



# Sustainability

campus sustainability report 2012



WPI

# Table of Contents

- Sustainability Reporting** ..... 3
- The WPI Campus Sustainability Plan**..... 4
  - Accomplishments & Goals ..... 5
- Academics** ..... 6
  - Course Work ..... 7
  - Projects..... 8
  - Research ..... 9
- The WPI Community** ..... 10
  - Student Impact ..... 11
  - Engagement ..... 12
- Campus Impact**..... 13
  - Facilities & Grounds ..... 14
  - Energy ..... 15
  - Greenhouse Gases ..... 16
  - Transportation..... 17
  - Water..... 18
  - Food ..... 19
  - Waste & Recycling ..... 20
- Participation**..... 22

## A Message from President Berkey

The President’s Task Force on Sustainability, now in its fifth year, has achieved an impressive list of accomplishments since its inception, and this past year was no exception. This is the third annual report that WPI has published on its sustainability efforts, and in these pages you’ll find the comprehensive approach that the Institute has undertaken, as well as the many accomplishments achieved this year.

Our track record of success has been notable, ranging from important policy recommendations to electric vehicle charging stations to eight new academic courses focusing upon sustainability to our new Sports and Recreation Center, which deploys cutting-edge sustainable thinking and design throughout many of its most important features.

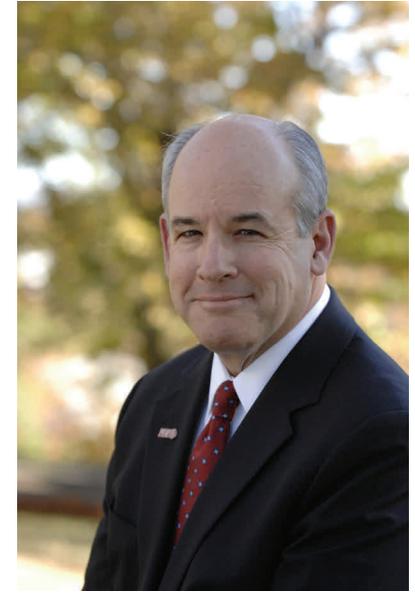
This annual report also shows the broad involvement of our students, faculty, and staff regarding sustainability, ensuring a deep and meaningful commitment on behalf of the WPI community. I am

especially proud to share that WPI has been careful to address all three aspects of sustainability—environmental, economic, and societal—in both its planning and implementation.

This commitment is reflected in the process for developing a comprehensive WPI Plan for Sustainability. This effort was launched in March of 2012 and represents a two-year strategic initiative led by the President’s Task Force, with additional support from four campus working groups. This process will identify our next round of short- and long-term sustainability goals, and the action steps needed to achieve them. This vital work will touch every department and every segment of our campus community. The recommendations resulting from the Campus Plan for Sustainability will guide WPI’s sustainability efforts for many years to come.

I am proud to be part of a campus community that places such a high value on sustainability, and the critically important benefits that such efforts bring to our campus, our community, and the city of Worcester.

Dennis Berkey  
President



# Sustainability Reporting



## Sustainability at WPI

Since its establishment in 2007, the President's Task Force on Sustainability has coordinated WPI's campus-wide efforts to assure long-term sustainability in WPI's academic, research, and facilities-related activities in support of the educational mission. The Task Force endeavors to lead the campus community toward a broader understanding of the meaning of sustainability, both on campus and across the globe.

The Task Force espouses the three-part definition of sustainability put forth in *Our Common Future*, the culminating report of the United Nation's Brundtland Commission in 1987. This definition encompasses the goals of environmental protection, social equity, and economic security for all. WPI is proudly engaged in each of these critical areas in its teaching, learning, research, administration, and operations. WPI is a community, and the Task Force actively seeks to assist that community in producing innovative ideas and practical solutions to the complex problems associated with each component of sustainability.

For more information about the President's Task Force on Sustainability and sustainability at WPI, please visit [www.wpi.edu/+sustainability](http://www.wpi.edu/+sustainability).

## This Report

This Sustainability Report addresses Academic Year 2011-12 and represents WPI's third such annual report. To track progress, **indicators** have been chosen to represent the university's performance in specific areas, such as energy use and water use. As WPI's efforts in sustainability continue to grow, additional indicators will be added and tracked. By presenting information in the form of a series of quantitative indicators, the Institute can visualize the data and trends, and make appropriate operational and policy decisions. By presenting the accomplishments that have been made and highlighting areas in need of improvement, this report serves as motivation for improvement and insight into new directions of sustainable development.

Not all components of sustainable development can be quantified or illustrated graphically; these results are nonetheless summarized in this report. This report focuses primarily on three major areas: academics, community, and campus impact. The **Academics** section focuses on sustainability in curriculum and research at WPI. The **Community** section examines WPI's impact on its local and global communities. The **Campus Impact** section deals with the global impact of the physical campus, in resource use and greenhouse gas emissions.

This report was written by Ryan Pollin, Class of 2014.

# The WPI Campus Sustainability Plan

## The First Steps

To establish the most effective path for advancing sustainability, the President's Task Force on Sustainability has initiated the development of a WPI Campus Sustainability Plan.

On March 21, 2012, the Sustainability Planning Kickoff began the two-year strategic planning process with the expected outcomes, including an in-depth catalog of sustainable activity currently on campus, short-term and long-term goals, and specific action steps to achieve them. The outcomes of this planning process will shape the direction of the university for the coming decade.



[wpi.edu/+sustainability](http://wpi.edu/+sustainability)



It is too early in the planning process to report any successes. Expect great strides in the sustainable development of all aspects of the campus in the coming years.

## Broad Scope, Deep Impact

The Task Force and four working groups are leading a two-phased planning process over the next two years to catalog current sustainability efforts, set goals, and implement new policies and practices of sustainability on campus. The project solicits input from students, faculty, staff, and alumni in four working areas:

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

This plan is not analogous to a Climate Action Plan, which tackles only greenhouse gas reductions, but a broader approach to sustainability that encompasses all three aspects of sustainability: environmental protection, social equity, and economic security.

# Accomplishments & Goals



The Princeton Review's  
**GUIDE TO 322  
GREEN COLLEGES**

Presented in partnership with the U.S. Green Building Council



## Distinction

Worcester Polytechnic Institute has received national distinction in sustainability from three of the most widely respected agencies in the field. The 2011 College Sustainability Report Card from the Sustainable Endowments Institute rated WPI with an **A-**, only eight schools received a higher grade. The Princeton Review featured WPI as one of the **Nation's Greenest Colleges of 2012**. The Sierra Club's 2011 Coolest Schools report ranked WPI as **64th nationwide**.

## Keeping Promises, Meeting Goals

Through the development of the Campus Sustainability Plan, WPI has the opportunity to address operational, cultural, and academic goals. A number of goals set by the 2011 Sustainability Report have been achieved:

- Sustainability course work has been well collected and will be made available to students for course selection.
- Eleven buildings had electrical sub-metering retrofits commissioned during the summer of 2012. Data from this will be an effective baseline to track improvements.
- Better reporting structures for community service have improved awareness of the breadth of WPI students' community impact.
- The Energy Task Force established academic goals.
- A waste audit has been conducted.



## New Vision of Sustainability

*"WPI will demonstrate a commitment to improving the quality of life for current and future generations. 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 work to advance the three pillars of sustainability – environmental preservation, economic prosperity, and social equity – in keeping with our institutional goal to develop in all community members a deep appreciation of the interrelationships among basic knowledge, technological advances, and human need."*

-President's Task Force on Sustainability, preliminary Vision for the WPI Campus Sustainability Plan

# Academics

There is a steady growth of sustainability topics in all corners of the WPI curriculum, from student project work around the globe, to advanced graduate courses and leading-edge research. The theoretical and practical learning at WPI are critical to building a stable global future; today's labs are the incubators of tomorrow's green innovations. This section highlights WPI's integration of sustainability into institutional academic learning goals.



## Fostering New Leadership

As a technical institution, WPI is responsible for educating future scientists and engineers to become leaders in their workplaces and communities. This mandates instilling an inherent consideration of sustainable impacts to personal and professional decision-making. The environmental, social, and economic impact of technocratic decisions are the most important component to the success of sustainability in a society. In this sense, it is imperative to the success of society that WPI students embody and elevate the institution's Mission, "to create, to discover, and to convey knowledge at the frontiers of academic inquiry for the betterment of society."

## The WPI Mission

WPI educates talented men and women in engineering, science, management, and 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.



# Academics: Course Work

## New Sustainability Courses

WPI added these sustainability courses for Academic Year 2012-13:

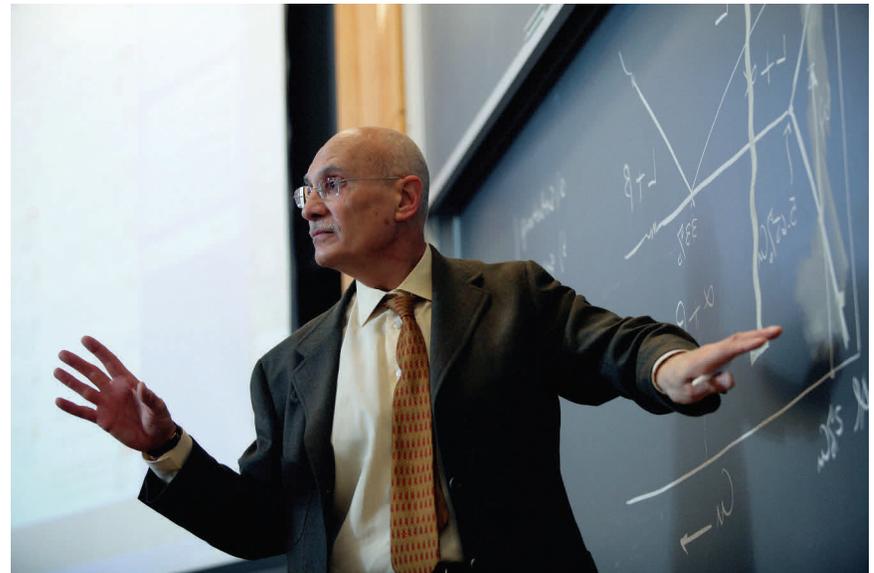
- ENV 150X Introduction to Geographical Information Systems
- ENV 210X Ethical Roots of Environmental Policy
- ENV 230X Environmental Governance, Technology, and Innovation
- SOC 124X Introduction to Comparative Sociology & Globalization
- AREN 2023 Introduction to Architectural Engineering Systems
- AREN 3001 Architectural Graphics and Communication
- BB4150 Environmental Change: Problems & Approaches
- ECE 250X Introduction to Contemporary Electric Power Systems



## Course Offerings

The Environmental and Sustainability Studies program is home to sustainability in the WPI curriculum. The program offers majors and minors, and recognizes sustainability course work from an array of other departments, making its incorporation as a second degree very practical. WPI also introduced the first Architectural Engineering degree program in New England, which intrinsically revolves around green construction and sustainable design. Civil & Environmental Engineering, Social Science & Policy Studies, Humanities & Arts, and Biology & Biotechnology all support a variety of sustainability course work at WPI.

A review of the WPI undergraduate course catalog identified **70 courses** that apply to sustainability. Many of these courses tackle growing technological problems, such as water quality management or energy production, which are critical to sustainable development. By the widely used definitions of the Association for the Advancement of Sustainability in Higher Education (AASHE), there are 32 sustainability-*focused* courses and 38 sustainability-*related* courses.



# Academics: Projects

## Theory and Practice

The WPI motto “Lehr und Kunst,” or theory and practice, translates to an innovative project-based curriculum. Three project components of a WPI undergraduate career give repeated exposure to social and technical sustainability problem solving on campus and in 32 communities around the world. **Fourteen such communities**, Bangkok, Cape Town, Copenhagen, Costa Rica, Hong Kong, London, Melbourne, Namibia, Panama City, Puerto Rico, Stantec, Venice, Wellington, and Worcester, offer sustainability projects.

The first year Great Problems Seminar project series is an optional but popular choice. Titles like “Feed the World,” “The World’s Water,” and “Power the World,” exemplify students’ eagerness to dig in to global sustainability challenges.

The Interactive Qualifying Project (IQP) sees students devote a full term to community building through examining the impact of technology on people, making it particularly suited to address sustainability. The Major Qualifying Project (MQP) is discipline specific, which leads to meaningful solutions to technical challenges. Throughout this report, IQPs and MQPs will be showcased as a testament to the academic integration of sustainability.



## Sustainable Solutions from Students

Each year, five IQPs that exemplify the goals of the program in their focus on the relation between science, technology, and societal needs are nominated for the WPI President’s IQP award. This year, **all five projects** were sustainability-focused:

- ***Improving Water Quality and Sanitation in Rural Namibian Communities*** by Valerie Boutin, Caitlin Butler, Samuel Kesseli, Mary Clare McCorry; advised by Ulrike Brisson, Ingrid Shockey. (1st place)
- ***Measurement and Analysis of Walkability in Hong Kong*** by Michael Audi, Kathryn Byorkman, Alison Couture, and Suzanne Najem; advised by Zhikun Hou and Robert Kinicki.
- ***Initiation Site Development in Khayelitsha, Cape Town: Addressing the Challenges of Urban Initiation While Preserving Tradition and Culture*** by Qiu Chen, Luis Quiroga, Matthew Connolly, Andrew Stewart; advised by Robert Hersh and Scott Justo.
- ***Water Resources Development in Isaan, Thailand: The Social Case for Ban Thad*** by Daniel Bjorge, Jessica Booth, Katrina Crocker, David Warfel; advised by Jennifer deWinter and Paul Davis.
- ***Strengthening Spaza Shops in Monwabisi Park*** by Likuvi Chebelyon-Dalizu, Zack Garbowitz, Alexandra Hause, Devin Thomas; advised by Robert Hersh and Scott Justo.

# Academics: Research



WPI Faculty engage in a wide range of research and scholarship, a notable portion of which pertains to sustainability. Chemical Engineering, the Civil & Environmental Engineering, Mechanical Engineering, Biology & Biotechnology, Electrical & Computer Engineering, Social Science & Policy departments, and the Interdisciplinary & Global Studies Division are all involved in sustainability-related research:

- WPI Fuel Cell Center
- Infrastructure and building design
- Water and wastewater management
- Water quality protection
- Power generating kites
- Energy storage systems
- Hydraulic hybrid engine
- Biofuels and bioremediation applications
- Economic, political science, and system dynamics models of energy
- Sustainable economic development
- Climate change strategies and resource management
- Urban knowledge infrastructure and experiential education

## Faculty Leadership

- Yan Wang's flow battery innovations improved energy density tenfold, earning him the Catalyst Award from the Massachusetts Clean Energy Center for smart grid technology innovation.
- Robert Krueger, international figure in sustainability, addressed European Commission's Conference on Regions and Cities, pictured below. His new book, *Trickle Down Sustainability? The Politics of Smart Growth*, is based on urban development research with WPI student Linnea Palmer Paton.
- Diana Lados is conducting ground breaking studies on crack propagation in lightweight metals, dictating the future of lighter, more efficient transportation. Her research led to the prestigious National Science Foundation CAREER Award.
- Advanced membrane research in the Fuel Cell Center, led by Yi Hua Ma and Ravindra Datta, is leading to viable fuel cell production.



# The WPI Community

The WPI student body has some outstanding student organizations that are generating sustainable change on and off campus. Students hold the immense task of generating culture change and new lifestyle practices that support sustainable living; their role in campus change is paramount. Beyond a core of organizations leading sustainability, myriad Greek chapters, official student organizations, and all work-study student employees participate in community engagement. Community engagement through service and interaction produces mutually beneficial relationships.

## Active Community Membership

Sustainability at WPI includes promoting equality in a just society. By interacting with the WPI community in a positive way, the university improves the lives of students and local residents in Worcester. Projects and research lead students and staff to integrate with the Worcester community, as well as the 32 Global Perspective Program Project Center communities. Students, faculty, and staff are actively engaged in community service and philanthropy in the area to help those in need.

Worcester is a city long past its post-industrial woes: it is burgeoning into a renaissance era. This new growth offers a great opportunity to reestablish the city as the vibrant center of New England. WPI, along with the other 11 members of the Colleges of Worcester Consortium, are aiding in the revitalization of the city through primary education programs like Camp Reach or Frontiers, small business incubation centers, like the Institute for Energy & Sustainability, and strong adult education for advancing the community work force, like the WPI Corporate and Profession Education program.



# The WPI Community: Student Impact

## WPI Student Green Team

The WPI Student Green Team is an organization that aims to increase sustainable efforts and awareness on campus. The Green Team jump-starts every year by inviting students, faculty, and staff to sign a sustainability pledge. Along with various awareness campaigns each semester, the organization engages in sustainable projects which have included WPI's first waste audit and an e-waste drive. The Green Carnival, an annual event held at the end of the year, mixes interactive games and trivia to get the WPI campus community involved in sustainability. The Student Green Team is open to new ideas and projects and strives to be a leading sustainability group on the WPI campus.

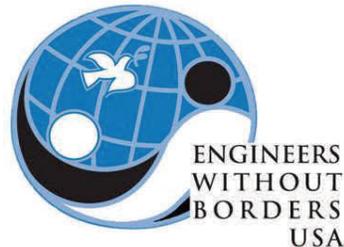
Contact: [studentgreenteam@wpi.edu](mailto:studentgreenteam@wpi.edu)



## Engineers Without Borders

Engineers Without Borders-WPI is one of the many student chapters of EWB-USA. Each chapter of EWB-USA partners with a community to improve the community's quality of life. Typically this is achieved through implementation of environmentally friendly and economically sustainable engineering projects with a focus on community involvement. The WPI chapter is partnering with the community of Guachtu'uq to help them develop a year round supply of safe drinking water as well as develop an improved wood stove design so smoke inhalation is reduced. Through hard work during the school year and on location trips, WPI students are given the opportunity to work with real world engineering projects.

Contact: [ewb-execs@wpi.edu](mailto:ewb-execs@wpi.edu)



## Students for a Just and Stable Future

Students for a Just and Stable Future (SJSF) is a statewide student initiative to promote sustainable practices and environmental awareness. SJSF actively works against the instigators of global climate change and social injustice through various means of non-violent direct action, political activism, and grassroots movement. Over the past year, SJSF at WPI has been involved in a number of initiatives, including

- Sustainability Alliance: an environmentally conscious network of students, alumni, and faculty
- WPI Green Fund for sustainability and energy efficiency projects on campus.
- Climate Change Art Show, art by blacklisted activist Franke James

Contact: [sjsfexecs@wpi.edu](mailto:sjsfexecs@wpi.edu)



## Global Humanitarian Alliance

Global Humanitarian Alliance (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 on issues regarding global poverty and related topics. The major campus outreach event this year was WISH, a Week of Inspiration, Service and Hope. The culturally enlightening event featured local organizations. GHA hopes to expand its cultural outreach and continue to make a difference both close to home and across the world.

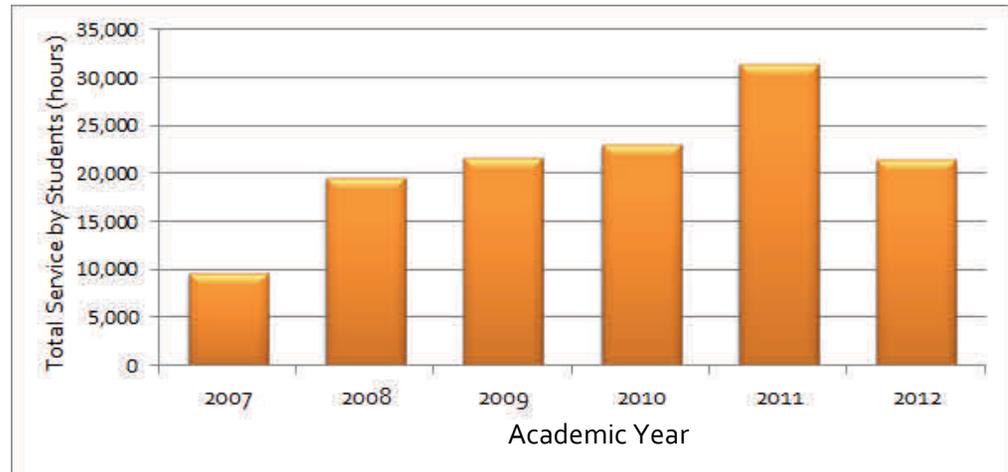
Contact: [ghaofficers@wpi.edu](mailto:ghaofficers@wpi.edu)



# The WPI Community: Engagement

## Local and International Community Membership

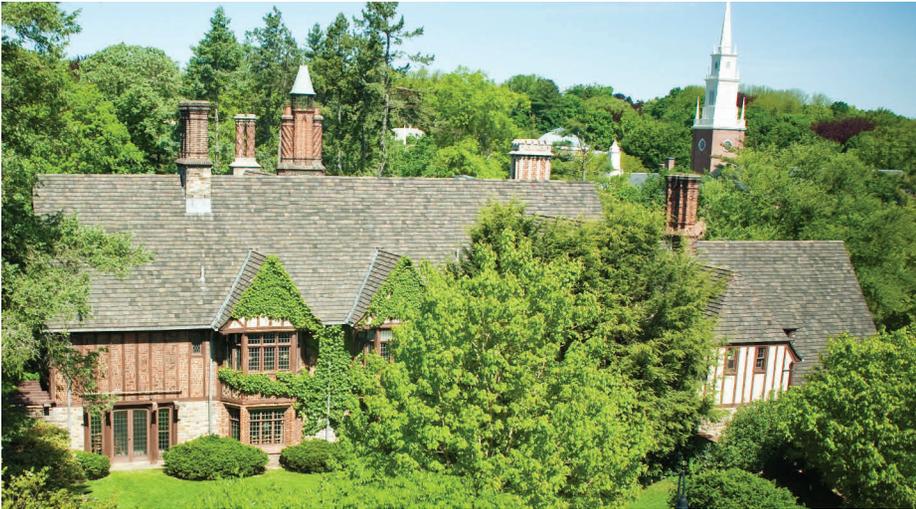
Many WPI groups actively participate in community service both locally and internationally. Groups such as Habitat for Humanity and Alpha Phi Omega help those in need in the immediate community. Other groups, such as Amnesty International, Relay for Life, and Invisible Children deal with international issues. Organizations like the Gay-Straight Alliance and Active Minds focus on issues of personal development and social justice, crucial components of a healthy community. The benefit of sending over 60% of WPI students to global communities is invaluable for teaching practical community cooperation in the context of societal problem solving. Through volunteer service and direct interaction of project teams with communities all over the world, WPI has a track record of outstanding partnership.



## Student Projects

- **The Implications of Globalization on the Sustainability of Society**, IQP by Patrick Cardone, Monique Cote, Haley Gustafson, Patrick Kearney, Joseph Worthy, advised by David Dollenmayer. This study examines the societal interdependencies that are impacted by globalization. Educational methods, new communications developments, and restructured economic policies are needed to maintain global resources. It was determined that globalization is inevitable, its factors are fragile and dynamic, and the extent of its growth is finite.
- **Where Has Urban Sustainability Gone? The Affordable Housing Gap in Smart Growth Development in the U.S.** MQP by Linnea Palmer Paton, advised by Robert Krueger. This research uses affordable housing as a metric for analyzing "smart growth" mixed use property developments. The lack of affordable housing in these complexes suggests that these "sustainable" growth districts may not fully encompass social sustainability.
- **Comparative Aspirations Study on Worcester Secondary Schools**, IQP by Devin Thayer, Nadia Zahid, advised by John Wilkes. This project focused on career aspirations studies conducted among 8th and 11th graders in Worcester schools to determine the race and gender disparity of aspiring career paths. Medicine, business, and law were likely to achieve gender equality first, over technology and politics.

# Campus Impact



## The WPI Campus

Teaching sustainability without a sustainable campus is a little like learning to swim without water. With almost 5,000 people bustling about every day, the WPI campus uses a lot of energy. The campus incurs heating, electricity, lighting, food, water, transportation, construction and renovation, grounds keeping and maintenance, and waste. All these add to the carbon footprint of the institution, impact the local environment, and contribute to global climate change.

WPI tracks its consumption of water, electricity, heating fuels, and waste produced, and publishes its greenhouse gas emissions in the annual Massachusetts Department of Environmental Protection Greenhouse Gas Report. WPI is working on reducing its environmental impact in these areas in the midst of population expansion and building construction.

## Essential Data AY2011-12

### Students

- 3747 full time equivalent undergraduates FTE (3681 full-time, 168 part-time)
- 1096 graduate students FTE (615 full-time, 1259 part-time)
- 21 Graduate certificate students (55 part-time)
- 4864 total students FTE

### Faculty & Staff

- 425 faculty (279 full-time, 117 part-time)
- 943 total employees

### Facilities

- 97-acre campus
- 72 buildings
- 11 residence halls
- 2.0 million square feet of building space
- 120,000 square feet of LEED certifiable building space (6% of total)

*“WPI is moving from a period of growth to a period of sustainability.”*

-Dennis Berkey, President



# Campus Impact: Facilities & Grounds



## Environmentally Conscious Growth

Construction, renovation, and grounds management all impact the local environment. The campus has seen 16 major building renovations; Goddard Hall, Alden Memorial, and the Project Center have recently seen changes that improve climate control, efficiency, and insulation. Reducing the buildings' total impact is an ongoing process, and continues to show benefits in energy usage data. Construction waste averages about four pounds per square foot, so at WPI proper construction material recycling is stressed. In a recent Goddard Hall renovation, 94% of waste was diverted from landfills. During East Hall construction, 93.4% of waste was diverted.

The burgeoning **Gateway campus is a nationally recognized and award-winning project**, it has been recognized by the U.S. Department of Commerce for its urban economic development and the revitalization of one of Worcester's most poorly utilized neighborhoods. The anchor for the first Massachusetts Growth District, Gateway Park is a thriving example of accessible, sustainable urban development. Its final vision includes four mixed-ownership research buildings and a residence hall, among storefront shops and housing.



## Green Grass

WPI groundskeeping practices place emphasis on local, organic maintenance; **87% of grounds is controlled organically**, and current planting practices focus on low-water impact, native planting. These plants are well adapted to Worcester's precipitation patterns and local pests, so pest control and irrigation are minimal. All groundskeeping waste is composted.

# Campus Impact: Energy

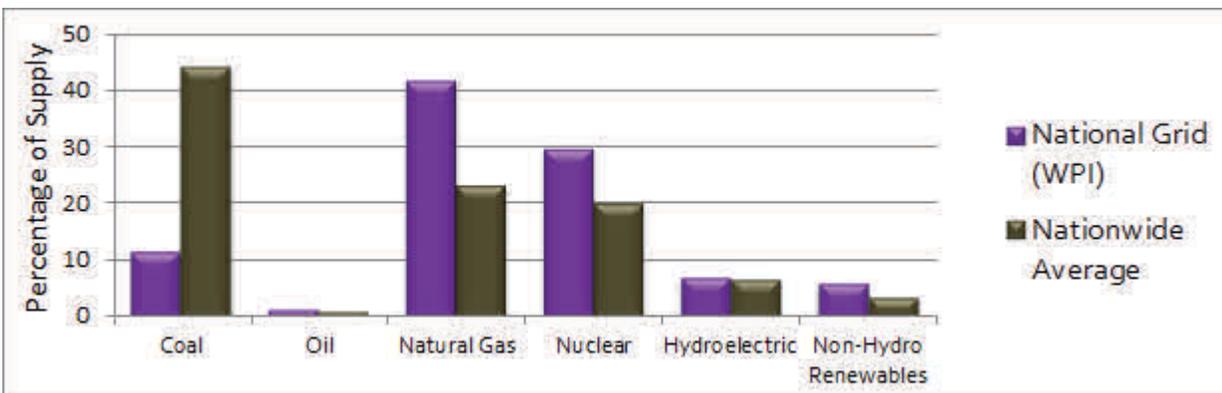
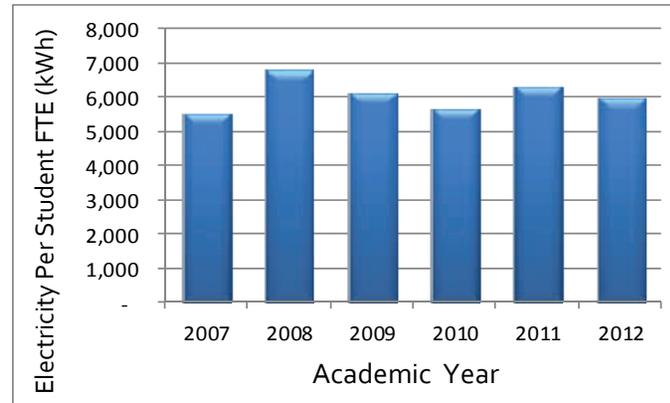
## Tough Choices on Energy Needs

The WPI campus rests in the heart of New England, so from November through March the campus needs heating. WPI has more computers than students on campus and a host of complex lab equipment, so electricity needs are demanding. Many students have done research projects on renewable energy sources for WPI, such as wind collection or solar capacity studies. The campus is pursuing reductions in energy use as the primary strategy for minimizing greenhouse gas impact. However, the blue graph shows that our energy use per student has been steady with student growth.

Aside from a few off-grid, solar-powered street lamps, WPI gets all of its electricity from National Grid, a leading energy supplier in Massachusetts, **the most energy-efficient state in the nation**. Below in purple is the “power profile” of National Grid’s

energy sources compared to the national averages in brown. National Grid is on the cleaner side of nearly every source. (The further to the right, the cleaner the energy).

WPI is a member of a volunteer power-shedding agreement with EnerNOC, which serves to control grid stress by shutting down systems during periods of high peak demand. This saves the New England power grid from brownouts and blackouts.



## The Power House

WPI’s Power House provides heat to the main campus from October to April. In 2006, the Power House switched its fuel source from #2 oil (diesel) to natural gas, achieving significant cost and environmental benefits. **Less than 1% of campus heating now comes from oil.**

# Campus Impact: Greenhouse Gases



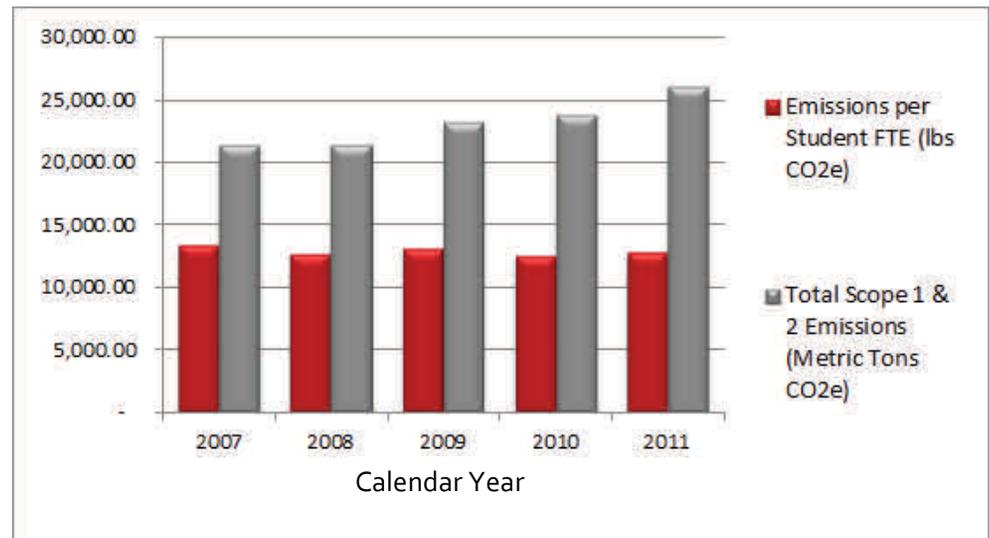
## Carbon Tracking

Greenhouse gasses (GHGs) are pollutants emitted in the burning of fossil fuels for heat and electricity needs. By tracking energy usage on campus, Scope 1 and 2 emissions can be tracked (Scope 1 is directly emitted GHGs from burning fuel, Scope 2 is from energy produced elsewhere for use on campus). GHG emissions could be lowered with efficiency improvements or increases in renewable energy generation.

The Clean Air Cool Planet Carbon Calculator was used to supplement Massachusetts Department of Environmental Protection Source Registration and Greenhouse Gas Reports. Scope 1 and 2 emissions are catalogued and presented at the right. Campus growth is clearly reflected in GHG increases of about 5% per year, despite a per capita decrease of about 1% per year.

## Student Projects

- **Analyzing an Energy Reduction Policy at WPI, IQP** by Jeffrey Baker, Christin Grygorcewicz; advised by Brian Savilonis. This project analyzed the effectiveness of emissions and energy usage reduction policies at universities with the goal of encouraging WPI to enact a policy of its own. The group's findings helped formulate an outline for a feasible emissions reduction policy at WPI.
- **Tracking and Reducing Greenhouse Gases at WPI, IQP** by Adam Haines, Timothy Lawton, Brandon Steacy, advised by Scott Jiusto. This report explored the carbon emissions directly produced from on-campus activities. This inventory of emissions will inform several possible reduction strategies, and will serve as a precedent for annual inventory.
- **Conserving Energy through Fuel Poverty Mapping in Worcester, MA, MQP** by Nicholas Amendolare, advised by Robert Krueger. The goal of the project was to develop a method for mapping fuel poverty across a region. The model used the Multivariate Gaussian model to predict fuel poverty, and was trained with data from 167 block groups in Worcester.



# Campus Impact: Transportation



## Go Anywhere

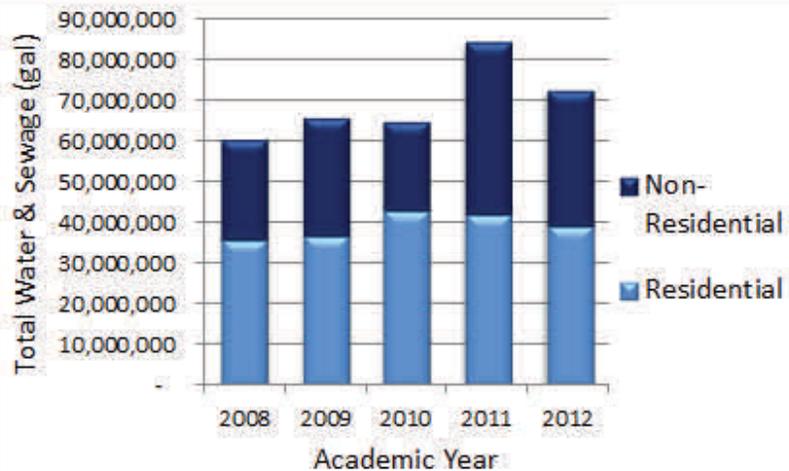
The vast majority of the WPI Campus is made up of adjacent properties so walking is the primary mode of transportation on campus. From end to end it takes 15 minutes between any two places on campus. The new athletics area parking garage, opening January 2013, will allow many cars and roadways to be removed from within the campus, further enhancing walkability and green spaces. The Gateway Shuttle manages on-campus travel to and from the Gateway parking garage. Public transportation is encouraged via the Worcester Regional Transportation Authority and Union Train Station. WPI offers the WooBus to circulate students between 5 local universities and the major city centers. The WPI SNAP vans provide safe transportation to all locations within one mile of campus plus Union Station on nights and weekends. Occasional trips are suited for Zipcar rentals or the community carpooling network, Carpool World. For those who do drive personal cars, **WPI accommodates plug-in electric vehicles** with two plug-in stations and further station expansion in the new parking garage.

## Student Projects

- **Worcester's Role in the Reduction of Greenhouse Gas Emissions**, IQP by Lindsey Roberts, Michael Raineri, Baran Ozden, Danielle Kane; advised by James Demetry and Isa Bar-On. The goal of this project was to make policy recommendations to the city of Worcester to reduce vehicular greenhouse gas emissions. Downsizing municipal fleets, alternative fuels, trip reduction programs, and public education were among the recommendations.
- **Measurement and Analysis of Walkability in Hong Kong**, IQP by Michael Audi, Kathryn Byorkman, Alison Couture, Suzanne Najem; advised by Zhikun Hou and Robert Kinicki. The project surveyed 16 waterfront districts, assessing their walkability using a tool created by the research team and conducted preference surveys to understand the perception of Hong Kong pedestrians. Safety, length, crowdedness, ease of navigation, and amenities were values recommended for improvement of pedestrian access of Hong Kong's Victoria Harbor.
- **Sustainability and Transportation at WPI**, IQP by Emmanuel Akese, Steven Ellis, Shubhneet Sandu, Neda Zahid; advised by Matt Ward. This project looked at how the WPI community can reduce its carbon footprint by driving less. Driving habits were surveyed and the comprehensive cost, including emissions impact, were calculated to demonstrate a need to reduce vehicular carbon emissions.



# Campus Impact: Water



## Water Sourcing

WPI purchases water from the City of Worcester, which has 10 reservoirs around the city. Water usage calculations include academic and residential halls as both incoming domestic water, and flushed sewage use. 54% of water and sewage use is from residential properties. The new sports and recreation center, set to open summer of 2012 boasts rain water collection cisterns that cycles rain runoff into the HVAC system as coolant, **which will save an estimated 800,000 gallons of water every year.** The graph on the left shows steady residential water use, and opportunity for savings elsewhere.



## Student Projects

- **Sustainable Landscape Design: A Rain Garden on the WPI Campus**, IQP by Jenine Knibb, Daniel Mello, Emmanuel Michaelidis, Nikole Stone, advised by Robert Krueger and Jennifer deWinter. Flooding and water pollution, and their associated property and environmental damage, can be avoided with use of a rain garden. Stormwater runoff is mitigated while improving the well-being of the community.
- **Climate Change Adaptation Planning for Massachusetts Drinking Water and Wastewater Utilities**, IQP by Adrian Catarius, John Flannagan, Saul Garcia, and Matthew Weisman; advised by Richard Vaz and Chrysanthe Demetry. This project focused on how MassDEP can provide assistance to water utilities for adapting to climate change effects such as sea-level rise, increases in storm intensity, and rising temperatures.
- **Low-tech Water Treatment Facility**, MQP by Meshal Alasfour, Charles Caisse, Jonathan Wong; advised by Simon Evans and Isa Bar-On. A low-tech, economical, and sustainable treatment system for the purpose of removing petroleum hydrocarbons from polluted water is necessary to reduce disease and promote continued livelihood of indigenous people in the northeastern region of Ecuador.

## Low-flow, High Performance

Water is the most precious resource on the planet, and so its use must be respected appropriately. While commodity pricing is not at objectionable levels like some combustion fuels, it is the perfect time to set up frugal water use systems before it threatens economic security. WPI implements water conservation methods, such as low-flow faucets, toilets, and showers, and exclusively purchasing energy star water appliances. With water sub-metering available in each building, conservation will become an emphasis in Residential Life programming.

# Campus Impact: Food



## Practicing What They Preach

Chartwells showcases not only sustainably sourced food, as described at the right, but sustainability in their dining services. Trayless dining means an estimated **120,000 gallons of water saved** in the wash room. Trim Trax, a waste stream auditing for service kitchens, has proven to minimize trimming scraps and waste in food prep. A post-consumer program, Project Clean Plate, began at WPI and became the Chartwells national model. **All pre-consumer and post-consumer food waste is composted** by local farmers. Extra food from events is given to a local veterans shelter. Paper, plastic, and styrofoam containers and dinnerware have been replaced with recyclable or compostable options. Chartwells also holds farmers' market days on campus.

## Food for Thought

Dining services on the WPI campus is managed by Chartwells Dining Services. Morgan Dining Hall, the Campus Center Food Court, Outtakes, and the Goat's Head Restaurant make up the available locations. Chartwells management is very proactive in its sustainable practices. Here are some of their dining policies:

- Vegan main dish with two sides available on campus twice a day, seven days a week.
- Humane Farm Animal Care (HFAC)-approved cage-free eggs.
- Environmental Defense Fund partnership for hormone-free poultry.
- Socially and ecologically certified coffee through Pura Vida growers in Guatemala.
- Monterey Bay Aquarium's Seafood Watch sustainable seafood choices for responsibly farmed, local seafood.
- Milk products free of artificial bovine growth hormones (rBGH/rBST).
- 27% of food budget from local foods (within 150 miles of campus), advised by the Institute for Agricultural Trade.

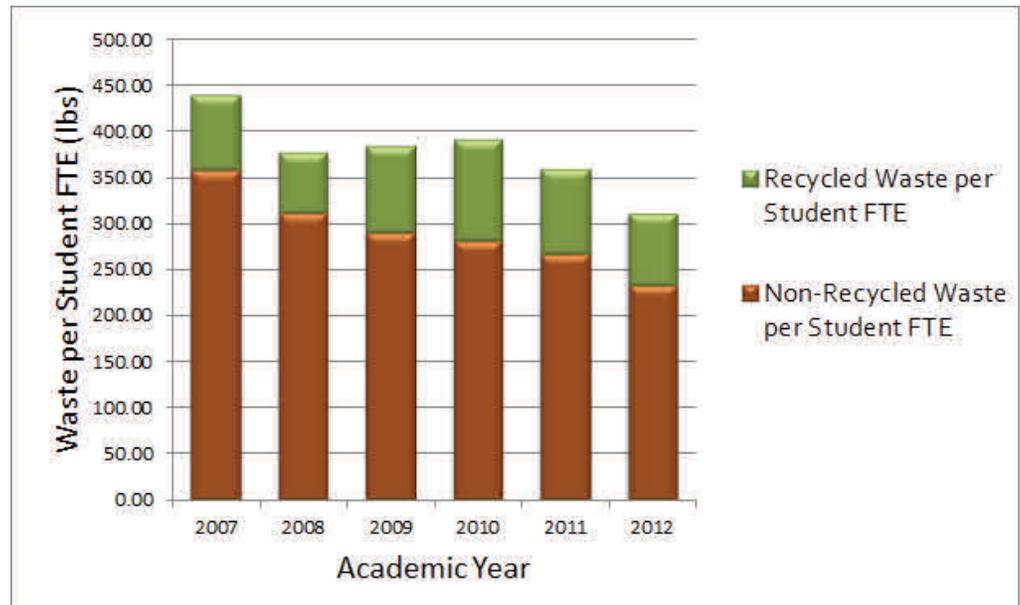


# Campus Impact: Waste

## A Cleaner Campus

WPI's students and staff are aware that proper disposal of trash, recyclables, and hazardous waste is a powerful way to reduce impact on the environment. **100% of WPI's waste is diverted from landfills**, either through recycling or a nearby waste-to-energy incinerator. The community is actively seeking ways to reduce waste and to increase recycling through campus-wide initiatives. The graph to the right shows a steady decrease in waste per student, and a relatively steady recycling rate of about 25%. While the six-year period shows an average decline of about 5.7% per year in total waste per student, the recycling rate remains disappointingly far below the national average.

The campus won recognition in a nation-wide college recycling competition, RecycleMania, for having the greatest improvement between weeks of reporting. PREcycleMania, a campus-wide recycling competition, offers incentives for behavior-changing recycling efforts.

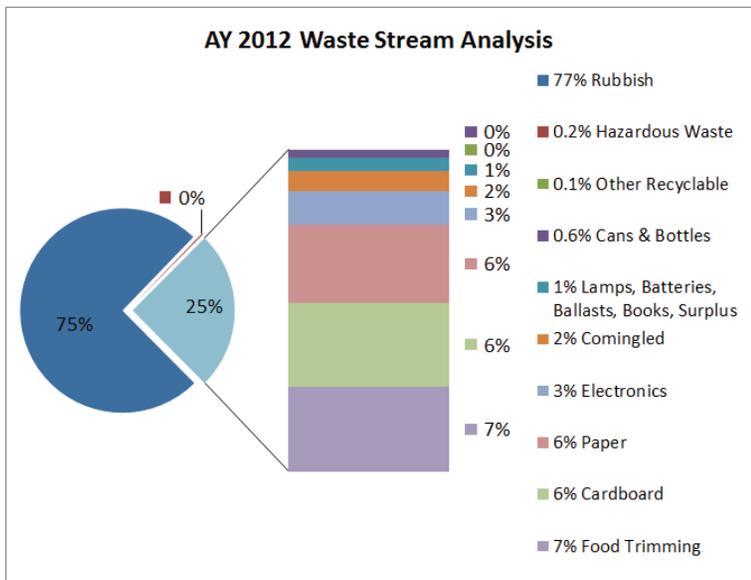


## Waste Minimizing Protocols

The WPI community is working hard to decrease waste on campus. Increased recycling initiatives and improving community understanding of the recycling guidelines have improved campus performance. The best way to minimize waste is to prevent products from being used in the first place. WPI Undergraduate Admissions and Graduate Admissions has gone paperless, avoiding many thousands of pages of application materials. All classes at WPI are required to post course information and syllabus material online, and many professors adopt online assignments.

While the campus-wide recycling rate dipped this year, the amount of waste per student is steadily decreasing. WPI expects this trend to continue as waste handling procedures continue to be improved.

# Campus Impact: Waste



New procedures with cans and bottles recycling led to as much as 60% of material being recycled before weighing. Therefore, the true recycling rate is knowingly understated at 25%.

## Get Dirty to Get Clean

Last fall, the WPI Green Team championed the first campus waste audit. Set up on the campus quadrangle, one day's trash from a handful of buildings was laid out bag by bag. Trash was analyzed for its adherence to campus waste and recycling protocols. When tallied up, everyone clearly saw (and smelled) how much improvement there is to be made in the waste stream. This pilot audit program cuts to the heart of campus recycling habits, and revealed some 10-30% of disposed trash could have been recycled. Residential buildings need the most attention, but with better waste education and receptacle placement, improvement is sure to follow.

## Student Projects

- A Feasibility Study of a Biodiesel Plant in Cartago, Costa Rica**, IQP by David Alspaugh, Gabriel Lyon, Katelyn Tolbert, Xuanya Zhang; advised by James Dempsey and Jeanine Skorinko. Industrial waste oil currently polluting the Reventazon River would be diverted to a biodiesel plant and resold to the community as fuel. After social, economic and environmental studies, the proposal was deemed beneficial for all parties.
- Revitalizing Recycling in Denmark**, IQP by Celena Dopart, Stephanie Post, Erik Silva; advised by Fred Looft. Denmark is considered an international leader in environmentalism, but household recycling rates are significantly lower than the national mark. Psychological factors were assessed in context of an interactive recycling, and a program that focused on convenience, information, norms, and incentives was recommended to the Norrebro community recycling program.
- An Analysis of Local and National Recycling and Waste Disposal Policies**, IQP by Conor Rochford, Joe Thomas, Sidath Wijesooriya; advised by Satya Shivkumar. Local and national recycling and waste disposal policies were analyzed, and the Pay as You Throw program was recommended and adopted by the town of West Boylston. Mandatory recycling at multifamily dwellings and curbside composting were suggested practices for the city of Worcester.



# Participation

## Teamwork

Sustainability, by definition, is something that comes from the entire community, and is mutually beneficial for the entire community. As demonstrated in this Annual Report, there are a multitude of areas at WPI that pursue sustainability, but to achieve powerful change it must stand in solidarity. As such, the WPI sustainability team needs your help! Without public support of initiatives, or a vocal demand for change, there is no way it will happen. The stronger your voices, the more difference can be made.

As highlighted on page 4, WPI is beginning the huge undertaking of a far-reaching sustainability overhaul. That process needs volunteers, research, critique, and support. The working groups on focus areas are looking for students to ramp up their intensity and expand their capability. Reach out to the contacts at the right and make your idea come to fruition.



## Organizational Leaders

The President's Task Force on Sustainability:

- John Orr, Professor of ECE (Chairman), [orr@wpi.edu](mailto:orr@wpi.edu)
- Jeff Solomon, Executive VP/CFO, [solomon@wpi.edu](mailto:solomon@wpi.edu)
- Alfred DiMauro, Assistant VP for Facilities, [fred@wpi.edu](mailto:fred@wpi.edu)
- Janet Richardson, VP for Student Affairs, [jbrich@wpi.edu](mailto:jbrich@wpi.edu)
- Eileen Mell, Director of Public Relations, [ebmell@wpi.edu](mailto:ebmell@wpi.edu)
- Rick Sisson, Dean of Graduate Studies, [sission@wpi.edu](mailto:sission@wpi.edu)
- Liz Tomaszewski, Sustainability Coordinator, [ltomasz@wpi.edu](mailto:ltomasz@wpi.edu)
- Joe Kraskouskas, Dining Services Manager, [joe\\_k@wpi.edu](mailto:joe_k@wpi.edu)
- Linda Looft, Asst VP of Government & Communications, [lclooft@wpi.edu](mailto:lclooft@wpi.edu)
- Karen Oates, Dean of Arts & Sciences, Professor, [koates@wpi.edu](mailto:koates@wpi.edu)
- Rob Krueger, Director, Environmental & Sustainability Studies, [krueger@wpi.edu](mailto:krueger@wpi.edu)
- Fred Hart, Professor of CEE, [flhart@wpi.edu](mailto:flhart@wpi.edu)
- Paul Mathisen, Associate Professor of CEE, [mathisen@wpi.edu](mailto:mathisen@wpi.edu)
- Pam Weathers, Professor Biology & Biotechnology, [weathers@wpi.edu](mailto:weathers@wpi.edu)
- Casey Hayes, Student Government Association, [casey\\_hayes@wpi.edu](mailto:casey_hayes@wpi.edu)
- Kate Roosa, Student Green Team, [klroosa@wpi.edu](mailto:klroosa@wpi.edu)
- Ryan Pollin, Students for a Just and Stable Future, [rypollin@wpi.edu](mailto:rypollin@wpi.edu)

Sustainability Planning Working Group Chairpersons:

- Deborah Scott, Policy, [dscott@wpi.edu](mailto:dscott@wpi.edu)
- Judi Trainor, Policy, [jtrainor@wpi.edu](mailto:jtrainor@wpi.edu)
- Bill Spratt, Facilities & Operations, [wpspratt@wpi.edu](mailto:wpspratt@wpi.edu)
- Jon Bartelson, Facilities & Operations, [jonb@wpi.edu](mailto:jonb@wpi.edu)
- Rob Krueger, Academics, [krueger@wpi.edu](mailto:krueger@wpi.edu)
- Paul Mathisen, Academics, [mathisen@wpi.edu](mailto:mathisen@wpi.edu)
- Anne Ogilvie, Community Engagement, [atogilvie@wpi.edu](mailto:atogilvie@wpi.edu)
- Christine Girouard, Community Engagement, [cgirouard@wpi.edu](mailto:cgirouard@wpi.edu)