LEARN IT. LIVE IT.

EDUCATE & EMPOWER
our students while on campus to become leaders who will use their knowledge to create sustainable impact in service to the world.

TRANSLATE
research and teaching into practice, and use our campus to pilot innovative solutions to real-world challenges.

AMPLIFY
impact by sharing replicable models that can be implemented inside and outside Harvard.

INSTITUTIONALIZE
best practices in sustainable operations.
HARVARD UNIVERSITY SUSTAINABILITY PLAN

- Owner’s Project Requirements
- Campus-wide water audits
- Waste bin standards development
- Green Lab Competition
- Freecycle events for labs and office
- Chemical Amnesty Day

- Bike Fair and Safety Summit
- Flame-retardant-free furniture
- Healthy and Sustainable Food Standards
- Take the Stairs Campaign

EMISSIONS AND ENERGY

- HMS Strategic Energy Plan ‘16-'21
- HU Lab Ventilation Study
- PI Coresight
- BAS QC Program
- Commissioning
- Training

CAMPUS OPERATIONS

- Countway Community Garden
- Bi-Annual Arnold Arboretum Tour

NATURE AND ECOSYSTEMS

CULTURE AND LEARNING

- Earth Month Sustainability Fair
- EcoMosquito Newsletter
- Green Lab efforts: Researcher communication and outreach

- Healthy and Sustainable Food Standards
- Take the Stairs Campaign
<table>
<thead>
<tr>
<th>Description of Event</th>
<th>Plan Focus Area</th>
<th>Date</th>
<th># of attendees</th>
</tr>
</thead>
<tbody>
<tr>
<td>EcoMosquito Newsletter</td>
<td>Culture &amp; Learning</td>
<td>Monthly Distribution</td>
<td>+250 person email list, Posted in +40 locations throughout campus</td>
</tr>
<tr>
<td>Harvard Longwood Bicyclists Newsletter</td>
<td>Culture &amp; Learning</td>
<td>Monthly Distribution</td>
<td>1,200 person email list</td>
</tr>
<tr>
<td>Summer Garden Gathering</td>
<td>Nature &amp; Eco., Culture &amp; Learning</td>
<td>June 2016</td>
<td>35 Community Members</td>
</tr>
<tr>
<td>Arnold Arboretum Student Trips</td>
<td>Nature &amp; Ecosystems</td>
<td>Oct. 2015, May 2016</td>
<td>30 Chan School Students</td>
</tr>
<tr>
<td>Lab &amp; Office Supply Freecycles, HMS and Harvard Chan School</td>
<td>Campus Operations</td>
<td>July, 2015, October 2015, May 2016</td>
<td>+200 community members at each</td>
</tr>
<tr>
<td>Chemical Amnesty &amp; Swap</td>
<td>Campus Operations</td>
<td>May 2016</td>
<td>~50 labs participated</td>
</tr>
<tr>
<td>Take the Stairs</td>
<td>Health &amp; Wellbeing</td>
<td>April 2016</td>
<td>+570 Community members, +177,000 flights of stairs</td>
</tr>
<tr>
<td>Earth Day Sustainability Fairs</td>
<td>Culture &amp; Learning</td>
<td>April 2016</td>
<td>+250 Community members</td>
</tr>
<tr>
<td>Longwood Bicyclist Events: Bike Breakfast, Maintenance Classes, Safety Summit</td>
<td>Health &amp; Wellbeing</td>
<td>Sept. 2015, April 2016</td>
<td>+300 Community members</td>
</tr>
<tr>
<td>Waste Reduction Ambassadors</td>
<td>Culture &amp; Learning, Campus Operations</td>
<td>July &amp; September 2015, March 2016</td>
<td>10 volunteers, reaches +150 community members each time</td>
</tr>
<tr>
<td>Green Labs Competition</td>
<td>Emissions &amp; Energy, Campus Operations</td>
<td>October 2015</td>
<td>11 labs across Longwood</td>
</tr>
<tr>
<td>Dental School Special-Tea</td>
<td>Culture &amp; Learning</td>
<td>September 2015</td>
<td>30 attendees</td>
</tr>
<tr>
<td>Annual Campus Bike Fair</td>
<td>Campus Operations</td>
<td>September 2015</td>
<td>+150 community members</td>
</tr>
<tr>
<td>Countway Garden Harvest Festival</td>
<td>Nature &amp; Ecosystems</td>
<td>September 2015</td>
<td>30 Garden members</td>
</tr>
<tr>
<td>Countway Garden Social</td>
<td>Culture &amp; Learning</td>
<td>August 2015</td>
<td>10</td>
</tr>
<tr>
<td>Energy Lighting Fairs</td>
<td>Emissions &amp; Energy</td>
<td>December 2015, April 2016</td>
<td>68 and 51 Ratepayers respectively</td>
</tr>
<tr>
<td>Sustainability Signage on M2</td>
<td>Culture &amp; Learning</td>
<td>Ongoing since July, 2015</td>
<td>Visible to 500 researchers/day</td>
</tr>
<tr>
<td>Sustainability Trivia</td>
<td>Culture &amp; Learning</td>
<td>June &amp; Oct. 2015, January 2016</td>
<td>~25 Staff</td>
</tr>
</tbody>
</table>
HMS GHG EMISSIONS REDUCTION PROGRESS

HMS GHG emissions by category

- Electricity
- Fugitive Emissions
- Stationary Combustion
- Steam
- Chilled Water
- Mobile Combustion

FY 2006 - FY 2016

17% reduction

Metric tonnes GHG
AS OF FY16, HMS IS REPORTING A **17 PERCENT REDUCTION** FROM THE FY06 BASELINE YEAR.

HMS’s Longwood Base saw a 21 percent emissions reduction from 2006

<table>
<thead>
<tr>
<th>Campus</th>
<th>GHG</th>
<th>Energy Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Campus Gross Square Footage</strong></td>
<td><strong>Total Emissions</strong></td>
<td><strong>Total energy use, including growth</strong></td>
</tr>
</tbody>
</table>
| FY06: 2.91 Million ft²  
FY16: 3.05 Million ft² | FY06: 53,013 MTCDE  
FY16: 44,308 MTCDE | FY06: 716,145,888 kBtu  
FY16: 609,011,763 kBtu |
| Δ in ft² since FY06: +140,000 | 17% reduction total  
21% reduction in 2006  
Longwood Base buildings | Approx. 15% reduction in kBtu |

<table>
<thead>
<tr>
<th>Water</th>
<th>Waste</th>
<th>New Programs and Tools</th>
</tr>
</thead>
</table>
| FY06: 16,854 CCF  
FY16: 15,738 CCF | FY06: 1,075 tons  
FY16: *Not Available* | HMS Facilities Design Standard  
HMS Energy Strategic Plan  
PI Coresight (with app)  
Energy Accounting System |
| Reduction of ~1,116 CCF  
6.6 % reduction in CCF | | |
ENERGY CONSERVATION MEASURES AND STRATEGIC ENERGY PROJECTS

HMS STRATEGIC ENERGY
5-YEAR PLAN ‘16-’21

PI CORESIGHT

HU LAB VENTILATION STUDY
1. BUILDING AUTOMATION SYSTEM - QUALITY CONTROL PROGRAM
2. COMMISSIONING
   1. Continuous CX BAS
   2. Commission/re-commission custom code to ensure HU temperature standards compliance
   3. BAS Fault detection program – over 700 items identified
   4. BMS Master spreadsheet – baseline of BAS Readings
3. TRAINING
   1. Hot-Cold Protocol Operator training
   4. Air Handler Coil Cleaning for improved efficiency
VENTILATION: AIR-CHANGE RATES/HOUR

AIR-CHANGE REDUCTIONS

- Vivarium Holding-Room spaces
- NRB
  - Supply Air Temperature Reset
  - Rebalance of non-lab spaces to current ASHRAE/IECC ventilation standards
- TMEC exhaust fan rebalance and consolidation

CAPITAL PROJECTS

AIR-HANDLER UPGRADES WITH FAN-ARRAY TECHNOLOGY

- Redundancies
- Decreased maintenance costs
- Increased ability for variable control
LED LIGHTING UPGRADES
• Warren Alpert Building Garage
• Vanderbilt Hall Exterior
• NRB - HCCM 4’ LED Tubes
• Campus-wide CFL→LED Lunera 4-pin
  • 2,000 lamps across HMS
HMS ECMS AND STRATEGIC ENERGY PROJECTS

FACILITIES CONSTRUCTION DESIGN STANDARDS DEVELOPED

• Maintains internal consistency at HMS for construction and renovation projects

VENTILATION REDUCTION PROJECTS

• Discharge air temp (NRB)
• Revise ventilation rates to new Energy Code requirements

NRB - AIRFLOW ANALYSIS
07.20.15
HMS ECMS AND STRATEGIC ENERGY PROJECTS

AUTOMATED AND CONTINUOUS COMMISSIONING OF BUILDING AUTOMATION SYSTEM (BAS)
  • Using Fault Detection and Diagnosis

ASHRAE LEVEL 2 ENERGY AUDITS COMPLETED: C BUILDING, WAB
  • HMS performs at least 2 ASHRAE Level-2 audits per year.
  • Lab buildings are audited at least every 5-years

FAN COIL UNIT (FCU) REPLACEMENT
  • Units equipped with energy saving Electronically Commutated Motors (ECM) motors
OPR is a written document completed by the Owner or Owner’s Representative.

This document will be used as the outline for the more detailed and technical Basis of Design (BOD) document.

Both the OPR and BOD inform, direct, and guide the design and construction process.
HMS Facilities continued a preventative maintenance program on Harvard Owned Ultra Low Temperature freezers, which includes “-80” and “-140” degree freezers.

207 freezers were serviced, covering 331 issues, including connecting to Central Alarm, repairing gaskets/seals, and defrosting.

Energy savings are associated with keeping freezer coils and filters free of dust, allowing for proper heat exchange.

The PM program saves energy while providing a more secure environment for research samples—a win-win situation for research labs and facilities teams alike.
ULT FREEZER ENERGY BATTLES

Eversource Rebate for both Sterling and TSX

OFS efforts to address researcher concerns with Sterling QA/QC

Next Steps:
• Move away from “-80” to “ULT”
• Advocate for temp. increase to -70 where appropriate
EMISSIONS AND ENERGY

LAB EQUIPMENT MONITORING

Harvard iLab Start Up - Tetrascience

HMS Laboratories in NRB and SJM actively monitoring over 30 piece of equipment – at no cost!

FREEZER, MEET CLOUD.
Get alerts, log data, and monitor your equipment remotely with the wi-fi enabled device from Harvard Innovation Lab start-up Tetrascience.

Interested?
Email: GREENLABS@HARVARD.EDU

FREEZER/INCUBATOR MONITORING FOR LABS
TETRASCIENCE IS EXCITED TO PARTNER WITH THE HARVARD OFFICE FOR SUSTAINABILITY TO PROVIDE HARVARD RESEARCH LABS WITH FREEZER AND INCUBATOR MONITORING PROBES AND DEVICES

- ALERTS VIA TEXT AND EMAIL
- WI-FI ENABLED SUPPORT
- WORKS WITH A WIDE RANGE OF TEMPERATURES

Contact energy@fas.harvard.edu to learn more!

- Enable your -80°C or -20°C freezer and/or your 37°C incubators. Other temperature ranges supported.
- Monitor your sensors from anywhere, anytime through our Wi-Fi enabled solution
- stay in control by receiving texts and email as a per your preference

LEARN IT. LIVE IT.
GREEN.HARVARD.EDU/LABS

TRUSTED BY RESEARCHERS AT HARVARD, MGH, VERTEX, ETC.
Completed a waste assessment and review of current practices and procedures around the waste stream

Identified priority locations for improvement and conducted onsite assessments

Approved updated informational signage for waste, recycling, and compost

WE’VE GOT A GOAL to reduce waste per capita 50% by 2020 from a 2006 baseline, with the aspirational goal of becoming a zero-waste campus
CAMPUS OPERATIONS

WATER CONSERVATION
CAMPUS-WIDE WATER AUDIT COMPLETED

Completed in June 2016.

Recommendations under consideration for implementation in future years.
LONGWOOD GREEN LABS COMPETITION

The Longwood Campus held its second Green Lab Competition in 2015. The Harvard Program in Therapeutic Sciences (HiTS) won!

11 labs from HMS and Harvard Chan participated.

PI, Peter Sorger, helped clean out a -20 freezer with samples that were older than his graduate students!
The Longwood Campus held its second Chemical Amnesty Day, organized by HMS Operations in partnership with Environmental Health & Safety. For approximately $28k, the coordinated series of events engaged about 50 labs and collected over 6,000 unwanted chemical containers for safe disposal and over 41 chemical containers were swapped to labs who needed them.

The event’s success depended on engagement from a number of departments and stakeholders. The elimination of unwanted chemical containers reduces the associated risks of storing them on campus and creates additional storage space in a limited real estate environment.

<table>
<thead>
<tr>
<th>Campus/School</th>
<th>Collected</th>
<th>&quot;Swapped&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSPH</td>
<td>900</td>
<td>4</td>
</tr>
<tr>
<td>HMS South/HSDM</td>
<td>2,600</td>
<td>--</td>
</tr>
<tr>
<td>HMS North</td>
<td>2,500</td>
<td>37</td>
</tr>
<tr>
<td>All locations total</td>
<td>6,000</td>
<td>41</td>
</tr>
</tbody>
</table>
NATURE AND ECOSYSTEMS

COUNTWAY COMMUNITY GARDEN

Reorganization of Community Garden plot management “sponsored” plots model – received more applications than plots available

✓ Annual Fall Harvest festival

✓ Annual Spring Garden Gathering

✓ Initiated Re(Design) Innovation Challenge
NATURE AND ECOSYSTEMS

INITIATED A BI-ANNUAL TOUR OF HARVARD’S ARNOLD ARBORETUM

Autumn Foliage ‘15

Spring Flowering ‘16

LILAC SUNDAY AT THE ARNOLD ARBORETUM
SUNDAY, MAY 8TH AT 10:30AM

RSVP AT: LILACSUNDAY.EVENTBRITE.COM

ON S/R MEET AT THE KREGE ENTRANCE, 677 HUNTINGTON AVE, AT 10:30 AM FOR THE FREE SHUTTLE TO THE ARBORETUM

OR JOIN THE GROUP RISING TO THE ARBORETUM, WHICH WILL BE JOINED BY A MEMBER OF THE HARVARD LONGWOOD BICYCLISTS

This is the second bi-annual trip to the Arnold Arboretum, sponsored by EcoOpportunity, Longwood’s Green Team.

The Arnold Arboretum celebrates the flowering of the lilacs each year with Lilac Sunday, a day that has tours of the lilacs and other special collections, family activities and food vendors. The lilac collection at the Arnold Arboretum is among the premier collections of these plants in North America.
HARVARD’S LONGWOOD CAMPUS RECEIVED THE CITY OF BOSTON’S HIGHEST AWARD FOR BIKE FRIENDLY BUSINESSES, THE CHOCOLATE AWARD

THE LONGWOOD CAMPUS WAS AWARDED FIRST PLACE FOR OUR CATEGORY IN THE MASSCOMMUTE BIKE CHALLENGE

The Longwood Campus is home to about 850 bike racks!

The Harvard Longwood Bicyclists group continues to engage with all stakeholders across the Longwood Campus with over 1,500 members. The group advocates for advancement in bike-friendly infrastructure and parking, provides safety and learn-to-bike lessons for the Harvard community,

Safety, maintenance, and learn to bicycle classes

New bike racks in bike cages

• Bicycle fair
• Bicycle breakfast
• “Handlebar” happy hours
Healthy Eating: Nutrition and Sustainability

**HEALTHY EATING PLATE**

- **Use healthy oils** (like olive and canola oil) for cooking, on salad, and at the table. Limit butter. Avoid trans fat.
- **Drink water, tea, or coffee** (with little or no sugar). Limit milk/dairy (1-2 servings/day) and juice (1 small glass/day). Avoid sugary drinks.
- **The more veggies – and the greater the variety – the better.** Potatoes and French fries don’t count.
- **Eat a variety of whole grains** (like whole-wheat bread, whole-grain pasta, and brown rice). Limit refined grains (like white rice and white bread).
- **Choose fish, poultry, beans, and nuts:** limit red meat and cheese; avoid bacon, cold cuts, and other processed meats.
- **Eat plenty of fruits of all colors.**

**STAY ACTIVE!**

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Harvard T.H. Chan School of Public Health
The Nutrition Source
www.hsph.harvard.edu/nutritionsource

Harvard Medical School
Harvard Health Publications
www.health.harvard.edu

Sustainable and Healthful Food Standards Working Group

Participation in MASCO’s Farm to LMA

Sustainable food sourcing through Restaurant Associates

Harvard #FoodBetter Conference
In partnership with Harvard’s office for Sustainability and Green Building Services, HMS’ campus Planning office has responded to the change in Boston’s fire code by creating finishing standards, which include furniture standards, that aim to minimize exposure to chemicals of concern.

**BUY FLAME RETARDANT-FREE FURNITURE**

The best way to minimize risk is to choose flame retardant-free furniture for your next capital project, renovation, or office furniture purchase.

The Sustainability and Energy Management Council, Office for Sustainability, and Strategic Procurement recommend that the Harvard community specify and purchase cost-competitive furniture that is free of flame retardants and meets all new applicable fire safety regulations and flammability standards.

**PROJECT MANAGERS**

- Add language to your project’s contract and specs stating you would like to purchase furniture free of chemical flame retardants that meets the TB117-2013 standard.
- Clearly communicate with all vendors that Harvard has a preference for products free of chemical flame retardants.
- Confirm that the project’s code consultant clearly understands Harvard’s preference for chemical flame retardant-free furniture when allowed by the updated fire safety codes.

**PURCHASERS**

- Confirm with your retailer or manufacturer that chemical flame retardants have not been added to the product.
- Confirm that the product has a TB117-2013 label that says it does not contain flame retardant chemicals.
- Avoid any products with a TB117 or TB133 label.

**BUYING TIPS:**

- Check the label located under the product or seat cushion to confirm the upholstered material includes no added flame retardants.
- Because some fabrics may still contain chemicals, confirm with your retailer or manufacturer that flame retardants have NOT been added to the product (fabric or foam).
- In order to obtain fully flame retardant-free products, confirm with your manufacturer that flame retardants were not added to any plastic parts.

"Fire retardant foams did not offer a practically significant greater level of open flame safety than did the untreated foams."

—Consumer Product Safety Commission

**EDUCATE YOURSELF AND YOUR COMMUNITY**

Visit green.harvard.edu/chemicalsofconcern to access educational resources, research highlights, and additional information on how you can reduce exposure to flame retardants at home or in the office.

Contact the Office for Sustainability for Harvard-specific guidance, sample technical specifications, and assistance in purchasing flame retardant-free furniture at 617.495.3822, green.harvard.edu, or sustainability@harvard.edu.
Take the Stairs
TAKE THE STAIRS EXPANDED TO ALL OF HARVARD’S LONGWOOD CAMPUS.
LARGEST NUMBER OF PARTICIPANTS YET!

577 Participants | 121 teams | 58 teams reached Meru!
Strong interest from across Harvard in replicating competition.

Meru = 21,850 feet (1457 flights)
RESEARCHER ENGAGEMENT

New Signage on the M2 Shuttles are seen by hundreds of Longwood researchers each day.

2nd Longwood Green Labs Competition

Over 7,500 unused chemicals were removed from campus because of “Chemical Amnesty Day”

With the environmental footprint of labs being far greater per person than any other space type, engaging the researchers is a top priority. A collaboration between Longwood, MASCO, and the FAS Green team, established sustainability signage on the M2 shuttles that researchers and students ride every day.

GOT ICE?
Take advantage of FREE freezer kits to clear away ice buildup in your Ultra Low Temperature freezers and keep them running efficiently.

Email: GREENLABS@HARVARD.EDU.

5 GREEN TIPS from the Nocera Lab
1. REUSE materials, such as packing supplies and pipette tip boxes.
2. SAVE ENERGY by consolidating samples to cut down freezer space needed.
3. COORDINATE INSTRUMENT USE in the lab to maximize efficient use time.
4. Utilize a CHEMICAL INVENTORY SYSTEM to share chemicals with other labs.
5. Use a REUSABLE MUG!
ECOOPPORTUNITY, LONGWOOD’S GREEN TEAM, LED EFFORTS THROUGHOUT THE YEAR THAT ENGAGED THE ENTIRE LONGWOOD CAMPUS COMMUNITY

- Sustainability Fair
- Lighting Fair
- Waste Ambassadors
- Countway Garden
- Chemical Amnesty
- Take the Stairs

For the first time, HMS implemented significant efforts to reduce waste on Class Day by using reusable, biodegradable or recyclable materials. Image: Bobbie Collins
As the controllers of many campus resources, staff members play a vital role in our campus and also have significant influence on the experiences of students. Giving them opportunities to get involved can have significant impacts in many areas. In addition, many of the programs we offer contribute to improving the work/life balance of these members of our community.
Published content on green.harvard.edu in FY16:

Website engagement:

Unique visitors for your top 10 most visited pages totals over: 3,000
Average time on page for top 10 most visited pages: 2 minutes, 21 seconds

Top 10 pages:
1. Impact of green buildings on cognitive function (HCSPH research highlight)
2. HMS Landing Page
3. De-ice your freezer in 4 steps (HMS lab featured)
4. Empirical Case for a Plant-based Diet (HCSPH Research highlight)
5. 6 strategies to create more sustainable meals (HCSPH resource)
6. Healthy Eating Plate (HCSPH resource)
7. 5 tips for sustainable eating (HCSPH resource)
8. Encourage mindful eating with a mindful eating corner
9. Start an interoffice envelope reuse system (EcoOp)
10. HCSPH Landing Page

OFS sends a monthly newsletter to a list of more than 10,000 students, staff, faculty, and members of the outside community.

HSPH/HMS is represented in each newsletter through research, shout outs, stories, tools or resources, or links to social media posts.

HCSPH/HMS provided 4 photos of the 80 photos posted by OFS to Instagram. Including the awesome video of Donna Shalala giving EcoOp a shout out.

OFS tweets 6-8 times per day. On average, HSPH/HMS are mentioned in 10-12 tweets per week (heavily research-related content). OFS also retweets HCSPH, HSPH Nutrition, and CHGE frequently.

OFS posts once daily to Facebook. Generally, HCSPH/HMS (mostly research) are represented 2-3 times per month.