Universities play a crucial role in helping the world adapt to a changing planet, and to challenging issues such as climate change and resource depletion. Tufts faculty address these issues at the highest level of insight in their teaching, and with our students break new ground in research. At the same time, our faculty, students, staff and alumni are all providing leadership in the public- and private-sector responses.

But it is not only through our teaching and research that we can play an important role in shaping a sustainable future. As members of an educational community with a deep commitment to active citizenship, we have opportunities to address these challenging issues institutionally as well as individually, using evidence-based approaches that are both innovative and effective. We can demonstrate on campus how it is possible to take action in ways that are fiscally responsible and enhance our collective quality of life.

We can be proud of the university's long history of dedication to environmental sustainability. I established the Campus Sustainability Council in my first year at Tufts in order to renew our commitments and establish new, specific goals for a more sustainable campus. The Council began meeting in January 2012 and has concentrated on reducing Tufts' own footprint. Our first priorities for action were the areas where we have the greatest impact on the environment: in energy and greenhouse gas emissions, waste, and water use.

Over the past year, the Campus Sustainability Council and its Working Groups have developed goals and objectives related to each of these key areas of impact. This document contains their recommendations. During the deliberations, it became apparent that success will require the full engagement of the whole university community. Working together, we can make Tufts a safer, healthier, and more sustainable place to live and work. I hope that you will join me to ensure that Tufts is not only brown and blue, but green.

**TONY MONACO**
President, Tufts University
Chair, Campus Sustainability Council
The Sustainability Council Report would not have been possible without the efforts of many faculty, staff and students volunteering their time above and beyond their normal course of work. The compilation of this report was managed by the Tufts Office of Sustainability and brings together all the work done throughout that past year by the Sustainability Council and Working Groups under the guidance of Barbra Batshalom, president of the Sustainable Performance Institute.

Many thanks go out to the working group chairs: Professors Ann Rappaport, Jonathan Kenny, Scott Horsley and Gretchen Kaufman and staff members Betsy Isenstein, Dawn Quirk and Bob Burns for leading the working groups, providing valuable expertise and guiding the creation of relevant, achievable goals. I am especially grateful for the diligent work of Betsy Isenstein and Dawn Quirk in collecting and reporting all the available data on campus waste, energy and waste use and production.

I would like to extend sincere appreciation and thank all members of the working groups for devoting significant time and energy to learning about water, waste and energy management at Tufts and making suggestions, doing research and providing insight into the goals and strategies outlined in this document.

I would like to thank the following people for their feedback, review and editing of this report: Barbra Batshalom, Peter Kelly-Joseph, Andrew Ramsburg, Betsy Isenstein, Dawn Quirk, Grant Garven, Ann Rappaport, Colin Orians, Laurie Sabol, and Bob Lynch.

Finally, I would like to extend deepest gratitude to President Tony Monaco for convening the Council and making Campus Sustainability one of his core strategic initiatives. Without such strong support from Tufts leadership, sustainability would not have received the level of attention it has enjoyed during the past year.

PATRICIA CAMPBELL
Executive Vice President
Co-chair, Campus Sustainability Council
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When Tufts President Anthony P. Monaco joined the university in August of 2011, he identified sustainability as one of the strategic priorities of his administration. He formed a Campus Sustainability Council and personally serves as its Chair.

The Council convened for the first time in January 2012 with members from all three campuses and representation from university leadership, staff, faculty, and undergraduate and graduate students. While acknowledging that a sustainable campus encompasses much more than a reduction in its energy, greenhouse emission, water and waste impacts, the Council focused its work on these three areas as they are the areas of greatest impact on the environment from Tufts’ campus operations.

The Working Groups reviewed existing goals related to these topics, progress towards those goals, existing data, and relevant benchmarks. They then developed goals, objectives and strategies for each area. At each stage, the Council provided feedback to the Working Groups on their recommendations.

During March 2013, the Council is soliciting comments, suggestions and questions from the Tufts community on this DRAFT report before the goals and strategies are finalized. Your participation as a member of the community is extremely important.

Once the feedback from the public is received and incorporated into a final sustainability plan, Tufts administration will develop an implementation plan, including budget and staffing allocations, to achieve the stated goals.

**Summary of Working Group Goals**

The **Waste Working Group** envisions the entire Tufts community playing an intentional role in fostering a cradle-to-cradle economy. Their primary goal is to reduce waste by 3% each year through source reduction, waste management strategies, and behavior change.

The **Water Working Group** sees Tufts employing an integrated water management approach that reduces consumption, promotes reuse, and minimizes impacts on the environment. Within one year their goal is to:

1. Develop a plan to evaluate and prioritize targets to reduce consumption.
2. Identify and (where appropriate) implement water re-use opportunities.
3. Institutionalize policies and protocols to meet and exceed federal, state and local regulations related to storm and wastewater.

The **Energy and Emissions Working Group** envisions Tufts as a leader in responsible climate action through energy efficiency, emissions reduction, clean energy, and adaptation. They created the following goals:
1. Reduce energy consumption 5-7% per year for 3 years starting in 2013.
2. Reduce greenhouse gas emissions 10-25% below 1990 levels by 2020 and 75-85% below 2001 levels by 2050.
3. Develop a Renewable Portfolio Standard.
4. Begin the process of Adaptation Planning.
5. Address non-carbon greenhouse gas emissions.
6. Develop transportation initiatives to reduce impacts of campus vehicles (fleet), commuting and business travel.

Throughout the process, certain issues emerged which were **common to all groups**. They are as follows:

- Responsibility, accountability, and incentive structures must be developed to support progress towards the new goals.
- Additional proactive planning regarding facilities renovations and construction is needed to identify important questions or issues early on in decision making processes.
- Data, reporting and feedback loops are necessary to track and measure progress.
- Laboratory and hospital facilities have some of the largest environmental impacts on each campus and warrant special attention.
- There is a desire to use the campus as a ‘learning lab’ to tie together sustainability work on campus with academic research and teaching.
- A culture shift towards more sustainable behaviors across the Tufts community is necessary and must be addressed in an intentional way.

The following **Education and Behavior Change goals** were also identified for Tufts faculty, staff and students. Within five years the entire Tufts community will:

- Know what to do to reduce energy consumption as a building occupant and use that knowledge to create less energy intensive habits.
- Understand how individual actions impact water usage and quality, why it is important and how to reduce use and mitigate negative impacts on the watershed.
- Know how to divert and reduce waste and actively participate in waste reduction and diversion practices.

**How to provide feedback**

Please submit feedback online ([http://go.tufts.edu/CampusSustainabilityCouncil](http://go.tufts.edu/CampusSustainabilityCouncil)), via email at sustainabilityoffice@tufts.edu, or in person during open forum events hosted by the Tufts Office of Sustainability. Visit [http://Sustainability.Tufts.Edu](http://Sustainability.Tufts.Edu) or follow the Tufts Office of Sustainability on [Twitter](http://Twitter) and [Facebook](http://Facebook) to receive updates. The deadline for feedback is **March 31st, 2013**.
The Campus Sustainability Council

Since the signing of the Talloires Declaration in 1990, Tufts University has been a leader in promoting sustainability and good environmental stewardship in higher education.

When Anthony P. Monaco became the 13th President of Tufts University, he chose sustainability as one of the strategic priorities of his administration. Citing the university’s “strong obligation toward the environment,” President Monaco formed the Campus Sustainability Council in September of 2011 and personally serves as its Chair.

“We need to bring passion and our best ideas to bear on sustainability—and other priorities—if we are to effect change,” wrote the new President in a memo to all members of the community announcing the Council.

The Council was created to set goals and monitor achievement regarding Tufts activities in the areas of energy use and carbon emissions, waste management and water usage. Specifically, it was tasked with:

1. Reviewing the existing goals in these areas and progress to date in meeting those goals.
2. Considering relevant benchmarks for comparison with other Universities.
3. Guiding three working groups tasked with addressing Tufts energy use/carbon emissions, waste management, and water.
4. Reviewing working group proposals for revised or additional goals in each area.
5. Recommending, with input from the working groups, mechanisms for broad Tufts community input regarding the proposed revised goals.
6. Monitoring progress in achieving the established goals.

Purpose and Structure

The Council’s membership consists of university leadership, Tufts staff and faculty, as well as undergraduate and graduate student representatives from across the University’s various schools, programs, and campuses.

The Council oversees three working groups devoted to developing goals, strategies, and metrics for improved sustainability in the following major areas of environmental impact:

- Energy and Emissions
- Water
- Waste
The working groups boast a diverse array of members representing Tufts staff, faculty, and students. Each working group is co-chaired by a faculty member and a staff member who has direct influence over the area of interest.

The Council and working group members are listed in Appendix A: Council Membership.

**Process**

Since its formation, the Council and its working groups have met regularly to develop goals for improved campus sustainability, as well as strategies and metrics designed to best reach those goals. Figure 1 outlines the process followed by the Council and Working Groups, from creating a vision (V) through determining the appropriate metrics for implementation planning.

![Figure 1. Stages of planning followed by Sustainability Council](image)

The Council met five times in the last year, in sessions chaired by President Monaco, and discussed the findings of the working groups. (See Appendix B: Schedule of Meetings)

The Working Groups reviewed existing environmental commitments (see Appendix F. Tufts Commitments and Environmental Policies) and progress towards those goals. They also examined currently available data and relevant benchmarks related to water, waste and energy/ emissions. They then developed goals, objectives and strategies for each area, and began developing implementation plans, timelines, and metrics for each goal to make sure the goal is met. At each stage the Council provided feedback to the Working Groups on their recommendations.

The release of this document for public comment marks the conclusion of the intense, first-year phase of the Sustainability Council. The next phase of the process is implementation planning and then execution. Once the feedback from the public is received and incorporated into a final campus sustainability plan, Tufts administration will develop a workplan, including resources needed, to achieve the stated goals.

The Sustainability Council will reconvene a year after the workplan has been put in place to evaluate progress, provide feedback and address challenges that may arise.

---

1 See Appendix H: Sustainable Goal Comparison
**How this document is organized**

There are four major sections after the Introduction, beginning with the Cross Cutting Issues that span across working groups.

The last three sections each cover one of the three Working Groups and lay out their work from a macro to a micro level, beginning with each group’s vision for Tufts in their respective areas of Waste, Water, and Energy and Emissions. Background information is included at the beginning of each section to provide context for the group’s recommendations.

**Goals** are broken out into specific **Objectives** which outline the key steps necessary to reach the goal. The objectives are supported by specific **Strategies**, which provide more details as to exactly how the objective will be met.

The appendices contain details on the council membership and additional materials such as graphs, Project Management Toolkit, and historical documents for reference.
History of Sustainability at Tufts

Tufts University has a long and rich environmental history. Here are some highlights of environmental and sustainability milestones in the last half century.

1973 The M.A. degree is first offered through the new Department of Urban, Social and Environmental Policy, founded by Professor Hermann Field.

1984 The Center for Environmental Management (CEM) is established with EPA funding. The Lincoln Filene Center begins the New England Environmental Network and launches the first of 18 annual New England Environmental Conferences.

1984 The undergraduate Environmental Studies Program begins as an optional second major, open to students majoring in any field in Arts & Sciences or Engineering.

1986 CEM receives a 5-year grant from EPA and supports more than 65 faculty members to conduct research projects, in addition to training, outreach, corporate involvement, and campus greening.

1990 Tufts receives EPA funding to initiate Tufts CLEAN! (Cooperation, Learning and Environmental Awareness Now!) to reduce or eliminate harmful environmental impacts of the university’s own operations.

1990 Jean Mayer, Tufts President, convenes 22 university presidents and chancellors in Talloires, France, to discuss environmental sustainability. They sign the Talloires Declaration, a 10-point action plan for incorporating sustainability and environmental literacy into campus teaching, research, operations, and outreach. The Declaration has since been signed by over 433 university presidents and chancellors.

1990 The Center for International Environment and Resource Policy (CIERP) at The Fletcher School is established.

1991 Tufts Environmental Literacy Institute (TELI), a training course for faculty to learn how to incorporate environmental topics into courses in any discipline, receives the Presidential Environment and Conservation Challenge Award from the Council on Environmental Quality.

1993 GDAE (Global Development and Environment Institute) is founded under the direction of Neva Goodwin and Professor William Moomaw to promote a better understanding of how societies can pursue their economic and community goals in an environmentally and socially sustainable manner.

1997 The Tufts Center for Conservation Medicine (TuftsCCM) pioneers the concept of conservation medicine as a new approach focusing on the health relationships at the interface of humans, animals and the environment.

1998 Tufts Institute of the Environment (TIE) is established under the direction of Professor William Moomaw to coordinate and catalyze environmental research, learning, outreach and service across all Schools of Tufts University.

1999 Tufts pledges to meet or beat the Kyoto Protocol to the United Nations Framework Convention on Climate Change, setting the goal of reductions in greenhouse gas emissions from Tufts campuses to 7% below 1990 levels by the year 2012. The Tufts Climate Initiative, a grant funded unit housed by TIE, is created.
2000  Tufts President John DiBiaggio and Grace Perez, Executive Director of the Mystic River Watershed Association, join organizational forces creating the Mystic Watershed Collaborative to improve water quality, habitat, public access and watershed awareness in the watershed where the main Tufts campus is located.

2001  The first Eco-Reps program for residential students begins.

2003  Tufts joins the Chicago Climate Exchange. President Lawrence Bacow adopts the goals of the New England Governors and Eastern Canadian Premiers Climate Change Action Plan (10% reduction from 1990 levels of greenhouse gases produced by the University by 2020 with a 75-85% reduction from 2001 levels by 2050).


2005  The United States Environmental Protection Agency awards the prestigious Climate Protection Award to Tufts for its efforts.

2006  Sophia Gordon Hall, Tufts’ first LEED-certified building, opens. It received LEED Gold, exceeding expectations. The Tufts Climate Initiative becomes a department under Tufts Central Administration and is renamed the Tufts Office of Sustainability.

2008  The Eco-Ambassador program, which teaches staff and faculty how to enact changes in their office or departments to make them more sustainable, begins. Tufts Environmental Literacy Institute (TELI) re-starts.

2008  Engineering for Sustainability is identified as one of the 3 strategic focus areas for the Engineering school

2009  Tufts named #9 on Sierra magazine’s list of Top Ten Greenest Schools.

2009  Tufts Dental School vertical expansion is completed and earns LEED Silver certification.

2010  Tufts is recognized by the Northeast Energy Efficiency Partnerships as a Business Leader for a five year body of energy conservation projects.

2010  Tufts dining goes “trayless” as a result of advocacy by students in the Ex-College’s Environmental Action Class. Weekly on-campus farmer’s market opens on Medford campus.

2010  Tufts’ Engineering Professor Maria Flytzani-Stephanopoulos named first Haber professor of sustainable energy.

2011  Tufts Bikes, a student-run free bike sharing program, is launched.

2011  Hodgdon Goes Green eliminates the sale of single use beverages bottles and disposable bags at the Hodgdon-Good-To-Go eatery.

2011  Tufts earns a Silver rating in the Sustainability Tracking, Assessment & Rating System™ (STARS), developed by the Association for the Advancement of Sustainability in Higher Education (AASHE).

2012  President Tony Monaco establishes a university-wide Sustainability Council to look at the areas of water, waste and energy/GHG emissions.

2012  Tufts named a Pinnacle Employer for Excellence in Commuter Options at the Massachusetts ECO Awards. Tufts Dental School Level 2 Renovation Project earns LEED Gold Certification.
2012  Tufts receives a Green Award from the City of Medford in recognition of its work implementing energy efficiency, water conservation and resource use reduction efforts.

2012  Tufts is presented with the Silver Institution Recycling Award at MassRecycles's 17th Annual Recycling Awards Ceremony.

More information about the environmental history of Tufts can be found on the Office of Sustainability website.
Cross-Cutting Issues

Although each working group was focused on the different topic areas, some of the proposed strategies were common to all of the groups. Those cross-cutting issues and the strategies to address them are captured in this section.

Responsibility, Accountability and Incentives

Each group articulated the need for targets to be tracked within each school so that the existing chain of accountability can support new goals. Clear direction from President Monaco and his direct reports, down through each of the Executive Administrative Deans (EADs) and Academic Deans will help promote the priorities of sustainability directly. Working groups recommended that select job descriptions and performance reviews include specific language about achieving sustainability goals. New policies and protocols will only be successful if sustainability is clearly and consistently communicated as a priority and the goals are measurable and achievable. To achieve reductions in energy consumption, waste and water, EADs would be engaged as part of the solution and help to implement strategies that are effective within their individual schools. Incentives are often an effective way to encourage change and each working group discussed different ways to recognize and reward best practices of individuals and schools, within the Tufts community.

Planning

Proactive planning came up as a central theme in all working groups. In this context, planning refers both to making sure the right questions or issues are raised early on in a decision process as well as connecting systems and stakeholder groups that don’t typically interact. For example, in the waste working group, planning will help ensure that equipment or furniture being removed from a facility is designated for recycling or donation at the beginning of a remodeling process as opposed to the end, when there isn’t enough time to make sure that it gets reused. This will help staff manage their efforts more efficiently, reduce the need for storage and also reduce damaged while in storage. In this example, purchasing systems and work orders can trigger planning and people involved early in a project are connected to facilities staff proactively. In energy and water related efforts, improved proactive planning will safeguard both the timely engagement of all key stakeholders and the ability to incorporate life cycle parameters into critical-path decisions.

Data, Reporting and Feedback Loops

None of the sustainability goals will be achieved without measurement and tracking. The need for good data and analysis and effective feedback loops are critical for
Working Group Recommendations

assessing if Tufts is on track to achieve its goals and to be able to make corrections as challenges arise. Each of the groups articulated different strategies for gathering and tracking data, but there was a consensus that annual reporting back to each school (and possibly each building) will be the single most important tool for engaging the various stakeholder groups, keeping them on track and incentivizing commitment. The role of Building Curators came up many times, as a critical mechanism for both ongoing communications and data feedback. A first year pilot Sustainability Report will focus on Pearson and will test a comprehensive evaluation of key data and behavior related to energy, waste and water. In subsequent years, the ideal would be to have an annual Sustainability Report submitted to each school, summarizing data related to energy and emissions, water consumption (and/or reuse) and waste management and recycling. The report would provide feedback on quantitative as well as qualitative aspects of performance such as occupant behavior and commitment. The Building Curator would play a key role in the creation of the Report, the dissemination of its content and engagement of stakeholder groups to reflect on progress.

Laboratories and Hospitals

It is not surprising that each working group singled out lab and hospital facilities as having the largest potential impact across all Tufts campuses. Because these types of facilities require the most energy and water, and generate the most waste, each group wanted to target specific strategies to the lab and hospital community. For example, education and training is important for everyone at Tufts, but would be applied in specific ways within the Dental or Veterinary schools. The content would target specific challenges in those contexts and promote actions that are appropriate in those environments. Waste management is an institution-wide issue, but certain strategies, such as working with suppliers to reduce packaging waste, would have significant benefits in these environments.

Campus as Learning Lab

Tufts’ campuses are a rich and varied source of learning and can teach the entire community about sustainability. Each of the working groups articulated scenarios where student work could tie directly to research and analysis related to site or building improvements. Additionally, there are many classes at Tufts that could benefit from using the campus as a learning lab independent of Facilities projects. While the collaboration between students, faculty and facilities staff was uniformly supported, an effective process for planning and coordinating these activities is critical. For projects that connect students to facilities work, the planning must allow ample time for coordination, taking into account both the academic cycles as well as Facilities staff scheduling.
Steps are being taken to put systems in place so this can be realized: the Office of Sustainability is developing a database that can hold campus-based course projects (papers, senior projects, etc) for other students and interested staff to refer to. The database is being developed to be compatible with GIS metadata conventions and the Tisch library cataloguing system so that in the future it can become part of the Tufts library catalogue. Additionally, a list of potential sustainability related projects on campus will be created annually and be available on the Office of Sustainability’s website for students to refer to for project or report ideas. Along with the list will be guidance on how to arrange effective on-campus projects. Lastly, a symposium or poster session showcasing on-campus student projects will be organized for the end of the school year so relevant staff and interested students can share in the knowledge gained from the project.

For general learning, the expansion of data and tracking and the plan for an annual Sustainability Report for each school will begin to create a vehicle for students to connect to in order to understand how the campus operates.

Culture Change

For any new initiative within an organization, culture change must be an intentional objective and process. Many sustainability plans fall apart when they are limited to a list of items and actions and do not take into consideration the human resistance to change. The working groups all discussed culture change at length and recognized the importance of being intentional about the culture of sustainability at Tufts.

An organization’s culture is a shared set of behaviors and characteristics – how it does business, what is considered “normal,” etc. In order to become truly sustainable, Tufts needs to change how it makes decisions and re-examine habitual operating practices. Sustainability is not a set of projects or issues; it is a way of thinking that incorporates the future into decision making. A truly sustainable university is one that is poised to exist into the foreseeable future, without exhausting the physical (land, fuel, food, clean air and water), human (employees & students) and financial resources necessary to keep it functioning. By changing Tufts culture to one where decisions are made based on the long-term sustainability of the resulting action, we can hope to create a university that is not only vibrant and healthy itself, but exists in a thriving town, region and world. There are many methods of changing the culture of an organization and you will see examples of these throughout this document, from developing new decision-making strategies to requiring the use of certain checklists to changing personal behaviors.

Tufts Community of faculty, staff, students, and visitors, is a vital part of culture change in their role as building occupants. Through gaining knowledge and changing habits and behaviors, occupants set the wheels in motion to drive the shift towards a sustainable future.

Two types of goals were identified by the working groups: education and behavior change. Tufts must be committed to teaching the ethics and substance of
Working Group Recommendations

sustainability and graduating global citizens who act sustainably in their professional and personal lives.

The second type of goal revolved around human behavior. Community Based Social Marketing (CBSM) strategies are being developed by the Working Groups and the Tufts Office of Sustainability to allow Tufts to meet these goals. Appendix G: Fostering a Sustainable Culture shows how CBSM works along with the ideas generated in the Working Groups. Below are the goals and salient points.

Education and Behavior Change Goals

Within five years,

1. All of the Tufts Community will know what they can do to reduce energy consumption as a building occupant and will use that knowledge to modify their habits to be less energy intensive.
2. All of the Tufts community will know how to divert and reduce waste. Specifically, they will know:
   a. What, how, and where to divert waste
   b. What to reduce and how
3. Active participation in waste diversion will increase by 50%.
4. All of the Tufts community understands how their actions impact water usage and quality, why it is important and how they can act to reduce use and mitigate negative impacts on their watershed.

Key Recommendations

Focus on:

1. Labs and clinics
2. Purchasing choices
3. New employees and students
4. Connecting coursework and on-campus projects
5. Residence halls with dining halls
6. Re-useable or recyclable items from renovations
7. Rethinking existing water and energy intensive operations, e.g. leaving water running while washing in kitchens and labs
8. Improving the quality of water leaving a site

Use full range of Community Based Social Marketing techniques:

1. New or enhanced strategies
2. Incentives and disincentives
3. Enhanced convenience
4. Marketing and promotion
5. Commitments
6. Prompts
7. Norms
8. Social diffusion

**Key New or Enhanced Strategies:**

1. Revolving loan fund that can be used by departments to upgrade equipment or pay the incremental cost of more efficient equipment
2. Dedicated person to focus on culture/behavior change in labs and clinics
3. Additional, topic-specific trainings
4. Use of the Integrated Design Process (IDP) to incorporate more discussion between the engineers, architects and owners of a project
5. Training module specifically on lab efficiency and good practices
6. On-line training module on recycling
7. Augmented recycling education in student and employee orientations
8. Have one of the existing distribution requirements (for AS&E) be an environmental course
9. Monitor compliance through office or lab ‘audits’, flagging Facilities ‘project charters’, trash audits, surveys
10. Incentive and recognition programs
11. Reports on building metrics (energy, water usage numbers, waste production, behavior change progress etc) given to building occupants.
12. Accountability through job descriptions and performance planning process

For a more comprehensive overview of the CBSM process see Appendix G: Fostering a Sustainable Culture
The entire Tufts community plays an intentional role in fostering a cradle-to-cradle economy.

Goal

- Reduce Waste by 3% each year through source reduction, waste management strategies and behavior change.

Objectives

- Source Reduction
- Waste Management
- Culture, awareness and behavior

Strategies
## Summary of Recommendations

<table>
<thead>
<tr>
<th>Goal:</th>
<th>Reduce Waste by 3% each year through source reduction, waste management strategies and behavior change</th>
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<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Strategies</strong></td>
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</table>
| 1. Source Reduction: Reduce the source of waste through purchasing policies and practices and increase the percentage of purchased products that are recyclable and environmentally preferable. | - Improve and expand procurement guidelines and train decentralized buyers in each school.  
- Target and prioritize high volume disposable products, supplies and equipment and encourage alternative products as well as behavior change that will reduce purchasing quantities.  
- Engage and incentivize vendors to raise the bar on their offerings and reporting non-compliance.  
- Leverage centralized software to guide purchasers’ choices.  
- Develop and distribute a Sustainability Report to schools that includes information about their purchasing patterns and compliance. |
| 2. Waste Management: Improvements in planning and communication will increase the amount of solid waste that gets reused and streamline the disposal processes. | - Institutionalize proactive planning to minimize unnecessary waste.  
- Improve systems for tracking & communication including a Surplus Reutilization Program.  
- Enforce policies consistently across all campuses.  
- Increase reuse and sharing of equipment, furniture and other appropriate items within the university.  
- Incentivize and recognize best practices. |
| 3. Culture, awareness and behavior change: Ongoing education and culture change will increase participation in recycling and diversion. Within 5 years, all of Tufts will know how to divert and reduce waste and active participation in waste diversion will increase by 50%. | - Enhance that on-boarding & orientation process for new student, staff & faculty to include effective messaging and instruction about waste management at Tufts.  
- Perform specific outreach to integrate waste management expectations into lab and hospital trainings.  
- Create and expand resources and online training modules.  
- Include waste participation data in annual Sustainability Report to schools.  
- Reward & Recognition Program for best practices and achievements.  
- Enhance accountability for planning and waste management including spot audits.  
- Educate RAs to promote recycling, leverage Eco-Reps to help. |

Table 1: Summary of Waste Working Group Recommendations
Vision and Goal

The entire Tufts community plays an intentional role in fostering a cradle-to-cradle economy

The vision of the Waste Working Group describes a future in which each member of Tufts community considers the impact of acquisition and disposal of an object, and chooses the option that best supports a world without waste.

Cradle-to-cradle means taking into account the entire life cycle of a product and its components; from the extraction of raw materials, processing, manufacture, transport and distribution, use and purpose, repair and maintenance, reuse potential, and ultimately - recycling or disposal. This is an important concept to connect the dots between purchasing and disposal. If Tufts purchases materials that are environmentally preferable and have a high value in re-use, then the lifetime use of these resources has greater value overall. Alternately, some materials that fall into environmentally preferable category for purchasing have little value in the marketplace afterward, and are thus less sustainable.

A true cradle-to-cradle economy is one in which no goods are thrown ‘away’ but are instead recycled into new products or turned into soil, thus negating the need for new extraction of raw materials from the earth.

While the vision outlined above is aspirational, the goal of 3% waste reduction per year was chosen based on an analysis of trash tonnage as a reasonable, achievable goal that is easily measured on an annual basis.

Background

Recycling began at Tufts in 1990 as a student run initiative and has grown into a comprehensive program managed by a full-time Waste Reduction Program Manager in the Facilities Services Division. Recycling and reuse efforts are broad and many of them are outlined below.

Reuse Efforts

- r2ePACK (Reuse. Recycle Everything. Pack and Clean...’K?) is a large scale recycling and reuse initiative that takes place during move-out at the end of the academic year. This program takes the place of Jumbo Drop and the Jumbo Yard Sale. It encourages students to decrease their consumption of new goods and provides “freecycle” opportunities for goods that students commonly need.
- South Hall’s recent renovation introduced Tufts’ first dormitory freecycle swap areas adjacent to the central waste closets on each floor.
- Tufts Recycles! hosts weekly hours to “furniture shop” at the 550 Boston Avenue warehouse and actively works to reuse as much surplus furniture as possible either at Tufts or by donating to outside groups such as local school systems and non-profits.
- Outdated mattresses are donated locally
Recycling Efforts

During the 2011-2012 Fiscal year (July 2011-June 2012) the recycling rates, measured by taking the amount of recycling removed from campus and dividing it by the amount of trash plus the amount of recycling removed from campus, on each campus were:

- Medford 47-53% (depending on what is included)
- Boston 26%
- Grafton 14%

Tufts routinely recycles from both daily Facilities Services’ operations and University activities. The following are recyclable at Tufts:

- Bottles and cans
- Cell phones
- Computers and printers
- Construction and demolition waste
- Electronic media
- Florescent lamps (AKA lightbulbs) and ballasts
- General use batteries
- Glass
- Mattresses that cannot be reused (80% are reused)
- Metal
- Mixed paper and cardboard
- Plastic (rigid only, not films or Styrofoam)
- Printer cartridges
- Vehicle batteries
- Vehicle tires

Other recycling initiatives include:

- Special cardboard recycling services when students move-in in September
- Carpet from Medford campus renovations is often recycled (approximately 20 projects per year). Area rugs left behind in student residence halls at move-out are recycled.
- Recycling services are available for all special events
- The Greenbean reverse vending machine has been installed in the Meyer Campus Center in Medford as part of a five year program. Students will be able to get $.05 for each eligible can deposited.
- Recycling services are made available to fraternities
- Tufts participates in the nationally recognized RecycleMania competition and organizes an on campus residence hall competition
- Custodial staff trained in proper recycling techniques annually
- Glass/metal/plastic and mixed paper recycling bins are provided to every building, department, kitchen and outside
Working Group Recommendations

- 34 new outdoor trash and recycling receptacles were installed on the Medford campus between FY10-FY12
- Mixed paper deskside bins are made available to all residential students and employees and students with offices
- Single-stream (AKA zero-sort) recycling was adopted at the Dental School due to the unique needs of a public clinic
- Eco-reps (students in residence halls) and Eco-Ambassadors (employees in offices) are trained in recycling and subsequently teach their colleagues, act as a resource in their office or residence hall, and monitor recycling in their area

Composting

- Three public compost bins for Medford campus staff, faculty and students are available to those who wish to recycle vegetable matter and paper towels
- Eco-Reps maintain compost bins in the staffed residential halls
- Food is composted at special events such as Community Day, Matriculation and the President's Picnic in both Medford and Grafton
- Yard waste is routinely composted

Mail Services reduces and recycles

- The Address Hygiene Program is a partnership with Intra Mail Network to scrub lab catalog mailing lists prior to delivery. This reduces deliveries to researchers no longer at Tufts, provides a small stipend and keeps extra catalogs out of the waste stream.
- The Recycled Supplies Program periodically makes interdepartmental envelopes, paperclips and binder clips available to departments from Mail Services existing recycled supplies
- Junk mail (magazines and catalogs that cannot be forwarded) addressed to students, faculty or staff that are no longer at Tufts is picked up weekly for recycling

Metrics

Tufts recycling rate has been steadily increasing overall, mainly driven by the increased recycling rate on the Medford/Somerville campus (Figure 2: Tufts University Recycling Rates). Activities on the Boston and Grafton campuses are largely conducted in clinics and laboratories which present unique recycling challenges, which is reflected in the lower recycling rates. Beginning later in 2013, Tufts Recycles! will embark on an initiative to create waste profiles of each school. The profiles will help focus our efforts specifically to the campuses' needs so that we can meet our reduction goals.
Figure 2: Tufts University Recycling Rates

Additional graphs showing details from each campus are available in Appendix C: Waste Graphs.
Goal: Reduce Waste by 3% each year

Tufts will reduce its annual waste output by 3% per year through source reduction, waste management strategies and behavior change.

Objective 1: Source Reduction

Through careful planning and consistently enforced purchasing policies and practices, Tufts can reduce the source of waste as well as increase the percentage of purchased products that are recyclable and otherwise environmentally preferable.

Strategies

A. Improved and expanded procurement guidelines that are continuously updated and monitored will assist buyers in purchasing environmentally preferable products. Tufts will publish a university “statement of guidance” clarifying purchasing priorities and do outreach to large purchasers in each school to make sure the priorities are understood. Decentralized buyers in each department will receive training and education. Administration and financial decision-makers will be engaged to help communicate the priority to their departments which will help to reach PCard users who make purchases outside of the central purchasing system.

B. Target disposables, supplies and equipment by descending waste volume to identify specific areas to pursue. This includes reducing the use of disposables, eliminating non-recyclable materials, encouraging behavior change (e.g. paperless meetings) and readily accessible (physically and financially) alternatives to disposable products.

C. Engage and incentivize vendors to meet expectations as well as to provide feedback on purchasing trends and behavior. Tufts will communicate to vendors changes in purchasing policies designed to encourage environmentally preferable product choices and packaging so they may update their product offerings to comply. Identify key contracts to review, track and target for compliance and let vendors know that “spot checks” may be performed. Tufts can create incentive programs, including internal promotion and preferred partnerships, for exemplary vendors. Tufts will also have vendors provide reports to track trends and flag areas of opportunity (especially with PCard purchases). Tufts will engage vendors in dialogue about how to improve their product offerings and develop packaging alternatives.

D. Leverage the existing centralized purchasing software tools (e.g. E-Req) to guide and influence purchaser’s choices by incorporating prompts, drop down menus and other mechanisms.

E. As part of the larger annual Sustainability Reporting and Feedback effort, provide schools with summaries of their purchasing trends and waste impacts as well as information about non-compliance with purchasing policies and protocols.
Objective 2: Waste Management

Improvements in planning and communication will increase the amount of items that get reused and streamline the disposal process.

Planning for waste management is a cost-neutral and effective way to capture wasted time and resources. When ordering furniture, equipment and other costly or large-volume items, the person ordering would be triggered to declare or itemize existing items that are being replacing so that timely planning can take place to remove the existing items, before replacement, in the most environmentally and socially beneficial way. This will eliminate the current problem of last minute crisis management when large quantities of goods are removed from a facility. This will also allow others within the Tufts community to be notified of these resources in advance in case they can be of use in another location. If they can’t be used at Tufts, this will give Facilities staff enough time to plan for their distribution outside of the University to community partners and others. Currently, this does not happen consistently and a commitment to institutionalizing this process can reduce waste, yield cost savings and improve staff efficiency. When planning ahead does not happen, items are thrown away or into storage where they get damaged and become unusable.

Strategies

A. Tufts will institutionalize planning protocols to minimize unnecessary waste. This includes the incorporation of deconstruction or product removal in the Project Charter\(^2\), with Facilities Waste Management staff included in the sign-off. It could also include prompts in centralize purchasing software.

B. Facilities staff will improve systems for tracking and communication to understand trends and identify non-compliance, advertise re-use opportunities and promote optimal planning. This includes the establishment of a new Surplus Reutilization Program via a Tufts initiative or with a third party vendor.

C. Enforce policies consistently across all campuses by using the Sustainability Report as a vehicle for sharing information about noncompliance with Executive Administrative Deans and Budget and Finance Officers. Accountability will be balanced with incentives for implementing best practices.

D. Increase reuse and sharing of equipment, furniture and other items across the university through the use of the planning tools mentioned above as well as working with labs and hospitals specifically to identify opportunities where sharing of equipment and furniture is appropriate.

E. Incentivize and recognize best practices by individuals or schools through an awards and recognition program based on information gathered in the

\(^2\) A document used by Tufts Facilities Services group to outline an upcoming project’s scope
Sustainability Report or annual program information such as RecycleMania. Recognition programs could be integrated into existing ones, such as Tufts Distinction Awards, or new ones could be developed.

**Objective 3: Culture, Awareness and Behavior Change**

Ongoing education and culture change will increase participation in recycling and diversion. Within 5 years, all of the Tufts Community will know how to divert and reduce waste and active participation in waste diversion will increase by 50%.

**Strategies**

Create CBSM plans (see Appendix G: Fostering a Sustainable Culture) for desired behaviors such as recycling participation, lab plastics recycling, equipment sharing, and resource sharing.
### Summary of Recommendations

<table>
<thead>
<tr>
<th>Goal 1</th>
<th>Within one year, Tufts will develop a plan to evaluate and prioritize targets to reduce consumption.</th>
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<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Strategies</strong></td>
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</table>
| Catalogue and identify all major points of consumption, quantify them and manage consumption | • Identify and quantify the most significant points of consumption, create plan for improvements.  
• Institute policy to adhere to the highest industry standards for large projects  
• Develop internal standards defining Tufts approved strategies for water use reduction and when to use them, which will be integrated in the Project Management Checklist and Goal Setting.  
• Facilities will identify systems, products and technologies that are preferred for use in different situations and maintain a list of them for future reference.  
• Ensure that metering and moisture sensors are installed and maintained, particularly with irrigation. |

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<tr>
<th>Goal 2</th>
<th>Within one year, Tufts will identify and (where appropriate) implement water re-use opportunities</th>
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<tr>
<td><strong>Objectives</strong></td>
<td><strong>Strategies</strong></td>
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</table>
| Tufts will optimize the potential for water reuse on campus and implement where appropriate. | • Identify all existing conditions where water or condensate might be captured and reused. Institutionalize a standard approach for reuse on all projects in the Project Management checklist.  
• Identify typical scenarios for rainwater capture for use in irrigation and develop a plan for implementation.  
• Identify scenarios for graywater reuse and initiate a dialogue with the municipalities related to permitting and doing pilot projects on campus. |

<table>
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<tr>
<th>Goal 3</th>
<th>Within one year, Tufts will institutionalize policies and protocols to meet and exceed federal, state and local regulations.</th>
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<tr>
<td><strong>Objectives</strong></td>
<td><strong>Strategies</strong></td>
</tr>
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</table>
| To reduce the environmental impact of runoff and discharge and improve water quality. | • Implement careful metering and spot testing to track water discharge and quality, including total suspended solids, nutrients and pathogens.  
• Create Low Impact Development (LID) master plans to identify opportunities for managing site runoff and water quality.  
• Plan and construct additional walkways where pedestrian traffic is causing erosion and re-vegetate degraded areas.  
• Create a policy to minimize chemical fertilizers and pesticides for landscaping and provide training to grounds crews on new protocols and products. |

<table>
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<tr>
<th>Goal 4</th>
<th>Within five years, all of Tufts community will understand how their actions impact water usage and quality, why it’s important and how they can act to reduce use and mitigate negative impacts on their watershed. (Refer to Cross-Cutting Issues section for detail)</th>
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</thead>
</table>

Table 2: Summary of Water Working Group Recommendations
Vision and Goals

Tufts employs an integrated water management approach that reduces consumption, promotes reuse, and minimizes impacts on the environment.
### Working Group Recommendations

#### Water

**Goal**
- Increase knowledge
- Encourage water saving behavior
- Reduce stormwater flow

**Objectives**
- Tufts Community understands how their actions impact water usage

**Strategies**
- Increase re-use
  - Identify opportunities for reuse of condensate, rainwater and greywater
- Manage stormwater volume and quality
  - Reduce impact of runoff and discharge; improve water quality
- Reduce consumption
  - Catalog, prioritize and address all major points of consumption.

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**Goal**
- Reduce consumption

**Objectives**
- Increase knowledge
- Encourage water saving behavior
- Reduce stormwater flow

**Strategies**
- Increase re-use
  - Identify opportunities for reuse of condensate, rainwater and greywater
- Manage stormwater volume and quality
  - Reduce impact of runoff and discharge; improve water quality
- Reduce consumption
  - Catalog, prioritize and address all major points of consumption.
Background

Water resources are significantly impacted by a variety of human actions including excessive consumption and stormwater runoff. Tufts is fortunate to be geographically located in a relatively water-rich region, however water quality has been compromised and streamflows have declined. Climate change poses further challenges for us related to changes in weather patterns which may exacerbate seasonal droughts and floods.

At Tufts, the combination of increasingly frequent extreme precipitation events and aging infrastructure have resulted in increased water costs and service disruptions impacting our core mission of teaching and research. The local municipalities are starting to focus on water issues through more stringent regulations aimed at reducing water use and addressing stormwater challenges.

It is the view of the Water Working Group that Tufts can expect to be subject to stricter quality and quantity requirements in the near future and our community should adapt to policy changes proactively and cost-effectively. The Water Working Group identified three key areas to focus on: water use, water re-use and stormwater. Additionally, it was recognized that water-related challenges will likely affect individuals in the future no matter where they live. Therefore, Tufts has a responsibility to educate members of the campus community about how they can improve our water sustainability.

A variety of Water Reduction and Stormwater Management initiatives have taken place at Tufts:

Water conservation

- Two irrigation wells installed at Alumni Field were activated in the spring of 2012. Efforts to identify appropriate areas for additional ground water for irrigation continue with good prospects in the area of Ellis Oval.
- Drought tolerant plants are used in landscaping.
- Weather-informed irrigation technologies are currently being investigated.
- Condensate recapture and reuse implemented in pilot tests in Medford and Boston (2012)
- Replacement of dishwasher in Dewick Dining with state-of-the-art water and energy efficient dishwasher (2012)
- Trayless dining instituted (2011)
- Medford residence hall bathroom upgrades include dual flush or low flush toilets and low flow shower heads
- Dual flush toilets used routinely in new construction
- Front Load clothes washing machines requiring less water, energy and detergent are installed in most residence hall laundry rooms
**Stormwater Management**

- Students from Urban and Environmental Planning and Policy (UEP) have completed preliminary Low Impact Designs (LID) for campus for the use by Facilities Services to address stormwater retention and quality.
- Fifty percent of the buildings on the Medford/Somerville campus have downspouts that drain into dry wells (allowing the water to slowly infiltrate into the soil instead of running into storm drains). Integrated Pest Management (IPM) is used on the approximately 20 acres of grounds on the Medford/Somerville campus. The main fertilizer is applied 3 times per year and consists of slow release methlene urea or sulphur coated urea. Broadleaf weeds and crabgrass are only treated where found in accordance with IPM specifications.
- Tufts’ first rain garden has been installed on the Medford/Somerville campus near Hodgdon and Lewis Halls. The garden features permeable stone that will filter rain from the surrounding area. The goal of the garden is to reduce downstream flooding and improve water quality. (2012)
- 520 Boston Avenue rain barrels installed to capture roof run-off for landscape irrigation. Drought resistant plantings selected to avoid irrigation system.
As depicted in the chart below Figure 3: Water Consumption by Campus, water usage on the Medford/Somerville campus peaked in 2008, due primarily to a series of steam and condensate leaks that were subsequently located and repaired.

Figure 3: Water Consumption by Campus
Working Group Recommendations

Goal 1: Reduce consumption: Within one year, Tufts will develop a plan to evaluate and prioritize targets to reduce consumption.

Objective: Tufts will catalogue and identify all major points of consumption, quantify them and manage consumption

To have a clear understanding of consumption patterns across the campuses and high-impact targets in order to prioritize strategies.

Strategies

A. Identify and quantify most significant points of consumption (in irrigation, building use and infrastructure) and create a plan to target them over the next year, including opportunities to leverage and align with existing plans for site work.

B. Institute a policy to adhere to industry standards and best practices for new construction and renovation (LEED™, SITE™) and include those standards in construction and renovation project checklists.

C. Develop an internal standard defining Tufts approved strategies for water use reduction and when to use them (for items not covered in LEED, etc). These standards will be integrated into the main Project Management checklist and Project Goal setting document to ensure consistent implementation.

D. Facilities staff will identify systems, products and technologies that are preferred for use in different situations and will maintain a listing of them to be referenced at every upgrade, replacement, renovation or new project.

E. Ensure that metering and moisture sensors are installed and maintained, with a particular focus on irrigation systems.
Goal 2: Reuse: Within one year, Tufts will identify opportunities and implement water reuse strategies

Objective 1: Tufts will optimize the potential for water reuse on campus and implement where appropriate

Tufts will explore opportunities for reuse in existing scenarios and work with permitting authorities to potentially allow for future innovations.

Strategies

A. Tufts will identify all existing conditions where water or condensate might be captured and reused. These scenarios will be catalogued and a standard approach for reuse on all projects will be institutionalized in the Project Management checklist.

B. Identify typical scenarios for rainwater capture for use in irrigation and develop a plan to implement those strategies on the campuses where appropriate.

C. Identify scenarios where graywater might be reused and initiate a dialogue with the municipalities related to permitting and doing pilot projects on campus.
Goal 3: Wastewater and Stormwater Quality: Within one year Tufts will institutionalize policies and protocols to meet and exceed federal, state and local regulations.

Objective 1: To reduce the environmental impact of runoff and discharge and improve water quality

Tufts deploys water management strategies as an opportunity to improve ecosystem health and minimize negative impacts on surrounding communities such as wastewater or stormwater based pollution and excessive stormwater discharge into municipal sewers.

Strategies

A. Tufts will implement careful metering and spot testing for ongoing quantification of water consumption and quality, including total suspended solids, nutrients and pathogens. Facilities staff will take advantage of the numerous summer construction projects to do water testing before and after construction, and the results will be logged and tracked.

B. Tufts will produce Low Impact Development (LID) master plans3 to define opportunities for managing site runoff and water quality which will be implemented as part of upcoming construction projects and in new initiatives. Facilities staff will work with Urban and Environmental Planning and Policy (UEP) students through LID courses to execute analysis and perform calculations to inform the plans. LID strategies will also be integrated into project goals and Project Management checklist. Within 3 years, Tufts Facilities Services will know what they can do to reduce the flow of stormwater entering municipal systems during periods of intense rain.

C. Plan and construct additional walkways where pedestrian traffic is causing erosion and re-vegetate eroded areas to eliminate further erosion

D. Tufts will employ integrated pest management approaches employing predetermined thresholds for use of pesticides and herbicides

______________________________

3 Massachusetts Department of Environmental Protection’s Low Impact Development (LID) page: http://www.mass.gov/envir/smart_growth_toolkit/pages/mod-lid.html
**Goal 4: Culture change** Within five years, all of Tufts community understands how their actions impact water usage and quality, why it's important and how they can act to reduce use and mitigate negative impacts on their watershed.

**Objective 1: Increase student knowledge of water ecosystems and human impacts on water systems.**

**Strategies**

A. For Arts Science and Engineering students require that one of the already existing distribution requirements include an environmental component.

B. Run training sessions for professors to learn how to incorporate water topics into their classes (e.g. through Tufts Environmental Literacy Institute, a one-week program run by Tufts Institute for the Environmental in May each year)

C. Work with Provost's office to identify other opportunities for integration of water issues into coursework in other schools.

**Objective 2: Encourage water saving behavior, alternatives to water intensive practices, and proper disposal of chemicals and medicines.**

**Strategies**

Create CBSM plans (See Appendix G: Fostering a Sustainable Culture) for desired behaviors such as turning off water when brushing teeth, washing dishes and shaving; taking shorter showers.

Work with Environmental Health and Safety department to develop appropriate behavior goals for reducing inappropriate chemical and medication disposal in wastewater.

Introduce a dedicated person to focus on culture/behavior change in labs and clinics.

**Objective 3: Within 3 years, Tufts Facilities Services staff will know what they can do to reduce the flow of stormwater entering municipal systems during periods of intense rain.**

**Strategies**

Have staff work side by side with faculty and students to incorporate low impact development landscaping practices on campus where appropriate

Involve staff in installing rain gardens to filter runoff and help restore the natural hydrologic system.

Provide additional training as necessary.
Tufts is a leader in responsible climate action through energy efficiency, emissions reduction, clean energy and adaptation.
## Summary of Recommendations

<table>
<thead>
<tr>
<th>Goal</th>
<th>Reduce Tufts greenhouse gas emissions:</th>
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<tbody>
<tr>
<td></td>
<td>• 7% below 1990 levels by 2012</td>
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<td></td>
<td>• 10-25% reduction below 1990 levels by 2020</td>
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<td></td>
<td>• 75-85% below 2001 levels by 2050</td>
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<tr>
<td></td>
<td>In addition, Tufts will reduce energy consumption 5-7% per year for 3 years starting in 2013</td>
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<tr>
<th>Objectives</th>
<th>Strategies</th>
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<td>Optimize planning and design process for capital projects to allow for appropriate analysis to achieve performance goals and reduce wasted resources.</td>
<td>• Optimize planning process</td>
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<td></td>
<td>• Adopt internal guidelines, standards and tools and institutionalize life cycle costing</td>
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<td></td>
<td>• Develop campus energy/utility masterplan</td>
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<td></td>
<td>• Enhance accountability throughout decision process</td>
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<tr>
<td>Continuous Improvement of Facility Performance through Operations and Maintenance best practices</td>
<td>• Implement preventative maintenance plans for each building</td>
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<td></td>
<td>• Institutionalize internal standards and guidelines, including establishment of energy usage intensity (EUI) targets</td>
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<td>• Expand data &amp; tracking, establish reporting &amp; feedback loops</td>
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<td>• Expand the role of the Building Curator</td>
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<td></td>
<td>• Enhance accountability within each school</td>
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<td>Education, awareness and accountability contribute to culture change so that sustainability becomes a community mindset.</td>
<td>• Ongoing education, communication and raising awareness</td>
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<td></td>
<td>• Energy intensive facilities integrate new protocols in standard trainings and procedures</td>
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<td></td>
<td>• Facilities will work with schools to identify appropriate opportunities for sharing high-energy equipment</td>
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<tr>
<th>Goal</th>
<th>Develop a Renewable Portfolio Standard (RPS)</th>
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<td></td>
<td>RPS becomes an integral part of Tufts’ overall strategy to reduce emissions</td>
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<th>Objectives</th>
<th>Strategies</th>
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<td></td>
<td>Convene a stakeholder group to deliberate what’s important, how to define and proceed.</td>
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<tr>
<th>Goal</th>
<th>Begin the process of Adaptation Planning</th>
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<tr>
<td></td>
<td>Ensure that Tufts is positioned to adapt to the impacts of climate change</td>
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<th>Objective</th>
<th>Strategies</th>
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<tbody>
<tr>
<td></td>
<td>Convene a stakeholder group to deliberate what’s important, how to define and proceed. Work with Director of Emergency Management to identify existing risks to infrastructure due to predicted climate change impacts.</td>
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<td></td>
<td>The Project Management checklist should include items to evaluate risks of major equipment location and sizing based on likelihood of flooding, future climate variations and other related issues.</td>
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<tr>
<th>Goal</th>
<th>Address non-carbon greenhouse gas emissions</th>
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<td>Understand the scope and opportunity of non-carbon greenhouse gas and other gases implicated in health concerns</td>
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<th>Objective</th>
<th>Strategies</th>
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<td></td>
<td>Develop an accounting of emissions sources including lab and hospital chemical use &amp; construction finishes.</td>
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<td></td>
<td>Develop list of alternative chemicals and/or procedures to reduce the storage or use of those chemicals</td>
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<td></td>
<td>Develop a prioritized reduction plan based on GHG emissions potential and value to research and teaching</td>
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4 Some of these are previously existing goals. See Appendix F. Tufts Commitments and Environmental Policies for further information.
Goal 5

Develop transportation initiatives to reduce impacts of campus vehicles (fleet), commuting and business travel.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Strategies</th>
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</table>
| Understand and prioritize opportunities to address Tufts fleet, vendor fleets, idling policy enforcement, logistics for campus deliveries, policy for intra-campus car-pooling and use of electric vehicles and other lower impact initiatives that can influence behavior. | • Convene a stakeholder group to deliberate what’s important, how to define and proceed.  
• Develop a strategic approach to reduce the volume of single occupancy vehicles on campus. Tie to the health and wellness initiative.  
• Develop a way to quantify and reduce emissions from air travel due to Tufts business |
Vision and Goals

“For the sake of our children and our future, we must do more to combat climate change. ... Heat waves, droughts, wildfires and floods - all are now more frequent and intense. We can choose to believe that Superstorm Sandy, and the most severe drought in decades, and the worst wildfires some states have ever seen were all just a freak coincidence. Or we can choose to believe in the overwhelming judgment of science - and act before it’s too late.”

- President Barack Obama, State of the Union Address, February 12, 2013

As the effects of climate change become more and more evident, the need to plan for future impacts of climate-related events on university business becomes exceedingly obvious. Additionally, Tufts, in its position as a global citizen and home to a significant amount of research on renewable energy technologies has a duty to do what it can to support the transition away from fossil fuel-based energy production.

The most immediate way Tufts can reduce its own contribution to climate change is to address its production of greenhouse gases – either through on-campus burning of fossil fuels or purchasing of energy produced elsewhere. Energy efficiency is the logical first area of focus – first reduce the amount of energy you use, and then strive to reduce the emissions potential of your fuel.

The energy and emissions working group examined both energy usage as well as greenhouse gases produced by Tufts’ operations. Although Tufts is bound by an aspirational goal to reduce its greenhouse gas emissions by 75-85% below 2001 levels by 2050, the working group identified a need for short term emissions goals as well as goals related to renewable energy, adaptation planning, non-carbon greenhouse and hazardous gases, and transportation. The latter two, in particular, begin to bridge the gap between the health of the climate and human health and wellbeing.

Tufts is similar to our vibrant host communities in the sense that the university is in dire need of energy infrastructure upgrading. As with cities, the university is faced with space and financial constraints, and must maintain continuity in its critical operations while new energy systems are built and tested. New systems and ambitious upgrades are critical to meeting climate and energy goals, and to maintaining reliable services within budget constraints. Reduced fossil fuel use is associated with improvements in local and regional air quality and reductions in heat-trapping gases that contribute to climate change.

When the university adds new space it will choose energy-efficient green buildings that are designed for flexibility and incorporate renewable energy. Renovations to

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5 See Appendix F. Tufts Commitments and Environmental Policies
existing buildings are far more challenging than new construction. The academic calendar imposes constraints to renovation, with shorter projects scheduled for winter break and more extensive projects taking place during summers. These brief windows of opportunity have, in the past, precluded the ambitious energy system renovations that are desperately needed.

Open and inclusive decision making processes for new buildings and major renovations are the cornerstone of culture change that will lead to reduced emissions and energy across campuses. Our campuses are learning laboratories presenting rich opportunities for collaboration among staff, faculty and students interested in research and practice related to technological and social systems innovation.

Swing space is needed for renovations to facilitate the implementation of ambitious energy overhauls to many campus buildings. The ability to relocate all building occupants is critical to holistic energy, waste and water system renovations; swing space can accommodate such relocations.

Laboratory buildings present a particular renovation challenge; equipment can be difficult to move and experiments need particular conditions. Swing space is generic in nature and generally not appropriate for highly specialized laboratory work (web labs or other processes requiring fume hoods). This makes systemic overhauls to complex laboratory buildings more difficult, but not impossible.

Age of building stock is also a factor on all of our campuses. In Medford, several university buildings date to the late 1800s and early 1900s, and their energy systems are idiosyncratic and problematic. One example of the renovation challenge is Pearson Memorial Laboratory, home to the Chemistry department. Over the decades, this iconic 1921 building has undergone countless upgrades to its energy infrastructure to ensure occupant health, comfort and safety, building functionality and compliance with laws and regulations. Each time a space is renovated, a portion of the energy infrastructure is upgraded as well. The net result is that Pearson’s mechanical rooms are crowded, and the heating, ventilating and air conditioning systems are ingenious patchworks. Despite implementation of many energy saving strategies and technologies, Pearson’s systems function less efficiently than an integrated system in a new building or a comprehensive renovation.

At the national and local level, it can be difficult to generate political support for infrastructure upgrades. A similar dynamic could be in play at a research university with many demands on its budget. Fortunately, President Monaco recognizes the strategic value of infrastructure to research and learning and is leading the development and demonstration of energy and emission reduction technologies and new decision making systems.
Background

Tufts has a long history of tackling climate change: the Tufts Climate Initiative (TCI) was created in 1999 to reduce Tufts greenhouse gas emissions in line with the Kyoto protocol goals. Since then, Tufts has worked steadfastly to reduce the emissions from its activities and has met the Kyoto goal of a 7% reduction in greenhouse gas emissions from 1990 levels by 2012. Tufts continued to set emissions reductions goals in line with regional and national efforts when it became the first university in New England to adopt the climate change goals of the Conference of New England Governors and Eastern Canadian Premiers Climate Change Action Plan (NEG/ECP CCAP), an international partnership of states and provinces focused on the environment, economic development, energy and other issues.

Despite growth on all three campuses, Tufts met the Kyoto Protocol goal through a combination of energy efficiency, fuel switching and electric and steam procurement decisions. The longer term goals will require more aggressive action. See .

Figure 4: Tufts greenhouse gas emissions and fossil fuel BTU usage over time
Tufts initiatives

Many energy-related initiatives have taken place at Tufts in the following areas:

Emissions Reductions

Energy

- Long-term power supply contract with TransCanada, an electric supplier with a clean portfolio of power generation, consisting of generation from hydropower, natural gas, and wind.
- In 2011, 30% of the Boston’s purchased steam was co-generated with zero emissions attributable to Tufts
- Oil to natural gas conversions:
  - Central Heating Plant, Medford (#6 fuel to gas conversion complete with #2 fuel back up planned)
  - Tilton Plant, Somerville (operational change from #6 fuel to gas, conversion to #2 fuel as back-up planned)
  - Hospital for Large Animals and Foster Hospital for Small Animals, Grafton (#2 fuel to gas conversion)
  - 179 College Avenue, Medford (#2 fuel to gas conversion)
  - 17 Chetwynd, Somerville (#2 fuel to gas conversion)
  - Wood frame houses routinely converted to natural gas if available as boilers need replacing
- Medford campus generator readiness testing reduced to one hour per month

Vehicles

- Medford Facilities Services
  - Uses a first generation Toyota Prius
  - Uses B5 ultra low sulfur diesel (5% biodiesel) in diesel fueled vehicles
- Grafton Facilities Services uses an electric GEM vehicle when weather permits
- Boston Facilities Services uses biodiesel for the Green Machine Sweeper

Renewables

- Sophia Gordon Hall has a roof mounted 23.8 kW photovoltaic system and a roof mounted solar thermal system to supplement the gas fired domestic hot water system
- Fairmount House has two 250 Watt photovoltaic panels on the roof generating about 700 kWh of electricity annually (since 1999)
- Schmalz House has two solar thermal panels for supplemental domestic hot water and a small photovoltaic panel to run the system pump (since 1999)
- Lane Hall Ground Source Heat Pump installed as a pilot project. Geothermal well installed by Geology Department. Facilities Services installed a heat pump to provide conditioned air to a basement classroom.
Working Group Recommendations

Studies

- Data Center Efficiency Study considered hot aisle containment, evaporative fluid cooler for heat rejection, high efficiency lighting and controls, ECM motors and heat rejection to the building heat pump system.
- University-wide photovoltaic review in process with competitively selected solar developer. Under consideration:
  - Grafton – engineering in process for two ground mounted photo-voltaic systems. Total generation expected to be 3 MWs in two locations.
  - Medford – selected roofs will be considered based on size, orientation, exposure, roof age and condition
  - Boston – high-rise roofs less feasible due to higher installation costs and complexities of the downtown electric system

Building 20 Combined Heat and Power Feasibility Study – preliminary calculations show a 6-year payback with utility incentive (2011)

Cummings School of Veterinary Medicine Wind Turbine Feasibility Study funded through a grant from the Massachusetts Renewable Energy Trust (2010)

Cousens south facing roof solar feasibility study (2010)

Grafton Campus Renewable Energy Feasibility Study (2006)

Demand Response

- Jaharis and the Biomedical Research and Public Health building (BRPH) generators are enrolled in the New England Independent System Operator’s (ISO-NE) demand response program. Demand Response allows the ISO to use our generators and others to stabilize the electric grid during times of grid stress and helps reduce the need to bring older, dirtier plants on line or build additional power plants.

Energy Reduction

- Lighting efficiency improvements and occupancy based lighting controls virtually everywhere.

Projects recently completed:

- LED site lighting being tested on the Medford/Somerville campus
- A19 LED lamps suitable for use in desk lamps provided to all incoming students in the fall of 2013. Lamps provided by Nstar and National Grid at a deep discount.
- Installation of over 1,500 LED lamps on all campuses. LED lamps funded by MASS SAVE at no cost to Tufts.
- Public Safety, Medford – old technology T8s converted to new technology T8s
- Jackson Gym and Dance Studio, Medford – HID to fluorescent conversion
Working Group Recommendations

- Aidekman Art Gallery, Medford – incandescent to LED upgrade, controls upgrade
- Grafton – Administration Building, Loew Center, Faculty Office Building, Buildings 20 and 21, Peabody Pavilion, McGrath Teaching Lab, and the Hospital for Large Animals and Foster Hospital for Small Animals

- Medford
  - Classrooms in Eaton Hall
  - TAB lighting controls
  - Brown and Brew LEDs, Tufts Institute for the Environment, 527 and 550 Boston Avenue, Anderson Hall, Robinson Hall, Central Heating Plant, Cousens boiler plant, 175 College Avenue and Blakeley Hall common areas

- Dowling parking garage LED retrofit (first of its kind in Massachusetts)

Currently under study:

- Medford
  - Dowling Hall, Michael Pearson, stairwell and corridor lighting, Remis Sculpture Court, Carmichael Dining – incandescent to LED upgrade, LEDs in site lighting

- Boston
  - Jaharis – additional lighting controls
  - Biomedical Research and Public Health building – various locations

- Energy Star refrigerators purchased for residence halls
- Boiler upgrades

- Routinely using highly efficient condensing boiler technology when steam is not required

As a replacement for existing conventional efficiency boilers

- Jean Mayer Administration Building, Grafton
- Hospital for Large Animals and Foster Hospital for Small Animals summer boiler, Grafton
- Science and Technology Center at 4 Colby Street, Medford
- Mayer Campus Center, Medford
- Gifford House, Medford
In new construction

- Sophia Gordon Hall (supplies Granoff Music Center as well), Somerville
- 80 George Street, Medford
- 58 Winthrop Street, Medford
- Varis Campus Center, Grafton
- Isolation Building, Grafton
- Tisch Fitness Center, Medford (under construction)

- Boiler controls upgrades for improved boiler control and more efficient operation
  - Grafton – Building 20, Hospital for Large Animals and Foster Hospital for Small Animals
  - Medford – Central Heating Plant
  - Planned for Medford: Tilton, Cousens and Jackson boiler plants

- Retro-commissioning
  - Tisch Library VAV (variable air volume) box retro-commissioning as preparation for Tisch air handler replacements. Various low/no cost repairs and adjustments made to dampers, valves, controllers, coils, sensors and thermostats.
  - Large Animal Hospital and Small Animal Hospital retro-commissioning
  - 4 Colby St. retro-commissioning led to several energy improvements
    - Returned previously unused heat recovery equipment to operation
    - Installation of condensing boilers
    - HVAC chiller retrofit project reused an existing 17-year-old chiller by retrofitting it with a newer environmentally friendlier refrigerant and three highly efficient, frictionless, oil-free, magnetic bearing compressors

- The Residence Hall Winter Break Shut-Down (8th annual) is a team effort among Facilities Services, Residential Life, Public Safety and the Office of Sustainability. All unsupervised residence hall rooms are checked to be sure that lights are off, heat is turned down, appliances are off and windows are closed for the month-long winter break
- Variable frequency drives are installed at every feasible opportunity
- Demand control ventilation (CO2 control), outdoor air reset and other energy savings control strategies are applied wherever possible using the Building Automation System

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6 Heating, Ventilation and Air Conditioning
• Aircuity system (demand control ventilation) is installed in Arnold Laboratory renovations, floors 5 and 6. The system allows reduction of general exhaust air changes during normal operations, but continuously samples air quality and ramps up air changes in the event of a chemical spill.

• Capital (new) projects
  
  o 520 Boston Avenue renovation included insulated walls, occupancy based lighting, heating and cooling controls, replacement of old inefficient air handling equipment with one high performance roof top air handling unit, new low-e windows, daylight harvesting and careful attention to sustainable material choices. Rain barrels installed to landscape irrigation. Plantings selected for ease of maintenance and drought tolerance. Bicycle rack installed.
  
  o Steve Tisch Sports and Fitness Center includes a high efficiency oil-free variable speed chiller, high efficiency energy recovery enthalpy wheel for areas requiring 100% outside air, an efficient fan wall system with variable frequency drives, a high efficiency summer boiler and a Kone EcoSpace machine-room-less elevator (no oil used and 1/3 the energy of a hydraulic elevator). Electrical efficiency includes day light harvesting at south facing windows, efficient lighting with dark sky compliant LED site lighting and Energy Star rated LEDs where appropriate. Occupancy sensors throughout. Dual flush toilets, drought-resistant landscaping, on-site storm water mitigation and hydration stations to refill water bottles. Recycled rubber flooring used in first floor corridors and construction waste recycled to date is 83%.
  
  o Biology Labs at 200 Boston Avenue includes cutting edge laboratory energy efficiency approaches with chilled beams, radiant heating, demand control ventilation (Aircuity), energy recovery and high efficiency chillers

• Deferred maintenance
  
  o Dewick Dining – HVAC equipment replacement designed with highest efficiency equipment
  
  o Cohen Auditorium – HVAC and lighting replacements designed with highest efficiency equipment
  
  o Considerable focus on building envelope improvements including new or refurbished windows and roof replacements. Infrared photography before and after has become standard.

    ▪ Windows replaced at:
      • BRPH, Boston – work is on-going
      • Dental Building, Boston
      • Tufts Administration Building, Somerville
      • 80 George Street, Medford
      • Miller Hall, Medford
    
    ▪ Windows refurbished on the Medford campus at:
      • Paige and Minor Halls
      • Braker Hall
Working Group Recommendations

- East Hall
- West Hall
- Goddard Chapel
- Eaton Hall
- Barnum Hall

  - Medford summer 2010 wood frame renovations included insulation and low-e\(^7\) windows
  - Cousens Gym roof replacement included insulation and is well positioned for a future solar project

Recognition

- Medford Green Business Award 2012
- Northeast Energy Efficiency Partnerships 2010 Business Leader for Energy Efficiency for continued efforts to advance energy efficiency resulting in savings of over six million kWh per year
- The Grafton Building 20 Energy Conservation Project received the “Best Energy Project in Higher Education” award from the New England Association of Energy Engineers (2009)
- National Grid recognized Tufts with their “Excellence in Energy Efficiency” award as they celebrated 20 years of energy efficiency programs (2008)
- LEED Certifications:
  - Sophia Gordon Hall – Gold
  - School of Dental Medicine, Vertical Expansion – Silver
  - School of Dental Medicine, Level 2 Renovation – Gold
  - School of Medicine, Sackler Building – Silver anticipated
  - Biology Labs at 200 Boston Avenue – Gold anticipated

\(^7\) Low (thermal) emissivity – basically low-e windows reduce the amount of heat from the sun entering the building.
Goals of the Energy & Emissions Working Group

Goal

Reduce Greenhouse Gas Emissions and Energy Consumption

Objectives

• Optimize planning & design process
• Continuous improvement of Facility performance
• Education, awareness and accountability becomes community mindset

Objectives

• Develop a Renewable Portfolio Standard (RPS)

Objectives

• Ensure that Tufts is positioned to adapt to climate change impacts

Objectives

• Begin the process of Adaptation Planning

Objectives

• RPS becomes an integral part of Tufts' overall strategy
Working Group Recommendations

Energy & Emissions

- Address non-carbon emissions
  - Understand scope & reduce non-carbon greenhouse gas emissions

Goal

Objectives

- Develop transportation initiatives
  - Reduce impacts of campus vehicles & business travel

Strategies
Goal 1: Reduce greenhouse gas emissions and energy consumption in line with specific local, regional and international goals

Emissions reductions goals (existing):

- 7% below 1990 levels by 2012 (Kyoto Protocol)
- 10% below 2001 by 2020 (NEG-ECP CCAP)
- 75-85% below 2001 levels by 2050 (NEG-ECP CCAP)

New emissions reduction goal:

- 10-25% reduction below 1990 levels by 2020, in line with Massachusetts state goals (Global Warming Solutions Act of 2008)

In addition, Tufts will reduce energy consumption 5-7% per year for 3 years starting in 2013 and set additional targets for consumption reduction in 2016.

The Working Group began by reviewing the available energy data and agreed that the primary target for reducing emissions is a focus on the “first fuel” – energy conservation. The most effective pathway to achieve significant reductions is to set consumption targets for both new and existing buildings and implement building-specific upgrades and maintenance to conserve energy. From an operational standpoint, this requires a paradigm shift in mindset from “doing it right now” to “doing it right”. Life cycle costing, which goes beyond first costs to consider all operational, maintenance and replacement impacts, needs to be institutionalized in all decision-making, and purchasing. Success also depends on clear accountability within each school, utilizing feedback loops of data to inform behavior and decisions and preventative maintenance plans for each building. In addition to pursuing the First Fuel priority, Tufts will continue to actively evaluate opportunities for renewable energy strategies and has most recently committed to a solar array which will be deployed on the Grafton campus through a power purchase agreement with SunEdison.

Objective 1. Optimize planning and design processes to create conditions conducive to long-term success

The working group identified many opportunities to improve the current project planning and design process. These enhancements would reduce wasted time and money and improve performance by institutionalizing new best practices; connecting the dots between planning and long-term operations and maintenance needs. The introduction of new internal standards for managing both new projects and existing building improvements would help to ensure a consistent approach to

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8 New England Governor’s and Eastern Canadian Premier’s Climate Change Action Plan
project management and execution. Most of these strategies require commitment, quality control and shifts in current protocols but do not require significant resources. The working group did not have time to estimate the savings from these changes, but discussions of typical scenarios validated that the savings in time and money would be significant.

Tufts institutionalizes protocols in the planning process for capital projects that ensure optimal participation and analysis. The planning process will engage the appropriate stakeholders early enough to get critical input and allow for adequate analysis and planning time to consider life cycle issues, achieve performance goals and reduce wasted resources. High performance goals, as a basis of design, will be embedded in projects from the outset of the planning process through design, construction and ongoing operations. Tufts project management will intentionally evaluate success at every milestone along the project timeline using clear and deliberate methodologies, establishing key process protocols and tools that will ensure consistent implementation and quality control. This objective connects to Objective 2: Continuous Improvement, in that tracking the actual costs of building operation will be an invaluable tool for early decision-making. (Refer to Appendix E: Project Process and Tools Timeline)

Strategies

A. Institutionalize an inclusive planning process: The Planning and Facilities Departments work together to refine the planning process with the goal of optimizing long-term performance throughout the project's lifecycle. Minimum lead-times for key decisions will be established so that necessary analysis can be done and all critical stakeholders can provide input, as appropriate. Swing space will be allocated and utilized to optimize staff time and resources and minimize avoidable costs.

B. Adopt internal guidelines standards and tools and methodologies. Project management at Tufts will be based on clear goal setting and a collaborative process, consistently using tools and standards that drive success. These processes and tools are all contained in the Project Management Toolkit and their application will be required. Life cycle costing is institutionalized from project initiation through design and ongoing maintenance. For every project, design teams will be required to work with Tufts to create a Project Roadmap (by schematic design) that articulates the specific metrics for performance, critical path decisions and factors that will make the project a success. Goals will be outlined in a Project Goal Setting Document and will include energy targets, operations and maintenance considerations, occupant health and parameters for life cycle cost evaluations. All of these will be incorporated into the Project Charter and/or OPR (Owners Project Requirements). The Roadmap will identify critical decision-making milestones that the team must reach and will serve to clarify how to coordinate efforts. Essential tools to be used in the design process include the following. (Refer to Appendix E: Project Process and Tools Timeline):

- Project Charter and OPR
Working Group Recommendations

- Adopted framework (LEED and other)
- Tufts Building performance guidelines
- Project Goal Setting document
- Life Cycle Costing Template
- Project Management Checklist (includes utility incentive program participation)
- Procurement guidelines
- BIM guidelines
- Project Roadmap (for integrative design)
- Maximo (and other systems for tracking costs)
- Building Systems Commissioning guidelines

C. Develop campus energy and utility masterplan: Tufts will develop a masterplan that provides a comprehensive overview of systems and loads which will be critical to support intelligent decision making and will ensure that every decision is made in the context of the larger system constraints.

D. Enhance accountability: Every stakeholder with a role on a capital project should be making decisions with the responsibility for long-term impacts of campus energy consumption and emissions. Energy budget allocations (at the school level) can inform project planning and considerations for life cycle costs, operations and maintenance and energy use intensity of their space. Academic and Executive Administrative Deans and Budget and Finance Officers are engaged as part of the solution to connect the dots between capital and operating budgets and other considerations and will be responsible to ensure that energy budget allocations are met.

In addition to accountability within each school, a larger-scale, systemic approach could be considered. Absent national energy policy or a carbon tax, in the future, Tufts can create an environment that fosters energy and carbon reductions through methods such as establishing an internal ‘carbon tax’, and creating incentive programs that reward lower energy use.

Objective 2. Continuous Improvement of facility performance by institutionalizing best practices for operations and maintenance

In addition to the existing deferred maintenance program, ongoing facility performance will be optimized through two different efforts, establishing proactive and preventative maintenance plans for each building and targeted energy efficiency projects. Tufts will evaluate a range of energy savings projects across the campuses that will require university investment and determine their priority based on the amount of carbon saved over a particular time period, versus upfront and maintenance costs and payback period. Tufts will also institutionalize best practices for operations and maintenance to ensure that investments made in facility improvements will achieve their intended outcomes over time.

The link between clearly articulated project performance goals and long-term monitoring and feedback is the foundation for continuous improvement. The requirement to set (and document) clear performance targets for projects that are
based on a life-cycle-costing framework, would be tied to post-project evaluation and then longer-term evaluations. This institutionalization of “Lessons Learned” would create an opportunity for accountability as well as the ability to understand discrepancies between predicted and actual performance (including economics).

This proposed linkage is based on the assumption that internal guidelines or standards would be established and that key data would be tracked and analyzed. In addition to data, the recommendation for the re-introduction of the Building Curator role and a pilot Sustainability Reporting initiative would serve as an active conduit to connect the dots between various user groups, a building’s performance history and idiosyncrasies; behaviors that impact consumption, and considerations for future planning.

The proposed pilot Sustainability Reporting Initiative would involve gathering both the data about a sample building’s energy performance, as well as occupant usage trends and behaviors that impact its performance, and compiling it into an Energy Performance Report which is returned to the occupants. This would help identify what ongoing training or policy enhancements might be needed for the occupants, as well as what operations and maintenance improvements could be made to the building. Being able to connect occupant behavior to building performance creates a feedback loop that can support awareness and accountability, provide a vehicle for incentives and would be a valuable way to engage various groups across the institution.

The proposed role of the Building Curator (which has existed at Tufts in the past but has become less active) is for a person to be connected to a particular building in a formalized way to serve as both a repository of knowledge about a building’s performance, occupancy patterns and occupant behavior as well as having knowledge of a school or department’s future plans that may impact that building. Beyond a repository of information, this Curator would also serve a qualitative communications role between occupants and facilities staff and to bringing stakeholder groups together around specific activities. For example, an annual discussion of a school’s annual performance Sustainability Report. The Curator would be a unique and valuable connection between a school’s occupants and facilities and other groups outside of the school’s immediate population. For schools with highly complex facilities, the Curator may be a paid position, whereas in a less complex building, it could continue to be compensated as a stipend.

At this point in time, the working group has established emissions reductions goals as shown above, including energy consumption reduction targets for the next three years. It is the intention that, during or after this 3-years, longer term energy consumption reduction targets could be set. The data that would be collected and analyzed during this time and the new energy/utility masterplan both provide a context that would help establish longer-term targets. The future targets could be both absolute and/or relate to energy-use intensities for different building and activity types. This has been an important discussion within the working group and would be an ongoing consideration.
This set of strategies would incur investment in data - from enhanced metering to increased resources to manage and analyze data.

Additional support for enhancing the Building Curator role and additional staff time related to synthesizing information into useful reports might be needed but the working group has not yet defined those resources.

**Strategies**

**A. Establish internal standards** and processes based on life cycle costing and long term energy intensity targets. These standards and protocols address project close-out, long-term operation and maintenance and equipment upgrades. A formal Lessons Learned process will be institutionalized to inform future decisions. These standards and tools include the following:

- POE (post occupancy evaluation) and project closeout checklist
- Lessons learned checklist and meeting of Tufts team and design team
- Internal review system that tracks performance of service providers (input as part of Lessons Learned meeting)
- O&M (operations and maintenance) standard and retro commissioning
- Preventative maintenance checklist and plan for each building
- Lighting protocols
- Equipment replacement checklist – identifying what opportunities to pursue when replacing equipment

**B. Expand Data and Tracking:** Sub-metering will be increased over time, taking particular advantage of ongoing construction opportunities. Network metering will be modernized and enhanced to allow for better data mining and analysis. The Medford utility/energy masterplan will include a study of the most effective ways to install sub-metering where it does not exist and network both existing and new metering. There will be a similar process on the Boston and Grafton campuses. Data will be collected by a common platform, likely the campus building automation system.

**C. Pilot test reporting and feedback loops** that engage building occupants, academic faculty, administrative and facilities staff. A first year Reporting Pilot focusing on one facility will test the effect of providing feedback on building performance to building occupants. The reports will contain building specific information that provide building occupants with energy, waste and water consumption data as well as information about current behavior that affects those impacts. These reports provide a mechanism for engaging stakeholders collectively in a dialogue about their facility's performance and their role in it and can be a basis for incentives. If effective, project specific feedback loops will be institutionalized at project closeout and at 1 year post occupancy.

**D. Revive and adapt the role of the Building Curator** as the lynch pin connecting building occupants, facilities, and administrative staff. The Curator will be the repository of the building’s history, the main point of contact for any building
related business (utility shutdowns, fire alarm testing etc), can provide unique input and context in project planning and is the best observer of occupant behavior. The Curator is a neutral party and can convene an annual feedback session based on the Building Sustainability Performance Report, to facilitate dialogue among the stakeholders about the past years performance. A strong, well connected building curator would save Facilities and others time by acting as an effective information conduit.

**E. Implement preventative maintenance programs.** Facilities staff will work with the schools to define, prioritize and schedule ongoing energy efficiency and equipment upgrades.

**F. Enhance Accountability:** In addition to energy budget allocations and Sustainability Reports to the schools, a change management team will work with schools, in particular medical and dental, to establish requirements for lab managers to implement and enforce certain SOP (standard operating procedures) that support best practices without wasting energy and water or unnecessarily increasing waste. Other prospective methods to enhance accountability include labeling buildings with their energy usage, incorporating energy reduction responsibilities and goals in individual’s job descriptions and performance plans.
Objective 3. Education, awareness and accountability contribute to culture change so that sustainability becomes a community mindset.

The Tufts community must hear consistent messaging in all of their interactions, from when they arrive on campus (or before) to their departure. Timely reports about Tufts energy and water usage, emissions and waste production are necessary to identify and prioritize appropriate culture change targets.

A wide reaching, targeted education and engagement process will lead to within 5 years, all of the Tufts Community knowing what they can do to reduce energy consumption. Specific strategies that apply to all working groups can be found in the section on Cross-Cutting Issues.

Strategies

- Energy intense facilities integrate protocols and training to address behaviors that impact consumption. All lab and hospital facility managers will be required to include education and training protocols that relate to the management of waste and consumption of energy and water.
- Schools will consider opportunities where sharing high-energy equipment is appropriate. A culture change task force will engage labs and hospitals and work with school leadership to ascertain where appropriate equipment sharing can take place, and then work to institutionalize those practices where possible.

Goal 2: Develop a renewable portfolio standard (RPS)

Within one year, Tufts will develop a Renewable Portfolio Standard (RPS)

Objective 1. RPS becomes an integral part of Tufts’ overall strategy to reduce emissions

Strategies

A. Convene a stakeholder group to deliberate what’s important, how to define and proceed
Goal 3: Begin the process of Adaptation Planning

Facilities Services, in conjunction with Emergency Management and others, will identify areas of vulnerability (e.g. ground mounted generators in filled areas of Boston may be vulnerable to flooding) to develop an adaptation and resilience plan. After risk assessment, a prioritized corrective list will be developed and integrated into the planning process.

Objective 1. Ensure that Tufts is positioned to adapt to the impacts of climate change

Tufts must plan to address both the resilience of physical infrastructure as well as scheduling and other operational issues in order to minimize or avoid managing occupancy during peak heating or cooling periods. The final adaptation plan would be followed by periodic review to re-evaluate potential scenarios.

Strategies

A. Plan: Convene a stakeholder group within one year to deliberate what's important, how to define and proceed. Work with Director of Emergency Management to identify existing risks to infrastructure due to predicted climate change impacts.

B. Project management checklist should include items to evaluate risks of major equipment location and sizing based on likelihood of flooding, future climate variations and other related issues.
Goal 4: Address non-carbon emissions

While fossil and other organic fuels constitute the majority of Tufts greenhouse gas emissions, there are other greenhouse gas sources at Tufts that do not contain carbon (e.g. SF₆). Additionally, there are other gases emitted by various sources that are toxic but do not contribute to global warming. It is important to address the health implications of exposure to these gases during the course of employment or residency at Tufts. They are often linked with 'green' building practices and thus a natural companion to efforts to reduce greenhouse gases.

Objective 1. Tufts institutes a plan to reduce non-carbon emissions on campus related to construction finishes, lab and hospital chemical use, off-gassing from plastics, etc.

Schools need to develop an accounting of sources of emissions including lab and hospitals chemical use, construction finishes (paint, adhesives, refrigerants), etc. Once this baseline is developed, schools can try to identify appropriate alternatives and create a prioritized reduction plan based on GHG emissions potential and other factors.

Strategies

A. Develop an accounting of sources of emissions including lab and hospitals chemical use, construction finishes (paint, adhesives, refrigerants), etc.

B. Develop a list of alternative, less harmful options and/or procedures that minimize the storage or use of quantities of these chemicals. Additional efforts to reach out to suppliers and engage them to meet Tufts’ objectives may stimulate supply-side opportunities. This could fall under a larger “Green Chemistry” program, similar to other universities in the United States.

C. Develop a prioritized reduction plan based on GHG emissions potential, value to research and teaching, effect on occupant health, and other factors.
Goal 5: Develop transportation initiatives to reduce the impacts of campus vehicles (fleet), commuting and business travel

Vehicle traffic on campus roads, particularly on the Medford/Somerville campus, present an opportunity to reduce greenhouse gases from the burning of gasoline and diesel, as well as improve the air quality and pedestrian and cyclist safety on campus. Programs designed to discourage single occupancy car travel can enhance the health and well-being of students and employees through increased walking or biking for those who are able, additional social interaction as well as relieve congestion on campus roads and free up space in the central core of campus for other uses such as building sites, gardens or recreation.

Objective 1. Within one year, convene a stakeholder group to provide input for a long-term transportation initiative.

Understand and prioritize opportunities to address Tufts fleet, vendor fleets, idling policy enforcement, logistics for campus deliveries, policy for intra-campus carpooling, single occupancy car alternatives and use of electric vehicles and other lower impact initiatives that can influence behavior.

Strategies

A. Convene a stakeholder group within one year to deliberate what's important, how to define and proceed

B. Commuting: Develop a strategic approach using community based social marketing (See Appendix G: Fostering a Sustainable Culture) to reduce the volume of single occupancy vehicles on campus. Tie to the health and wellness initiative.

C. Business travel (air and ground): Develop a way to quantify air miles traveled and then develop protocols and policies that will reduce miles travelled for Tufts business.

D. Enforce existing anti-idling laws.
This is an important stage in the Council’s work.

During February and March 2013, the Council is soliciting your comments, suggestions and questions before the goals and strategies are finalized.

Your participation as a member of the community is extremely important. Once the strategic goals and objectives are in place, the next step will be putting together implementation plans and solidifying ways to measure progress and success.

Whatever comes of this stage will drive the future of sustainability at Tufts. This is your chance to voice your opinions, thoughts and concerns.

How to give feedback

There are several ways to make your voice heard.

- **Online:** There is a feedback form accessible from on the [Campus Sustainability Council webpage](http://go.tufts.edu/CampusSustainabilityCouncil).

- **Email:** sustainabilityoffice@tufts.edu

- **Postal mail:** Sustainability Council Report c/o Office of Sustainability, Miller Hall, 210 Packard Ave. Medford, MA 02155

- **In Person:** The Tufts Office of Sustainability will host open forums in the following month. Please visit [http://Sustainability.Tufts.Edu](http://Sustainability.Tufts.Edu) or follow the Tufts Office of Sustainability on [Twitter](http://twitter.com) and [Facebook](http://facebook.com) to receive updates.

Deadlines

Please submit feedback by **March 22, Friday**.

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*I invite you to bring your passion and ideas to the Council’s work*

— *Tony Monaco*
Appendix A: Council Membership

Chair
Anthony Monaco
Tufts University President

Co-Chair
Patricia Campbell
Executive Vice President

Linda Snyder
Vice President for Operations

Peter Brodeur
Associate Professor
Pathology Department
School of Medicine

Bob Burns
Director, Facilities Services

Dan Doherty
Trustee, Chair, Buildings & Grounds
Subcommittee

Kelly Sims Gallagher
Associate Professor
Director, Energy, Climate, and Innovation (ECI) research program in the Center for International Environment and Resource Policy (CIERP), The Fletcher School

Timothy Griffin
Associate Professor
Program Director, Agriculture, Food and Environment
Friedman School of Nutrition Science and Policy

Marc Hodes
Associate Professor
Mechanical Engineering
School of Engineering

Betsy Isenstein
Director of Facilities Technical Services

Stephanie Krantz
Undergraduate Student
Co-president, Tufts Sustainability Collective
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Appendix B: Schedule of Meetings

President’s Sustainability Council

- January 30, 2012 – 9:00 AM – 520 Boston Avenue
- March 30, 2012 – 3:30 PM – Mugar 235
- September 14, 2012 – 9:00 AM – Cabot 7th Floor Conference Room
- December 11, 2012 – 1:00 PM – Coolidge Room
- January 28, 2013 – 3:00 PM - Coolidge Room

Energy/Emissions Working Group

- March 15, 2012
- March 29, 2012
- April 19, 2012
- May 1, 2012 (Retreat)
- July 10, 2012
- July 27, 2012
- August 21, 2012
- September 10, 2012
- October 9, 2012
- October 18, 2012
- October 26, 2012
- November 20, 2012
- November 30, 2012
- January 25, 2013

Waste Working Group

- March 12, 2012
- March 23, 2012
- April 6, 2012
- April 20, 2012
- May 4, 2012
- May 18, 2012
- July 9, 2012
- July 16, 2012 (Retreat)
- September 25, 2012
- October 11, 2012
- October 23, 2012
- November 8, 2012
- November 20, 2012
- December 6, 2012
- December 20, 2012

Water Working Group

- March 2, 2012
- March 16, 2012
- March 30, 2012
- April 13, 2012
- April 27, 2012
- May 11, 2012
- July 18, 2012 (Retreat)
- October 19, 2012
- November 9, 2012
- December 7, 2012
Appendix C: Waste Graphs

Figure 5: Boston campus solid waste data
Figure 6: Grafton campus solid waste data
Figure 7: Medford/Somerville solid waste data
Appendix D: Energy and Emissions Graphs

The following charts show the amount of heating fuels burned to heat buildings on the Medford/Somerville campus from 1998 on, with 1990 included as a reference point. Since all the fuels have different units of measurement (gallons, therms, etc.) they were all converted to British Thermal Units (BTUs), a measure of the energy content of the fuel9.

In February of 2011, Tufts stopped burning #6 fuel, a heavy, "leftover" product of crude oil after the more valuable hydrocarbons have been removed, and contains many impurities. The Tilton Heating Plant was switched to natural gas and remains on gas to this day. The Central Heating Plant was converted to #2 fuel while preparations were made to convert to natural gas. #2 fuel is also known as home heating oil and is similar to diesel fuel. It is a cleaner burning fuel than #6 fuel.

The Central Plant boilers first fired on natural gas on November 30, 2011. #2 fuel will be the back-up fuel for both plants. Both #2 fuel and natural gas have lower emissions coefficients than #6 fuel and so the conversion will reduce Tufts emissions profile due to heating fuel.

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9 A British Thermal Unit (BTU) is the amount of heat energy needed to raise the temperature of one pound of water by one degree F. This is the standard measurement used to state the amount of energy that a fuel has as well as the amount of output of any heat generating device.
Figure 8: Medford Somerville campus heating fuel use and greenhouse gas emissions
Grafton campus #2 fuel usage has reduced over time as gas infrastructure was built out and boilers were converted or replaced (Figure 8). The most significant conversion took place in the spring of 2008 when the boiler plant serving the Hospital for Large Animals and the Foster Hospital for Small Animals was converted to natural gas with #2 fuel as a back-up.

Figure 9: Grafton campus heating fuels and greenhouse gas emissions
As Tufts grows, so does the amount of space it uses (Figure 9). Tufts’ building footprint has expanded and changed over time and is expected to expand into the future, making energy, waste and water reductions especially challenging.

Figure 10: Tufts University Maintained Square Footage
Figure 10 shows the difference in energy intensity (BTU per gross square foot) of buildings on the different campuses. As complex and energy intensive facilities have been added on the Boston and Grafton campuses, energy consumption has climbed. New facilities in Medford have been less technically complex and more resources have been devoted to energy efficiency projects, and thus you see the decline in energy intensity over time.

New building designs incorporated energy efficiency to varying degrees, so resulting consumption would have been higher without deploying these strategies. Energy performance in Tufts facilities is extremely weather dependent; note the impact of the very warm winter of 2012.

Figure 11: Energy use intensity by campus
The students in EM51 (Engineering Management 51) were assigned a project to “green” Tufts. The EM51 Energy Tracking Team researched an affordable tracking system that uses already-existing utility metering. The team worked with Facilities Services to set up the system on a trial basis. While this is only appropriate for utility metered properties, it provides easy comparison between buildings and clear targets of opportunity.

Figure 12: Energy use in CO$_2$ per square foot per day – sample of utility metered properties
Appendix E: Project Process and Tools Timeline

The Energy & Emissions Working Group discussed many aspects of the design, construction and operations process that could be improved by institutionalizing new protocols and new tools. Those tools and processes are captured in the Project Management Toolkit, outlined below. The aim of this Toolkit is to embed life cycle costing and clear goal setting in the process and link design and construction more intentionally to operations and maintenance. The group felt strongly that the consistent implementation of these items across all projects would serve to save money and ultimately improve the performance of the facilities and safeguard occupant health and satisfaction. Additionally, the creation of a Lessons Learned process will ensure that design teams, staff, faculty and building occupants have a chance to reflect and learn, which will inform future projects.

1. The Project Charter is an existing tool used by Tufts and can be enhanced by including items relating to operations and maintenance (O&M) in order to better inform budgetary and planning considerations. Facilities staff should be engaged at this point to give feedback and make sure all planning and coordination is being optimized, including the use of swing space. The Project Charter is created at the inception of the project, and is used internally by Tufts to get everyone on the same page about project needs.

2. OPR (Owners Project Requirements) The OPR is a new tool for Tufts. It is used to set project performance targets, understand occupancy patterns, refer to specific 3rd party standards and other aspects of the project that should influence design decisions. The OPR may be integrated into the Project Charter, or be a stand-alone document. The creation of the OPR happens prior to the issuance of an RFQ or RFP.

3. RFQ and RFP: (Request For Qualifications or Proposals) Tufts needs to create a standard set of documents that articulates Tufts priorities and expectations related to project process and outcomes. Different documents need to be created for different types of services (Architectural, Commissioning, etc). Tufts can build from the best example that exists currently and ensure that the same model is used consistently.

4. Design team selection process: There are alternative design team selection processes that provide both the owner and teams with a more valuable interaction and highlight the "fit" of the working relationship in addition to the skills and capabilities of the team. These processes are similar to "micro-charrettes" where the team spends an hour or so with the owner in a "working session" (details provided separately). For larger, more complex projects, Tufts may choose to implement this process.

5. Project Goal Setting and Project Management (PM) Checklist: The Project Goal Setting document contains the specific parameters to consider on every project in great detail and would help ensure quality control across all projects. The PM checklist provides guidance to ensure each project manager is asking the right questions at the right time and adhering to best practices protocols. This includes Utility rebate program participation and commitment to 3rd party performance guidelines, such as LEED™.

6. Integrative Design Process (IDP and PM): The standard design and construction process does not support highly integrated building systems, collaboration or success in high performance projects. Tufts will adopt standard protocols and a methodology for project management that is based on IDP (defined and outlined in the ANSI standard for IDP) and optimizes critical-path decision making to achieve optimum performance. This process methodology utilizes new tools to
help manage quality control across projects, such as life cycle costing templates and the Project Roadmap, below.

7. **Project Roadmap**: Early in the design process of a project, the team will work together to create a process roadmap that articulates specific metrics for performance and outlines major points of analysis and critical-path decision making. This serves to clarify who is responsible for what action and how they will collaborate to achieve success. This ensures that life cycle cost assessments and analysis verification happen in a timely manner with appropriate input. The roadmap also includes targets and deliverables related to simulations and analysis as well as LEED requirements, where applicable. This roadmap can be embedded in the master project schedule or can be a standalone document. The roadmap aligns with the Owners Project Requirements. Decisions such as whether or not to use BIM or Integrated Project Delivery (IPD, a multi-prime contract for design and construction services) are made by this stage.

8. **Building Systems Commissioning (Cx)**: Building Systems Commissioning checklist to ensure consistent quality and implementation of protocols by all Tufts facilities staff and outside vendors.

9. **POE Post occupancy evaluation (POE)**: Tufts will develop a checklist of items to evaluate in the post occupancy phase, and directions for engaging all appropriate stakeholders in the process. POE should happen one year post occupancy and happen in conjunction with Lessons Learned debrief.

10. **Lessons Learned checklist to guide discussion and track**: Lessons Learned includes both a checklist of items to review as well as data from the POE. The review includes cost, systems performance, occupant satisfaction and other factors. Tracking of products used and system performance can be captured in a database, which is maintained to inform future decisions. An internal "Angie's List" is proposed to track satisfaction of outside contractors and vendors so project managers can refer to it on future projects.

11. **Building Curator and Annual Reporting**: The building curator is proposed to be the point of connection to gather and disseminate comprehensive consumption patterns and occupancy behavior. This includes data related to energy use, emissions, water use and management, waste (including purchasing) and building occupant behavior using lighting and equipment etc., (existing tools such as Maximo and others provide data tracking). The building curator is the keeper of the building profile, knowing the history and eccentricities of a particular building so that when a change is proposed, he or she can provide any information that might influence planning decisions. After the Lessons Learned milestone, ongoing reporting and evaluation happens through the Sustainability Report and with the assistance of the Curator.

12. **Preventative maintenance plan** (developed w/ schools) Facilities staff will work with each school to develop a preventative maintenance plan and will institute standard protocols for basic equipment upgrades.
Appendix F. Tufts Commitments and Environmental Policies

Greenhouse Gas Emissions Goals

1. In 1999, Tufts University president John DiBiaggio committed Tufts to reducing its greenhouse gas emissions consistent with the goals of the Kyoto Protocol (7% below 1990 levels by 2012).

2. In 2003, Tufts President Lawrence Bacow renewed the University’s dedication to climate protection by adopting the goals of the New England Governors and Eastern Canadian Premiers (CCAP). The CCAP calls for a return to 1990 greenhouse gas levels by 2010, and a further reduction of 10% vs. 1990 levels by 2020. The region has also set a reduction target of 75-85% below 2001 levels by 2050. These goals represent a more significant decrease in emissions than called for in the Kyoto Protocols.

Environmental Policies

In 1990 Tufts President Jean Mayer presided over the creation of the Tufts Environmental Policy and the Talloires Declaration.

President Mayer convened a group of university presidents from around the world at Tufts campus in Talloires France, where they created and signed the Talloires Declaration, a 10-point action plan for incorporating sustainability and environmental literacy in teaching, research, operations and outreach at colleges and universities. The declaration has since been signed by 433 institutions in over 40 countries.
The Talloires Declaration

We, the presidents, rectors, and vice chancellors of universities from all regions of the world are deeply concerned about the unprecedented scale and speed of environmental pollution and degradation, and the depletion of natural resources.

Local, regional, and global air and water pollution; accumulation and distribution of toxic wastes; destruction and depletion of forests, soil, and water; depletion of the ozone layer and emission of "green house" gases threaten the survival of humans and thousands of other living species, the integrity of the earth and its biodiversity, the security of nations, and the heritage of future generations. These environmental changes are caused by inequitable and unsustainable production and consumption patterns that aggravate poverty in many regions of the world.

We believe that urgent actions are needed to address these fundamental problems and reverse the trends. Stabilization of human population, adoption of environmentally sound industrial and agricultural technologies, reforestation, and ecological restoration are crucial elements in creating an equitable and sustainable future for all humankind in harmony with nature.

Universities have a major role in the education, research, policy formation, and information exchange necessary to make these goals possible. Thus, university leaders must initiate and support mobilization of internal and external resources so that their institutions respond to this urgent challenge.

We, therefore, agree to take the following actions:

1. Increase Awareness of Environmentally Sustainable Development
Use every opportunity to raise public, government, industry, foundation, and university awareness by openly addressing the urgent need to move toward an environmentally sustainable future.

2. Create an Institutional Culture of Sustainability
Encourage all universities to engage in education, research, policy formation, and information exchange on population, environment, and development to move toward global sustainability.

3. Educate for Environmentally Responsible Citizenship
Establish programs to produce expertise in environmental management, sustainable economic development, population, and related fields to ensure that all university graduates are environmentally literate and have the awareness and understanding to be ecologically responsible citizens.

4. Foster Environmental Literacy For All
Create programs to develop the capability of university faculty to teach environmental literacy to all undergraduate, graduate, and professional students.

5. Practice Institutional Ecology
Set an example of environmental responsibility by establishing institutional ecology policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations.
6. Involve All Stakeholders
Encourage involvement of government, foundations, and industry in supporting interdisciplinary research, education, policy formation, and information exchange in environmentally sustainable development. Expand work with community and nongovernmental organizations to assist in finding solutions to environmental problems.

7. Collaborate for Interdisciplinary Approaches
Convene university faculty and administrators with environmental practitioners to develop interdisciplinary approaches to curricula, research initiatives, operations, and outreach activities that support an environmentally sustainable future.

8. Enhance Capacity of Primary and Secondary Schools
Establish partnerships with primary and secondary schools to help develop the capacity for interdisciplinary teaching about population, environment, and sustainable development.

9. Broaden Service and Outreach Nationally and Internationally
Work with national and international organizations to promote a worldwide university effort toward a sustainable future.

10. Maintain the Movement
Establish a Secretariat and a steering committee to continue this momentum, and to inform and support each other’s efforts in carrying out this declaration.

Creators and Original Signatories

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Tufts Environmental Policy

We, the Tufts University community, affirm our belief that university faculty, staff and students have a responsibility to take a leadership role in conducting activities as responsible stewards of the physical environment and using educational activities to promote environmental awareness, local action and global thinking.

In our university functions, Tufts University will strive to:

- conserve natural resources and support their sustainable use
- conduct affairs in a manner that safeguards the environmental health and safety of students, faculty, staff and communities
- reduce the use of toxic substances and the generation of wastes and to promote strategies to reuse and recycle those wastes that cannot be avoided
- purchase renewable, reusable, recyclable and recycled materials
- conduct our business practices in accordance with this policy.

In our education and research missions, Tufts University will strive to:

- foster an understanding of and a responsibility for the physical environment
- ensure that individuals are knowledgeable about the environmental and health issues that affect their discipline
- encourage environmental research
- conduct research and teaching in an environmentally responsible way
- provide a forum for the open flow of information among governments, international organizations, industry, and academia to discuss and study environmental issues and their relationship to other social issues.

In our student and employee relations, Tufts University will strive to:

- delineate individual responsibility
- guide action for ensuring safety and minimizing adverse environmental impacts in the implementation of this policy.

Tufts will consider full compliance with the law to be the minimally acceptable standard and will exercise whatever control is reasonable and necessary to avoid harm to public health and the environment, whether or not such control is required by regulations.

Tufts will initiate, promote and conduct programs that fully implement this policy throughout the university and the global community.
Appendix G: Fostering a Sustainable Culture

Every day marketers use research to determine their customer’s values and preferences, needs and concerns. They select target audiences and study the perceived barriers and benefits of buying their product. They establish clear objectives and goals and choose the best price, place and locations to sell their product. They identify language that is oriented towards their customer. And finally, they monitor and evaluate the effectiveness of their efforts and adjust as needed.

Social marketers draw upon these well-researched methods to “create, communicate and deliver benefits that a target audience(s) wants in exchange for audience behavior that benefits society without financial profit to the marketer” (Kotler & Lee, 2008). It is used extensively in public health and injury prevention (e.g. anti-smoking campaigns).

Community Based Social Marketing (CBSM) adds additional, community-based tools to the social marketing process as well as the concept of pilot-testing. It has proven to be an even more effective way to create change that is beneficial to society at large, and works particularly well for environmental changes. Many examples of successful applications of this process exist (see (Kotler & Lee, 2008), (McKenzie-Mohr, Lee, Schultz, & Kotler, 2011) and (Weinreich, 2011)). CBSM developed out of the recognition that wide-spread education campaigns, the method of choice for many environmentalists, usually do not lead to wide-spread behavior change. While awareness and knowledge of the issues at hand may increase, this does not translate into an actual change in behavior in the targeted group.

CBSM can be used for a wide variety of behavior change – from recycling to choosing energy efficient products. The key point is that it is a community-focused, deliberate, strategic process that selects specific, targeted behaviors, identifies the relevant audience(s), examines barriers and potential benefits of the desired behavior, creates a comprehensive plan, and evaluates the effectiveness of the efforts.

The need for a cultural shift towards more sustainable actions came up in every Sustainability Council Working Group – along with the recognition that just telling someone to shut off the lights or take a shorter shower isn’t enough. Most people at Tufts care about the environment and do not wish to do harm, but are stymied by existing systems and mindsets that support the status quo. Without addressing the underlying barriers to action there will be little progress in creating the systemic change necessary to meet our goals. CBSM provides a robust process through which to do this.

There are 5 steps to CBSM (McKenzie-Mohr, Lee, Schultz, & Kotler, 2011):

1. Select which behavior to target
2. Identify the barriers and benefits to the selected behavior (from the audience’s perspective)

A Science-Driven Process

"CBSM is based upon research in the social sciences that demonstrates that behavior change is often more effectively achieved through initiatives delivered at the community level that focus on removing barriers to an activity while simultaneously enhancing the activity's benefits."

(McKenzie-Mohr, Lee, Schultz, & Kotler, 2011)
3. Develop a strategy that reduces barriers to the behavior to be promoted, while simultaneously increasing the behavior’s perceived benefits
4. Pilot the strategy
5. Evaluate broadscale implementation and ongoing evaluation once the strategy has been broadly implemented

Each step consists of many pieces. For example, in order to select the behaviors to target you must know your goals, objectives and target audiences. The Working Groups decided upon the following goals related to education and behavior change:

1. Within 5 years, all of the Tufts Community will know what they can do to reduce energy consumption as a building occupant and will use that knowledge to modify their habits to be less energy intensive.
2. Within 5 years, all of the Tufts community will know how to divert and reduce waste. Specifically, they will know:
   a. What, how, and where to divert waste
   b. What to reduce and how
3. Active participation in waste diversion will increase by 50%
4. Within five years, all of Tufts community understands how their actions impact water usage and quality, why it’s important and how they can act to reduce use and mitigate negative impacts on their watershed.

Some identified audiences are:

1. Lab users
2. Clinic staff, faculty and students
3. Principal Investigators (PIs)
4. General building occupants
5. Students
6. Faculty
7. Staff
8. Residential students
9. Gym users
10. Dining staff
11. Graduate students
12. Off-campus students
13. Animal care workers
14. Service contractors (e.g. construction, HVAC, landscaping)
15. Custodians

Specific behaviors have to be non-divisible and end-state. It is important to avoid focusing on strategies, like ‘getting an energy audit’ when your goal is actually ‘insulate your attic’.

Below are examples of some of the behaviors identified by the working groups:

**Water**

1. Reduce water use
   a. Take shorter showers
b. Turn off faucet while brushing teeth  
c. Only wash full loads of laundry
2. Dispose of excess medications properly (e.g. by mixing them with coffee grounds and putting in the trash instead of flushing them down the toilet)

**Waste**

1. Place all recyclable office items in the correct recycling bin
2. Notify the Waste Reduction Program Manager when disposing of potentially recyclable or reusable materials.
3. Purchase recycled content products
4. Place compostables in residence hall/public/dining compost bin
5. Break down and recycle cardboard during residence hall move-in
6. Purchase EPEAT certified computers
7. Use surplus furniture

**Energy**

1. Shut fume hood sash (on non-automated fume hoods)
2. Share equipment - especially equipment that runs continuously
3. Turn off equipment when not in use
4. Close your windows when air is conditioned (i.e. the heat or A/C is on)
5. Use power strips
6. Turn off lights in unoccupied areas
7. Report inefficiencies
8. Use video conferencing

Some or all the behaviors identified by the Working Groups may be addressed depending on which have the highest impact, lowest current participation rate and highest probability of adoption. These are still under evaluation.

**Works Cited**
## Appendix H: Sustainable Goal Comparison

<table>
<thead>
<tr>
<th>Energy</th>
<th>Topic</th>
<th>Metrics (Target for Future Years)</th>
<th>Specific Initiatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown</td>
<td>GHG reduction commitment</td>
<td>- Reduce greenhouse gas emissions by 80% below 1990 levels by 2050. As an interim commitment Brown University should reduce its emissions by 10% to 15% below 1990 levels by 2020 (45% to 48% below FY 2007 levels).&lt;br&gt;- Allocate funds and implement a policy to achieve carbon neutrality by FY2008 to be maintained at least through 2020.</td>
<td>In the past four years, Brown University has reduced its energy-related carbon footprint by 26.1 percent (exceeded original goal of 16 percent reduction) below 2007 levels. The University achieved reduction targets by switching from carbon intensive Number 6 fuel oil to natural gas at its Central Heat Plant; switching to a new, less carbon intensive electricity supplier; and a continued focus on energy efficiency investments initiated in fiscal year 2008 to help meet future fiscal year reduction targets.</td>
</tr>
<tr>
<td></td>
<td>Energy</td>
<td>- Maintain leadership position in addressing climate change&lt;br&gt;- For Existing Buildings: Reduce greenhouse gas emissions to 42 percent below 2007 levels (equivalent to 15 percent below 1990 levels).&lt;br&gt;- 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. Achieve at minimum LEED Silver.</td>
<td></td>
</tr>
<tr>
<td>Columbia</td>
<td>GHG reduction commitment</td>
<td>Reduce emissions 30% at the Morningside campus below 2007 levels by 2017</td>
<td>Replacing old and inefficient equipment, implementing energy standards for labs, installing geothermal and microturbine energy systems as well as installing LED lighting and energy-efficient central systems.</td>
</tr>
<tr>
<td></td>
<td>Energy</td>
<td>- Require new buildings to meet a LEED Silver standard&lt;br&gt;- New appliances purchased for residence halls are Energy Star-rated, as are computers throughout the central administration</td>
<td></td>
</tr>
<tr>
<td>College</td>
<td>Energy</td>
<td>Metrics (Target for Future Years)</td>
<td>Specific Initiatives</td>
</tr>
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</tbody>
</table>
| Cornell | GHG reduction commitment | Achieve carbon neutrality by 2050 | • Green Development and reducing energy growth through campus planning, space efficiency, and efficient construction.  
• Energy Conservation and using less energy by retrofitting buildings, using energy management tools, and energy education.  
• Transportation Alternatives and using less energy to support transportation needs  
• Fuel Mix and Renewables and replacing fossil fuels with clean and renewable energy  
• Off-setting Actions and reducing carbon emissions beyond campus boundaries |
| Dartmouth | Energy | Reduce emissions below current levels according to the following timeline: 20% reduction by 2015; 25% reduction by 2020; 30% reduction by 2030  
- Incorporate investments in plant, technology, alternative fuel sources, and infrastructure in order to achieve the energy and GHG emissions reduction.  
- Engage the entire community in the effort to reduce energy and GHG reductions  
- Report annually on progress. The Task Force will develop metrics to track the College’s progress on energy and GHG emissions reductions. | The program should include a plan to make significant changes to daily operations and practices of the College community. All opportunities to reduce energy and GHG emissions should be explored and adopted if feasible.  
Dartmouth should initiate a program to engage its students, faculty, and staff in the College’s effort to reduce energy use and GHG emissions. Dartmouth should seek input and suggestions from all corners of campus, and incentives should be developed to reward community members for their suggestions. A revolving loan fund should be established to implement suggestions. |
<p>| Duke | GHG reduction commitment | As Duke works towards a goal of 2024 for climate neutrality and significant on-campus GHG reductions, efforts will also be focused on interim GHG reduction milestones. These include the following reduction percentages every five years starting in 2010 calculated from a 2007 baseline: 2010 – 10%; 2015 – 21%; 2020 – 45%; 2025 – 45%; 2030 – 70%; 2035 – 74%; 2040 – 79%; 2045 – 83%; 2050 – 88% | |</p>
<table>
<thead>
<tr>
<th>Energy</th>
<th>Topic</th>
<th>Metrics (Target for Future Years)</th>
<th>Specific Initiatives</th>
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</table>
|        | Energy | All new construction and major renovations will achieve Leadership in Energy and Environmental Design (LEED) Certification standards, with a goal of LEED Silver | • Shifting on-campus fuel mix from coal to natural gas, bio-mass, and biogas  
• Tracking Duke Energy's progress toward climate neutrality  
• Expanding energy conservation and green building efforts  
• Pursuing significant on-site renewable energy projects |
|        | Energy | The University has an Energy Star Policy, which states that the University will purchase ENERGY STAR certified products when available: | |
| Furman | GHG reduction commitment | Achieve carbon neutrality by 2026. | • Complete and annual GHG emissions inventory  
• Set a target date and interim milestones for becoming climate neutral (i.e., prepare a Climate Action Plan (CAP))  
• Take immediate steps to reduce GHG emissions  
• Integrate sustainability into our curriculum and co-curriculum  
• Make publicly available the action plan, annual GHG inventory and progress reports |
| Furman | GHG reduction commitment | Enhance Sustainability services opportunities and create local carbon offset projects and programs | • Promote “sustainable service” as a form of community outreach  
• Collaborate with greater Greenville-area community organizations on service programs and offset options |
| Furman | Energy | Further improve the energy efficiency of buildings, operations, and information technology | a. Expand energy and water efficiency improvements  
 b. Make operational and maintenance practices more sustainable |
| Furman | Energy | Invest in large scale renewable energy projects | a. Identify, when financially feasible, the most appropriate large-scale renewable energy projects to reduce the utilities budget and campus carbon footprint  
 b. Continue working with the Duke Endowment and the colleges it supports to examine renewable energy options (ongoing)  
 c. Pursue emerging state and federal level funding/ incentives to assist with renewable energy efforts (ongoing)  
 d. Collaborate with Duke Energy to encourage a reduction in the GHG emissions produced by their coal-fired power plants. |
<p>| Georgetown | GHG reduction commitment | Reduce Scope 1 and 2 GHG emissions by 50% per square foot by the year 2020, from an FY06 baseline. | |</p>
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<tbody>
<tr>
<td>Harvard</td>
<td>Energy</td>
<td>Continue to reduce emissions toward achievement of 2020 GHG reduction goals (see below).</td>
<td>• Sponsored 3rd annual competition to reduce energy consumption by students in residence halls. • Variable Frequency Drives (VFDs) installed in 35% of buildings.</td>
</tr>
<tr>
<td>Johns Hopkins</td>
<td>GHG reduction commitment</td>
<td>Reduce GHG emissions 30% below 2006 baseline by 2016 including growth Improve green building standards</td>
<td>• Use Integrated design on all projects. • Use Life-cycle costing and value engineering on all projects. • Use energy modeling/GHG calculations on all projects. • Use metering and sub-metering on all projects. • New projects and major renovations are required to achieve LEED Gold certification at a minimum.</td>
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<tr>
<td>Middlebury</td>
<td>GHG reduction commitment</td>
<td>Decrease university-wide greenhouse gas emissions by 3.5%, keeping the university on track for the 2025 target.</td>
<td>• Advance test installations of LED lighting technologies to gauge their long-term effectiveness. • Complete the co-generation project on the Homewood campus. • Advance the larger co-generation project (15 megawatts) on the East Baltimore Campus • Investigate the potential for geothermal and tri-generation at various locations. • Install the university’s first large-scale on-site renewable energy system.</td>
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<tr>
<td>Middlebury</td>
<td>GHG reduction commitment</td>
<td>Achieve carbon neutrality by 2016</td>
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<td>Energy</td>
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<tr>
<td>Nyu</td>
<td>GHG reduction commitment</td>
<td>Reduce GHG emissions per square foot by 30 percent from FY 2006 levels by FY 2017. Nyu pledges to achieve climate neutrality or net-zero emissions by FY2040. Reduce energy intensity (50 percent of its climate neutrality goal). Generate and use cleaner energy (30 percent of its goal). Generate renewable energy (10 percent of its goal). Reduce or offset remaining emissions (10 percent of its goal).</td>
<td>Relamping with energy-efficient bulbs and ballasts to save energy used in lighting in over 40 buildings. Installation of 4,000 occupancy sensor air conditioning and heating controls in student residences. Installation of 4,500 occupancy sensor lighting controls in offices, meeting rooms, and classrooms. Setting special HVAC, lighting, and elevator schedules during winter, spring, summer, Thanksgiving Recess. &quot;Lights Off&quot; campaign to turn off unused lighting and other loads, especially before weekends or breaks. Verifying schedules and correct operation of Building Management Systems. Recommissioning, or bringing building systems back into proper functioning for reliability and energy savings.</td>
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<tr>
<td>Oberlin</td>
<td>GHG reduction commitment</td>
<td>Achieve carbon neutrality by 2025. All new construction and major renovations on campus have to be designed and built to achieve LEED Silver Certification. Seek to reduce the rate at which the College contributes to the depletion and degradation of natural resources, to increase the use of renewable resources, and to consider other measures that can enhance the physical environment in which we live. To the extent practicable, develop and implement state-of-the-art standards for building design, construction, and performance, and for land use, consistent with the above goals of energy efficiency and prudent resource use. Work toward environmentally sound as well as aesthetically pleasing means of maintaining the physical plant, the landscape, and their surroundings. Enhance and develop further opportunities for students and faculty to participate in the continuing &quot;greening&quot; of the campus and the wider community through</td>
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<td>Energy</td>
<td>promoting course work in various curricular areas, independent research projects, and community service.</td>
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<td>UC System</td>
<td>Reduce greenhouse gas emissions to 1990 levels by 2020</td>
<td>• Eliminate the growth in energy use in existing buildings through education and management;</td>
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<td>-Achieve carbon neutrality by 2042.</td>
<td>• Improve the efficiency of existing buildings’ utility systems, and adopt conservation measures such as building re-commissioning, metering, and incentives for better energy performance; and</td>
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<td>-Reduce energy usage by 5 percent from the 2007 baseline in fiscal year 2010, and a 17 percent decrease from the 2007 baseline by 2014.</td>
<td>• Continue purchase of renewable energy credits (RECs).</td>
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<td>Upenn</td>
<td>Reduce greenhouse gas emissions to 1990 greenhouse gas emissions level by 2020 without purchasing carbon offsets.</td>
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<td>-Reduce greenhouse gas emissions and build more sustainably by achieving standards equivalent to or exceeding LEED Silver for all new construction and major renovations of existing buildings, and pursuing LEED Gold or Platinum when appropriate.</td>
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<td>-Reduce greenhouse gas emissions by decreasing solo-occupant automobiles coming to campus by 10% by the year 2012.</td>
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<td>- All new building construction will be, and comprehensive renovation projects will generally be, designed to LEED standards of at least Gold rating or above.</td>
<td>- All Yale Project Managers and Planners will be required to be certified as a LEED Green Associate. Yale will support the training process and continuing education required to maintain this accreditation by June 2013. - The University Planner will publish a supplement to the Yale Framework for Campus Planning entitled “A Sustainability Supplement: A Guideline for Campus Planning &amp; the Built Environment” by June 30, 2013. - Based on the 2005 building gross square footage benchmark, reduce energy consumption 15% by 2013; this represents a 4% reduction from FY2009. - Increase the supply of energy from on-campus and off-campus renewable sources, with a target of obtaining 25% of our energy from such sources by 2020; the implementation of on-campus renewable energy projects would result in an annual reduction of 10,000 metric tons of CO2e emitted. - Reduce workstation electricity consumption by 40% by June 2013. Make progress toward the University goal of reducing GHG emissions to 10% below 1990 levels by 2020, a 43% reduction from 2005 levels.</td>
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<td>Waste</td>
<td>- 45% of solid waste recycled on Main, Medical and East Campuses.</td>
<td>- Increased recycling facilities in residential and administrative buildings, including distribution of deske side recycling bins to all faculty and staff offices and adding recycling stations on each floor in residence halls.</td>
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<td>Georgetown</td>
<td>- Less than 15% of all waste is deposited in a landfill; what is not recycled or composted is sent to a local Waste to Energy facility.</td>
<td>- Distributed 20 &quot;Big Belly&quot; brand solar-compacting recycling stations on campus grounds.</td>
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<td>Approximately 275 tons of pre- and post-consumer food waste (99.9% of food waste at student dining hall) sent to a compost facility.</td>
<td>Compost all pre- and post-consumer food waste at Leo’s Dining Hall (since 2008).</td>
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<td>Reduce total solid waste by 3% per year for the next 5-10 years and to achieve 50% diversion rate by 2015 (currently at 40%).</td>
<td>All organic landscape and yard waste is composted.</td>
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<td>Dartmouth</td>
<td>Recycling</td>
<td>• Continue aggressive outreach efforts to ensure that paper consumption levels do not exceed FY2010 levels.</td>
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<td>• Engage administrators at departmental level to encourage using recycled content paper, and increase recycled content paper to 90% of total paper consumed.</td>
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<td>• Establish a Green Office program to recognize offices that demonstrate exemplary performance</td>
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<td>• Increase the university-wide annual waste diversion rate to 35%, matching the potential demonstrated during the Recyclemania contest period.</td>
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<td>• Expand the composting program to accept materials from both dining facilities and office buildings.</td>
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<td>• Establish recycling programs in labs and research settings.</td>
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<td>• Increase the visibility of recycling at sporting events.</td>
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<td>• Pilot a series of “zero-waste” events on campuses.</td>
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<td>Johns Hopkins</td>
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<tr>
<td>NYU</td>
<td>Recycling</td>
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<td></td>
<td>Continue to increase recycling</td>
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<tr>
<td>UC System</td>
<td>Waste</td>
<td>Achieve zero waste</td>
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<td><strong>Upenn</strong></td>
<td><strong>Recycling</strong></td>
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<td>Double Penn’s diversion rate of paper, cardboard, commingled recyclables to 40 percent by 2014, and reduce Penn’s overall waste stream through improved purchasing practices, and by providing education to the Penn community.</td>
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<td>Lower landfill impact by reducing solid waste by 20% on the Medical Campus and 35% on the Danforth Campus by 2012.</td>
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<td><strong>Washington</strong></td>
<td><strong>Waste</strong></td>
<td>Increase Yale’s recycling rate by 25% by June 30, 2013</td>
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<tr>
<td></td>
<td><strong>Recycling</strong></td>
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<td><strong>Yale</strong></td>
<td><strong>Waste</strong></td>
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<td></td>
<td>Decrease Yale’s solid municipal waste by 25% by June 30, 2013</td>
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<td>Increase by 20% the amount of bulky waste diverted from the municipal solid waste stream for subsequent reuse by June 30, 2013</td>
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<td>By June 2012, implement a plan to reduce laboratory-related waste and energy use, and to promote the use of safer research materials.</td>
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<td><strong>Water</strong></td>
<td><strong>Johns Hopkins Water Use</strong></td>
<td>Install additional rainwater collection systems to displace the use of potable water with rain water.</td>
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<td>Decrease university-wide potable water consumption by 3%</td>
<td>Continue conversion of bathroom fixtures with lowflow efficient fixtures.</td>
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<td></td>
<td>• Install additional rainwater collection systems to displace the use of potable water with rain water.</td>
<td>Find additional opportunities for reducing irrigation needs</td>
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<td></td>
<td>• Continue conversion of bathroom fixtures with lowflow efficient fixtures.</td>
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<td>• Find additional opportunities for reducing irrigation needs</td>
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<td>Develop a University-wide storm-water discharge reduction goal and strategy by 2013.</td>
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**Boston College, Northwestern, and Warren Wilson not currently publishing specific goals**
Appendix I. Greenhouse Gases Overview

Gases that trap heat in the atmosphere are called greenhouse gases (GHG). (For more information on the science of climate change and other climate forcers, such as black carbon, please visit the Climate Change Science Home Page.) The main types of GHG are:

- **Carbon dioxide (CO$_2$)**: Carbon dioxide enters the atmosphere through burning fossil fuels (coal, natural gas and oil), solid waste, trees and wood products, and also as a result of certain chemical reactions (e.g., manufacture of cement). Carbon dioxide is removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of the biological carbon cycle.

- **Methane (CH$_4$)**: Methane is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices and by the decay of organic waste in municipal solid waste landfills.

- **Nitrous oxide (N$_2$O)**: Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste.

- **Fluorinated gases**: Hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride are synthetic, powerful greenhouse gases that are emitted from a variety of industrial processes. Fluorinated gases are sometimes used as substitutes for stratospheric ozone-depleting substances (e.g., chlorofluorocarbons, hydrochlorofluorocarbons, and halons). These gases are typically emitted in smaller quantities, but because they are potent greenhouse gases, they are sometimes referred to as High Global Warming Potential gases (“High GWP gases”).


Source: http://www.epa.gov/climatechange/ghgemissions/gases.html