I. (Personal email dated August 26, 2013)



i. **SCRAP**, Brown's Student Composting Initiative, is working towards making composting more easily accessible to the Brown community. Their mission is to increase composting education, awareness, and practice through an improved campus-wide composting system in order to complete a zero-waste food cycle at Brown. Compost is vital because it not only diverts food waste from the landfill, reducing methane and other greenhouse gas emissions, but it can also be used as a natural fertilizer, avoiding the need to use petroleum-based fertilizers. A 100% natural process, composting is an integral part of how we acquire our food and how we dispose of it sustainably.¹⁴

j. 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 organizing food-related workshops. 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.

During the 2012/2013 academic year SuFI drafted a new constitution which included a new structure. SuFI spent a lot of time in the last year working on improving the Student Garden by completing a new 3-bin composting system and planting crops. SuFI also organized canning workshops and screened "The Garden," a film on urban agriculture. SuFI plans to continue to invest time in the Student Garden as well as push for more Real Food on campus and more food studies courses.¹⁵

One of the SuFI initiatives that has taken off the last year is **Meatless Mondays**, which has collected over 540 student pledges to forgo meat once a week in light of the environmental, health, and economic benefits of a vegetarian diet. One hundred fifty (150) students participated in a photo campaign to show support for hanging a Brown Meatless Mondays sign in the dining halls. This sign, a reminder to students who have pledged, was hung in the Sharpe Refectory in the spring of 2013.¹⁶

k. The Brown Market Shares program developed out of SuFI. Brown Market Shares is a campus-based food distribution program. Inspired by the Community Supported Agriculture (CSA) model, the program partners with regional farmers and producers to bring fresh, local, and sustainably-produced food to the university community. The

¹⁴ Fields, J. (Personal email dated August 25, 2013)

¹⁵ Sambor, D. (Personal email dated September 1, 2013)

¹⁶ Kirsch, A. (Personal email dated August 25, 2013)



program is fueled almost entirely by volunteer labor and is directed by a six person coordinating team.

The market shares program has received two C.V Starr Social Entrepreneurship Fellowships from the Swearer Center at Brown University. Brown Market Shares representatives also traveled to the White House as a finalist for the Campus Champions of Change Challenge in 2012.

2. **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.¹⁷

3. **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."¹⁸ Greater building efficiency can meet 85 percent of future U.S. demand 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. In 2012/2013, 15 students participated in as many as ten (10) study sessions for the Green Associate exam and led three campus LEED building tours.¹⁹

4. **West House** is Brown's Environmental Program House. Fourteen students live in the house during the academic year. Its community includes a total of 36 individuals who are a part of the West House Food Co-operative. The House is open to visitors every Friday for Open Dinner Night at 6:30 pm. 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 2010.²⁰

¹⁷ MacDougal, E. (Personal email dated September 11, 2013)

¹⁸ Brown University, U.S. Green Building Council Brown University Chapter, n.d., Web 29 Aug 2013 <<http://mygroups.brown.edu/organization/usgbc>>

¹⁹ Ozgren, M. (Personal email dated August 29, 2013)

²⁰ Sambor, D. (Personal email dated September 10, 2013)



B. Student Groups Working in the Local Community

1. **Engineers Without Borders (EWB)** is a group of students and faculty dedicated to using engineering for social and environmental good. EWB partners with communities to enact sustainable development projects, locally and internationally, which range in impact from improving health standards to providing engineering and science-related education.

In 2011, EWB started an after school program to bring hands-on do it yourself (DIY) projects to high school students to develop their design skills and scientific curiosity. EWB has also sent two members to visit Tireo, Dominican Republic to assess the sanitation situation and start a conversation with local leaders in hopes of moving forward with a specific sustainable development project, building a latrine near a school.

2. **Food Recovery Network at Brown (FRN@Brown)** is a network of student groups and individuals at Brown University volunteering to recover the surplus food from campus dining halls and special events and donate it to hungry men, women, and children in the Providence area. FRN partners with Brown Dining services and recovers food every day of the week from seven campus eateries. They are reducing the amount of food that ends up in landfills, which helps both the University's bottom line and the environment (food in landfills releases methane, which has an effect 21 times the size of carbon on global warming). At the same time, they are helping reduce hunger in the local community of Providence, where 1 in 7 families are food insecure.

In the spring of 2012, its first semester in existence, FRN@Brown recovered 6,500 pounds of food, which provided 6,500 meals to members of the Providence community, through four shelters and meal sites. Thirty (30) volunteers worked 200 hours recovering food from 5 dining halls and 3 conferences on campus.²¹

FRN@Brown is a member of the **Food Recovery Network**, a national movement to create student-led food recovery groups on every college campus in the country. FRN@Brown also partners with **We Share Hope**, a local food recovery organization that recovers over 250,000 pounds of food a year and gives it to people who need it.²²

3. 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.

²¹ Robles, R. (Personal email dated September 11, 2013)

²² Chesler, B. (Personal email dated October 4, 2012)



During the 2011-2012 school year, SCP worked with the Green and Healthy Homes Initiative on a number of different projects, and began work with the Mayor's office on an energy performance project. Over a dozen students worked in four project teams researching best practices and new ideas. The main goals of the Green and Healthy Homes Initiative projects were to help improve the sustainability standards for retro-fitting low-income housing and to examine the possibility of using more local materials during those retro-fits. The project with the Mayor's office aimed to use current energy reporting systems to model and help improve energy efficiency in municipal buildings throughout Providence.

4. **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.²³

C. Student Groups Working in the Global Community

Rainwater for Humanity²⁴ (R4H) is a collaborative social enterprise initiated by Brown University students in partnership with local organizations in Kerala, India. To address the potable water crisis in the region, R4H finances the construction of rainwater harvesting tanks under a sustainable pay-per-use water vending model and trains rural women to manage each structure. Every tank supplies a group of families with affordable and accessible water for their drinking and cooking needs throughout the dry season, safeguarding community health and increasing household savings.

During the 2011/2012 academic year, R4H built three new rainwater harvesting structures in collaboration with Mahatma Gandhi University. Engineering research, conducted at Brown University, to reduce construction costs through alternative materials has yielded a promising new tank design to be further studied this coming year. If successful, cost savings are projected to be around 20 percent.

²³ Rothenberg, J. (Personal email dated September 1, 2013)

²⁴ Flores, D. (Personal email dated August 27, 2013)



VII. 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 2013, Brown University recycled 40 percent of its waste as a result of campus initiatives, representing a three percent decrease over fiscal year 2013.

Over 522 tons of curbside recycling was collected across campus. Materials include bottles, cans, office paper, mixed paper, and cardboard for which there are receptacles found throughout the campus.

In addition to the traditional curbside recycling collected, Brown diverted 833 tons of additional material through the programs described in sections V.B through V. N below.

B. Composting: Facilities Management delivered over 68 tons of leaf and yard waste to compost at the Rhode Island Resource Recovery Corporation in Johnston, Rhode Island. The Grounds Office also donates material to eight (8) local urban gardens on the south side, Olneyville, Buffalo Court, and Salvati Way. These donations are not weighed and, therefore, are not included in our overall diversion numbers.

C. Mattress and Furniture Donations: Brown University's Residential Life Office regularly partners with [Green Reuse and Recycling Organization International](#) (GRRO) to donate furniture from its dorm areas.

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. Over one ton of books were recycled implementing the program in 2010. 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.²⁵

²⁵ Souza, S. (Personal email dated August 25, 2013)



E. Academic Year Clothing, Shoes, and Accessories Swaps: The Vault was founded through the Student Activities Office and Brown Student Agencies in the fall of 2010 with a two-fold mission. First, to facilitate the recycling and reuse of goods which traditionally have a very brief cradle-to-grave life span in the Brown community. Second, to give members of the community a set of concrete skills in “upcycling”, the ability to add value to items which would otherwise go to waste. These goals are accomplished through twice-weekly sale days, during which students and faculty can purchase clothes and household goods donated by others, or bring in their own items for store credit. The Vault is self-sustaining and uses profit from sale days to host monthly workshops. These cover a variety of topics. In the past The Vault has hosted workshops centered on Halloween costumes, old T-Shirts, and winter wear. They have also partnered with Bikes@Brown and Fashion Week and introduced related projects.

The Vault currently has 120 active donors, and many more customers. To date, they kept over \$2,400 worth of goods (many priced below market value) in circulation and out of landfills. With limited storage but a very high turnover, they were able to build an effective and self-sustaining initiative with a positive environmental impact. Their affordable prices, flexible donation pickups, and free workshops also allow them to build the Brown community in an inclusive way. They look forward to increasing their reach and positive impact, and strengthening their partnerships with both environmental and creative groups on campus.

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 office; 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 2013 program partnered with the Furniture Bank and Good Will 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 32 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. Five more units were placed in fiscal year 2012, and are located at the Ship Street Market, Nelson Fitness Center, Emery Hall, South Walk, and lower Sears House.

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 34 tons of electronics in fiscal year 2013 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 retrofitted into existing buildings. After careful financial, labor, and energy analysis during the summer of 2012, one building was selected to be the first to be retrofitted—Pizzitola.

J. Paperless Offices and Processes:

1. Computing Accounts and Passwords has moved almost all paper-based access forms to an online format. The remaining four forms must remain on paper for audit reasons. Customers can now request access or changes to 60 applications through the online forms.
2. Since the Bursar's Office implemented electronic student account statements in lieu of hard copy printouts, they have saved on printing and mailing of over 217,000 statements (2010 = 78419; 2011 = 79185, 2012 YTD = 60025). They estimate that this has saved the University approximately \$41,000 per year in costs of statements, printing and mailing, for a total of \$123k.
3. As of January 17 2012, the Bursar's Office implemented electronic refunds for students. Through this process, students can receive any overpayment refunds directed to their US savings or checking account. Since implementation, over 2,300 electronic refunds have been processed, which is approximately 80 percent of all refunds. This provides a significant savings to accounts payable in processing and printing checks and streamlined the processing for both areas.²⁶
4. Academic year 2011 was the first time the Admission's Office viewed applications online thanks to their new digital reading process.²⁷ With up to 30,000 applications per year, that's almost one ton of paper saved each year. Last year, the Admission's Office further reduced paper and materials consumption by participating with Slideroom, and an on-line platform that allows applicants to upload their music and art portfolio materials rather than mailing in hard copy submissions. In its first year, they received 2,302 submissions and avoided a significant amount of paper and CD waste.²⁸

²⁶ Richardson, W. (Personal email dated September 26, 2012)

²⁷ Rosales, Joseph, "Apps up, admissions goes digital", Brown Daily Herald, 18 Nov 2010
<<http://www.browndailyherald.com/apps-up-admissions-goes-digital-1.2410499>>

²⁸ Livingston, C. (Personal email dated August 28, 2013)



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 2011.²⁹ An unintended benefit of this decision was that in their desire to reduce paper waste, many departmental faculty advisors elected to not receive hard copies of the catalogues. By the measures taken to discontinue the widespread publication, over 15,000 books, over the past three years, are no longer published. At approximately 250 pages each, a total of 3.75 million sheets of paper were saved. The Registrar's hope is that over time they can completely eliminate the pre-production of the roughly 1,500 copies (375,000 sheets per year) they are still required to publish annually.³⁰

K. Toner Cartridge Recycling: In October 2011, the Bookstore Tech Center and Cartridge World partnered to bring recycled ink and laser toner cartridges to customers. Through this program, instead of new products, 822 recycled ink and 83 recycled laser toner cartridges were purchased in fiscal year 2012, reducing the consumption of oil used in the manufacture of new cartridges.³¹ All types of toner and ink cartridges can be returned to Office Max via a postage-paid box supplied by them. In fiscal year 2012, Brown returned, to Office Max, 105 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.

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.

M. Incandescent and Compact Fluorescent Bulb Recycling: Light 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

²⁹ 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>

³⁰ Fitzgerald, R.E. (Personal email dated September 25, 2013)

³¹ Souza, S. (Personal email dated September 21, 2012)

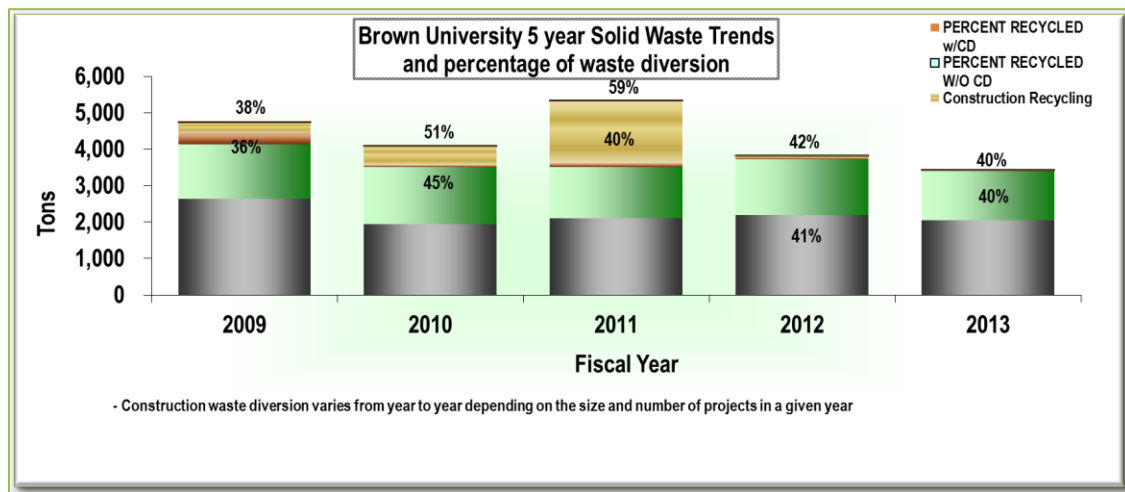


contractor, the replaced bulbs and ballasts are provided to a third party to process. By these three methods, Brown recycled 6 tons of bulbs and ballasts in fiscal year 2012.

N. Surplus: The Purchasing Department, in an effort to encourage responsible procurement practices, in 2009 implemented a surplus program. Departments seeking to dispose of used furniture and office equipment turn it over to the Purchasing Department, who keep it in storage in the event other departments are in need of the same items. Furniture and office equipment which is not claimed internally is donated to local non-profit organizations. Since the program began, 1,776 pieces of furniture and office equipment were exchanged internally and 5875 pieces were donated to sixty-one (61) non-profit organizations.³²

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

Figure 10: Solid Waste Trends



³² Venturini, K. (Personal email dated September 18, 2013)



VIII. 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 fourth 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 23 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 \$20 fee. Hourly rates range from \$7.25 to \$11.00 depending on the type of vehicle reserved. Eight of the 23 vehicles are hybrids and 2,500 Brown-related members use them to travel 30,000 miles a month. There is also a spin off Providence city program which hosts 60+ Zipcar vehicles located throughout the Providence area.
3. **Bicycle Parking Racks:** 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. All new construction and major renovations are required to install racks as part of their projects, and ten new racks were added across campus in spring 2011 for a total of over 90 racks. Together these racks provide hundreds of spaces for the community to secure their bicycles while attending classes, meetings, or social events. The racks are located in spaces that are easy to locate and are accessible to all visitors to campus.
4. **Bicycle Sharing:** Cyclists can 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. They now have a fleet of thirty bicycles, which can be signed out for a week at a time at no charge and for no deposit.



5. Alternative Fuel Fleet: In its fleet of 129 vehicles, Brown has three 100 percent electric vehicles, five hybrid vehicles, and eleven flex-fuel vehicles. The Grounds Division of Facilities Management has been using biodiesel in all of its on-road diesel vehicles since 2006.

B. Brown Dining Services (BDS)

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

BDS's commitment to sustainability is demonstrated by 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. The program, now in its 14th year, focuses on sustainable purchasing at the local level. Community Harvest supports local growers, food producers, processors, and practices artisanal craftsmanship through food. Additionally, the program contributes to strengthening the local food system through educational programs as well as by providing a large-scale, steady purchaser for local farms. Since the program's inception, results include a weekly farmers' market; an annual local food forum; and special event meals, for which menus are created around local and in-season sources.

The special event meals highlight foods native to this area. The menus serve as a platform to discuss the topic of local farming and challenges in agriculture today; an added benefit is the purchase of a significant volume of local products served and/or re-sold on Brown's campus. In addition, interns, whose positions were created as part of the Community Harvest initiative, have helped organize harvest crews, farm tours, and other student activities focused on strengthening the 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 preserve the farmer's way of life
- Provide fresher and healthier options for BDS' customers through the purchasing of a variety of local foods, including several from each food group, from local producers.

2. **Farmer Partnerships:** BDS developed and has maintained committed relationships with the farmers who were part of the original initiative to bring fresh, local produce to the



dining halls. As BDS aims to expand the program each year, it has established relationships with many additional farms so that today, BDS works with over 30 local farms. Dining Services also works with many producers, processors and distributors of local food and dairy products, including continued support of the Rhode Island Dairy Farms Cooperative, a group of 8 dairy farms located throughout the state.

3. **The Sustainable Food Initiative (SuFI):** The Sustainable Food Initiative (SuFI) is a student group dedicated to all aspects of sustainable food. The SuFI-managed student garden, located just blocks from the main dining hall, is a small, urban green space where students grow and harvest their own crops each year. BDS helps to support the garden by purchasing from their harvest. SuFI is now parented by a larger student group, empower. Within SuFI are several student-interest areas which generate education programs and opportunities to support mutual causes, an important aspect to BDS.

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 non-profit organization whose mission is to strengthen the local Rhode Island food system by creating stronger, healthier connections between producers, consumers, and the environment. Currently, FFRI manages eight urban farmers' markets in the greater Providence area, and with BDS, co-manages a weekly market held on Brown's campus in the fall and late spring.

5. The **Market Mobile**, a FFRI initiative developed in the winter of 2008-09, provides a centralized distribution system for Rhode Island farmers. Each week farmers post prices for their available products through a central online price list. Local restaurants and institutions view the list and place orders. The Market Mobile picks up farmers' weekly deliveries from one central location and delivers them according to a scheduled route.

BDS is one of several participating local institutions that assist in supporting the **Market Shares** program, a campus-based Community Supported Agriculture (CSA) program that purchases directly through the Market Mobile initiative.

6. **Local Food Forum:** The Local Food Forum is an annual event hosted by BDS and held on the Brown campus. The Forum, developed through collaboration between BDS and FFRI, began in the spring of 2005. Its purpose was to connect stakeholders and build networks among those interested in strengthening the local food system. The event attracts over 200 attendees including farmers, food producers, restaurateurs, chefs, faculty, staff, students and interested members of the public. In addition to building connections, the Forum provides buyers and producers an opportunity to better understand each other's needs.

7. The **Real Food Initiative:** In 2009, as a result of a grassroots effort by a group of students, BDS met the **Real Food Challenge**. The goal was to create a process through which



all food purchasing decisions consider four main criteria: whether foods are local, ecological, fair, and humane. Additionally, students worked towards the capability to trace and track food purchases to determine how they stacked up to the *Real Food Calculator*. Additional student intern positions were created to assist BDS with this process and in moving the campaign forward.

Brown Dining was one of the first institutions in the nation to pilot the Real Food Calculator to track and assess its purchases. Today, BDS is one of over 340 colleges and high schools nationwide that supports just and sustainable agricultural systems.

Currently, BDS has increased its percentage of purchases at the Blue Room to 50 percent Real Food. The Calculator has enabled BDS to assess how well food purchases measure up against the criteria. Areas of focus have included milk, cage-free eggs, beef, fish, shellfish, and coffee.

As of today, BDS has already surpassed their 2014 goal of having 35 percent of food purchases meet the Real Food criteria, standing now at 39.9 percent. BDS received the Pioneer Award from the Real Food Challenge for its work on this initiative.

8. After the Harvest and Waste Reduction Strategies: The After the Harvest (AtH) initiative, part of the Community Harvest initiative, began during Hunger and Homelessness week in 2005. As a result, BDS has successfully coordinated efforts to both reduce food waste and reroute overproduced food appropriate for donation to local hunger relief programs.

9. Food Donations: Since 2005, BDS has donated over 45,000 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.

In 2012, Brown Dining Services furthered this effort by partnering with We Share Hope, a local organization committed to recovering unused food from manufacturers, restaurants, hospitals, and colleges in Rhode Island and Southern Massachusetts for distribution to organizations that serve the poor and hungry. During the 2012-2013 academic year, Dining Services was able to donate over 16,900 pounds of food to this worthwhile program.

This collaboration developed as a result of discussions with Brown University students, who inquired about the possibility of donating unused baked goods from campus coffee shops to those in need. A team of volunteers, comprised of student group Food Recovery Network @ Brown members, volunteers from We Share Hope, and BDS staff has worked together to collect and distribute daily contributions to those in need and, in the process, created a sustainable distribution system.



10. Recycling & Reusables: Brown Dining Services recycled over 540 tons of solid waste in fiscal year 2013. The University community is committed to the recycling of bottles, cans, and mixed paper, which are collected through designated receptacles located throughout campus.

The dining hall 'to-go' program offers compostable takeout containers, cups, and napkins for students who choose to take their food out. These containers are designed to decompose in two years.

In the spring of 2010, BDS implemented **Eco To-Go**, a reusable takeout container program. As a first step, BDS interns and staff worked to recruit student participants. These pioneers would provide valuable feedback, which would inform decisions about the structure of a large-scale program. Of those who expressed interest, BDS selected fifty participants based primarily on the frequency with which they opt for takeout. The results were so successful that BDS received numerous requests to expand participation. As a result, a reusable takeout container as an alternative to the compostable version was made available to all interested students in the fall of 2011. Besides offering the container, BDS also worked to educate students about landfill waste and the benefits of re-use. The following YouTube video was produced by a BDS intern and made available through the Dining Services web page: <http://www.youtube.com/watch?v=tlwQdVeOajE&feature=youtube>

In addition, BDS sells reusable mugs in its retail units. Beverages purchased in a reusable mug are offered at a discount.

11. 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 donated oil, combined with oil from other local food establishments, goes through a refining process before it is ready to be used as a recycled, renewable, sustainable fuel. Four dining locations participate in the program: Verney-Woolley, Sharpe Refectory, Josiah's, and the Faculty Club. Between the four locations they have donated 16,963 gallons of oil and grease since 2010.³³

12. Composting: Compost is a sustainable process that diverts "waste" food from the landfill and puts it back into the soil. Composting 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 of composting, but the key elements are the carbon and nitrogen. The compost naturally heats up (accelerating the decomposition process); only occasional mixing is required to help every element break down.

³³ Barboza, J. (Personal email dated August 26, 2013)



Composted produce becomes nutritious food for local pigs and fertile organic compost. BDS composts pre- and post- consumer waste as follows:

Pre-consumer waste refers to the organic matter generated in the production and preparation of meals. At BDS, this waste includes (but is not limited to) melon rinds, potato peels, onion skins, and broccoli stalks. BDS' post-consumer waste includes the food that is left on the tray or plate after consumers have finished their meal. BDS combines all pre- and post-consumer waste and donates it to a local pig farmer, who picks up what becomes hearty, nutritious fare for pigs.

Additionally, BDS' butcher shop staff separate meat scraps and donate approximately 300 pounds per week to Full Circle Recycling, a Rhode Island recycling company. As a result, approximately 12,000 pounds of meat scraps per year are diverted from the waste stream and processed into compost.

13. **SCRAP:** SCRAP (Student Composting to Rejuvenate Agriculture in Providence) is a Brown University student composting initiative. Members, working with BDS and Facilities Management, strive to offer the opportunity to compost not only to students in the dining halls but to those who live off-campus.

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

VW customer counts range from 250 to over 1,000 per meal, depending on the course. Trayless dining conserves one third to a half gallon of heated water per person by eliminating the need to wash those trays. 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. Trayless dining also reduces energy that would otherwise be used to heat the water and detergents used to wash trays. Studies suggest that the elimination of trays may also reduce food waste because people take fewer items without them.

Due to interest among students, BDS conducted a survey in October 2010 to gather feedback on the possibility of implementing trayless dining in the Sharpe Refectory and found strong support. Combining the support from students with the continued success of the VW program, BDS has introduced voluntary trayless dining in the Sharpe Refectory. The size and layout of the Sharpe Refectory creates challenges and makes it less conducive to trayless dining than Verney-Woolley. However, in the interim and with the assistance of student interns, BDS has implemented a program in which students scrape their plates and separate trash. In addition, interns assist in educating customers about the benefits of composting.



15. **Beyond the Bottle, reducing bottled water on-campus:** Beyond the Bottle (BtB) is an initiative started by students in February of 2008 with the goal of reducing the supply and demand of bottled water at Brown.

A student environmental advocacy group called emPOWER submitted a resolution that was approved by the Brown University Community Council (BUCC). The 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.”

At the request of the President’s Office, Facilities Management’s Energy and Environment Office formed the Beyond the Bottle (BtB) Committee. The committee was charged with developing policies and goals to support the resolution.

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

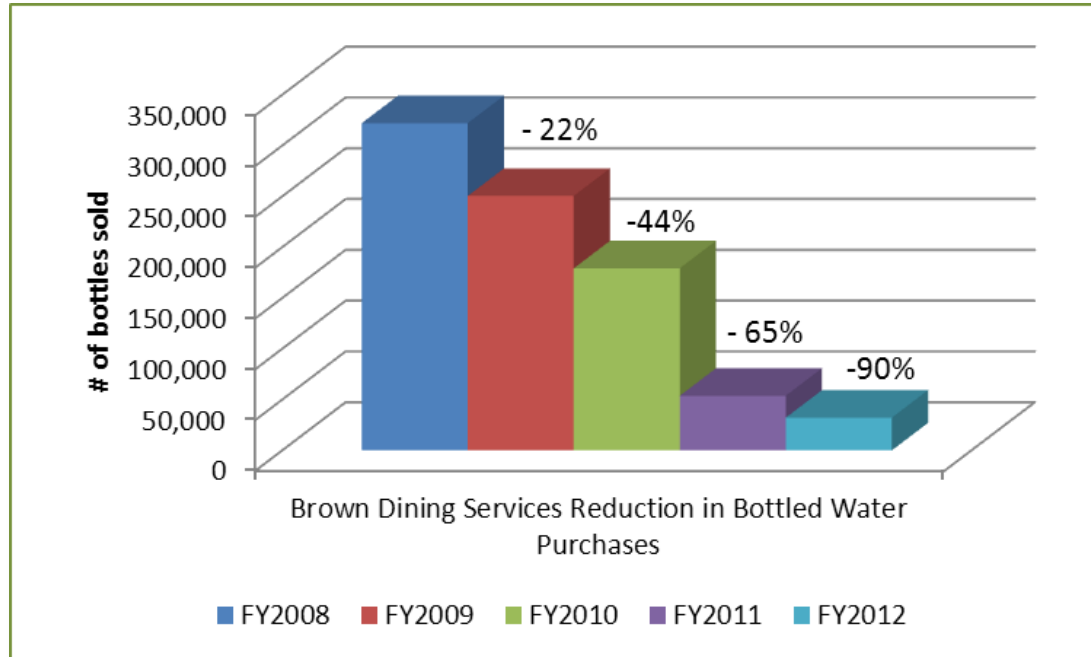
- Reduce purchased bottled water by 65 percent, by end of year, in fiscal year 2011 and by 80 percent, by end of year, in fiscal year 2012.
- Aspire to reducing purchased bottled water by 90 percent by the end of fiscal year 2013.

Since that time, BtB has organized numerous awareness events (including movie screenings, taste tests, water carnival, tabling, etc.) and has partnered closely with Dining Services to increase awareness of the initiative. In the 2010 - 2011 academic year, BDS discontinued the sale of bottled water at all retail outlets, installed hydration stations at Sharpe Refectory, the Campus Center, and other facilities, provided free, re-useable water bottles to all incoming first year students, and provided free water from a portable hydration station throughout Commencement weekend. 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 90 percent since the inception of the initiative, exceeding the fiscal year 2012 goal of 80 percent and meeting the aspirational goals for fiscal year 2013 one year early. This effort continues and the reduction of bottled water purchases by 90 percent is maintained today.



Figure 11: Bottled Water Purchases



16. Awards, Recognitions, Certifications

- Green Certification, Rhode Island Hospitality Association, 2009 and 2010
- Recognized as 'Friend' of the Rhode Island Food Bank, 2009, 2010, and 2011
- The Green Report Card, food and recycling earned an 'A' in 2010 and 2011
- Real Food Pioneer Award, 2011 – Real Food Challenge
- Top 10 Vegan Friendly Colleges, 2011 – Peta2
- 52 Best Colleges for Food in America, 2012 - The Daily Meal
- 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

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.

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 in which the purchases are delivered, 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 2006, 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 office supply deliveries from five times per week to four times per week.

For the first time in FY2012, the Purchasing Department and Facilities Management partnered with a furniture company to supply re-claimed modular furniture during renovations of office spaces. The renovation of the Purchasing Department marked the first office to take advantage of this new program.

E. Custodial Office

Brown University began using green cleaning products in 2004, when they reached out to local vendors to replace current cleaning agents to more environmentally friendly alternatives. Research and testing led to the purchasing of "green seal approved" chemicals, microfiber applications, non-acid bathroom products, and products containing hydrogen peroxide.



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 use of bleach, specifically to address the cleaning needs of bodily fluids (at a 10:1 ratio), none of the cleaning products used at Brown contain harmful chemicals.

F. Grounds Office

Brown University received in spring 2013 the Rhode Island Higher Education Sports Greens and Landscaping Sustainability Certification from the Rhode Island Department of Environmental Management in partnership with the Association of Physical Plant Managers (APPA). This award was achieved by demonstrating through Best Management Practices its reduction of environmental impact and improvement of environmental quality to on-campus and off-campus properties.

G. Residential Life

Residence Life in 2012 began a comprehensive, campus-wide residence hall laundry room upgrade. The upgrade consists of two components: payment technology upgrade and laundry machine upgrade. The payment technology, for laundry machines, was changed to a new "online" networked payment system that draws from student's Bear Bucks debit accounts. This coin-less system helps reduce CO₂ emissions: No coin collection means a reduction in miles driven by collection vehicles, and decreased weight of the vehicles improves miles per gallon.

Additionally, laundry rooms are now equipped with High-Efficiency front-load washers, which save approximately 2.5 gallons per cycle compared to previous washers. This new equipment saves Brown over 300,000 gallons of water each year.³⁴

³⁴ Thatcher, S (Personal email dated August 31, 2012)

Figure 12: Laundry machine upgrades



BROWN UNIVERSITY IS CLEAN & GREEN!

SAVING WATER:

This laundry room is equipped with High-Efficiency front-load washers, which save approximately 2.5 gallons per cycle compared to your previous washers. By using more energy-efficient equipment, **BROWN UNIVERSITY SAVES OVER 300,000 GALLONS OF WATER CAMPUS WIDE EACH YEAR.**



CLEAN VENTING:

Clogged dryer vents restrict airflow, which increases required dry times and related CO₂ emissions. Mac-Gray cleans and maintains vents to improve dryer efficiency.



CARD PAYMENT:

Brown University's Bear Bucks system helps reduce CO₂ emissions. Fewer coins are collected, which reduces the miles driven by Mac-Gray collection vehicles and decreases the weight of the vehicle to improve MPG.



Need more info? Visit www.CleanandGreenVision.com



IX. 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) provides leadership at Brown University in environmental education, research and policy engagement. CES administers two undergraduate concentrations: Environmental Studies and Environmental Science. These concentrations provide students with the breadth to understand complex, interdisciplinary problems and the disciplinary depth to make meaningful contributions to solving this century's environmental challenges. Their faculty are recognized nationally and internationally for their research in solving applied environmental challenges and their work to improve the policy surrounding these issues. Their community of students, staff and faculty are committed to advancing environmental stewardship locally, nationally and internationally.

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 across multiple departments, ECI supports a broad and ambitious agenda in environmental research at Brown. Particular strengths include land change science, conservation science, biogeochemistry, and climate impacts and adaptation. Emerging areas of emphasis include interactions of past and future climate with health and culture. More information at <http://brown.edu/eci>.

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>.³⁵

C. The Watson Institute for International Studies

³⁵ Downs, M. (Personal email dated September 13, 2013)



The Watson Institute is a community of scholars whose work aims to help us understand and address the world's great challenges, such as globalization, economic uncertainty, security threats, environmental degradation, and poverty. Focusing on three main areas – development, security challenges, and governance – the Institute leverages Brown's tradition of true interdisciplinarity to foster innovative, policy-relevant scholarly activities. From Latin America to China, from the Middle East to Southeast Asia, the strongest theoretical models emerge through observations in the field.

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. 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.

G. 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.

H. Biology and Medicine

The Division of Biology and Medicine, or Bio Med, is one of Brown's largest and most active divisions, with a mission of understanding and improving the health of humans and their environment. Bio Med 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.

I. 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.

J. 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.



X. 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 and is one of only 322 schools to make it into their annual Green College review guide.

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.

D. Community Partner

Brown University received in 2011 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 five years since the program's inception, more than 60 tons of goods were donated to the Furniture Bank to distribute among its 16 participating organizations as needed.

E. International Sustainability Campus Network

In June 2011, Brown received international recognition for its ambitious carbon reduction goals and the plans and projects that are making those goals achievable. In an [article](http://www.international-sustainable-campus-network.org/latest-news/2011-iscn-awards-announced.html)³⁶ 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."

³⁶International Sustainable Campus Network, Web 13 Jun 2011, 20 Sep 2011 <<http://www.international-sustainable-campus-network.org/latest-news/2011-iscn-awards-announced.html>>



F. New England Clean Energy Council Corporate Citizen of the Year

Brown University was honored at the Fourth Annual Green Tie Gala in November 2011 for its environmental stewardship, advocacy, research and education, and commitment to greenhouse gas reduction.



XI. Acknowledgments

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STAFF:

Dining Services
Environmental Change Initiative
Environmental Health & Safety
Facilities Management
Financial and Administrative Services
Graphic Services
Purchasing Department
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*
- *Clean Break (Move out) and Commencement*