WAYNE STATE UNIVERSITY

CLEAN, GREEN & LEAN

Building a culture of sustainability in times of economic challenge

Executive summary

Green and gold may be the official colors of Wayne State University, but a move is afoot to take greening to new levels. In the past two years, Wayne State has solidified its commitment to environmental stewardship. A 28-member task force issued a report in 2007 identifying a wide range of recommendations toward an environmentally friendly and sustainable campus. The report focused on five categories: energy conservation, recycling, sustainability, transportation and waste stream and mass balance. Next, a standing committee was charged to implement these recommendations and create a campus culture committed to sustainability.

Since 2007, the university has launched a comprehensive recycling program, designed and built two multimillion dollar buildings in accord with Leadership in Energy and Environmental Design (LEED) standards and slashed its energy consumption through improvements that require an up-front investment but reap long-term savings. A breadth of initiatives is underway, such as a weekly farmers market featuring locally-grown produce, campus gardens whose produce is served in the cafeterias, elimination of paper forms for routine transactions and creative reuse of historic buildings. Partnering with fellow institutions and consolidating resources for shared shuttle service are other examples of how Wayne State strives to reduce adverse impacts on the environment.

At Wayne State, students, faculty and staff create a culture dedicated to environmental stewardship. Student activism helped launch the university's growing recycling program. Our students plant community gardens in low-income neighborhoods, design green roofs for public transit stations and mount legal challenges to protect the Great Lakes. Whether it is clean technology to power the next generation of vehicles or the development of eco-friendly cement, Wayne State faculty create knowledge and generate solutions. Through TechTown, the university's research and technology park, Wayne State partners with the private sector in alternative energy and on water quality issues. The collaboration between entrepreneurs and top research minds makes TechTown an ideal laboratory for green technologies and services.

Wayne State's main campus is in Midtown Detroit. We partner with our neighbors to transform Midtown's landscape with greenways for joggers and bicycles, green alleys bathed in energy-efficient light and streetscapes abundant with native vegetation.

The five sections of this paper elaborate Wayne State's leadership in the green movement. The first section describes efficiencies now incorporated to conserve resources and streamline operations. The second portion focuses on our students' accomplishments in translating their education into environmental stewardship. The third section highlights the university's extensive research enterprise, which focuses on 21st century sustainability solutions. The fourth section explores the array of environmental initiatives underway at TechTown. The final and fifth section concerns the greening of our Midtown neighborhood.

Earth friendly efficiencies

Through its daily operations, Wayne State strives to minimize waste, save precious resources and work efficiently. This section describes business practices that simultaneously reduce expenses and conserve.

The commitment of the Standing Committee on Environmental Initiatives

The Standing Committee on Environmental Initiatives was charged in fall 2007 to develop a roadmap for efforts to green the campus. The committee was formed following a comprehensive report that outlined key strategies to improve Wayne State's environmental performance. The 11-member standing committee is made up of faculty, staff and students. The committee, headed by Carol Miller, chair of the Department of Civil and Environmental Engineering, has three main goals: infuse sustainability and environmental stewardship into core academic programs; integrate sustainability practices into campus operations; and increase awareness of environmental stewardship throughout campus.

Four subcommittees function under the auspices of the full committee: energy, recycling, transportation and academic engagement. The committee has:

- Incorporated energy conservation measures into the Marvin I. Danto Engineering Development Center and the Richard Mazurek Educational Commons at the School of Medicine. Both facilities have applied for LEED certification;
- Initiated a strategic energy plan to identify efficiencies across campus;
- Established protocols to incorporate energy-efficient design and technologies for new construction and renovation projects at Wayne State;
- Launched an improved campus recycling program for paper, plastic bottles and aluminum cans;
- Established a postgraduate certificate program in sustainability in the College of Engineering;
- Helped launch a new student organization, the Student Environmental Action League (SEAL).

Curbing energy costs

A sprawling campus with older buildings and infrastructure, as well as sophisticated laboratories and residential facilities, presents real challenges in curbing the energy costs of Wayne State's physical plant. Wayne State's Facilities, Planning and Management division continues to institute best practices. In 2008-09, the university installed 30 new steam plants across campus to generate its own heat and reduce consumption. After 2010, Wayne State will save $1 million a year in savings from these steam plants. Scott Hall, one of the campus's busiest classroom buildings, was revamped in 2002 with $6 million in improvements to lighting, chillers and heating and ventilation systems. Although this is a substantial investment, the university will save almost a $1 million a year over 15 years from energy savings at this building alone.

"Smart buildings" now achieve greater efficiencies and make classrooms and offices more comfortable. Computer-controlled building automation systems turn down the heat or air conditioning when no one is around. These systems also prevent extreme temperature fluctuations and keep rooms from becoming too chilly or stuffy. The Chemistry Building, the Law School, the Mort Harris Recreation and Fitness Center, the Eugene Applebaum College of Pharmacy and Health Sciences, the Marvin I. Danto Engineering Development Center, Manoogian Hall, the Richard J. Mazurek, M.D. Medical Education Commons and the Welcome Center all have smart technology features to cut costs and consumption.

Next, building tune-up teams routinely will analyze chillers, boilers, pumps, air handling units, cooling towers and outside air dampers to pinpoint efficiencies. These teams will be complemented by building energy audits to identify energy conservation measures with a high return on investment for specific buildings. The goal of tune-up teams and energy audits is to correct equipment problems that waste energy.

Overall, the university's goal is to adopt specific energy consumption targets for the next five years. This includes looking at ways to reduce Wayne State's carbon footprint and educate the campus on behavioral changes to conserve energy and resources.

LEEDing to green buildings

The university has applied for LEED certification for two multimillion dollar campus projects, one at the College of Engineering and the other at the School of Medicine. This designation provides independent, third-party verification that a building project meets the highest green building and performance measures. Both buildings, completed in 2009, are on track to receive "silver" LEED certification.

The $28 million Marvin I. Danto Engineering Development Center incorporates several green design categories required for LEED certification:

sustainable sites, water efficiency, energy and atmosphere, materials and resources and indoor environmental quality. This is realized in part by:

- Specialized air handlers;
- Efficient circulation pumps;
- Systems to monitor CO2 and fresh air;
- High efficiency and low-flow lab fume hoods;
- Main exhaust systems that recover and reuse energy normally wasted as part of the exhaust process;
- High-efficiency, low-mass boilers;
- High-efficiency water heaters;
- Waterless urinals, toilets and faucets and nozzles equipped with low-flow aerators and sensors.

The $35 million Richard J. Mazurek, M.D. Medical Education Commons also has multiple design features necessary for LEED certification. The energy-conscious features include:

- A white roof with a high solar reflectance to keep the building cool;
- Water-conserving toilets, faucets and waterless urinals;
- Recycling paper, plastic, glass, cardboard and metal;
- Built on the shell of the former Shiffman Medical Library. Creative re-use conserved resources and reduced demolition waste;
- Certification of the wood used in the building by the Forest Stewardship Council, which leads forest managers in responsible timber management;
- Light switches and the addition of task lighting enable individual control. Occupancy sensors throughout the building add to energy savings.

The best of both worlds

Restoration of architectural gems for the 21st century workforce presents a unique challenge. The challenge is to preserve a building's beauty and accommodate the latest technology and computer equipment. In June 2008, the Wayne State University Police Department (WSUPD) did both and opened its new high-tech headquarters, an Albert Kahn-designed, terra-cotta building originally constructed in 1924.

The facility mirrors the historic splendor of the neighborhood and the outstanding reputation of the WSUPD. The new dispatch center includes some of the most advanced police technology in the nation, including fiber optics and wireless Internet access. It also promotes the goals of sustainability to preserve the past through creative reuse of an existing building.

Paperless processes

On May 27, 2009, Wayne State eliminated printed pay statements. The switchover is a small but significant step forward for the university's sustainability efforts. Under the new system, all information formerly on printed statement is securely available electronically on WSU Pipeline.

The paperless payroll follows the 2008 launch of e-bills for student tuition and fees. This secure, on-line billing system allows students 24/7 electronic access to their statement and the ability to e-mail bills to parents, sponsors or employers.

Conversion from paper to electronic forms was a top priority for Wayne State Human Resources. More than 30,000 paper forms for routine transactions were processed every year, which required printing, copying and retention of forms and supporting documentation. With the new Electronic Personnel Action Forms (EPAF), paper forms are eliminated

and support documents are scanned, routed and maintained electronically.

To be green or not to be green may stump a modern-day Hamlet, but not Wayne State's Hilberry Theatre Company. The company launched an e-mail collection campaign in which Hilberry patrons and the public have the opportunity to join the HilberryClick,a special group that receives Hilberry benefits through e-mail.

The Hilberry Click is a new way for the Hilberry Theatre Company to connect to its audience members. More than 175,000 pieces of paper are sent to patrons each year, mostly in the form of postcards, brochures and season calendars. To reduce paper waste, the Hilberry envisions the Click as a new cultural pit stop on the information superhighway.

Live green

Wayne State can boast that campus recycling saves 400 trees, 88 cubic yards of landfill space, 130,000 gallons of water and 64 barrels of oil a year. The program continues to recycle greater amounts of trash. For example, 7,800 pounds of paper were recycled in 2008. During the first six months of 2009, that number jumped to 26,000 pounds of paper.

Wayne State's Green Team, a division of Facilities Planning and Management, has expanded its blue-bag recycling program and a new source-separation pilot program is underway. Wayne State's Environmental Health and Safety division, Office Max and Hewlett Packard are program partners. Recycling containers in the 19 pilot facilities will accept plastics Nos. 1-7, all types of paper magazines, cardboard, clear glass and universal waste, which includes CDs, cell phones, batteries, ink and toner cartridges and light bulbs.

"WSU's source separation takes recycling to a new level and will end the mix of recycled materials with rubbish in the same dumpster," said James Sears, associate vice president for Facilities, Planning and Management. "The enhanced program allows waste materials to be separated from recyclable materials at campus buildings instead of transporting it to a vendor's transfer station."

Libraries lead the green revolution

Despite the online revolution, libraries remain paper-intensive. Students still print and photocopy even though scholarly journals and resource materials are online. Wayne State's library system

Let it **RAIN**

Rain barrels help build sustainable food systems in cities where water is expensive or hard to come by. Just ask anyone who has attempted to garden without a secure and reliable source of water.

SEED Wayne offered a spring workshop on making a rain barrel from commonly available tools and parts found at local hardware stores. After building, hook a hose to the barrel's connector pieces, and let gravity work its magic.

The original article appeared in Wayne SEEDLING, newsletter of SEED Wayne, Vol 2, Issue 1, June 15, 2009. Please browse this newsletter and previous ones at: www.clas.wayne.edu/seedwayne/

Spotlight on **Barry Neal Johnson**, adjunct faculty, History Department

"I like to dig; it is an excellent cardio vascular workout. Consequently, when I heard about the Greening of Detroit and its founder Beth Sachs, the wife of the former director of the Detroit Institute of Arts, in the spring of 1989, I went to the first tree planting on Larned. I was working at the 36th District Court in Detroit and I felt that one should contribute more than taxes to the city where a person works. I do not like the banality of exercising on treadmills and the like. Exercise with positive results in the form of work accomplished makes sense to me.

"The benefits of tree planting are many. Carbon sequestration to trap excess carbon dioxide is one. Trees produce oxygen, filter dust from the air, put moisture into the air reducing temperatures around them, shade dwellings to reduce energy use in the summer and protect them during winter winds. They have a calming social effect on people who congregate under them during hot weather. They attract wildlife. The benefits are many.

"Greening of Detroit evaluates many inner city youth for summer jobs. In 2008, 900 showed up for a chance at a job; this year more than 1,200 applied for 90 summertime jobs. This program has been running for several years, and we have hired many of these youth as tree planters. Many have gone on to college."

does its part to minimize paper waste and cultivate a culture of sustainability. Independent of the university-wide recycling program, the library system recycles on average more than 80,000 pounds of office white paper, cardboard, newsprint and mixed color paper in a calendar year. Laser and inkjet printer cartridges, all types of batteries and scrap metal also are recycled. In the refurbished Shiffman Library housed in the new Richard J. Mazurek, M.D. Medical education Commons, space and motion detectors control lights in the stacks that automatically shut off when no one is present.

Handling hazardous waste

Blazing a trail to the next scientific or medical breakthrough at times requires large amounts of dangerous chemical compounds that can leave a negative stamp on the environment. As a major research enterprise, Wayne State University handles hazardous materials with the utmost care. A blend of customer service and scientific know-how characterizes the OEHS staff and their day-to-day relationships with those on the brink of the next big discovery.

OEHS segregates packages and identifies biomedical, radiological, chemical and universal wastes in accord with stringent federal and state regulations. A complete inventory of all biological, chemical and radiological materials on campus has been completed.

The reduction of mercury, a hazardous material, is underway. Mercury can infiltrate waterways, contaminate the food chain and pose a threat to human health. The mercury found in a single thermometer can contaminate 5 million gallons of water! Wayne State is replacing the mercury thermometers at its School of Medicine and College of Nursing. Old sinks also can be a source of mercury. Campus plumbers are taught how to remove these sinks to capture mercury compounds and prevent wastewater contamination.

Reuse and recycling of non-hazardous material is another practice spearheaded by OEHS. For example, excess cans of latex paint from university building projects are donated to Habitat for Humanity, the non-profit housing ministry.

Green computing

The WSU Utility IT Consolidation Strategy launched by Computing & Information Technology (C&IT) has met with resounding success. Consolidating computer equipment and streamlining communication systems have saved energy and enhanced computing efficiency. First, departments no longer need to build, maintain and operate smaller, less efficient computing facilities. C&IT now provides server facilities and hosts more than 150 departmental servers in its central datacenter.

Second, more than 30 smaller, less-efficient servers have been consolidated into larger, more energy-efficient machines using new server virtualization technologies. Industry estimates indicate that energy savings from server virtualization initiatives will average around 25 percent.

Third, the new Wayne Connect system makes it easier to use e-mail and instant messaging and to schedule meetings. The new system creates a unified messaging environment for use by students, faculty and staff and allows WSU to consolidate 30 campus e-mail servers into a single, more efficient platform.

Keep Wayne State clean

Wayne State boasts a clean campus. Groundskeepers take great pride in maintaining a friendly and pleasant environment. While litter may not be the most pressing issue on campus, unwanted debris and trash can negatively impact perceptions about the university.

The Clean Campus Initiative was launched in March 2007 to motivate the university community to take an active role in keeping the campus clean. The work of the committee encourages students and employees to be accountable for their behavior and dispose of litter in a socially-responsible manner. A pilot program to reduce litter, including cigarette butts, was launched at select locations. The committee uses signage, table tents, banners, ads in Facebook and The South End student newspaper, Web communications, e-mail blasts and library screen savers to spread the clean campus message.

Green dining

If you have a meal ticket at Wayne State's residential facility cafeterias, chances are you probably are feasting on locally grown produce. Campus dining facilities operated by AVI Food Systems purchase vegetables from two local suppliers, and fresh produce is used for salad bars. Herbs from SEED Wayne's (Sustainable Food Systems, Education and Engagement in Detroit) demonstration gardens add flavor and depth to dishes prepared by Executive Chef Giulio Fattore. Fresh, whole potatoes are used, and peelings are recycled as compost for campus gardens operated by SEED Wayne. Cardboard and cans are recycled, and any meal catered by AVI uses biodegradable cups instead of plastic cups.

Visible success

A bustling farmers market, bountiful campus gardens and a rain barrel workshop are just a few of the initiatives of an organization that is turning the campus green. Started in summer 2008, SEED Wayne is the brainchild of Kameshwari Pothukuchi, an associate professor of Geography and Urban Planning. In less than a year, two large campus gardens have sprung up, a successful farmers market featuring fresh fruits and vegetables was launched and funding was secured from the Ford Motor Company Fund.

SEED Wayne sponsors student led workshops, cafeteria food waste composting and university lectures and seminars on sustainable food systems.

Off campus, SEED Wayne also is involved in citywide planning processes related to the Detroit Food Policy Council and the Detroit Food and Fitness Collaborative. All program activities are designed and implemented with campus and community partners; students are involved as leaders, beneficiaries and volunteers.

SEED Wayne's two signature programs are urban gardens and a farmers market:

Campus gardens take root: Hauling lumber and compost, spreading top soil and cutting boards, 40 Wayne State students and staff staked their claim in spring 2009. The St. Andrew's Allotment Garden behind St. Andrew's Church, off the Lodge Service Drive, close to Anthony Wayne Drive, has 18 garden beds measuring 4 feet by 8 feet. Student organizations pledged to maintain the gardens, which are made up of vegetables, herbs and flowers, with the assistance of SEED Wayne and forgo chemical pesticides or fertilizers.

The St. Andrew's garden follows on the heels of the successful Warrior Demonstration Garden,

located between the Undergraduate Library and Warrior Grille on main campus. The Warrior Demonstration Garden's first harvest yielded vegetables and herbs that were donated to the community-based Capuchin Soup Kitchen or used in campus cafeterias.

Healthy choices: One can find juicy Michigan apples, crisp asparagus or firm stalks of broccoli at the Wednesday Farmers Market on Cass Avenue in front of Prentis Hall on central campus. The market was such a resounding success in 2008 that it now runs every week from June through October instead of once a month. Locally grown food is the market's trademark.

According to the U.S. Centers for Disease Control and Prevention, two-thirds of American adults are overweight or obese. Obesity rates among all groups in society regardless of age, sex, race, ethnicity, socioeconomic status, education level or geographic region markedly have increased. In the midst of this threat, Wayne State affords the university community the opportunity to purchase healthy, fresh and affordable food while supporting local growers and producers.

Green air

WDET 101.9 FM, owned and operated by Wayne State, focuses on the global, national and local environment. Through National Public Radio and WDET programs, listeners are exposed to a broad array of environmental news. Detroit Today, a weekday program on local issues, frequently focuses on the environment. Some of the stories include:

- The impact of the Detroit incinerator and its future;
- Environmental contamination and clean-up efforts around the Dow Chemical Midland plant;
- The new carbon emissions standards set by the Obama administration and how clean diesel technology might revolutionize Michigan's bus fleets;
- A new program to convert Detroit's vacant lots into a large-scale agribusiness network;
- President Obama's $475 million dollar pledge to clean up the Great Lakes;
- DTE's plans to build a new nuclear reactor near the Fermi II plant and alternative energy options;
- A Department of Labor and Economic Growth report stating there are more than 100,000 private sector "green jobs" in Michigan; and
- New EPA regulations on mercury levels from cement kilns and their impact on Michigan's five cement kilns and surrounding environments.

Earth Week 2009

One of the environmental movements most respected leaders played a key role in Wayne State's Earth Week 2009 celebration. Award-winning scientist, author, broadcaster and sustainability expert David Suzuki delivered an impassioned address to a packed auditorium of 600 people as part of the Forum on Contemporary Issues in Society (FOCIS) lecture and outreach series created by funding from alumnus Eugene Applebaum. The event was also streamed live on the Internet and bloggers joined in and provided real-time commentary as Dr. Suzuki spoke.

Dr. Suzuki's message focused on rebuilding the economy with the Earth in mind. He told the crowd that current strategies to retool the economy do not consider the Earth's resources. He cited the immeasurable benefits of trees, noting they pump oxygen into the air, minimize erosion and keep waterways clean. He noted the irony that economists do not acknowledge the benefit of trees in the economic equation.

Give the car a break

With 32,000 students, 8,000 employees and tens of thousands of visitors every year, Wayne State generates substantial vehicle traffic. Wayne State strives to increase the convenience and incentives for commuters to use alternative modes of transportation to preserve precious green space and reduce auto emissions:

- An April 2009 survey conducted in partnership with the Detroit Medical Center [DMC], Henry Ford Health System and the Center for Creative Studies asked respondents about their transportation needs. The goal is to create a Midtown shuttle service that links major institutions and reduces individual car trips.
- Wayne State offers a campus shuttle between the School of Medicine and central campus. This

free service is available to all faculty, students and WSU and DMC staff. It reduces traffic and auto emissions.

- Wayne State provides a service to match faculty and staff for carpools based on home destination and days and times of travel. The university community has the option to sign up for a carpool through the MIRideShare and MichiVan websites.
- The Hub of Detroit, a nonprofit bicycle repair and resource center; the Wheel House Detroit, promoting local educational bike tours, sales and repair services; and Detroit Synergy, host of the Detroit Bikes – Commuting on Two Wheels program, are active on campus and conduct information sessions and workshops

Students and stewardship

At Wayne State, we strive to empower our students to change the world. Here is a snapshot of our educational programs, community projects and student-led initiatives that cultivate a culture dedicated to environmental stewardship.

Sustainability in the classroom

The design and practice of sustainability curricula requires a departure from traditional engineering and problem solving. The Wayne State Department of Chemical Engineering develops and tests curriculum using a 'spiral' learning approach. This allows students at different educational levels to work together on challenging real-world engineering problems with a sustainability focus. The course is designed to motivate students toward sustainability concepts and bridge the gap between learning and real-world problems.

Green collar jobs

The College of Engineering offers a graduate certificate in sustainability. Students learn the fundamentals of sustainable engineering in a 15-credit program designed for graduate students and working professionals. The certificate program was created to meet the increasing demand for "green" products and processes that take into account economic, environmental and social outcomes. Wayne State's new certificate in sustainability complements the College of Engineering's existing alternative energy technology graduate certificate program and master's of science degree.

Collaboration and the new economy

Engineers will have new opportunities to advance the field of electric vehicles. Wayne State University and the Michigan Department of Energy, Labor and Economic Growth are partnering to train hybrid electric vehicle (HEV) engineers as the state's automotive industry transitions to manufacture of fuel-efficient vehicles. Graduate-level courses in advanced battery systems for HEVs are offered at the WSU College of Engineering, targeting employed automotive engineers as well as qualified displaced workers. Courses are team-taught by WSU faculty, HEV engineers from Delphi and General Motors and battery scientists from ECD Ovonics Battery.

Raise the green roof

A team of Wayne State engineering graduates may have played an important role in the installation of a green roof for the Detroit People Mover station at Joe Louis Arena. Students Leslie Coxon, Rich Gifaldi and Amit Shah researched sustainable roof projects in Michigan and Ohio and found that green roofs have many benefits. They presented their findings to People Mover officials in 2007. In 2008 The Detroit Free Press reported that a new green roof installed at the Joe Louis Station would be self-sustaining within a year. The roof, consisting of ground hugging plants, filters airborne pollutants, provides acoustic buffering and can last twice as long as a gravel roof.

WSU sisters Melissa and Jennifer Hui took first place in the photography category of the Microsoft Imagine Cup in Paris in 2008. They beat 200,000 students competing in teams from around the world. Contestants were asked to envision a world in which technology enables a sustainable environment. The sisters' winning photo essay transports viewers to rain forests, one of the world's most critical ecosystems, and depicts how technology is being applied there to slow global warming and deforestation

Passion for service

Anyone who claims today's generation is apathetic has not met Cevan Castle, a recent Wayne State graduate. As an undergraduate, she melded academics with a love of gardening. A Michigan

Master Gardener, she formed a partnership between a nonprofit that works to remediate blighted lots in southeast Detroit, and a nonprofit that recovers reusable lumber and other building materials destined for landfills. Engaging youth partners, the project transformed a vacant lot into a productive space through the construction of greenhouses built with recycled building materials.

Project Bright

Wayne State students Anita Patel and Peter Pham had a bright idea. They developed Project Bright to replace incandescent light bulbs at Wayne State with compact fluorescent light bulbs. The compact fluorescent bulbs last up to 10,000 hours, more than 10 times longer than incandescent bulbs. This conserves energy, allows consumers to save money and generates less waste.

Giving back

Fighting blight and planting the seeds of rebirth are all in a week's work for Wayne State students. This year, 44 students spent their spring break helping all over the city of Detroit. As part of Alternative Spring Break, students prepped a garden near the Capuchin Soup Kitchen, cleaned up an old building and warehouse and converted it into a coffeehouse, artists' studio and storage depot for the Motor City Blight Busters. "I love doing this. It just makes you feel like you've got a stake in the community," said Brittany Betham, a senior majoring in chemistry.

Digging Detroit

As a child, Antonio Austin always wanted to be an archaeologist. The Detroit resident and Wayne State student managed to live his dream while keeping his day job in finance and business. He participated in a dig at the Workers Row House, a wooden structure built in 1849 in Detroit's Corktown neighborhood. The restoration project seeks to promote the cultural resources and heritage of the city and train students in historic preservation. Wayne State students have been excavating in Corktown since 2006 to explore the working-class lives of immigrants to the city. For Austin, the course was too good to pass up. "When this course appeared, I had the chance to live out a childhood dream," says Austin. "Not only did I have fun playing in the dirt, I also learned about Detroit's history."

Sustainable cities

Urban planners advocate property investment and development in older cities and suburbs. In summer 2008, 21 urban planning students worked with the Michigan Suburbs Alliance to examine "redevelopment readiness" in the cities of Warren, Roseville, Pontiac, Highland Park, Ferndale and Dearborn. Teams of students were sent into these communities to study their planning, zoning and development practices; interview city officials and business leaders; analyze redevelopment procedures and recommend improvements.

Be the change

University campuses historically have been hotbeds of change. Wayne State, where students think globally and act locally, is no exception. Two student organizations, SEAL (Student Environmental Action League) and SEAC (Student Environmental Action Coalition), push campus sustainability and stewardship through awareness and activism. Speakers, films, recycling events and Earth Week activities are a few of the events sponsored by SEAL and SEAC.

Research

As a leading urban research university, Wayne State's strength lies in its ability to address significant challenges. Projects that cross academic boundaries flourish on campus. Faculty from many departments and schools work together in areas such as alternative energy, climate change and environmental health.

Build it green and they will come

The $28 million Marvin I. Danto Engineering Development Center (EDC) is an 82,500-square-foot facility for traditional university research and services for companies to accelerate their own research and development activities.

The Danto EDC houses several of Wayne State's top-ranked research programs that focus specifically on the environment. For example, the Advanced Propulsion Alternative Energy (APAE) labs seek to promote research in biofuels and diesel fuels, fuel cells, emissions and vehicle wear automotive systems.

The APAE labs are partnering with the National Biofuels Energy Lab at NextEnergy to develop the best formulation for a standard "B-20" biofuel that consists of 20 percent biomass. B-20 biofuel has been hailed as one solution for reducing America's dependence on foreign oil. The Wayne State Transportation Research Group, also housed at the Danto EDC, investigates ways to reduce traffic congestion.

Clean-burning gas

A Wayne State researcher is working to improve the crude oil refining process, which could result in cleaner burning gasoline and the increased use of North American crude oil. Stephanie Brock, professor of chemistry in the College of Liberal Arts and Sciences, received $79,529 from the National Science Foundation Division of Chemistry for a project on which she is a co-investigator. The study will test the potential of metal phosphides as catalysts - substances that initiate a chemical process - with the goal of removing more sulfur from crude oil than is possible with current methods. If successful, this research could lead to gasoline that releases lower quantities of sulfur dioxide and nitrogen dioxide, both toxic substances, and will enable the U.S. to meet the Environmental Protection Agency's mandate for lower emissions for both gases.

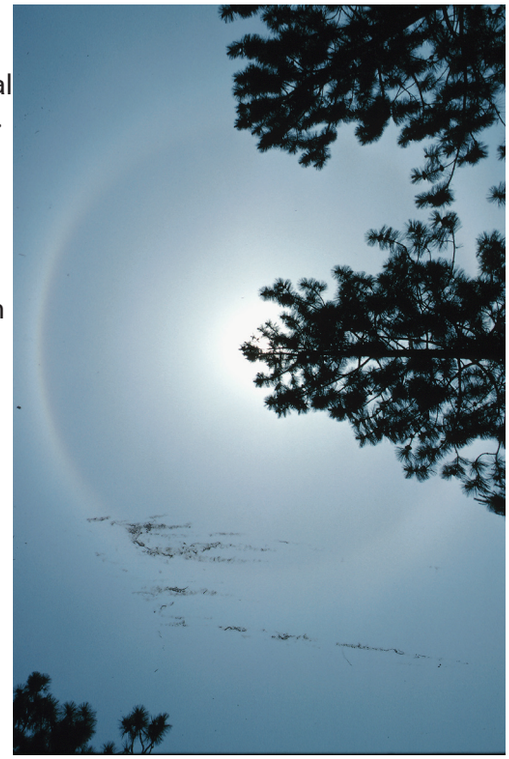
Although technologies such as solar and hydrogen power are making headway, Brock's research could result in more immediate solutions to the country's most pressing energy issues. "I think it's understood that we're going to continue to need fossil fuels for transportation, at least in the short term," Brock said. "Because of this, it's very important that we develop solutions to problems of the current system, meeting environmental regulations and addressing the energy security issues, while other alternatives are still being developed."

Harnessing the power of the sun

Three Wayne State University chemists are working to shed light on the use of solar power in the creation of alternatives to fossil fuels.

Claudio Verani, with co-investigators John Endicott and Bernhard Schlegel, received a $1.32 million U.S. Department of Energy grant to advance understanding of the fundamental mechanisms of water splitting, a process that yields dihydrogen, a clean, renewable alternative to petroleum.

However, several mechanisms of the process must be understood before the technology can be a viable alternative. Among these are the multi-electronic nature of the process and the potential formation of damaging and highly reactive radical intermediates.



The research will address chemical issues such as how to design molecules containing several different metal centers capable of accumulating charge for water splitting, how to transfer these charges and how to promote the dissociation of hydrogen and oxygen. They will also investigate potential catalysts capable of forming films to sustain water splitting.

"This research is at the forefront of understanding the basic principles mechanisms of water splitting, an integral step in advancing dihydrogen as a clean, renewable fuel that could help end U.S. dependence on foreign oil," Verani said.

More solar solutions

Imagine investing in alternative energy technology for your home and then selling the power you generate back to a big utility company. This is not a far-fetched idea, according to Caisheng Wang, assistant professor of electrical and computer engineering and engineering technology at Wayne State's College of Engineering. Wang's strategy manages new and old energy sources in one dynamic, integrated system that is more efficient and reliable than current energy distribution.

Wang and his colleague, Dr. Feng Lin, also a professor of electrical and computer engineering, received a $311,334 grant from the National Science Foundation to develop a control strategy for using both traditional power plant-generated electricity and alternative energy distributed generation sources including wind turbines, solar panels and fuel cells. These alternative power systems could become a standard feature in homes.

Wang says "integrating old and new energy sources presents a challenge because the current energy infrastructure was not designed for these small, additional power sources." He adds integration will make the power grid more effective and reduce the need for new power plants. Wang plans to set up a "microgrid" system to roll out his strategy at a university building that will be the prototype of the smart grid of the future.

"The system should be able to accommodate a variety of renewable sources. The big challenge will be how to integrate the current available technology seamlessly into our energy infrastructure so we can achieve our goal," he said. Wang predicts that as the efficiency of locally generated renewable energy sources improves from solar panels or rooftop wind turbines, opportunities will abound for homeowners to sell unused power back to the grid through the technology known as net metering.

Eco-friendly cement

Wayne State civil engineers are attacking global warming in a "concrete" way. Overall, cement production accounts for as much as 8 percent of carbon dioxide emissions worldwide.

A major source of carbon dioxide in cement production is the calcination of limestone, the main binding ingredient. The addition of mixtures such as fly ash and magnesium oxide in the manufacturing process can reduce these emissions and produce a higher strength, more durable cement. Addressing global climate change at this level can help the cement industry take a more responsible role to reduce harmful emissions.

Making water utilities green and lean

The Great Lakes Basin is home to massive water utilities that consume a significant portion of the region's energy. The Detroit Water and Sewerage Department provides water to more than 4 million people in 124 communities. Given the size of the region, even a small reduction in energy consumption by a large public water utility produces significant savings.

Carol Miller, professor and chair of the department of civil and environmental engineering, has received a $1.48 million grant from the Great Lakes Protection Fund to develop software to reduce energy waste during water utilities delivery. This software allows water utility controllers to make quick adjustments and decisions on the optimal way to move drinking water from its source. The program will be piloted at the Detroit Water and Sewerage Department, the country's third largest water utility.

Miller says most water pumps are controlled by human operators who make their decisions on when and how to pump water from experience, often resulting in waste of water and energy. The software allows operators to look at a graphics screen that shows energy use from pumping at different times. More energy-efficient pumping operations can translate into significantly reduced utility costs.

"We need to be better stewards of our water," says Miller. "We've been accustomed to cheap, clean water and don't always use it conservatively. Recently we've seen other regions in the country going through water shortage crises and have begun to look at ourselves and what we can do to conserve our water."

Going green saves green

A Wayne State University engineering professor has demonstrated that what's good for the environment is also good for the bottom line. Chemical engineering professor Yinlun Huang was one of two academics among seven award winners of the first Michigan Green Chemistry Governor's Award Program in September 2009. Huang was honored for developing technology that minimizes the use of

toxic chemicals, reduces hazardous discharges and helps create profits in electroplating production.

According to the American Electroplaters and Surface Finishers Society, Michigan has approximately 300 small electroplating plants. The plants consume huge amounts of hazardous chemicals. The waste streams from production lines usually contain more than 100 regulated chemical, metal and other contaminants. Ensuring product quality while reducing toxic chemicals and production costs has been a significant challenge for Michigan platers.

Over the past decade, Huang has led his research group to conduct comprehensive studies on hazardous substance-focused source reduction with a promise of profits through technology implementation. His work has reaped benefits for both the business and the environment. Technology developed by Huang was successfully implemented by K.C. Jones Plating Company in 2007 and demonstrated significant environmental and economic benefits. Hazardous chemical use was reduced, meaning fewer of these substances leached into the environment. At the same time, platers maintained product quality and reduced production costs.

Urban Watershed Environmental Research Group

The Urban Watershed Environment Research Group (UWERG) is an environmental organization at Wayne State University focused on urban areas near the St. Clair watershed. WSU is strategically positioned to play a critical role in developing a plan to protect, restore and sustain the St. Clair watershed, the geographical area from the St Clair River through Lake St Clair, down the Detroit River and to the Atlantic Ocean.

UWERG addresses the health of the ecosystem and water quality for the local urban community. Projections indicate that land areas experiencing increased water stress will significantly increase over the next several decades. The research group will develop a long-term urban-based model for monitoring and evaluating the impact of pollutants on the watershed ecosystem and human health.

The next "small" thing

Peter Hoffmann, associate professor of physics in WSU's College of Liberal Arts and Sciences, received a $365,000 award from the National Science Foundation to study the dynamics of liquid water confined in nanoscale spaces -- a topic of broad application and importance to the fields of biology and engineering. The study could give biologists an improved understanding of characteristics of water inside living cells, as well as assist engineers in the design of nanoscale-mechanical devices.

The engineering component of Hoffmann's research focuses on an understanding of nanoconfined water, crucial in the design of devices such as fuel cells. Fuel cells need to expel water formed from combining hydrogen and oxygen.

"Dr. Hoffmann's research will lead to a better understanding of the behavior of confined water on nanoscale and its important role in biology and nanotechnology" said Dr. Ratna Naik, chair of physics and astronomy at WSU. "In addition, this project offers Wayne State students unique hands-on research experience in developing state-of-the-art instrumentation working with leading physicists."

Beetles and climate change

Scientists may soon be closer to understanding the intricate connection between a large-scale insect outbreak in Yellowstone National Park and global climate change, thanks to the work of one Wayne State researcher.

Dan Kashian, assistant professor of Biological Sciences, received a $306,296 grant from the U.S. Department of Energy's National Institute of Climate Change Research to study how the current outbreak of mountain pine beetles in the Yellowstone region is altering carbon cycling in forests, and what effect this alteration may have on global climate change.

"This is a very critical question in the West right now, because there are huge bark beetle outbreaks all the way from British Columbia almost down to Mexico, and they're all happening at the same time," said Kashian. "So it's not just one big outbreak, it's a synchronized set of big outbreaks, which is unprecedented."

Mountain pine beetles attack large, old growth trees and result in slow death over two to three years, causing the trees' needles to turn bright red. There are several reasons these outbreaks are cause for alarm, Kashian explained. Trees killed by beetles have dead twigs and needles that are very flammable, and may create substantial fuel for wildfires. A second major aspect, and Kashian's focus, is the potential of these outbreaks to alter the rate of carbon cycling between the forest and the atmosphere, and the relationship of this cycle to climate change.

"Trees take up CO2 from the atmosphere as they grow, but release CO2 as they die and decay,"

Kashian said. “Any time you’re releasing carbon dioxide into the atmosphere, you’re potentially contributing to climate change. Bugs are very tuned in to climate. If climate change leads to a warmer or drier climate that favors bark beetle populations, those bugs will kill more trees, which may accelerate the whole process.”

Protect infants and toddlers

Household pesticides long have been recognized as dangerous toxins that can damage brain growth and function. A new study by a Wayne State University researcher aims to expand the understanding of the toxins’ harmful effects on the brain during its most important period of development.

Enrique Ostrea, Jr., M.D., professor of pediatrics in the School of Medicine, received an initial $3.2 million grant from the National Institute of Child Health and Human Development (NICHD) to investigate the damages to neurological development in children up to 2 years of age caused by pesticides in the fetal environment. Subsequently, he received a competing renewal award from NICHD of $2.8 million to continue the study of the children up to school age (4-6 years).

Exposure to pesticides before birth can cause an array of damage to developing functions of communication, movement, hearing and language and hand-eye coordination in the brain. Before Ostrea’s research, detecting infants who have been exposed was difficult. “This has been a major problem, because most of what we previously knew about exposure rates came simply from questionnaires,” Ostrea said. “Second, if they did screen for the toxicants in biomarkers such as blood and urine, these are only indicators of recent exposure.”

Ostrea has found a more effective biomarker in meconium - the earliest stools from an infant. Unlike blood and urine, meconium reveals not just recent pesticide exposure, but also exposure from the first trimester of pregnancy.

Although not as sensitive as meconium, maternal hair is an effective biomarker for the two pesticides, which, when combined with measurements taken from meconium, improves detection capabilities almost two-fold. The current study commences where Dr. Ostrea’s previous study left off. His initial findings showed delayed neurotoxicity effects in children who were exposed to pesticides (propoxur) during pregnancy. He now tests children who are four to six years old to determine if any previously observed neurotoxic effects persist, improve or increase in severity. He also is looking at new neurological deficits perhaps not observable by age two but apparent since. Finally, any post-birth pesticide exposure is factored into the analysis.

Ostrea expects his work will bring to light the neurological damage pregnant women can cause their unborn children when exposed to toxins as simple as household pesticides. Once the effects are known, it will encourage a standardized screening for pesticide exposure. “Although meconium is the more sensitive biomarker of fetal exposure to environmental pesticides, the advantage of being able to detect the toxicant in maternal hair is that you can intervene during pregnancy,” Ostrea said. “That way you can tell her that she’s being exposed when she otherwise may not realize it.”

Prevention of lead poisoning in children

Lead in earthworms may signal that contaminated soil is present and it poses serious and irreversible health risks to children. Wayne State’s Civil and Environmental Engineering Department is conducting an international study to pinpoint the absorption mechanisms of lead through animal surrogates in urban areas. High soil-lead contamination in earthworms correlates to unacceptable levels of lead in humans. Lead poisoning can cause reduced IQ and attention span, hyperactivity, impaired growth, learning disabilities, hearing loss and insomnia.

This study is taking place in two urban areas: Maracaibo, Venezuela and Detroit, both places with historically high exposures to lead. The major sources of lead contamination are house paint, auto emissions and industrial sources.

This generation and beyond

The National Institutes of Health funds the National Children’s Study, the largest research project ever

undertaken to study children's health and the causes of ailments such as autism, cerebral palsy and asthma. Wayne State plays a major role in this ambitious project, which has long-term implications.

The Michigan part of the project will follow about 1,000 children in five counties to study environmental influences including toxins, nutrition, physical living conditions and socioeconomic factors. Children are assessed throughout their development, including before birth.

Overall, the National Children's Study monitors more than 100,000 children across the nation from before birth to age 21.

"The National Children's Study will provide new insights into maternal-child health and development for the next 50 years and will, I'm sure, be considered a brilliant initiative, well worth the effort and cost," said Robert J. Sokol, M.D., director of the C.S. Mott Center for Human Growth and Development and distinguished professor of obstetrics and gynecology in the School of Medicine at Wayne State University. "Our children, grandchildren and great grandchildren will reap the benefits."

Asthma and the environment: A cross border study

A consortium of researchers from WSU, Henry Ford Health System, and the Universities of Windsor and Toronto are conducting a large scale study of air pollution in Detroit-Windsor. It is one of the first international studies to compare and contrast environmental indicators with specific health outcomes in two cities with shared pollution sources, but different health care systems.

The research team collects and analyzes data and develops sophisticated computer models. Working with the researchers, teams of undergraduate and graduate students collected air samples from 100 locations throughout Detroit and Windsor to determine air quality. Ultimately, the project will aid in the development of school- and community-based interventions to control and manage asthma in children and adults throughout Detroit and Windsor.

TechTown

TechTown, Wayne State's research and technology park, seeks to become the world's foremost business incubator, driving and creating a new Michigan economy. TechTown nurtures emerging companies through sustainable business operations, exemplary programs and services and comprehensive infrastructure.

TechTown is creating centers of excellence in many emerging high-technology fields including alternative energy and Great Lakes protection.

Alternative energy: An energy crisis is taking place on our planet. Nonrenewable energy resources are dwindling. The search for sustainable alternatives to fossil fuels becomes more important every year. TechTown has emerged as a leader in the field. Below are several initiatives at TechTown to address the next generation of energy needs.

NextEnergy

Launched in 2002, the mission of NextEnergy, a nonprofit company, is to be a business incubator and accelerator to help Michigan companies become leaders in the commercialization of alternative energies.

NextEnergy enables companies to develop energy technologies that will contribute to economic competitiveness, energy security and the environment. NextEnergy is developing large-scale manufacturing of alternative energy equipment for wind and solar power, alternative fuels, advanced electronics, energy storage and other emerging technologies to establish Michigan's prominence in the field. NextEnergy already manages millions of dollars of research projects for new technologies for power-generation, transportation and fuels.

One such project is a collaboration between TechTown and Wayne State for the National Biofuels Energy Lab, established with a $2 million U.S. Department of Energy grant. Biodiesel is fuel made from renewable resources such as vegetable oil, which can be recycled from restaurants or culled from organically grown crops such as soy and sunflower. It is biodegradable and nontoxic, and has significantly fewer emissions than petroleum-based diesel when burned.

The lab is part of NextEnergy's Biodiesel Value Chain Initiative, an approach to research and develop biodiesel use.

Battery bucks jolt economy, Wayne State and TechTown

In August 2009, Vice President Joe Biden announced outside TechTown's Next Energy that the federal government will provide $2.4 billion in federal grants to develop the next generation of electric vehicles and batteries. As the largest recipient of the funding, Michigan will garner $1 billion.

Of the $10.5 million allocated to Michigan universities, Wayne State will receive $5 million for educational programs that target graduate and undergraduate students and local teachers, technicians and the general public toward cleaner environmental practices. The money will be used in partnership with Macomb Community College and NextEnergy.

In making the announcement, Biden said the grants will kick-start a promising future. "There's no reason why the United States of America cannot lead and will not lead the 21st century in the manufacture of automobiles again," Biden said. "You can do it. We can help you get there."

Carbon Credit Environmental Services

Leading the way toward a cleaner environment, Carbon Credit Environmental Services (CCES) has more than 30 years of environmental experience reducing carbon dioxide and greenhouse gas emissions.

CCES seeks to empower every business and individual to eliminate their carbon footprint. Through education, emission-reduction programs and selling of carbon credits, CCES believes these actions will deliver significant environmental benefits to the world. CCES has extensive experience in environmental consulting, climate-change risk assessment and management, while maintaining the high-level Kyoto protocol standard.

Walker-Miller Energy Services

To meet the demands of the swiftly changing energy landscape, Walker-Miller Energy Services (WMES) leverages its experience and knowledge of the industry to provide companies innovative and cost-effective strategies.

WMES offers traditional products and services to maximize the performance of the current energy infrastructure, but also promotes renewable and sustainable technologies as viable solutions to drive economical and environmental efficiencies.

Great Lakes Center of Excellence

TechTown's Great Lakes Center of Excellence offers unique resources for supporting regional economic development and environmental research on the Great Lakes. Environmental information from multiple sources is housed within the Center. This includes the latest data on environmental research companies and technology development businesses that monitor and enforce activities for the lakes.

Great Lakes Environmental Digital Library

The Great Lakes Environmental Digital Library pools valuable information from numerous resources to provide a complete picture of the urban water environment, including the implications for public health, economic development and national security.

The comprehensive environmental data system links up-to-date information on atmospheric, aquatic and terrestrial measurements of urban watershed quality. This data will have a significant environmental impact on stewardship of the Great Lakes.

Visca

Housed within the Great Lakes Center of Excellence is Visca, an advanced engineering research and design company dedicated to water monitoring, bacteria and chemical contamination detection for beaches, streams and lakes.

Visca has projects with the Department of Defense and the National Institutes of Health, and is the main commercial arm for developing a field-portable and point of use real-time bio/chemical monitoring system for water.

Great Lakes Environmental Law Center

The Great Lakes Environmental Law Center was founded to protect the world's greatest freshwater

resource and the communities that depend on it. Based at TechTown, the Center's attorneys and law students address pressing environmental challenges. Current projects include halting the spread of invasive species such as the zebra mussel in the Great Lakes, challenges to construction of new coal-fired plants and implementation of the Great Lakes Compact through state programs to ensure enforcement.

No campus is an island

Wayne State University closely partners with the University Cultural Center Association and other anchor institutions as an agent of change in Midtown Detroit. The partnership with our neighbors creates vibrant, livable and green neighborhoods.

Earth-friendly loop

Cycling, jogging, walking and rollerblading will be much easier with the new two-mile Midtown Loop. The pedestrian trail will follow existing street patterns along Kirby Street, John R Street, Canfield Street and Cass Avenue. Warren Avenue will serve as the central connector.

The loop will link Wayne State and the Detroit Medical Center and adjoin greenways in surrounding neighborhoods. Eventually, the Midtown Loop will be connected to a larger greenway network linking New Center to Downtown and the Detroit River. The Midtown Loop features a widened walkway, improved pedestrian crossings and a variety of planting beds with native vegetation that separates pedestrians from cars.

From urban blight to green delight

A cleaner, greener neighborhood is sprouting at the southwest corner of Second Avenue and Willis Street in Midtown. The new North Cass Community Garden features 75 raised garden beds on three previously blighted parcels. Planted in spring 2009, the garden already has a 'waiting list' of gardeners.

Community gardens are recognized as a great way to grow food, improve health and create connected and vibrant neighborhoods. Other benefits include:

- Develops green space in an urban setting;
- Contributes to building an ecologically viable and socially just food system;
- Fosters community engagement and a culture of generosity, reciprocity, trust and
- self-help;
- Provides a source of fresh, healthy food for nonprofits and charity organizations;
- Reduces family food budgets.

How green was my alley?

Choked with weeds, trash and graffiti, alleys can be the scourge of a neighborhood. However, the long-maligned alley is undergoing a 21st century makeover in Midtown. A coalition of businesses, community organizations, Wayne State and DTE Energy plan to transform many alleys in the neighborhood. The first is a 220-foot alley off Second Avenue between Canfield and Prentis, which will transform into a community greenway for pedestrians and bicyclists.

Old -fashioned concrete is being removed and a new permeable concrete reduces runoff and the "heat island" effect. Native plants will adorn the greenway and a brand-new system will recycle storm water. DTE Energy will install energy-efficient street lamps to light the way.

The alley is surrounded by homes, restaurants, condominiums, apartments and commercial buildings. Collapsible bollards will be placed at each end to cordon off the alley and create a safe recreation zone. Plants, grass and a leisurely stroll in the sun all will become the norm in the green alley.

Green garage

"Silicon Valley meets Detroit" is one way to describe Midtown's Green Garage project, which is adjacent to the green alley described above. A 1920s warehouse will be the new home of the Green Garage company,

an incubator for green businesses, technology and services. The 8,500 square-foot building on Second Avenue is undergoing renovation, but many of its original architectural features will be restored. The Green Garage hopes to open for business on April 22, 2010—Earth Day.

Avalon on the rise

In the 1960s, Midtown's Cass Corridor was notorious for sex and drugs, but times have changed. These days the demand is for oven-fresh scones, artisan breads and cookies from the Avalon Bakery. Avalon Bakery recycles and uses natural ingredients for its products. Customers line up daily to buy Avalon's goodies.

Conclusion

Wayne State has a special role in society as an institution of educators, knowledge creators, leaders and innovators. In recognition of this role, the university developed a master plan for environmental stewardship and sustainability two years ago in the report issued by the Task Force on Environmental Initiatives. Since then, Wayne State has continued the quest toward sustainability in five key areas: operations, education of students, research, TechTown and community engagement. Green buildings and operations, comprehensive recycling, new and innovative educational programs, our research prowess and partnerships with our neighbors are just a few of the areas highlighted in this report. Taken together, the wide range of environmentally responsible activities at Wayne State creates a more ecological and economically viable community.

In our institutional capacity, Wayne State will strive to maintain a leadership role in environmental stewardship. We are committed to continuous improvements, best practices and generating solutions and knowledge. As an urban research university we bring vision, intellectual curiosity and passion to create practical applications to meet the environmental challenges of the 21st century. By doing so, we will leave the university and our world a better place for future generations.