Sustainability

Campus Sustainability Report 2013

WPI

The WPI Campus Annual Sustainability Report

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A Message from the President

I am proud to share this Annual Sustainability Report with the campus community as well as with our alumni, friends, and associates. This is the fourth report documenting WPI's sustainability efforts that have been directed by the WPI Task Force on Sustainability. Summarizing WPI's performance over the past year, it is a representation of the broad engagement of our campus community in addressing the three pillars of sustainability: ecological stewardship, social justice, and economic security, in both planning and execution.

This report also identifies our achievements. Most notable of these over the past year are the opening of the new Sports & Recreation Center, a 140,000-square-foot building filled with sustainable features, and the development of the WPI Sustainability Plan. This plan illustrates WPI's explicit commitment to sustainability as it is woven throughout our academic and research activities, community engagement, and daily campus operations. It is the result of a two-year effort, spearheaded by the WPI Task Force on Sustainability, and it engaged students, faculty, and staff in its development and priority-setting. These are two major achievements, but there are many activities that occur every day, from green housekeeping to building a zero net energy house to compete in the Solar Decathlon, that represent WPI 's commitment to continually improving our campus and our world.

We should all be proud to be part of a community that recognizes the importance of sustainability and that uses its principles to guide our studies, research, and daily operations.

Philip B. Ryan,
Interim President

Sustainability Reporting

Sustainability at WPI

This is WPI's fourth annual Campus Sustainability Report, addressing the 2013 Fiscal Year, beginning in July 2012 and ending in June 2013. A major force behind the completion of such a report is The WPI Task Force on Sustainability. The Task Force endorses a definition of sustainability that encompasses ***ecological stewardship, social justice, and economic security*** for all members of the local and global community. WPI's commitment and progress related to these principles is discussed in this report.

To track progress, indicator data is chosen to represent the university's performance in specific areas such as energy use and water use. By presenting information in the form of a series of quantitative indicators, the institution can visualize the data and trends, and make appropriate operational and policy decisions. By highlighting areas in need of improvement, this report will help to direct future efforts toward sustainability at WPI.

This Report

This report focuses on three major areas: academics, campus operations, and community engagement. The **Academics** section examines the role of sustainability in curriculum, project work, and research at WPI. The **Campus Operations** section summarizes topics such as energy use, greenhouse gases and waste management, as well as WPI's commitment to improving these areas as the campus continues to grow. The **Community Engagement** section examines WPI's impact on local and global communities. Of equal importance is WPI student course work related to these three areas, which will be featured throughout the report.

This report was written by Caryn MacDonald '14 and edited by Liz Tomaszweski. For more information about sustainability at WPI, please visit wpi.edu/+sustainability.

Sustainability Plan Working Group Co-Chair Bill Spratt presents goals to gain input from the WPI community.

New Vision of Sustainability

We at WPI will demonstrate our commitment to the preservation of the planet and all its life through the incorporation of the principles of sustainability throughout the institution. We will accomplish this goal by promoting a culture of sustainability that incorporates the beliefs and behaviors supported by our technical strengths and by our heritage of the application of both theory and practice, as embodied in our motto, Lehr und Kunst, to the solution of important problems. WPI will develop a bold and comprehensive strategy to advance the three broad goals of sustainability: ecological stewardship, social justice, and economic security.

-WPI Task Force on Sustainability

The WPI Campus Sustainability Plan

The WPI Task Force on Sustainability

Since its establishment in 2007, the WPI Task Force on Sustainability has coordinated WPI's efforts to ensure the long-term sustainability of the institution's academics, research, community engagement activities, and day-to-day campus operations. It actively seeks to assist the WPI community in producing innovative and practical solutions to sustainability challenges on campus. The Task Force represents WPI's first formal and explicit commitment to the principles of sustainability.

The Task Force and four Sustainability Plan Working Groups are responsible for The Plan for Sustainability at WPI, a document resulting from a two-stage process to catalog current sustainability efforts, set goals, and implement guidelines and practices of sustainability on campus. The plan's leaders sought input from students, faculty, staff, and alumni in four areas:

- Academic programs, including teaching, scholarship, and project work
- Operation of WPI's campus facilities
- Institutional policies that impact sustainability
- Community engagement, both on and off campus

Task Force Timeline

March 2012 - Community-wide Sustainability Plan Kickoff

December 2012 - Phase 1 Plan completed

January 2013 - Phase 1 Plan Presentation and Final Phase Kickoff event

March 2013 - World Café held to gain input on the Final Phase of the Sustainability Plan

May 2013 - Final Phase writing begins

April 2013 - Director of Sustainability position developed and approved

August 2013 - Expected Plan competition and presentation to the Board of Trustees

Distinction

WPI has received distinction in sustainability from two of the most widely respected agencies in the field: the Princeton Review's Nation's Greenest Colleges of 2013, 2012, 2011, and 2010, and Sierra Club's 2010 and 2011 Coolest Schools report ranked WPI as one of the 100 greenest schools.

March 2013—The World Café, hosted by the WPI Task Force on Sustainability and attended by many students, faculty, and staff, was held to gain input on the Final Phase of the Plan for Sustainability at WPI.

Sustainability Partners

Sustainability Partners

WPI engages with a number of partners in order to advance their sustainability goals. These partners include WPI, the College of the Holy Cross, and Clark University as part of the **SynergE Worcester** initiative, a tri-campus collaboration between the three campuses, sponsored by **National Grid** and facilitated by **GreenerU.** Focused on energy and carbon emission reduction through energy efficiency incentives and campus community engagement, SynergE Worcester initiates programs such as the Tri-Campus challenge, which engages members in sustainability at their schools through monthly challenge quizzes and also assists in the development of the Eco-Rep program. SynergE Worcester also works on the facilities program of sub-metering, building retro commissioning and Building Operator Certification training on the WPI campus. An energy use evaluation of high -energy consumption buildings has resulted in plans for retrofitting Gateway I and the Campus Center to reduce the energy consumption in these buildings. The Department of Facilities will communicate these changes to the WPI community and building occupants. The SynergE Worcester initiative hopes to be a model for colleges nationally.

GreenerU also assists many academic institutions throughout New England to advance sustainability on their campuses. At WPI, GreenerU plays a key role in facilitating the Plan for Sustainability at WPI.

Energy Savings Lighting Fair

In an effort to help employees and staff save money and energy, and protect the environment, the WPI Task Force on Sustainability and the Student Green Team hosted an **Energy Saving Lighting Fair,** which offered discounts on ENERGY STAR® efficient lighting products. The lighting fair was part of the Mass Save® Program, sponsored by National Grid.

Student Opportunities with United Technologies and National Grid

The WPI Engineering Ambassador (EA) Program is a professional development program with an outreach mission and is sponsored by United Technologies Corporation and National Grid. During the school year, the EAs deliver presentations to middle and high school students and lead interactive activities to promote the exciting possibilities of engineering. During the summer of 2013, three of the National Grid EAs, Mai Tomida, Veronica Rivero Gorrin and Justin Rice, completed their summer internships with National Grid, where their focus was on preparing the **Worcester Sustainability Hub**. The Hub, donated by Clark University and set to open in October 2013, will enable the community and National Grid's customers to receive education about energy efficiency and the Smart Energy Solutions Programs, National Grid's smart grid pilot project. The three WPI EAs worked on various Sustainability Hub preparation projects, such as promoting the Hub through social media, organizing the Hub events calendar, developing a staff manual and aiding in the LEED certification application for the building. The students also played a role in community outreach programs to make local non-profit organizations and schools aware of the smart grid technology.

Academics

"All of WPI's graduates will leave campus with the mindset and abilities to develop sustainable solutions to the world's problems. All WPI students (graduates and undergraduates) will have the opportunity to incorporate and critically evaluate significant aspects of sustainability in their education."

-WPI Task Force on Sustainability, draft Sustainability Plan goal

Academics

As a technical institution, WPI is responsible for educating future scientists and engineers to become leaders in their workplace and communities, facing a multitude of technological decisions every day. The environmental, social, and economic impact of technological decisions are an important component to the success of sustainability in a society. Therefore, it is vital that every student has the opportunity to leave campus with the knowledge and abilities to develop sustainable solutions to the world's problems. Sustainability can be integrated into academics at WPI through student projects, their course work, and the research conducted by faculty and staff, giving students the opportunity to engage in sustainability throughout all stages of their academic career.

WPI's Mission

WPI educates talented men and women in engineering, science, management, and the humanities in preparation for careers of professional practice, civic contribution, and leadership, facilitated by active lifelong learning. This educational process is true to the founders' directive to create, to discover, and to convey knowledge at the frontiers of academic inquiry for the betterment of society. Knowledge is created and discovered in the scholarly activities of faculty and students ranging across educational methodology, professional practice, and basic research. Knowledge is conveyed through scholarly publication and instruction.

Sustainability Project Competition

WPI's Task Force on Sustainability hosted its fifth annual sustainability project competition in April of 2013 with categories for first year students, undergraduates, and graduate students.

Winners of the project competition this year were:

First Year: Housing in a Bottle; *Students: Rachel Kennedy, Rita Newman, Jennifer Wallace, Adriana Reyes, Nathan George; Advisor: Diran Apelian*

Undergraduate: Intelligent Preprocessing of Electronic Waste during Recycling; *Students: Amy Loomis, Patrick Ford; Advisors: Diran Apelian, Jeanine Plummer*

Graduate: Treatment of 1,4-Dioxane in Water: Sustainable Treatment Options; *Students: Julie Bliss; Advisor: John Bergendahl*

Academics: Projects

"The ongoing objective of the IGSD is to create societies that are socially inclusive, culturally vibrant, economically prosperous, and ecologically sound. Research and teaching are closely aligned; we work with students and local partners from government, academia, and business to push the limits of what is possible."
- Interdisciplinary and Global Studies Division

Theory and Practice

WPI's innovative and rigorous project-based curriculum goes hand-and-hand with its motto, "Lehr und Kunst," or Theory and Practice. The Interactive Qualifying Project (IQP) and the Major Qualifying Project (MQP) not only teach students how to solve real world problems, but also to develop effective team dynamics. The IQP, which is non-discipline-specific, focuses on the impact of technology on people through the lens of social science. The MQP is discipline-specific and leads to meaningful solutions in technical challenges. Both the IQP and MQP, through the **Interdisciplinary and Global Studies Division (IGSD)** often address sustainability in one of WPI's project centers including Copenhagen, Costa Rica, Hong Kong, London, Melbourne, Panama City, Puerto Rico, and Wellington. The IQP and MQP also address sustainability issues in the Worcester community and on campus. The Great Problems Seminar (GPS) allows first year students to engage in rigorous project work, focusing on problems such as world hunger and alternative energy. GPS topics include titles such as Heal the World, The World's Water, Power the World, and Food Sustainability.

Sustaining the WPI Campus

In 2013 a new project center at WPI was created and will be directed by Susanne LePage. This new on-campus Project Center offers the ability to coordinate existing efforts, identifies current project needs, and provides support to the administration, faculty, staff, and students in their sustainability planning efforts now under way in areas such as energy, food waste, transportation, and water resources.

An IQP team worked with beekeepers to help tackle underemployment in Cape Town, South Africa

Winning Sustainable Solutions from Students

Each year, five IQPs that are superior in conception, execution, and presentation are nominated for the WPI President's IQP award. This past year, five sustainability-focused IQPs were recognized:

- Sustainable Paper Insulation for Kambashus in Informal Settlements of Namibia; *Students: Jonathan Cline, Emily Domingue, Emily Fournier, Marco Villar; Advisors: Svetlana Nikitina, Thomas Robertson*
- Supporting Urban Beekeeping Livelihood Strategies in Cape Town; *Students: Adam Cadwallader, Victoria Hewey, Evren Simsek, Santiago Isaza; Advisors: Scott Jiusto, Steve Taylor*
- Heat Impacts on Occupational Health: A Comparison Between Agricultural and Industrial Settings in the Time of Climate Change, Thailand; *Students: Sarah Bober, Devin Harrison, Rachel Hickcox, Chelsea Miller; Collaborating Thai Students: Gun Charoensiri, Suthamma Sa-nguankulchai, Piyada Sutthanusorn; Advisors: Ingrid Shockey, Bland Addison*
- Designing a Water Quality Monitoring Plan for El Yunque National Forest, Puerto Rico; *Students: Kassondra Hickey, Xavier Miller, Richard Valdes, Frank Bruton; Advisors: Aarti Madan, Creighton Peet*
- Lights on the Horizon: A Socioeconomic Impact Evaluation of Rural Electrification in Tsumkwe, Namibia; *Students: Donal Boyd, Brennan Ashton, Lauren Bisacky, Jessica Lopez; Advisors: Svetlana Nikitina and Thomas Robertson*

Academics: Course Work

Sustainability in Course Work

In order to provide students with ample opportunity to integrate sustainability into their education, a wide range of course work in sustainability must be offered. A preliminary review of the WPI undergraduate catalog yielded a list of courses that were sustainability-related or -focused. It is understood that sustainability is built on three principles: ecological stewardship, social justice, and economic security. Sustainability-focused courses place a strong emphasis on one or more of the three principles of sustainability in many or all aspects of the course curriculum, while sustainability-related courses incorporate at least one principle of sustainability in some significant aspect or aspects of the course curriculum. It is estimated that WPI currently offers approximately 56 sustainability-related courses and 38 sustainability-focused courses, out of about 700 listed courses.

New courses for the 2013 Academic Year:
ENV 150X: Introduction to Geographical Information Systems
ENV 230X: Case studies in Environmental Governance, Technology, and Innovation
ENV 280X: Environmental Policy and Ethics

Solar Decathlon China

WPI students from the disciplines of **Architectural and Civil Engineering** joined students and faculty from Ghent University in Belgium and Polytechnic Institute of New York at the Solar Decathlon China in the summer of 2013. Since 2012, this collaboration of schools (team BEMANY), has been working to promote sustainable home design with their solar, net-zero energy home, appropriately named, Solatrium. The home features atriums and skylights to utilize sunlight for passive heating and lighting in addition to rooftop solar panels. This project not only engaged WPI students in technical design challenges in sustainability, but it also presents the opportunity to collaborate on a multidisciplinary project with students and professors across the globe.

The Solar Decathlon is a competition that challenges collegiate teams from around the world to design and build functional and attractive solar houses. Teams are judged on ten categories, including market appeal and appliances. For more information, visit http://wp.wpi.edu/solatrium/en/.

Team BEMANY's Solar House in the Solar Decathlon

Academics: Research

"Through our research and scholarly activities, WPI will make significant contributions to the technologies, the policies, and the mindset that will help assure a sustainable world for humankind as well as for all of nature." -WPI Task Force on Sustainability, draft Sustainability Plan goal

Faculty Leadership

WPI faculty from all disciplines engage in a wide range of research and scholarship, a notable portion of which pertains to sustainability.

- Chemical engineering professor Ravindra Datta has been awarded a grant by the Massachusetts Clean Energy Center and Massachusetts Technology Transfer Center for further study of a **new biomass-to-energy process** that uses molten salts to dissolve and deconstruct biomass. Biomass-to-energy is part of a wide range of renewable-energy research efforts in which Datta has been involved.

- Roger Gottlieb (to the left), professor of philosophy, received the Board of Trustees' Award for Outstanding Research and Creative Scholarship. Internationally recognized for his work in **political philosophy and religious and social environmental studies**, Gottlieb is a prolific, influential, and innovative scholar. His anthology, *This Sacred Earth: Religion, Nature, Environment*, is known internationally as the first comprehensive collection on the topic of the religious, spiritual, and ethical dimensions of the environmental crisis.

- The Metal Processing Institute is an industry-university alliance, directed by Professor Diran Apelian, dedicated to advancing the state of the art in the **metal processing and materials recovery and recycling industries**.

- Faculty research areas in **environmental engineering** include topics such as bacterial adhesion and interaction forces, water quality modeling, chemical process safety, stormwater management, sanitation in developing countries, and organics removal from water.

WPI Professor, Michael Elmes

- Pamela Weathers, (Biology and Biotechnology professor) has conducted studies on **antimalarial drugs** and novel delivery options for developing countries.

- WPI's Center for Inorganic Membrane Studies, under the leadership of Yi Hua (Ed) Ma, James B. Manning Professor of Chemical Engineering, has received two awards from the U.S. Department of Energy to advance **WPI's patented palladium membrane technology** for separating hydrogen from various gases. Inorganic membranes can lower the cost of generating electricity while also reducing greenhouse gas emissions.

- Michael Elmes, a professor in WPI's School of Business, has been awarded a grant through the Fulbright Scholars Program, the U.S. government's flagship program in international educational exchange, to lecture and conduct pioneering research on **food security, sustainability, and social justice** in the Netherlands during the 2014 Academic Year. This is the second Fulbright award for Elmes, who was a Fulbright Scholar in New Zealand in 2005.

Campus Operations

"The operation of WPI's campus and facilities will demonstrate that the principles of sustainability guide our actions in providing a productive living and learning environment." -WPI Task Force on Sustainability, draft Sustainability Plan goal

The WPI Campus

With increasing enrollment, limited campus space and a building mix that ranges from those built in the late 1800's and mid-1900's to newer, LEED certified buildings, WPI faces the challenge of sustainable growth and resource conservation. Every campus operation decision that WPI makes, from fuel sources to food purchasing, has an impact on the immediate community, the city of Worcester, and the world.

One of the impacts that the WPI community has is resource consumption and waste generation. WPI maintains records of consumption of water, electricity, heating fuels, greenhouse gas emissions, and the amount of waste and recyclables produced. WPI is committed to reducing its environmental impact, while it experiences significant growth in student population and facilities infrastructure.

This section shows campus operations data for the 2013 Fiscal Year (July 2012 to June 2013), unless otherwise noted.

Essential Data FY13

Students, Faculty & Staff

- 3952 undergrads (3787 full-time, 165 part-time)
- 1950 grad students (655 full-time, 1295 part-time)
- 5957 total
- 5023 full-time equivalent
- 485 faculty
- 910 total employees

Facilities

- 93 acre campus
- 74 buildings
- 10 residence halls
- 2.2 million square feet of building space
- 120,000 square feet of LEED certifiable building space

Space Saving Growth

WPI's new rooftop playing field is the ultimate in space saving strategies. The new field, fit for softball, soccer, field hockey, lacrosse, and rugby, lays on top of a 527-space parking garage, providing much needed parking for the WPI community. The project makes efficient use of limited urban space while allowing the creation of more green space on campus. The project helps to support WPI's growing athletic program and creates a more pedestrian-friendly campus. The garage is filled with sustainable features such as a plug-in station for electric cars, designated spaces for Zipcars, a bicycle repair kiosk, and lights controlled by motion sensors. Recycled content was used in the steel, asphalt, and concrete construction. The dual purpose space is complete with an underground drainage system to keep storm water from overwhelming the city's current infrastructure.

Campus Operations: Grounds

Smart Grounds Management

From the inside out, WPI uses sustainable practices in landscaping and campus grounds maintenance. WPI grounds keeping practices include the following:

- An integrated pest management program through an outside contractor that utilizes organic and natural-based materials and reduced-risk products that provide effective pest suppression while protecting people and the environment. Contract arborists are trained to recognize beneficial insects that will help naturally suppress pest populations.
- Planting of native plants that require less water.
- Replacing of annuals with perennials to reduce the need to replant.

Bioswale in the Higgins House parking lot

- A bioswale in the Higgins House parking lot. A bioswale is a small depression, where soil, plants and woodchips provide natural sediment and contamination filtration from the parking lot run-off.
- Off-campus grounds waste composting for 100% of landscape waste.
- Magnesium chloride is used for on-campus walkways, a more plant-friendly option, as opposed to sodium chloride for de-icing.
- Mulching to help maintain moisture in soil.

Campus Operations: Smart Growth

Sustainable Growth

Gateway Park, WPI's Life Sciences and Bioengineering Center, is a prime example of WPI's commitment to minimizing its impact on the environment and improving and revitalizing the local community. Through offering a space for start-up companies to flourish, Gateway has been recognized by the U.S Department of Commerce for its urban economic development and the revitalization of one of Worcester's most underutilized neighborhoods. In 2013, WPI expanded Gateway Park, added another building, continuing WPI's commitment to economic development and job creation. In 2007, WPI pledged to build all future buildings with sustainability features sufficient to achieve LEED certification.

LEED Certification

- Developed by the U.S. Green Building Council in 1998 as a system to rate green buildings based on credits such as water conservation and energy efficiency
- A building can earn Certified, Silver, Gold, or Platinum accreditation

New Residence: Faraday Hall

Faraday Hall, a residence hall for 258 upper-class undergraduate and graduate students, expected to open in the Fall of 2013, will serve as a link between WPI's main campus and the lower campus at Gateway. The building, located on a remediated and redeveloped brownfield site, will further Gateway's mission of revitalizing the downtown Worcester area.

The building's features include the following:

- Efficient plumbing fixtures (shower heads, toilets, and faucets) and efficient irrigation system to reduce the potable water use
- Use of at least 20% less energy compared to a baseline case
- Use of recycled materials and regional materials
- Forest Stewardship Council certified wood for at least 50% of the total material cost for new wood on the project
- Demolition and construction waste diverted from landfills

It is anticipated that with the LEED certified features, LEED Gold will be achieved.

Sports & Recreation Center

The Sports & Recreation Center opened in July of 2012. The 145,000-square-foot building houses a four-court gymnasium, jogging track, competition size swimming pool, rowing tanks, convertible squash and racquetball courts, a two-level fitness space, three dance studios, robotics pits, and spaces for meetings, classrooms, and offices. The recreation center is also a great venue for events, open houses, and robotics tournaments.

Sustainability has been incorporated into every design aspect of the widely-used center. The building is tracking LEED Gold and includes sustainable features:

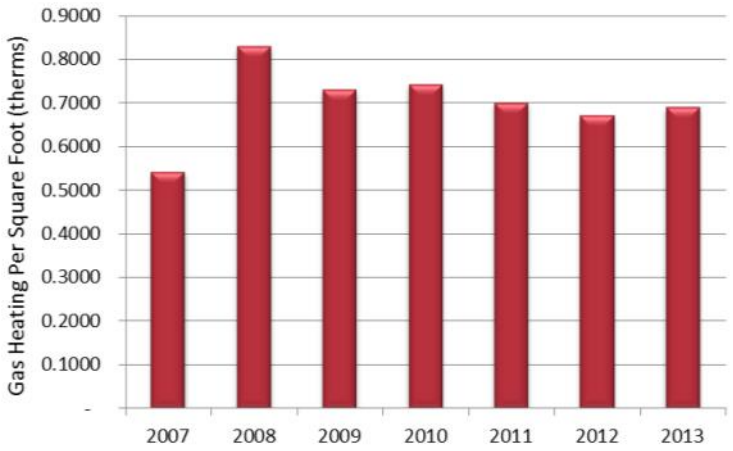
- Water bottle filling stations
- Glass countertops made from local, recycled glass
- Bamboo wall panels, doors, and ceiling tiles
- Energy efficient hand dryers
- Lighting sensors and controls
- Rooftop solar panels to heat pool water
- Exterior metal sunshades, interior sunscreens, fritted glass, and exterior mullions to reduce solar hear gain

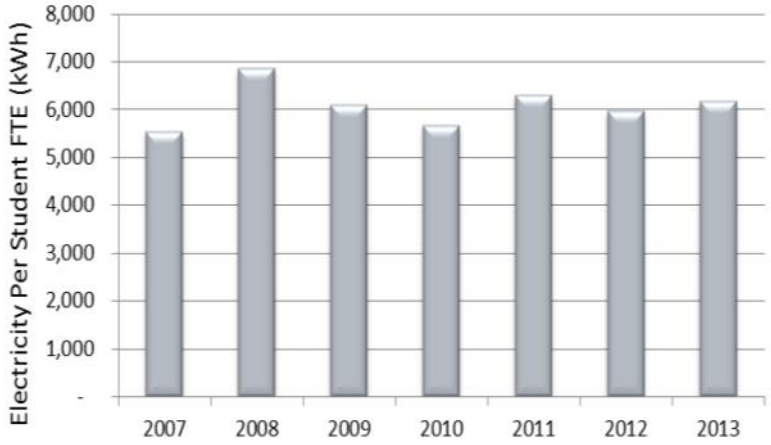
This project also provided an opportunity for students in mechanical and civil engineering to review building data and attend meetings with the design and construction teams at the project site.

Campus Operations: Energy

Energy

WPI's Power House provides heat to the main campus from October to May. In 2006, the Power House switched its main fuel from oil to natural gas, achieving significant cost and environmental benefits. Natural gas is one of the cleanest burning, energy efficient fossil fuels emitting very few by-products, helping WPI to reduce its GHG emissions by reducing its dependence on oil. Transitioning from oil to natural gas is ongoing in WPI's rental properties. Building renovations are designed to be more energy efficient through improved insulation and climate control, which will have a positive impact on our energy usage. These building renovations are proving to be effective as natural gas usage per square foot of building space has remained relatively constant over the past three years and has decreased overall since 2008.





WPI purchases its electricity from National Grid and Direct Energy. The institution is actively seeking ways to reduce electricity consumption on campus through building upgrades. The Department of Facilities evaluates its energy usage in all campus buildings, with the hope of retro commissioning all buildings on campus.

Evaluation of Nantucket's Mass Save Home Energy Assessment Program

Students: Michael Andres, Courtney Carroll, Ari Hopkinson; Advisor: Dominic Golding

The Mass Save Home Energy Assessment program was designed to promote energy conservation in Massachusetts residents. The goal of the project was to analyze the current implementation of the program on Nantucket and identify how it could better meet the island's distinctive needs. Based on interviews and surveys, high levels of satisfaction among program participants and relatively high levels of awareness about the program among the general population was found. Still, this project identified key areas that could be improved and made recommendations to the Nantucket Energy Office, Conservation Services Group and Mass Save to develop the marketing and implementation of the program in the future.

Campus Operations: Greenhouse Gases

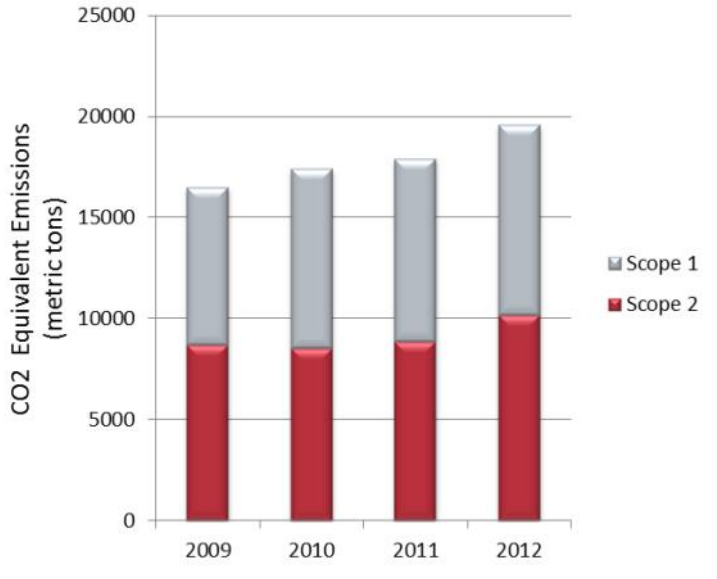
Greenhouse Gases

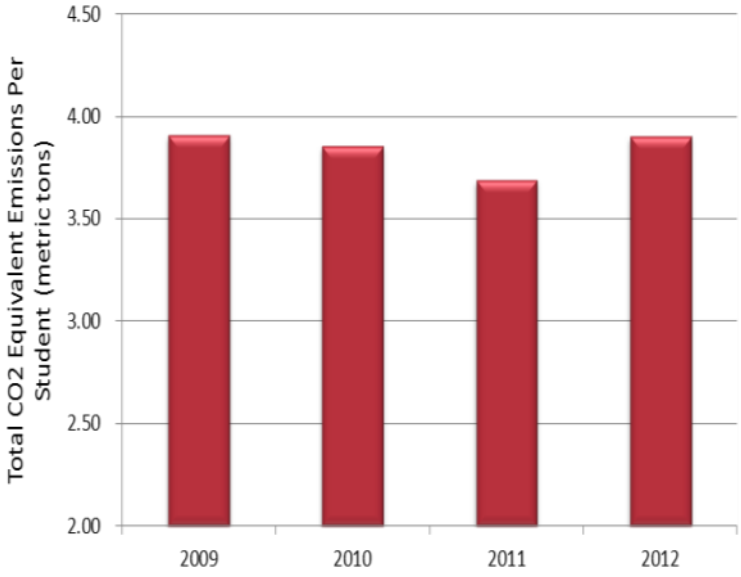
Greenhouse Gasses (GHGs) and other pollutants can result from oil, gas, and electricity usage. GHG emissions (in units of CO_2 equivalence) for Scope 1 and 2 emissions are reported. GHGs are reported here for the previous calendar year. Thus, this year's annual report shows GHG emissions from the 2012 Calendar Year.

Scope 1 emissions are direct GHG emissions from sources that are owned or controlled by the institution. According to the EPA, Scope 1 includes emissions from fossil fuels burned onsite, emissions from owned or leased vehicles, and other direct sources. Scope 1 emissions data at WPI is sourced from the Greenhouse Gas Reports compiled by an outside consultant and includes WPI's on-campus use of natural gas, distillate fuel oil, refrigerants, as well as gas and diesel fleet for on-campus vehicles.

Scope 2 emissions are indirect GHG emissions resulting from the generation of electricity, heating and cooling, or steam generated offsite but purchased by the entity, and the transmission and distribution losses associated with some purchased utilities. Scope 2 emissions were calculated using the Clean Air Cool Planet Carbon Calculator, which uses a CO_2 emissions factor for electricity based on the power sources in the New England Region. WPI's steady increase in total electricity consumption accounts for the increase in Scope 2 emissions.

The figure at the right shows a steady increase in total CO_2 equivalent emissions since 2009, while annual emissions per student remains fairly constant at about 4 metric tons of CO_2 equivalence per student annually.





Alternative Energy Solutions from Students: Gateway Turbine Design Project

Students: Tyler Chambers, Ryan Garcia, Ryan McNamara; Advisors: Leonard Albano, Mingjiang Tao

This project developed a framework to determine the feasibility of retrofitting a wind turbine onto a pre-existing structure. After an initial screening, the framework then analyzed the candidate's life cycle costs and structural effects on the building in order to determine a feasible turbine. The framework was then applied to the Gateway Park Phase II building to investigate the possibility of retrofitting a wind turbine.

Campus Operations: Transportation

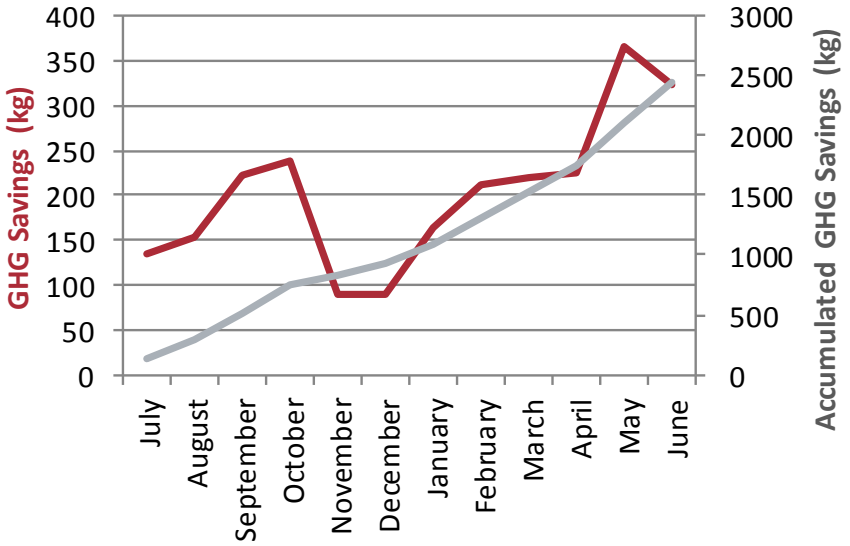
Transportation

WPI is building a greener campus by eliminating vehicles from the institution's Quadrangle. For travel off the main campus, WPI offers many options for transportation. The Gateway Shuttle provides travel to and from Gateway and its parking garage. The Office of Student Life offers discounted passes for first year students with the Worcester Regional Transportation Authority. The CityRide shuttle circulates students between local universities and major city centers. The WPI SNAP vans provide safe transportation to all locations within one mile of campus plus Union Station, the regional train station, on nights and weekends. For occasional travels, community members can take advantage of one of WPI's three Zipcar rentals or the community carpooling network, Carpool World.

The WPI Student Green Team at the Fuel Efficient car show, organized by Bryan Manning '14 , one of the Department of Energy's Student Ambassadors.

Electric Vehicle Charging Stations

WPI now has three Electric Vehicle charging stations in two locations on campus. The three EV charging stations have received almost 300 individual uses, as of July 2013, since the installation of the first station in April 2012. The first station was installed as a result of an initiative of the Massachusetts Department of Energy Resources, Electric Vehicle Infrastructure Grant. In January 2013, two more charging stations were added in WPI's new Park Avenue Garage. These electric vehicle charging stations receive steady usage throughout the year, helping to promote WPI's support of electric vehicle usage, at no cost to the user. Usage of electric vehicles in the 2013 Fiscal Year resulted in over 2,400 kg of greenhouse gas savings, as shown in the figure below.



Student Project: Implementing Bike Paths in the City of Worcester

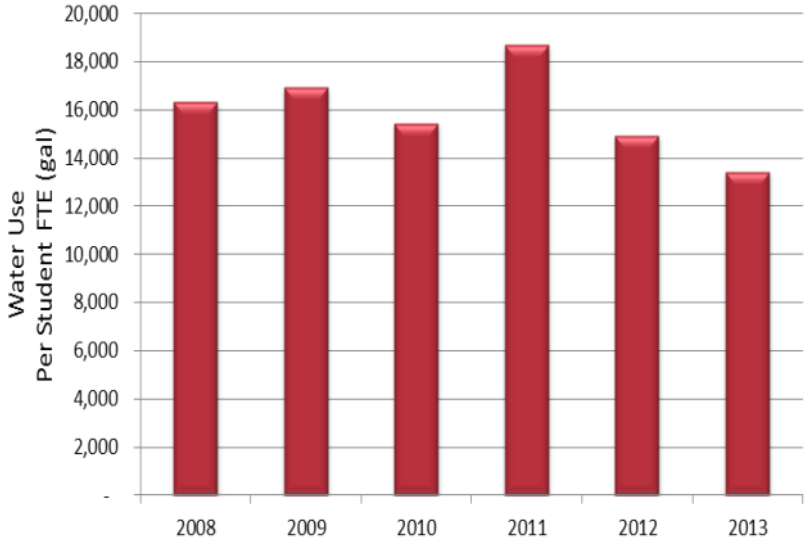
Students: Caitlin Dragun, Daniel Lent, Jordyn Rombola, Leonard Shollo; Advisors: Alexander Wyglinski, Peder Pederson

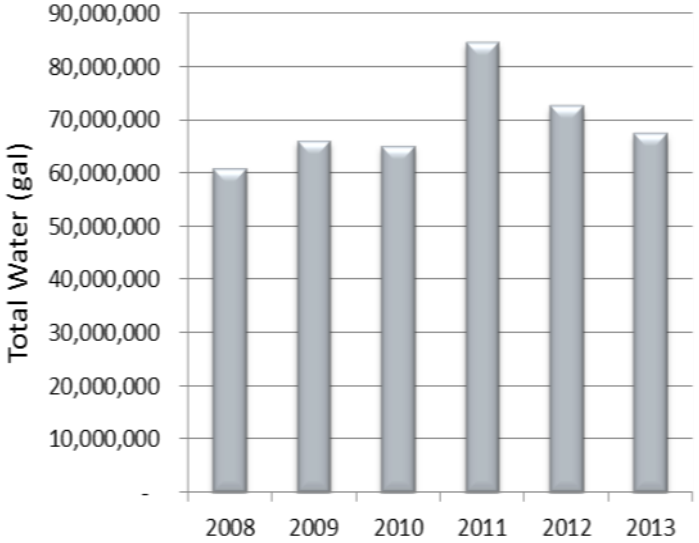
The goal of this IQP was to address the need for an alternative form of environmentally friendly and affordable transportation, and to make the community aware that biking not only helps to create a healthier, greener lifestyle, but it also provides the city residents a more affordable and equally accessible means of transportation.

Campus Operations: Water

Water Conservation

Although there has been an increase in the number of buildings and students, a steady decrease in total consumption since 2011 and an overall decrease in per capita consumption since 2008 (despite a spike in water use in 2011) shows that WPI's water conserving efforts have been effective. Water conserving devices including metering systems; low-flow showers, toilets, and faucets; toilet flushometers, and waterless urinals have been installed in WPI's recent major building renovations and new construction. The Sports & Recreation Center also uses rain water harvesting for the building's cooling towers, helping the campus to avoid the consumption of over 850,000 gallons of fresh water each year. The recent efforts to encourage reusable water bottles and the push for more water bottle filling stations may prove to increase WPI's total water consumption in the upcoming years.





WPI student presents her project; Water Filtration Methods in Developing Countries *as part of the Great Problems Seminar "The World's Water."*

MQP: An Evaluation of Stormwater Best Management Practice Effectiveness and Implications for Design

Students: Bryan LaRochelle, Max Schrader, Cassandra Stacy, Ian Weyburne; Advisor: Paul Mathisen

Stormwater best management practices (BMPs) remove contaminants that would otherwise enter a receiving water body, but the precise removal efficiency of different BMP designs is unknown. Two Massachusetts Department of Conservation and Recreation (DCR) BMPs were studied to determine their effectiveness in contaminant removal. A field sampling program was developed, laboratory analyses were performed on stormwater samples, and these results were utilized to create models of the basins. An ideal design approach was developed for a new DCR BMP.

Campus Operations: Waste

Waste Minimizing Protocols

WPI students embark on a number of initiatives to improve WPI's waste disposal habits. The Student Green teams, many IQP groups, and the Department of Facilities lead these efforts.

E-Waste Drive

The Student Green Team, an IQP team, and the Department of Facilities worked with Institutional Recycling Network to collect the Worcester community's electronic waste. All e-waste was accepted except for refrigerators and AC units. This year, 7287 pounds of electronic waste was collected, a nearly 50% increase over 2012.

Students load the truck at the E-Waste Drive

Student Green Team Waste Audit

On America Recycles Day, members of the Student Green Team and faculty and staff volunteers sorted through 1,058 pounds of waste from three residential buildings and three classroom buildings on campus to determine how effectively students, staff, and faculty are recycling. Before sorting the waste, it was found that the academic buildings had the highest presort recycling rates; Higgins Lab's had an 85% presort recycling rate, Atwater Kent, 66% and the Campus Center, 51%. The residence halls had much lower rates; Morgan Hall was 11%, Daniels, 36%, and Riley, 30%. Thus, the residence halls showed room for much improvement. One major issue was contamination of recyclables and the lack of training and convenience for residence hall recycling. The Student Green Team recommended utilizing the Eco-Reps and residential advisors to help address the issue. Another concern was the amount of Styrofoam containers found in the waste stream. The Student Green team suggested soliciting vendors to use alternatives to Styrofoam for their products.

This was the second waste audit held by the Student Green Team.

Students from the Green Team sort through trash during the second annual Waste Audit

Think Outside the Bottle, WPI

Students: (2012) Elizabeth Audet, Ximena Auger, Michael Cross, Maris Pepo; (2013) Francis Ascioti, Britney Atwater, Mark McCabe, Nicholas Rallis; Advisors: Corey Dehner, Dominic Golding

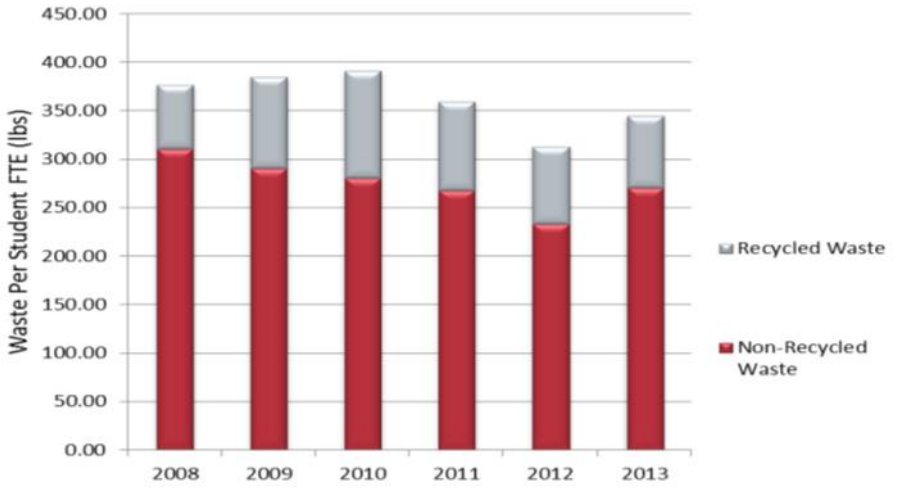
This project aims to promote public tap water by educating the community about its environmental and economic benefits, and expose the misleading marketing tactics of the bottled water industry. A publicity campaign was started on campus to phase out disposable water bottles, and recommend more water bottle filling stations.

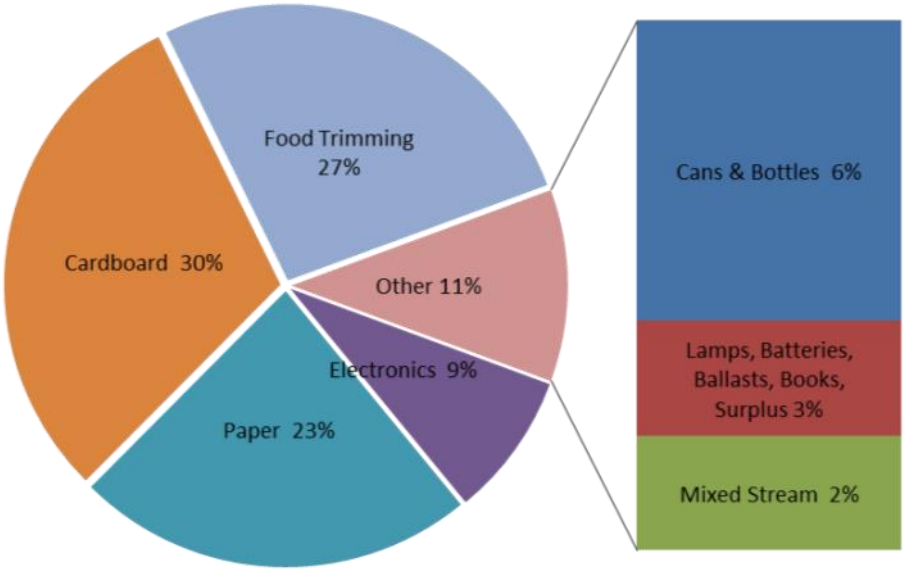
Campus Operations: Waste

Waste Minimizing Initiatives

- Undergraduate and graduate admissions has gone paperless, avoiding more than 160,000 pages of application materials per year.
- All classes at WPI are required to post course information and syllabus material online.
- 100% of WPI's waste is diverted from landfills, either through recycling or a nearby waste-to-energy incinerator.
- WPI tracks its waste and recyclables through the help of Waste Management, Superior Waste & Recycling, and Institution Recycling Network.
- WPI makes an effort to ensure the recycling of construction waste (85% of the Sports & Recreation Center construction waste was diverted from landfills).
- Campus surplus furniture is offered to the WPI Community and donated to local public schools or non-profits.

Despite these waste minimizing efforts, waste disposal per student has grown since 2012, as shown in the graph to the right. Efforts to increase awareness of ways to minimize waste and increase recycling are critical in addressing the concern.





Breakdown of recycling stream

WPI students investigate sustainable water and waste management strategies in remote desert environments while completing their Interactive Qualifying Project in Namibia.

Campus Operations: Dining Services

Food for Thought

Dining services is managed by Chartwells and includes Morgan Dining Hall, the Campus Center Food Court, Higgins House Dining, Class of 1970 Library Café, Outtakes Convenience Store, and the Goat's Head Restaurant. Chartwells is committed to sustainability, both in purchasing sustainably sourced products and in its day-to-day operations. Sustainable catering with emphasis on best practices in menu development, smart beverage/snack service, sustainable packaging, efficient delivery management, and waste management strategies are practiced. The company also purchases certified humane / cage-free eggs, zero trans fat products, rBGH-free milk, social and ecological certified coffee, and human antibiotic-free poultry and meats, and it is a member of the Sustainable Oceans Partnership with Monterey Bay Aquarium Seafood Watch. Chartwells also uses compostable serviceware and trayless dining, which has saved an estimated 120,000 gallons of water in the kitchen per year.

Chartwells Farmers' Market

Flexitarian Options

Animal agriculture makes up 18% of all greenhouse gas emissions and poses ethical problems for many students. Chartwells has taken the initiative to increase vegetarian options with its "Flexitarian" program for students who actively integrate meatless meals into their diet but are not full-time vegetarians. "Meatless Mondays" replace the main dining service stations that typically offer meat with vegetarian options.

Academic Year Highlights

- WPI has partnered with food distributor Foodex to support the purchasing of local food products. This vendor provides full producer traceability and supports the local economy.
- Chartwells worked with a Great Problems Seminar project team to donate over 100 pounds of food to the Worcester County Food Bank and $300 worth of food to the Veterans Shelter.
- Dishware made from bamboo, which takes less time to degrade than reusable plastic dishware, is now used in Morgan Dining Hall.

Project Clean Plate is a nationwide Chartwells program that **began here on the WPI campus**. The program, designed to reduce food waste in all-you-can-eat campus dining operations, provides awareness about international hunger to students. The program solicits help from on-campus student organizations to encourage peer-to-peer waste education. Food waste is monitored at the disposal area and an estimate of wasted food is posted weekly, educating students about preventable food waste. Other Chartwells food waste initiatives include TrimTrax, a waste stream auditing system for service kitchens and the Love Food Not Waste campaign, which works to promote savings in food waste, water, energy and packaging.

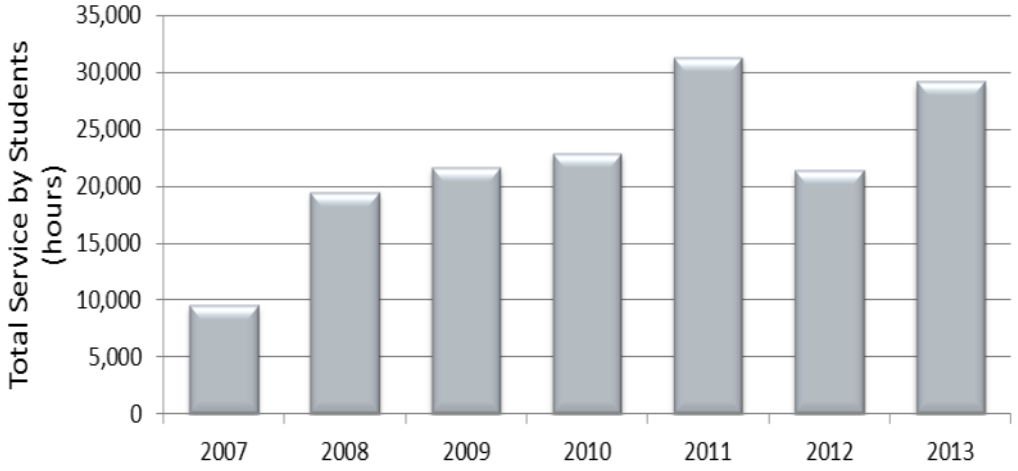
The WPI Community

"WPI's students, faculty, and staff will be actively engaged in promoting a culture of sustainability to enhance the current and future welfare of our communities: on campus, in Worcester, for our nation, and globally. " -WPI Task Force on Sustainability, draft Sustainability Plan goal

Community Service

Sustainability at WPI means more than addressing environmental issues; it includes promoting a just society. WPI students, faculty, and staff are actively engaged in community service and philanthropic projects in the Worcester community and abroad to help those in need. Many of these projects are completed through independent student initiatives, the WPI Greek Community and academic project work in WPI's 30+ Global Perspective Program Project Centers.

In the Academic Year 2013, WPI students logged a total of 29,205 reported community service hours, raising over $130,000 to benefit local and national charities. This impressive commitment to community service can be attributed to student organizations including Colleges Against Cancer, Alpha Phi Omega, WPI's 18 Fraternities and Sororities, Invisible Children Club, Active Minds, Gay-Straight Alliance, and Students Protecting Animal Welfare. The groups help those in need in the local and global community.



Student and Staff Eco-Rep Program

The eco-rep program was revitalized during the 2013 Fiscal Year. As part of collaboration with **SynergE** Worcester, eco-reps were interviewed and trained to be sustainable change agents in the residence halls or academic buildings who educate the WPI community about environmental issues and encourage them to live in a sustainable way. The goals of this Eco-rep program are to enhance students' knowledge and skills to successfully communicate sustainability to their peers, increase overall student awareness of environmental actions and ways to affect individual and group change on campus, and institutionalize environmental stewardship.

The WPI Community: Student Initiatives

Getting Involved

WPI students participate in many student organizations outside of their already engaging course work. These organizations often promote sustainable change on and off campus. These groups include but are not limited to: Habitat for Humanity, Students for a Just and Stable Future, Engineers Without Borders, Student Green Team, and Global Humanitarian Alliance.

Habitat For Humanity

habitatexecs@wpi.edu

Habitat for Humanity at WPI works on campus and in the local community to build, fundraise, educate, and advocate for Habitat for Humanity and their vision, "a world where everyone has a decent place to live." Habitat for Humanity at WPI has a strong focus on community service and giving back to the local community through volunteering at the local ReStore, attending local build days, and fundraising for the local affiliate. Build-A-Shed is a Habitat for Humanity annual event, where students construct a shed on campus that will be delivered to a local Habitat for Humanity Club.

Students for a Just and Stable Future (SJSF)

sjsfexecs@wpi.edu

SJSF is a statewide student initiative to promote sustainable practices, specifically focusing on addressing climate change. SJSF actively works against the instigators of global climate change and social injustice through various means of political activism and grassroots movements. Over the past year SJSF at WPI has focused on Divest WPI, a campaign to have WPI divest all of its investments in fossil fuels into more environmentally and socially responsible companies.

Engineers Without Borders at WPI completed its first implementation of rainwater harvesting systems in January 2013.

Engineers Without Borders (EWB)

ewb-execs@wpi.edu

EWB-USA is a national organization that supports community-driven development programs worldwide by collaborating with local partners to design and implement sustainable engineering projects. EWB at WPI is partnering with the community of Guachtu'uq, Guatemala to help develop a year-round supply of safe drinking water by implementing rainwater harvesting systems. The project focuses on utilizing locally available materials and community involvement to ensure success. Through hard work during the school year and on location trips, WPI students have the opportunity to connect their engineering knowledge with communities in need.

The WPI Community: Student Initiatives

WPI Student Green Team

greenteamexecs@wpi.edu

The WPI Student Green Team is an organization that aims to increase sustainability awareness on campus through events such as the annual waste audit, e-waste drive, and an environmentally friendly car show. The Student Green Team starts every year by inviting the campus to sign a sustainability pledge. They partner with other student groups on campus such as Soccom and Colleges Against Cancer to integrate sustainability into WPI campus events.

A student signs the Student Green Team sustainability pledge.

WPI's Global Humanitarian Alliance working on their Dengue Fever Awareness Campaign in Paraguay in May 2013.

Global Humanitarian Alliance (GHA)

ghaofficers@wpi.edu

GHA is devoted to helping the underprivileged people of developing countries and those within the community of Worcester. The GHA mission is to offer time, energy, and skills to help provide misfortunate youth with clean water, sanitation, and education. At WPI, GHA seeks to raise students' awareness of issues regarding global poverty and related topics through events such as the Global Poverty Project and their Day of Inspiration, Service, and Hope (DISH). GHA recently began the Paraguay Dengue Fever Awareness Campaign in May 2013, partnering with local churches, youth groups, and the Ministry of Health in Paraguay.

The WPI Community: Engagement Through Project Work

Local and International Community Membership

Many of WPI's projects tackle issues related to society and sustainable development in Worcester and abroad, helping to advance one of WPI's three pillars of sustainability: economic security. Three Interactive Qualifying Projects demonstrate this.

The Regional Environmental Council: An Investigation of Socioeconomic and Environmental Injustices

Students: Brittany Dicapua, Amanda Houy-ou, Kristen Schleier, Katie Wright; Advisor: Chickery Kasouf

Environmental and socioeconomic injustice is the unequal distribution of environmental hazards and social concerns based on race and income respectively. This project partnered with the Regional Environmental Council, a local non-profit organization in Worcester to identify social concerns including criminal activity, environmental hazards, and building abandonment, and map incidents of each in low-income and high-income neighborhoods. The goal of this project was to prove and document both socioeconomic and environmental injustice existing in lower income communities of Worcester.

Rooftop Gardens for Sustainable Livelihoods in Cape Town

Students: Paige Archinal, Laura Kowalczyk, Jefferson Lee, Ronald Sherrod; Advisors: Scott Jiusto, Robert Hersh

High rates of unemployment afflict Cape Town, especially in the informal settlements surrounding the city. This project developed a proposal for a rooftop gardening program in the hopes of promoting job creation, entrepreneurship, and local food production. Through GIS mapping, market research, and cost and revenue calculations, this project developed a program to implement rooftop gardens in the Central Business District of Cape Town.

Empowering the Women's Cooperative of Ban Pang Ung Mhai through the Competitive Marketing of Crafts

Students: Adrienne Lysen, Bryan Belliard, Courtney Langley, Mary Long; Thai Students: Chuchai Jittaviroj, Sarunporn Thanasuwanditee, Satipaj Saivat; Advisor: Seth Tuler

The goal of this project was to work with the Raks Thai Foundation to assist a Hmong women's craft cooperative in Northern Thailand to establish profitable business. With a focus on women's empowerment, methods of participatory action research were utilized to help women develop business skills and promotional tools. Recommendations aimed at enabling women to maintain success on their own in the future and encouraging the Raks Thai Foundation to support other communities were proposed.

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