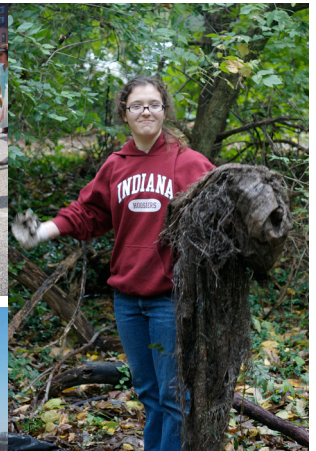
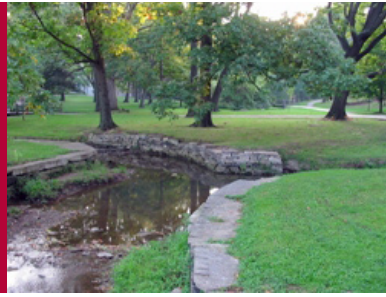


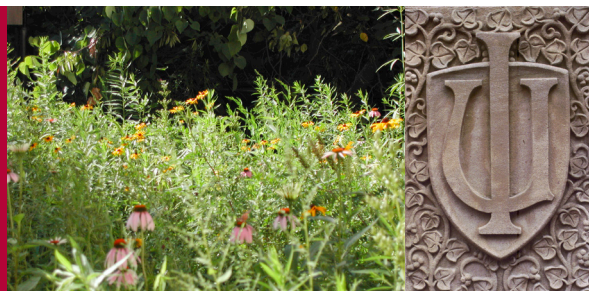
Indiana University Task Force
on Campus Sustainability

CAMPUS
SUSTAINABILITY
REPORT



INDIANA UNIVERSITY BLOOMINGTON
January 7, 2008

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Indiana University Task Force On Campus Sustainability

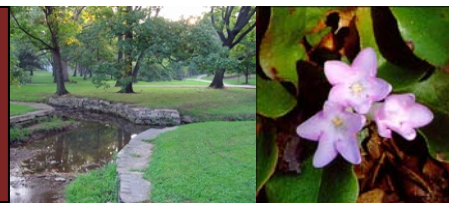
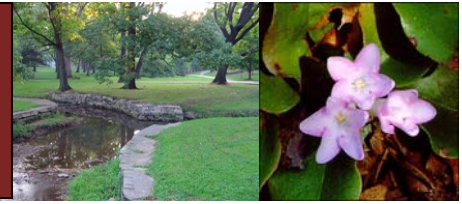


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Indiana University Task Force On Campus Sustainability Executive Summary



Executive Summary

This report summarizes the efforts of the Indiana University Task Force on Campus Sustainability to develop a comprehensive program in sustainability for the IU Bloomington campus. The work is the product of a broad-based effort by over 100 Indiana University faculty, staff, and students, under the leadership of a 16-member Task Force, who have examined issues of environmental sustainability across a broad swath of academic, administrative, and operational programs at IUB.

Background

For the purposes of this study “sustainability” is defined broadly as “meeting the needs of the present without compromising the ability of future generations to meet their own needs.”¹ It can be taken to encompass issues of local and global environmental quality, resource use, environmental literacy, and societal equity. We view this initiative as an opportunity for Indiana University to take a leadership role in incorporating concepts of sustainability into University practice and in the creation, dissemination, and application of new areas of academic scholarship in this emerging field. A mission statement for the sustainability initiative is included as Appendix A.

The Task Force was charged with assessing the current status of sustainability on the Bloomington campus, identifying key areas of concern, and establishing a framework for a long-term sustainability plan. During its six-month lifespan, the Task Force also developed a sustainability internship program, which included 20 undergraduate

and graduate student interns working on a broad array of sustainability-related projects². The group has laid plans for a speaker series on sustainability issues, created connections to national and international sustainability organizations, promoted student involvement in sustainability programs through its “Volunteers in Sustainability” effort, and has developed a new website devoted to campus sustainability (<http://www.indiana.edu/~sustain>).



A sustainability initiative would bring Indiana University into a growing national and international movement to address global-scale environmental issues in the academic arena. Large-scale sustainability efforts have become the hallmark of a

number of our nation’s leading public and private universities. Many of our peer institutions have distinguished themselves by undertaking major initiatives to limit greenhouse gas emissions, improve air and water quality, change faculty and student transportation patterns, and create new academic opportunities. This new academic interest in sustainability has been paralleled by similar moves in the corporate world. Many of the nation’s leading companies are making major investments in sustainability, and are increasingly interested in creating a future workforce that is competent in sustainability.

The Task Force defined its mission in terms of seven key areas of campus sustainability, and organized Working Groups to address sustain-

¹ World Commission on Environment & Development in *Our Common Future* (Oxford University Press, 1987, p. 8)

² Intern projects can be viewed at <https://www.indiana.edu/~sustain/sustainabilityiu/inter-ship-projects/>

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ability issues in each of seven areas: *Academic Initiatives; Energy; Environmental Quality/Land Use; Resource Use/Recycling; Transportation; Built Environment; and Food*. The product of each of these working groups provides the core of the document presented here.

Administration & Governance

Among our core recommendations is the creation of an **IU Bloomington Office of Sustainability**, which would provide administrative leadership and coordination for campus-wide programs on sustainability. This office would serve as a central administration and advocacy unit with sufficient resources to help catalyze and coordinate the large-scale university changes in academic programs and operations that are proposed in this report. This approach would follow the lead of many of our peer public institutions.

The primary functions of the Office of Sustainability would be to (1) Initiate, support, coordinate, and evaluate campus operational and academic issues related to sustainability; (2) work with key campus administrators (President, Provost, V.P. for Administration, and academic deans) on sustainability issues; (3) advise and collaborate with operational units to implement sustainability best practices; (4) act as advocate, clearing house, and coordinator for academic initiatives related to new degree programs, course offerings, minors, research projects, etc.; and (5) participate in strategic planning with top-level administrators to infuse sustainability focus into operations, academics, building, and land-use for the campus. The Office would serve to coordinate sustainability efforts between campus, community, university, state, and peer institutions and to communicate with both internal and external stakeholders on sustainability issues facing the campus. The Office would also coordinate student involvement in sustainability issues, in collaboration with other campus groups.

We examine four possible models for administration of an Office of Sustainability, including:

Option 1: Office of Sustainability reports directly to President, with strong collaborative linkage to VPAD and Provost/VPAA.

Option 2: Office of Sustainability has dual reporting to the office of the Provost/VPAA and VPAD.

Option 3: Office of Sustainability operates as an independent organizational unit with funding provided by administration, but reporting to Advisory Board.

Option 4: Office of Sustainability operates as an independent organizational unit acting as a consulting unit to academic and operational units.

Having examined the benefits and liabilities of each of these four options, the Sustainability Task Force concludes that Option I represents the best opportunity to address campus sustainability issues in a systematic, organized, and efficient fashion. Whatever option is chosen, we underscore the importance of establishing close administrative linkages with the Office of the Provost and the V.P. for Administration.

Institutional Commitment

As a concrete manifestation of its long-term commitment to sustainability, we believe that Indiana University should make a formal, public commitment by becoming a signatory of one (or more) of the nationally and internationally recognized documents in support of the sustainability movement.

1. The **Talloires Declaration**, a ten-point action plan for incorporating sustainability and environmental literacy in teaching, research, operations and outreach at colleges and universities, which has been signed by over 350 university presidents and chancellors in over 40 countries, and includes a number of our peer public institutions in the U.S., including the universities of Colorado, North Carolina, California, Arizona, and Florida.
2. The **American College and University Presidents' Climate Commitment**, a high-visibility effort to address global climate change by garnering institutional commitments to neutralize greenhouse gas emissions, and to accelerate the research and educational efforts of higher education to equip

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society to re-stabilize Earth's climate. Universities signing the Commitment pledge to eliminate campus greenhouse gas emissions over time through concrete actions to move campuses toward carbon neutrality. We believe not only that IU can achieve these goals, but that they will help garner broad-based support for our institution's efforts toward achieving a sustainable society. A detailed assessment is provided in Appendix C.

3. The **Chicago Climate Exchange** is a legally binding rules-based greenhouse gas emissions allowance trading system. Members make a voluntary but legally binding commitment to meet annual GHG emission reduction targets and to sell excess GHG reductions through a market-based exchange system. Among our peer institutions, the University of Minnesota, Michigan State University, and the University of Iowa have joined the Chicago Climate Exchange as a formal expression of their commitment to addressing global climate change.

Among these options, the Task Force formally endorses the American College and University Presidents' letter.

Funding Opportunities

The opportunities for funding sustainability related initiatives at Indiana University are varied, numerous, and growing. From corporations who are eager to develop capacity within their own organizations to address issues of sustainability, to passionate individual donors and foundations whose missions embrace sustainability, new sources of support are becoming available to universities. We identify new funding opportunities from:

1. **External funding agencies** involved in sustainability-related research (e.g., the Departments of Agriculture, Energy, Defense, Commerce, and Environmental Protection Agency), state-based research on environmental quality, and focused efforts from special congressional funding of energy- and environment-related research.
2. **Internal funding sources**, such as **revolving loan funds**. (e.g. using energy savings from energy-conservation projects to support infrastructure investment over time), **fund reallocation**. (e.g. revenue from computer recycling), **student fees**. (e.g. mandatory or optional fees, in order to develop funds for special projects).
3. **Special alumni funds**. The creation of a Special Alumni Fund for Sustainability may be a way to solicit donations from alumni that have not been motivated to contribute in the past. Major potential for this type of fundraising at IU exists with the number of environmentally focused alumni graduating with degrees in biology, geography, geology, and environmental science and management.

Community Collaboration

Sustainability issues extend beyond the physical boundaries of the Bloomington campus. As the campus develops policies to promote sustainability, collaboration between city and county staff, the Bloomington Commission on Sustainability, and the Bloomington Environmental Commission can benefit all parties. We envision particular opportunities for successful collaboration with local government agencies in the arenas of (1) **sustainable transportation** to and from campus, which requires integration of city and campus transportation systems, including bus, pedestrian, and bicycle routes; (2) **resource use and recycling**. The Monroe County Recycling Partners group, which is composed of representatives of IU, the City of Bloomington, Monroe County Community School System, and Hoosier Disposal and Recycling, shares best practices and develops ways to improve recycling throughout the community; (3) **built environment**. As IUB continues to grow, the city, county, and IU should work together to develop a smart growth plan—one that includes mixed-income neighborhoods, mixed rental and ownership neighborhoods, and mixed student and non-student neighborhoods; and (4) **service-learning**. The close proximity of campus and community offers remarkable opportunities for service learning and co-curricular education.

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Academic Initiatives

Objective: *To build an integrated program of academic research, undergraduate and graduate education, co-curricular and service-learning opportunities, and community outreach that will move Indiana University Bloomington into a position of national leadership in sustainability studies.*

We propose an ambitious program of academic initiatives that addresses sustainability in undergraduate and graduate education, research and creative activity, and co-curricular and outreach activities. Our review of existing academic programs at IUB identified some 29 undergraduate and 34 graduate programs, and over 20 research centers or institutes that address some component of sustainability. These academic programs offer the foundation from which a well coordinated, integrated, and high-profile sustainability program can grow. We conclude that a central, administrative catalyst is needed to help provide academic leadership, foster interdisciplinary activity, and develop new financial resources, in order to bring our programs into a position of national leadership. We can build on IU's unique suite of academic strengths—its traditional strengths in the life and environmental sciences, arts, and humanities, its unusual mixture of national-caliber professional schools, the quality of our faculty and students, our reputation in global scholarly activity, and the remarkable natural environment that surrounds the IUB campus—to build a high-profile interdisciplinary program in sustainability.

We propose the following approaches to build a national-caliber program in sustainability studies:

1. ***Support program development to offer new student learning opportunities in areas related to sustainability***, including (1) a program for hiring new faculty in order to expand and enrich our research and teaching strengths in the area of sustainability; (2) a faculty development program that encourages faculty to infuse sustainability into their teaching; (3) incorporating literacy on environmental and sustainability issues into the educational program of all undergraduate students; (4) an undergraduate "Area Certificate" in sustainability, comparable to those offered at many of our peer institutions; (5) a fellowship program to fund graduate and post-doctoral students in areas related to sustainability; (6) an interdisciplinary Ph.D. Minor in Sustainability; and (7) a student sustainability scholarship award for exemplary undergraduate and graduate research that focuses on sustainability.
2. ***Develop new mechanisms to support sustainability-related research***, including (1) interdepartmental and cross-school affiliations among faculty who conduct research related to sustainability; (2) mechanisms to assist faculty in obtaining external funding; (3) incentives to foster interdisciplinary research collaborations; (4) a program of high-profile external speakers and a colloquium series for local speakers; (5) mentoring of junior faculty to support interdisciplinary and transformational research; (6) an interdisciplinary center that could support formal graduate programs and Ph.D. minors in sustainability; and (7) seed funding to support interdisciplinary sustainability-related research.
3. ***Strengthen service-learning and community outreach opportunities*** by developing new linkages with community, national, and global organizations, by providing new resources to link IUB faculty, students, and staff, and offering new incentives for outreach and service-learning efforts.
4. ***Develop new resources for co-curricular activities related to sustainability***, including (1) efforts to increase awareness and recognition of sustainability issues within the co-curricular community; (2) increasing collaboration between student organizations involved in sustainability-related programs; and (3) supporting initiatives that encourage broader student engagement with sustainability issues.

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Energy

Objective: *To raise awareness of IUB's energy use among faculty, staff, and students and implement strategies to maximize the efficiency of on-campus production and distribution systems as well as reduce energy consumption and greenhouse gas emissions.*

The Energy Working Group recommends the development and implementation of an integrated energy master plan for the IUB campus that focuses on conservation, supports practical use of renewable energy including biofuels, and optimizes the efficiency of the IUB energy production and distribution facilities. We propose to use a number of formal metrics to assess our progress in this area, including a comprehensive annual survey of campus energy use (normalized by the number of students, building area, and operating budget); and an annual inventory of greenhouse gas (GHG) production.

Once inventoried, strategies for reducing GHG emissions could include: (1) reduced energy consumption (load management through improving building envelopes); (2) utilization of renewable energy sources for solar water heating, photovoltaic electric production; (3) evaluation of distributed energy production facilities; (4) investigation of biomass fuel for the central heating plant; and (5) purchase of renewable energy credits. Our specific recommendations for moving the campus toward a sustainable energy policy include the following:

1. ***Develop an integrated energy master plan*** that incorporates (1) a condition assessment of all major campus buildings; (2) development of a

list of projects that improve the efficiency of the steam and condensate return systems; (3) investigation of the latest applications of solar water heating, solar photo-voltaic, and wind-generated power technologies and evaluate the feasibility of incorporating these technologies into new and existing facilities; (4) investigation of the opportunities to incorporate biomass, into the fuel mix at the Central Heating Plant; (5) evaluation of the application of distributed energy production facilities for heating, cooling and electricity production to serve new campus facilities; (6) setting a goal to reduce the GHG emissions from our 1990 average to present at the following schedule: 10% by 2012, 20% by 2017, 50% by 2027, 90% by 2037, and Carbon Neutral by 2047.

2. ***Identify Qualified Energy Savings Projects*** for the Bloomington campus, targeting HVAC, lighting, and building envelope improvements that have a 10-year or shorter payback time. Working with the Office of the Treasurer, develop funding models to implement these projects on a continuous and revolving basis.
3. ***Develop campus-wide guidelines for computer use***, including proper use of the power-saving features for all personal computers, shutdown of all printers and peripherals at the end of the work day, and deployment of enhanced video-conferencing capability to reduce travel.

Environmental Quality and Land Use

Objective: *Through research, self-reporting, and adoption of environmentally sensitive land-use practices we seek to help IUB use resources sustainably and improve environmental quality and to protect the health of citizens on campus, in Bloomington, and beyond.*

We seek to improve the environmental quality and sustainable land use practices for Indiana University Bloomington, by improved master planning for the entire campus; environmentally sensitive management of grounds including the

IU Championship Golf Course, the Research and Teaching Preserve, and wooded and landscaped areas of campus; management of stormwater runoff, wetlands, and the Jordan River; and management of hazardous materials in the research and teaching environment and use and disposal of

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chemicals in non-research functions such as custodial work. Attention to the interconnections among the functions of newly constructed or refurbished building, residential life, transportation to and from dormitories, apartments, and homes, and other issues related to “smart growth” are also an integral part of environmental quality and land use concerns.

In recent years, Indiana University has made substantial progress by a variety of environmental quality measures. Among our most notable accomplishments: a significant reduction in pesticide use on campus; the rerouting of sanitary sewers and locking down of manhole covers have improved water quality in the Jordan River; and the cleanup of sites with hazardous waste risks, such as the Range Road shooting ranges.

Recycling and Resource Use

***Objective:** To raise awareness of resource use and recycling on the IUB campus among faculty, staff, and students, implement strategies to enhance campus recycling systems, and promote responsible resource use through green purchasing, conservation, and smart technology.*

The Recycling & Resource Use Working Group identified key benchmarks for the campus and compared current recycling and resource use practices with peer institutions in the Big Ten. Specific research areas included recycling of plastics, glass, aluminum, paper, and newspaper; “Green purchasing” practices (e.g., institutional policies on paper use and old growth forests; carpet purchasing and recycling; lighting fixtures and bulbs with higher efficiency); recycling system support network, including both on- and off-campus operations; and incentives to promote recycling among faculty, staff, and students. Our review of IUB’s current resource use and recycling practices reveals that our campus has already made significant steps towards becoming more sustainable. Most notable achievements include: the development of a robust recycling program at our residence halls; an effective End-of-Year Residence Halls Collection that diverted 20 truckloads of unwanted items from landfills to local charities; an efficient self-supporting

At the same time, we recognize that considerable work remains in order to maintain and enhance environmental stewardship of our campus.

Priority recommendations include:

1. heightened attention to ***environmentally-friendly master planning*** for future development projects on campus, with a focus on new urbanist concepts;
2. ***watershed protection projects***, including efforts to stabilize and improve biophysical conditions in and around the Jordan River;
3. elaboration and implementation of a holistic ***integrated pest management*** plan for the IUB campus;
4. development of a “***green chemistry***” management plan for teaching-related use of laboratory chemicals.

campus Surplus Store program that allows campus units to sell unwanted assets and generates approximately \$300K in revenue per year; a new “Green Purchasing” policy that promotes the purchase of green office products via an informational link on the Purchasing website; and purchasing of wood products from companies that have a “take an acre, replace an acre” policy.

Based on our review of resource use policies and practices at peer institutions, we have developed a suite of metrics to assess our progress, including (1) percent waste diverted from landfills via recycling, reuse, or resale; (2) waste generated at dining halls; (3) percent of high recycled content paper purchased on campus; and (4) proportion of Energy Star appliances purchased.

Our recommendations include both short- and long-term actions, including:

1. ***Enhancing IUB’s recycling efforts:*** including programs to pilot outdoor recycling program at

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athletic facilities; provide recycling bins for all residence hall rooms; develop a Greek and off campus recycling program; explore composting food waste generated at dining halls; explore a unified recycling program at IUB – i.e. combine RPS and IMU recycling; establish concrete recycling goals – e.g. OSU attempts to divert 30% of waste from the landfill.

2. **Minimizing resource use:** including the purchase of high recycled content paper; emphasizing recycling and conservation during residence hall move-in periods; and promoting the use and purchase of Energy Star appliances among students, faculty, academic departments, and operational units.

Transportation

Objective: *To promote a sustainable transportation system that will provide safe access and mobility for students, faculty, staff and visitors, and to ensure that individuals have a broad range of safe and convenient transportation options to walk, bicycle, carpool, or ride public transit to and around campus.*

Transportation on the IU Bloomington campus is a significant contributor to the university's environmental footprint. A sustainable transportation policy should support compact growth and multi-use development, where walking, bicycling, and bus transportation options are equally or more practical than traditional single-user car transport. We propose to use a series of specific metrics, such as the **modal split** or proportion of transportation types used by people commuting to the IUB campus, including walking, single-occupancy vehicles, car/van-pooling, taking buses, and biking. The goal of a sustainable transportation plan is to decrease the single-occupancy vehicle proportion of the commuting modal split. This can be accomplished by creating incentives to reduce car use on and around campus via enhancements for pedestrians, cyclists, bus users, and carpoolers as well as parking policies. Similarly, the university's use of fuel-efficient and non-carbon fueled vehicles is another important indicator of sustainability.

Specific recommendations proposed by the Transportation Working Group include:

1. **Enhancing efforts to support alternative transportation options** for IUB commuters by: emphasizing alternative modes of transportation in long-term planning for the IUB campus; providing administrative support for progress toward improving IUB's transportation sustaina-
2. **Developing policies that improve pedestrian travel options** within and to the IUB campus by: working with the city to improve the walking routes to campus; developing incentives to encourage faculty, staff and students to live within walking distance of campus; improving communication about pedestrian walkways to and throughout campus.
3. **Developing bicycle policies that support bicycle travel options** by: working with the city to improve the bikeways into campus, and to ensure that they connect easily to bikeways within the campus; improving the bike "infrastructure" on campus, including a comprehensive plan that would include improved bike routes within and to campus, more bicycle racks and garages, and better delineation of bike routes on campus; and improving communication about bike availability, bikeways, and bike safety to and throughout campus.
4. **Developing bus policies that support public transit options** by: establishing dedicated bus lanes; opening 7th street to buses, bikes, and pedestrians only; improving bus routes by: (a)

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studying the Stadium Park-and-Ride along with potential changes to routes and infrastructure; (b) coordinating with other public transit providers to create more express Bloomington Transit routes to campus, and improved bus options from areas outside of the city; and (c) ensuring the continued viability of East Tenth Street bus service by working with the city on

Built Environment

Objective: *To promote campus sustainability through innovative building design and engineering principles that promote functionality, safety, and energy efficiency while respecting campus culture and heritage.*

The landscape of the Bloomington campus presents an idyllic mixture of woodlands, green spaces, walkways, and buildings. Issues of sustainability in the built environment are intertwined with architectural integrity and preservation. Innovative design solutions are required to extend the useful life of historic structures and to integrate new structures into the campus facilities framework.

The first critical steps toward a sustainable built environment on the Bloomington campus include the establishment of guidelines for maintaining the distinctive character of existing buildings in tandem with efforts to ensure that historic buildings are safe, functional and energy efficient; the development of site-specific metering and monitoring systems that promote awareness of energy consumption and provide data to inform campus decision-making; and the promotion of green-building concepts in both commissioning and retro-commissioning of buildings. The energy-efficient design of the Multidisciplinary Science Center II (MSB2) as a LEED Silver building represents a major successes in this arena. The cost premium of such energy-efficient design is estimated at 2.4-4%. Over time, this additional cost will be recovered through improved energy-efficiency.

Through the work of a dedicated sustainability intern this summer, IUB calculated the energy density of many of its buildings, providing a new

ways to upgrade the railroad underpass between Union Street and the Bypass.

5. ***Developing parking policies that provide incentives that reduce single-occupancy vehicle travel*** to, from, and on campus, including modifying parking fees to encourage alternative commuting practices, encouraging flexible parking pass options, and subsidizing employees who regularly commute to campus.

metric for comparison with peer institutions. In many instances, IUB buildings exhibited below average energy densities compared to the peer institutions surveyed.

We propose to use building energy density metrics, LEED-certification of new buildings, and utility metering approaches to assess our progress on the built environment. On this basis, we make the following recommendations:

1. ***Reduce energy density by 3% per biennium:*** By applying standards for high-performance, energy-efficient buildings to all new and renovation projects, we seek to reduce energy density in all building types by 3% each biennium. We propose to incorporate energy modeling as a prerequisite for all new construction and renovation projects to validate each design, and establish a baseline to guide future design decisions.
2. ***Construct and renovate buildings to LEED criteria:*** The University should move as quickly as possible to establish LEED certification goals for new construction and major building renovations following the criteria set forth by the US Green Building Council. Following these guidelines will provide a tangible demonstration of Indiana University's commitment to sustainability and environmental stewardship.
3. ***Develop a utility enterprise:*** Based on a comprehensive metering program for all energy and utility sources, the campus energy production and distribution services could be run as an auxiliary enterprise. The establishment of a billing procedure would allow each academic and

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administrative department to become aware of and responsible for their energy and utility consumption. Ultimately, we seek to establish incentive programs for departments to fund energy-saving projects.

4. **Establish accurate project cost models:** Project cost models do not accurately reflect the lifecycle

economic, social, and environmental costs of a project. By incorporating lifecycle costs into a program statement, IUB will develop more accurate budget proposals and construct facilities that optimize the economic, social, and environmental performance from construction through demolition.

Food

Objective: *To promote high-quality dining options for IUB's students, staff, and faculty that support sustainable agricultural and food distribution practices while minimizing energy use and waste generation.*

The campus sustainable food model examines factors that affect food choices and food consumption on the IUB campus and considers food-related educational opportunities and benefits offered to the student body. Drawing upon the experiences of university and college campuses across the country, the food model focuses on: 1) sustainable food production and delivery, and 2) reduction and recycling of packaging materials and food waste. The model incorporates the current food carbon footprint for use as a benchmark, examines the feasibility of an edible permaculture plan for campus grounds, and explores ways to promote the food model to students, faculty, and staff.

Possible metrics for assessing our success in meeting the long-term objectives include: (1) amount of food purchased from local farms and vendors; (2) amount of packaging and food waste generated by dining facilities; (3) assessment of dining hall food carbon footprint. Our recommendations include both short-term and

long-term efforts to improve sustainability in food distribution at IU Bloomington.

1. **Short-term recommendations** include efforts to (1) develop and support relationships with vendors of locally-produced foods; (2) appoint a Sustainable Food Coordinator; (3) create comprehensive plans to reduce packaging on foods ordered for campus dining halls, and to recycle all unusable packaging materials; and (4) create a comprehensive plan to reduce food waste and recycle remaining waste.
2. **Long-term recommendations** include: (1) support a farm-to-college initiative to produce food for campus dining halls and to create food production learning experiences for students; (2) establish a regular farmer's market on campus that would accept student meal points; (3) establishment of an edible permaculture project on open areas of the campus; (4) instituting a series of cooking shows aimed at students to be distributed through the IUTV network and made available for podcast downloading; and (5) monitor campus dining halls' food carbon footprint.

Strategic Analysis

A strategic ("SWOT") analysis of the University's strengths, weaknesses, opportunities and threats with respect to sustainability is summarized in *Table I*. Our summary of the analysis is that Indiana University Bloomington is particularly well situated to take on a campus-wide sustainability initiative. Strong environmental science and policy programs are distributed

across at least five schools and a dozen or more departments at IUB; our academic strengths in allied fields, combined with strong professional school programs in environmental education and outdoor recreation offer remarkable opportunities for community and K-12 outreach. At the same time, we must acknowledge significant academic limitations that exist at IUB: the

Executive Summary

absence of agriculture and engineering programs limits research, teaching, and external funding opportunities in environmental engineering, agronomy, soil science, and other related fields.

In its operational side, the campus has taken some significant and positive steps toward building a sustainable campus over the last decade. However, these efforts have been modest and are not part of strategic and sustained efforts. Many operational units have tried to improve their efficiencies, and most initiatives have been focused on cutting costs, especially for utilities.

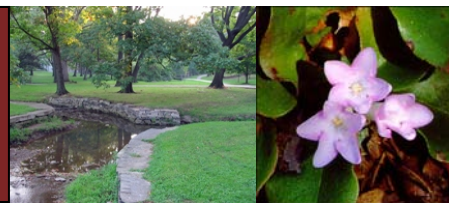
Many of the academic departments have identified sustainability as a rich area to attract student interest, particularly among students with increasing awareness and involvement in environmental issues. But, for the most part, these campus efforts have been isolated and disconnected and not part of an overall strategy. The creation of a new, campus-wide structure to address issues related to sustainability has the potential to effectively unify these isolated efforts into a high-visibility, focused effort that links academic, operational, and residential parts of campus life.

Executive Summary

Table I. Summary of Strategic Analysis of Sustainability Initiative at IUB.

<p>Strengths</p> <ol style="list-style-type: none"> 1. Education, Outreach and Student Engagement Strengths in environmental science & policy; substantial teaching/research infrastructure; strong student interest. 2. Resource Use and Recycling Significant recycling effort already in place; major student engagement. 3. Energy Successful energy-savings initiatives in place; strong current focus of student engagement; completion of major energy audit. 4. Built Environment Improved building standards for energy efficiency and indoor air quality. 5. Food Strong student interest & campus food service providers; new teaching & research opportunities. 6. Environmental Quality and Land Use Successful environmental remediation & watershed-protection efforts; significant decrease in use of herbicides and pesticides. 7. Transportation systems Campus is very accessible for both bicyclists and pedestrians; universal bus access for all students, faculty and staff. 	<p>Weaknesses</p> <ol style="list-style-type: none"> 1. Education, Outreach and Student Engagement Poor coordination of existing academic programs between units; no strategic focus on global environmental issues. 2. Resource Use and Recycling Limited market for recycling materials; no purchasing policies to encourage use of “environmentally friendly” products; No culture of ‘recycling responsibility’. 3. Energy Reliance on coal as the predominant energy source; limited metering of campus buildings for utility use. 4. Built Environment Legacy of older, energy-inefficient buildings; funding constraints and historic preservation guidelines limit energy-efficiency efforts. 5. Food Local suppliers’ limited ability to provide needed produce; limited awareness of benefits of local & organic food. 6. Environmental Quality and Land Use Use of exotic plants & chemicals for maintaining campus landscape; negative impacts of invasive flora & impervious surfaces. 7. Transportation systems Preponderance of single-driver automobile transit to campus; insufficient bicycle & pedestrian routes into campus.
<p>Opportunities</p> <ol style="list-style-type: none"> 1. Education, Outreach and Student Engagement Opportunities for development of new research, teaching, & service-learning programs; new sources of external funding. 2. Resource Use and Recycling Strong student interest and high visibility for recycling; opportunities to enhance recycling at construction sites; increasing availability of ‘green products’. 3. Energy Alternative fuel options for the Central Heating Plant; new utility metering options; opportunities for research into energy-efficient computing. 4. Built Environment Improved energy-efficiency & indoor environmental quality at new & renovation projects; introduction of IPM and improved laboratory air handling decreases indoor environmental hazards. 5. Food Opportunities to work with local farmers to increase local food use in campus dining halls; enhanced educational opportunities. 6. Environmental Quality and Land Use Campus master planning provides opportunities for long-term environmental sustainability; natural landscaping techniques can reduce use of chemicals on campus. 7. Transportation Opportunities for improving pedestrians & bicycle routes to campus; effective transit alternatives & pricing incentives can encourage car-pooling. 	<p>Threats</p> <ol style="list-style-type: none"> 1. Education, Outreach and Student Engagement Significant ‘opportunity cost’ due to delay or inaction and competition from peer institutions; possible loss of external funding opportunities. 2. Resource Use and Recycling Cost of recycling is a significant barrier to expanded efforts; ineffective communication & education could undermine campus recycling efforts. 3. Energy High investment costs; competition with other campus investments; cost and supply problems could limit alternative energy sources. 4. Built Environment Improvements for energy efficiency or indoor environmental quality can significantly increase cost. 5. Food Limited, and highly variable, supply of locally grown food; difficulties in educating students on value of locally grown food. 6. Environmental Quality and Land Use Need for campus master planning; differences in aesthetic interpretation of native plantings compared to traditional landscaping approaches. 7. Transportation systems High costs of public transit options; potential for increased health hazards associated with bicycle use.

Indiana University Task Force On Campus Sustainability Preamble



The awarding of this year's Nobel Peace Prize—to an American politician and an international group of scientists—underscores the degree to which global environmental issues have emerged as the leading societal challenges of the new century. Indeed, the 21st century has been dubbed "The Century of the Environment" in recognition of the role that the health of the global ecosystem plays in human health, the global economy, social justice, and security¹. It is now widely recognized that the changing state of the global environment is already having profound effects on the production of food, the impact of natural disasters, the spread of infectious disease, and conflict over scarce resources. Meeting these challenges is the goal of sustainability, which is broadly defined as "meeting the needs of the present without compromising the ability of future generations to meet their own needs."² It can be taken to encompass issues of local and global environmental quality, resource use, environmental literacy, and societal equity. Many contend that the concept of sustainability must become society's organizing principle³. The challenge of a rapidly growing world population—expected to exceed 9 billion by 2050—



against a backdrop of limited natural resources and global-scale environmental degradation make this principle ever more central to the peace and prosperity of our global civilization.

Closer to home, a recent *Forbes Magazine* review of 'America's greenest states'⁴ ranked our home state of Indiana 49th out of the 50 states, only a few points above West Virginia. *Forbes* noted that Indiana was ranked with the sixth highest carbon footprint of any state, that four of its ur-

ban areas are listed by the American Lung Association for serious smog problems, and one with an ozone pollution problem. Our water quality ranked near the bottom, with only four other states ranked lower. Indiana University has an opportunity—and indeed a responsibility—to help address these significant environmental and economic challenges, as part of its mission to the State of Indiana.

As with other great societal challenges, centers of learning have a crucial role to play in providing new tools to help us understand and respond to the complex interplay of physical, biological, and societal processes that govern human-environment interaction. They also have a responsibility to help shape the values, perspectives, and skills of future leaders who must navigate global-scale and environmental change. Achieving a sustainable society will depend in large part upon the ability of educational institutions to produce graduates who can think critically and to apply this critical thinking to solving both local and global issues of sustainability.

¹Lubchenco, J. 1998. "Entering the century of the environment: a new social contract for science," *Science* 279, pp. 491-497.

²This definition draws on the famous articulation of "sustainable development" by the World Commission on Environment and Development in *Our Common Future* (Oxford University Press, 1987, p. 8)

³Merkel, A. 1998. "The role of science in sustainable development," *Science* 281, pp. 336-337.; Sitarz, D. 1998. "Introduction," In Sitarz, D. (ed.) *Sustainable America: America's Environment, Economy, and Society in the 21st Century*. Carbondale, IL: Earthpress, pp. 3-23.

⁴http://www.forbes.com/2007/10/16/environment-energy-vermont-biz-beltway-cx_bw_mm_1017greenstates.html

Preamble

Academic institutions across the nation, including many of our peer public institutions, are rising to the challenge of global sustainability. “Green campuses” are advancing sustainability in their operations, research, teaching, and community outreach. We believe that Indiana University Bloomington is well positioned to take on a leading role in this movement. IU has been at the forefront of integrating environmental science and policy since the founding of the School of Public and Environmental Affairs over 35 years ago. Our internationally recognized strengths in environmental science and policy, in international affairs, in information technology, and in teacher education and community outreach position us well to take on a leadership role in this emerging academic arena. Moreover, we believe that a commitment to a solid program of research, scholarship, and creative activity related to sustainability will allow IUB to successfully compete with peer institutions—who are themselves moving rapidly in this direction—for recruitment of students and faculty, creation of research and learning opportunities, and accrual of new sources of external funding.

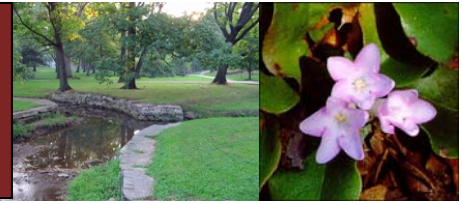
Indiana University has already asserted leadership in a few key sustainability-related areas, notably through its Life Sciences Initiative and the formation of the Richard G. Lugar Center for Renewable Energy. Individual schools, departments, programs, units and groups are already moving IUB forward in multiple areas associated with sustainability. Evidence of the growing commitment to sustainability includes:

- university commitment to building new LEED-certified buildings and making energy-efficient renovations;
- investment in cleaner forms of energy, including major renovations to the university’s heating plant that are saving energy and reducing stack emissions.
- major new improvements to our campus and community public transit system that have drastically reduced fuel consumption and traffic congestion;
- gradual replacement of ordinary lawn grass and exotic plants with native perennials and grasses on grounds throughout campus;
- creation of a wide variety of new academic programs related to sustainability, including the undergraduate B.S. in Environmental Science, B.A. degrees in Environmentally Sustainable Design and Human-Environment Interaction, as well as graduate programs in Environmental Science and Policy and a graduate minor in the Human Dimensions of Global Environmental Change.
- some 300 sustainability-related courses at IUB taught by more than 80 environmental science and sustainability-oriented faculty in over one dozen IUB academic units;
- partnering efforts with the City of Bloomington in order to promote sustainability as a community-wide theme, leading to recognition for its efforts to advance sustainability within the state and the country.

In spite of these significant efforts, much work remains to be done to make our university more sustainable. We lag far behind many of our peer institutions, both in operational and academic initiatives, and lack public visibility for our sustainability efforts. This proposal aims to reverse this trend, building on the strengths of our existing programs at IUB and bringing together new resources in support of an ambitious, coordinated initiative to address sustainability in all aspects of university life—from operation of the physical plant to scholarly research, teaching and service to students’ co-curricular and residential life. In tying these diverse aspects of university life to a single, integrated theme, we have the potential to substantially reduce our own ecological footprint, to increase our ‘academic footprint’ in developing innovative and flourishing new academic programs, and to make significant contributions to solving some of the world’s most pressing societal problems.

Indiana University Task Force On Campus Sustainability

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Introduction

This report summarizes the efforts of the Indiana University Task Force on Campus Sustainability to develop a comprehensive program in sustainability for the IU Bloomington campus. The work is the product of a broad-based effort by over 100 Indiana University faculty, staff, and students, under the leadership of a 16-member Task Force, who have examined issues of environmental sustainability across a broad swath of academic, administrative, and operational programs at IUB. It is organized into an *introductory chapter*, providing background on the history, structure, and mission of the Task Force, as well as a survey of sustainability programs at peer institutions; a chapter on *administration and governance*, providing a summary of the Task Force's principal organizational and policy recommendations, as well as a summary of communication, funding, and community collaboration opportunities, followed by a series of chapters representing the recommendations of each of the Task Force's seven sustainability working groups. The final chapter presents a summary of our strategic analysis of the institution's strengths, weaknesses, and opportunities and threats with respect to the sustainability initiative. A series of electronic appendices are available at the sustainability website: <http://www.indiana.edu/~sustain>.

History of the Sustainability Task Force

The Indiana University Task Force on Campus Sustainability is the product of a grassroots effort by several dozen Indiana University faculty, staff, and students who have advocated, over the course of the past several years, for a comprehensive institutional plan to address issues of environmental sustainability. The current phase of the sustainability initiative was catalyzed by a letter, submitted in October 2006, to then-Provost Michael McRobbie by 26 IUB faculty, staff, and students. Following a series of meetings with Provost McRobbie and Vice President Terry Clapacs, the Indiana University Task Force on Campus Sustainability was established by Vice President Clapacs on March 7, 2007. The 16-member task force, comprised of IU Bloomington faculty, students, and staff, is charged with the development of a framework for campus sustainability by fall 2007.



"Sustainability" is defined broadly by the task force as meeting the needs of the present without

compromising the ability of future generations to meet their own needs. It can be taken to encompass issues of local and global environmental quality, resource use, environmental literacy, and societal equity. In effect, we view this initiative as an opportunity for Indiana University to take a leadership role, not only in incorporating concepts of sustainability into University practice, but also in the creation, dissemination, and application of new areas of academic scholarship in this emerging field. A proposed mission statement for the sustainability initiative is included as *Appendix A*.

Previous Efforts

This is not, of course, the first initiative related to environmental sustainability. As early as 1997, Indiana University, under the leadership of

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IU President Myles Brand, agreed to promote a stewardship initiative that included formation of a council of faculty, staff and students representing academic and administrative departments and other organizations. The IUB Council for Environmental Stewardship (CFES) was established in 1998, and was funded by the IUB Chancellor's office for a period of seven years, during which time the group addressed a number of academic and operational issues closely related to the current sustainability initiative, e.g., energy, campus food, education, land use, etc.

A major academic initiative, the "Environmental Literacy and Sustainability Initiative" (ELSI) was developed in 2001 by an interdisciplinary group of faculty, staff, and students as an outgrowth of the Environmental Literacy Working Group of CFES. The group took on a comprehensive review of IUB environmental course offerings and focused its efforts on the development and promotion of coordinated interdisciplinary education programs for IUB. The group convened an interdisciplinary seminar series, featuring participants from a variety of schools and departments, and two off-campus speakers: David Orr (Oberlin) and Christopher Uhl (Penn State). The group helped develop a core strategy for promoting environmental literacy on the IUB campus, entitled "A Pedagogical Approach to Greening IU", and subsequently extended into a number of more focused interdisciplinary efforts, including

(a) the "Food for Thought" project, which focuses on food literacy as a key component of environmental literacy that cuts across multiple social, economic and environmental issues at local to global scales; (b) a curriculum development effort that has led to a new interdisciplinary curriculum in Human Environment and Ecology for the new Indiana University Human Biology Program (HUBI); and (c) development of an edited volume of writings on environmental literacy and pedagogy connected with IU's Scholarship of Teaching and Learning program.

In his charge to the Task Force, Vice President Clapacs asked the group to develop a set of sustainability indicators for the university, to assess the current sustainability status of the Bloomington campus, to identify key areas of concern, and to establish a framework for a long-term sustainability plan. This report is the product of that six-month effort. The Task Force has also developed a sustainability internship program, which has included twenty undergraduate and graduate student interns working on a wide variety of sustainability-related projects. The group has laid plans for a speaker series on sustainability issues, created connections to national and international sustainability organizations, promoted student involvement in sustainability programs through its "Volunteers in Sustainability" effort, and has developed a new website devoted to campus sustainability (<http://www.indiana.edu/~sustain>).

Organization and Mission

The Task Force defined its mission in terms of seven key areas of campus sustainability:

1. **Education, Outreach, and Student Engagement:** *To build an integrated program of academic research, undergraduate and graduate education, co-curricular and service-learning opportunities, and community outreach that will move Indiana University Bloomington into a position of national leadership in sustainability studies.*
2. **Energy:** *To raise awareness of IUB's energy use among faculty, staff, and students and implement strategies to maximize the efficiency of on-campus production and distribution systems as well as reduce energy consumption and greenhouse gas emissions.*

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3. **Environmental Quality and Land Use:** *Through research, self-reporting, and adoption of environmentally sensitive land-use practices we seek to help IUB use resources sustainably and improve environmental quality and to protect the health of citizens on campus, in Bloomington, and beyond.*
4. **Resource Use/Recycling:** *To raise awareness of resource use and recycling on the IUB campus among faculty, staff, and students, implement strategies to enhance campus recycling systems, and promote responsible resource use through green purchasing, conservation, and smart technology.*
5. **Transportation:** *To promote a sustainable transportation system that will provide safe access and mobility for students, faculty, staff and visitors, and to ensure that individuals have a broad range of safe and convenient transportation options to walk, bicycle, carpool, or ride public transit to and around campus.*
6. **Built Environment:** *To promote campus sustainability through innovative building design and engineering principles that promote functionality, safety, and energy efficiency while respecting campus culture and heritage.*
7. **Food:** *To promote high-quality dining options for IUB's students, staff, and faculty that support sustainable agricultural and food distribution practices while minimizing energy use and waste generation.*

The product of each of these working groups constitutes the core of the document presented here. The Task Force has met biweekly since its initial organizational meeting. The group has addressed a broad range of environmental and societal issues during its discussions. Among the principal accomplishments and plans addressed by the task force are:

1. Creation of an Oncourse work site as an 'electronic library' of resources related to sustainability issues;
2. IUB's membership in the American Association for Sustainability in Higher Education (AASHE)
3. Development of close linkages with the City of Bloomington's Commission on Sustainability
4. Support for IUB becoming a signatory to the American College and University Presidents' 'Climate Commitment' letter
5. Development of a campus sustainability website (<http://www.indiana.edu/~sustain>).
6. Engagement with a number of national sustainability initiatives (Green Building Conference, National Association of Educational Procurement, Bioneers Conference, Greening of the Campus Conference, etc.)
7. Publicity for the campus sustainability initiative, including several press releases through IU Media Relations and articles in the *Herald-Times* and *Indiana Daily Student*; and

8. Hosting visits by Terry Link, Director of Michigan State's Office of Sustainability, and Dr. Tom Kimmerer, Executive Director of the Association for Advancement of Sustainability in Higher Education (AASHE), for extended seminars and discussion with the Task Force and members of the Working Groups.

Internship Program

One of the most successful efforts of the Sustainability Task Force has been the engagement of an excellent group of twenty undergraduate and graduate student interns working on a variety of projects related to campus sustainability. The announcement of this student internship opportunity, posted during the final week of classes, elicited over 200 applications within a single week's time. The interns' projects ranged from broad research surveys on IUB's academic and outreach efforts related to sustainability to very focused projects on energy metering, 'green chemistry' alternatives to the use of toxic chemicals in teaching labs, a GIS inventory of IUB's tree canopy, and a restoration project on the Jordan River. Extended programs for the summer interns included seminars, field trips, informal discussion sessions, and social events for the participants. Their work culminated in a seminar in August 2007, which allowed interns to share their research projects in a forum open to the public. The interns' very impressive

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project reports are posted on the sustainability website (<http://www.iub.edu/~sustain/internship.htm>).

Volunteers in Sustainability

One of the most successful new efforts of the Sustainability Task Force is a new organization called “Volunteers in Sustainability,” coordinated by one of our Sustainability interns. ViS was created to draw both individual students and student organizations together to focus attention on campus and community issues related to sustainability. On the IU Bloomington campus, there exists a substantial level of student interest in sustainability and environmentally oriented issues. There are, in fact, at least a dozen clubs and organizations that specifically focus their efforts on such matters. However, these groups are scattered across campus, and although they share many common goals, many of them are unaware that the others exist. As a result, each group has a limited membership base and scarce resources with which to undertake any activities or projects in related areas. By facilitating networking and the sharing of ideas and projects, ViS hopes that rather than competing for volunteers and resources, these groups can come together to accomplish projects and outreach activities that

never would have been possible individually.

The kickoff event sponsored by ViS was a ‘Jordan River Cleanup’ event, held on Saturday, October 27. The very successful campus event was an excellent model for future sustainability-related events. It brought together members of the campus and greater community, combined educational presentations by Sustainability interns and community, and was followed by a hands-on volunteer effort that helped to improve one of our campus’s most cherished natural resources. Following the lead of this event, ViS hopes to draw volunteers from all over campus – from residence halls, from service clubs, from religious organizations, and from the Greek community, for example. Eventually, ViS hopes to expand into the greater Bloomington community, collaborating with sustainability-focused institutions, religious congregations, and area high schools, to name a few. By developing a coordinated collaborative effort on campus, we will be able to engage a broad section of the campus community to more successfully accomplish common goals for a more sustainable campus and world.

Institutional Context

Indiana University Bloomington will not be entering into a campus sustainability program in a vacuum. The ‘greening of the campus’ is part of a rapidly growing nationwide—and international—movement to address global-scale environmental issues. The growing visibility of this academic sustainability movement has been recognized in a special issue of the *Chronicle of Higher Education*, as well as numerous articles in popular media, including *Newsweek*, *Time*, *Business Week*, *Business Officer*, *Inside Higher Ed*, *The Chicago Tribune* and *The New York Times*.

Comparison with Peer Institutions

The academic sustainability movement began to formalize itself with the initiation of the 1990 Talloires Declaration. The Declaration, developed at an international conference in Talloires, France in 1990, is the first official statement made by university administrators of a commitment to environmental sustainability in higher education. The Declaration is a ten-point action

plan for incorporating sustainability and environmental literacy in teaching, research, operations and outreach at colleges and universities. It has been signed by over 350 university presidents and chancellors in over 40 countries, and includes a number of our peer public institutions in the U.S., including the universities of Colorado, North Carolina, California, Arizona, and Florida.

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A number of our nation's leading universities have committed themselves, in a very public way, to modify both their campus operation and academic mission to address these growing environmental challenges. Among the nation's leading private universities, Harvard, Yale, Princeton,

and Stanford have distinguished themselves in undertaking major initiatives to modify the way they do business, in order to limit greenhouse gas emissions, improve air and water quality, change faculty and student transportation patterns, and identify new academic opportunities.

To provide some context for our own sustainability initiatives, consider the efforts of three of the nation's leading institutions¹.

- **Harvard University** has one of the largest campus sustainability programs in the country. The Harvard Green Campus Initiative (HGCI) is responsible for implementing Harvard's campus-wide sustainability principles and has a staff of 20 full-time professionals and 40 part-time student interns, offering various campus sustainability support services, a project research and advocacy function, an extensive website, two courses, and a revolving \$12 million Green Campus Loan Fund. Successes of the HGCI include a high-performance building service for both new and existing buildings; a range of effective behavioral change programs that have produced substantial energy savings in residential dorms and laboratories; large purchases of renewable energy; on-campus solar panels; biodiesel in all campus shuttles; green cleaning in custodial services; a committed dining services policy that has resulted in a 57 percent reduction in waste thanks to aggressive recycling; and a recycling rate of over 45 percent.
- The **University of California** has one of the broadest-ranging sustainability initiatives of any state university system. The UC system president has signed the Presidents Climate Commitment and a University Policy on Sustainable Practices. The system-wide policy is overseen by a sustainability steering committee, which has working groups in the areas of sustainable transportation, climate change, green building renovations, sustainable operations, sustainable purchasing, recycling and waste reduction, and sustainable food systems. Each campus has an advisory committee on sustainability in addition to sustainability staff, and several campuses have complementary policies of their own. Four campuses have joined the California Climate Action Registry (CCAR) and are cataloging greenhouse gas emissions; other campuses are exploring joining the CCAR.
- A carbon emissions inventory has been completed at **Arizona State University** and will be used to develop a strategic plan to reach carbon neutral status; President Crow is a co-founder of the Presidents Climate Commitment. ASU recently issued a mandate for building temperatures to be raised two degrees in the summer and lowered two degrees in the winter. The new cogeneration plant on campus received an award from the EPA for its superior energy efficiency. Two additional solar arrays are currently under construction, with a 4-megawatt system being developed. Arizona State has developed then nation's first School of Sustainability.

The American Association for Sustainability in Higher Education reports some 30 institutions who have formalized their sustainability programs by initiating a permanent Office of Sustainability or its equivalent. Of our peer institutions in the CIC, only Michigan State and Penn State have a permanent sustainability coordinator, while Wisconsin, Michigan, Minnesota and Illinois have full-time operational officers with responsibility for sustainability-related issues. Table I compares the sustainability initiatives at the Big Ten institutions. It is worth noting that, while IU has made significant headway in many sustainability-related initiatives, it lags behind many of its Big Ten colleagues. A national rating of major U.S. universities by the Sustainable Endowments Institute, the *College Sustainability Report Card*, ranked IU at the bottom of the Big Ten, with an overall grade of C.

¹ From the *College Sustainability Report Card 2008: A Review of Campus & Endowment Practices at Leading Institutions*, Sustainable Endowments Institute, Cambridge, MA.

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Academic Initiatives

Most universities view the concept of sustainability through the lens of environmental stewardship. More inclusive definitions of sustainability, however, recognize the fact that the ability to enhance humans' interaction with the natural environment is interdependent with issues of economic prosperity and social equity. Universities that utilize this more inclusive definition are able to boast larger numbers of courses and programs dedicated to sustainability and the initiatives they undertake may include environmental stewardship as a part of larger efforts towards addressing sustainability in their communities. Indiana University's efforts to develop a broad program in campus sustainability are in keeping both with this inclusive definition of sustainability and with exciting programs in sustainability at major research universities across the country. The past decade has seen the creation of formal academic programs in sustainability at a number of the nation's leading research institutions. Prominent examples include Arizona State's *School of Sustainability*, the University of Michigan's *Graham Environmental Sustainability Institute*, and UC Berkeley's *Society and the Environment Program*.

Academic Programming

Recently a number of the nation's major public universities have been developing academic programming to take advantage of growing student and faculty interest in interdisciplinary programs that address humans' role in the global environment. The development of new programs in sustainability clearly can play a critical role in recruiting and retaining high-quality students and faculty. The following are a few of the prominent examples:

- **Arizona State University** stands out as being the first to launch a degree-granting School of Sustainability. The School itself has a limited number of graduate-level courses and relies on partnerships with other departments to offer a full suite of interdisciplinary courses needed for their newly minted Ph.D. in Sustainability, along with two bachelor's degrees, two masters programs, and a certificate program. In all ASU offers a total of 300 courses and 80 degree-granting programs involving some aspect of sustainability.
- The **University of Michigan** offers nearly 400 courses with some relation to environmental sustainability. Of particular note is its Erb Institute joint MBA/MS degree program in Global Sustainable Enterprise. This program integrates two well respected programs, The Ross School of Business and The School of Natural Resources and Environment with university-wide affiliated faculty to give students the most opportunity for interdisciplinary scholarship.
- **Michigan State University** is the recipient of the Campus Sustainability Leadership Award from the Association for the Advancement of Sustainability in Higher Education. Using the more inclusive definition of sustainability that was described previously, Michigan State claims 760 courses with a sustainability component to them. Michigan State also offers a wide variety of environmentally focused degree programs including undergraduate degrees and specializations, six M.S. degrees and a Ph.D. in environmental and natural resource economics. MSU also offers six advanced degree programs in environmental engineering including an interdisciplinary MS degree that combines coursework in urban studies.
- **Michigan Technological University** also is making a notable commitment to sustainability scholarship. In the fall of 2007 Michigan Tech announced the creation of 10 tenure-track faculty positions, including three endowed chairs, all related to sustainability. These new faculty will support graduate and undergraduate certificates in sustainability that complement various environmental degrees. Michigan Tech also offers the Sustainable Futures Integrative Graduate Education and Research Traineeship (IGERT), which engages students at all levels to develop an integrated scientific and social basis for decision-making on sustainability issues and develop tools and methods that promote sustainability. IGERT trainees receive \$30,000 stipends in addition to tuition remittances.

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Research Activity

Naturally, many of the sustainability degree programs offered at various universities are related to centers and institutes that are engaged in applied research to create sustainable solutions to the world's problems. Michigan Tech has a total of 15 such centers including *The Sustainable Futures Institute*, *The Center for Environmentally Benign Functional Materials*, *The National Institute for Climate Change Research*, and *The Advanced Power Systems Research Center*.

Research centers at some of our peer institutions include the *Institute for Social, Economic and Ecological Sustainability* (Minnesota), the *Center for Sustainable Enterprise* (UNC), the *Global Institute of Sustainability* (ASU), and the *Purdue Interdisciplinary Center for Ecological Sustainability*. There are of course many more at these and other universities.

Large interdisciplinary research projects are often the focal point of these centers. For example, the "Minnesota 2050: Pathways to a Sustainable Future" project at the University of Minnesota is analyzing and modeling trends in energy use, the built environment, and food production in the state to lead Minnesota towards a sustainable future. Here in Indiana, the *Purdue Interdisciplinary Center for Ecological Sustainability* is working on the Indiana Futures Project, which models the environmental, economic, and social outcomes of different development and environmental change scenarios. The *Sustainable Michigan Endowed Project* at Michigan State has similar goals to the other research projects mentioned but is also a vehicle for promoting discourse and creating cultural change within MSU with regard to sustainability and provides seed grants for sustainability research within the state.

Community Outreach

The impact of educational institutions on their host communities is often substantial. Although there remains considerable variability in impact on the environment, positive impacts of universities on their host communities include enhanc-

ing cultural opportunities and supporting the local economic base with an educated workforce, and offering meaningful learning opportunities for students engaged with the communities in which they reside. Still, educational institutions are commonly criticized for not going far enough in including the needs of the community into their agendas. One substantial effort aimed at addressing this problem is *The Social Embeddedness Plan* for ASU². Some of the stated goals of that plan are to

- (1) Foster a university-wide culture that embraces responsibility for contributing to positive social change in the community,
- (2) Develop internal and external structures and rewards systems to encourage effective implementation and long term sustainability of social embeddedness as a core value for ASU, and
- (3) Work in partnership with communities to increase the state's social capital and capacity of communities.

A plan for sustainability at IU could be modeled on the Social Embeddedness Plan from ASU and tailored to meet specific goals outlined in this initiative. Another example is UC Berkeley's Office of Community Relations, which administers the *Chancellor's Community Partnership Fund*. In 2007 this fund awarded over \$200,000 in grants for projects that will enhance the economic, social, or cultural well-being of Berkeley residents or improve upon the physical environment of the community. Another approach is the *Council on a Sustainable Community* at the University of North Carolina. The council brings together university personnel and the local Chamber of Commerce to maintain a sensible built environment, promote diversity, and support economic development.

In addition to university-wide initiatives such as those, many of the previously mentioned research

² <http://www.asu.edu/ui/documents/SEplanforASU-Sept2006.pdf>

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centers perform outreach to their communities by creating sustainability educational materials for K-12 students. One such program is the *Schoolyards, Science, and Sustainability* program from UMN's Institute for Social, Economic, and Environmental Sustainability. This program produces curriculum, workshops for teachers, and even public television programming to enhance the ecological literacy of K-12 students.

Sustainability in the Corporate World

Progressive businesses have been quick to see that changes are coming and have incorporated ambitious programs in the area of sustainability. These initiatives have arisen for several reasons. Strategically, they may preempt government regulations or deflect the demands of non-governmental organizations toward other firms. Investments in sustainability may also serve to attract employees, enhance the morale of existing employees, and enhance demand for a firm's products or its general corporate reputation. Many

manufacturing and retail firms have recognized that there is a growing market for new products that address sustainability in energy conservation, resource use and recycling, alternative transportation systems, and enhanced organic and local food production. Many of the nation's leading manufacturers, including Pepsico, Toyota, Wal-Mart, and GE, are making major investments in sustainability, and are increasingly interested in creating a future work-force that is competent in sustainability. The Wal-Mart Foundation for example, recently gave the Sam Walton School of Business at University of Arkansas \$1.5 million to develop an Applied Sustainability Center to perform interdisciplinary research to develop more sustainable business practices. Dow Chemical provided a \$10 million gift to UC Berkeley for establishment of a sustainability center; and the Wrigley family has supported \$25 million in gifts to Arizona State University to help establish its leadership in sustainability studies.

Table I. Comparison of Big Ten Sustainability Initiatives³.

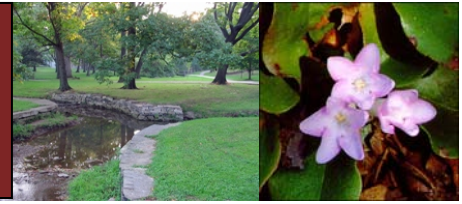
Institution (grade)	Administrative Commitment	Operations Structure	Transportation	Purchasing / Recycling	Food Services	Building/ Construction	Land/Water Use	Energy Use
Indiana University C	No institutional commitment.	Sustainability initiatives are pursued on an individual basis by various student and or faculty groups.	Universal bus pass for students, faculty, and staff. Working with City of Bloomington to create more bike routes to campus.	"Go Green Challenge" refillable bottle campaign, "End of Year Collection" reduces dorm waste, Surplus Store and Resource Redistribution Listserv. No current green purchasing programs.	"SPROUTS" student grown food available in Collins dorm, eat local publicity campaign.	Plans to seek LEED certification for MSBII, Research and Teaching Preserve lab, and new SPEA building.	Periodic Jordan River clean up, no long term programs.	Greenhouse gas assessment complete, upgrading to high-efficiency gas boiler.
University of Michigan B+	\$5.25 million towards the Graham Environmental Sustainability Institute (GESI).	Physical campus sustainability programs are run through the Department of Occupational Safety and Environmental Health (OSEH).	Zip-car program, 87% of passenger vehicles use alternative fuels.	Encouraged use of recycled and remanufactured supplies. Extensive recycling programs for all types of waste. "Take It or Leave It" student move-out week (14.2 tons of materials diverted and donated in 2006).	The Fresh Michigan program uses local and student grown produce in many of its menus, many organic and fair trade choices.	Design guidelines require energy conservation evaluations, and energy conservation efforts included with 6 to 8 year payback period.	North Campus Woods Conservation and storm water management programs in place.	Centralized conservation plan for alternative lighting system/controls, green computing, Cogeneration at the central power plant.
Michigan State B	Member of the Chicago Climate Exchange and provides funding for sustainability office.	Office of Sustainability reports to vice presidents of finance and operations, provost, and research and graduate studies.	20 Hybrid vehicles in the motor pool, successful bike leasing program.	Current pilot digester for food waste with plans for a permanent anaerobic digester and methane recovery system. Biodegradable corn based cups for athletic events.	Local and organic foods incorporated in dining halls, fair trade coffee available at 20 campus locations.	LEED certification required on all construction projects. One green roof installed.	No mow zones and use of native landscaping techniques. Riparian restoration along river.	Cogeneration of heat and power, innovative use of waste corn starch and sewage sludge as fuel.
University of Iowa B-	Member of the Chicago Climate Exchange, Campus Master Plan incorporates commitment to sustainability, commitment to 10% energy reduction and 15% renewable energy by 2013.	Energy Conservation Advisory Counsel (students, staff, faculty) advises Facilities Management on energy conservation, savings and utility rebates are reinvested in campus sustainability fund.	Rideshare Incentive program.	Purchasing guidelines specify energy efficient products. Comprehensive recycling program diverts over 20% of waste generated.	Local and organic foods incorporated in dining halls, fair trade coffee available at 20 campus locations.	Campus design standards include energy and water efficiency as well as material use guidelines.	Native landscaping throughout campus including river restoration and uses compost from dining hall waste.	Uses oat hulls in boilers and a total of 11% renewable energy.
University of Wisconsin B+	Pledge to use 20% renewable energy by 2010.	No sustainability office. Projects and initiatives are spearheaded by the physical plant with the assistance of a sustainability coordinator.	90% of students and 50% of faculty and staff use alternative transportation.	No special program identified.	Student grown organic food served in dining halls.	State mandated LEED certification requirements. Multiple green rooftops on campus.	Rain gardens and pervious pavement used throughout campus.	Recent energy audits revealed \$2.2 Million in annual savings.

³ grade is from Sustainable Endowments Institute's *College Sustainability Report Card 2008*

Table I. Comparison of Big Ten sustainability initiatives (continued)

Institution (grade)	Administrative Commitment	Operations Structure	Transportation	Purchasing / Recycling	Food Services	Building/ Construction	Land/Water Use	Energy Use
University of Minnesota B	Member of the Chicago Climate Exchange, Board of Regents adopted a "Sustainability and Energy Efficiency Policy".	No sustainability office. Projects and initiatives are spearheaded by facilities management.	Zip-car program, 30 Hybrid vehicles in the motor pool, rail and bus passes for students and faculty, offers low cost bike helmets and lights.	Program in place to reuse and redistribute laboratory chemicals and reduce waste.	Local food available emphasized by dining services. Composting program in all campus restaurants.	Sustainability Design guidelines result in the equivalent of a LEED silver rating for all new construction & renovation projects, including new stadium.	No special program identified.	Has reduced emissions 29% from '98-'01 baseline and uses oat hulls in boilers.
Penn State B	Environmental Initiative incorporated into strategic plan, \$10 million per year for six years into sustainability rotating fund, pledged 22% renewable energy by 2012.	No staff – goal to take sustainability to every employee and make it part of every employee's responsibilities. An Environmental Team directs program activities.	Hybrid vehicles, pedestrian oriented campus master plan.	Extensive recycling programs, composts nearly 2,000 tons of organic waste per year, construction/ demolition waste sorted for recycle and reuse, sale of scrap metal helps fund environmental curriculum.	Local and university farms produce a large portion of the food served on campus.	All new construction required to be LEED certified. 4 LEED certified buildings include 1 gold rating, 2 silver ratings and a certified baseball stadium.	On campus habitat restorations and native plantings utilized to teach good stewardship and design.	Committed to reducing emissions by 17% by 2010, 3rd largest university purchaser of renewable energy.
University of Illinois B-	No institutional commitment.	Building a Lasting Campus Environment (BLUE) program within Facilities and Services Department initiates numerous campus sustainability projects.	Promotes alternatives to single occupancy vehicle use.	All dining hall cooking oil recycled into veggie-diesel, composting pilot project underway.	Local produce and dairy products served.	LEED guidelines followed on projects over \$1 million, Gold rating achieved on one building.	Native plants incorporated into landscaping plan; review of master plan for opportunities for sustainable & ecological design options.	Three wind turbines installed on campus, student approved fee pays for other energy initiatives.
Purdue C	No institutional commitment.	None Identified.	Use of flex fuel and biodiesel in many campus vehicles, police & other employees use compact utility vehicles and bikes on campus.	No special program identified.	Local produce and dairy products served.	Green building design guidelines included in consultant handbook.	No special program identified.	New boiler will be capable of using ethanol and corn syrup by products.
Ohio State C+	No institutional commitment.	Office of Business Operations has implemented extensive sustainability policies.	Flexcar vehicle sharing and vanpool programs.	Environmentally and socially responsible purchasing is emphasized. Recent initiation of recycling at football games. Composts over 650 tons of food waste annually.	No special program identified.	Plans to include LEED guidelines in all future building projects.	No special program identified.	2006 boiler emissions reduced 79.1% from 2003 baseline.

Indiana University Task Force On Campus Sustainability II Administration & Governance



Administration and Governance

In order to flourish, campus sustainability needs substantial administrative and financial support.

A coordinated sustainability effort at an institution as large and diverse as IU Bloomington requires a central advocacy unit with significant resources in order to catalyze the large-scale university changes in academic programs and operations that are proposed in this report. Many of our peer institutions have already developed high-profile sustainability efforts. Many of them have organized—and generously funded—a *university office of campus sustainability*. The Association for Advancement of Sustainability in Higher Education (AASHE) lists some 30 universities—among them Harvard, Yale, Princeton,



MIT, Michigan State, University of North Carolina, and University of Colorado—that already boast a permanent Office of Sustainability and a full-time Director of Sustainability. One state institution, the University of New Hampshire, has appointed its first *Chief Sustainability Officer*.

In this section, we propose an **IU Bloomington Office of Sustainability**. We describe its functions and discuss options for governance and organizational structure, including funding and staffing. We also offer a number of actions for IUB to take in order to demonstrate its institutional commitment to sustainability, just as hundreds of other higher education institutions have done throughout the United States and many other countries.

Functions of an Office of Sustainability

Sustainability is a fundamental principle underlying the broad range of university academic programs and operations. Thus, an IUB Office of Sustainability must link formally with all of the administrative units that oversee campus academic and operational functions. We envision the following responsibilities for the Office:

- Initiate, support, coordinate, and evaluate campus operational and academic issues related to sustainability.
- Report to President, Provost, and Vice President for Administration on sustainability issues.
- Advise and collaborate with operational units to implement best sustainability practices.
- Act as advocate, clearing house, and coordinator for academic initiatives related to new degree programs, course offerings, minors, research projects, etc.
- Participate in strategic planning with top-level administrators to infuse sustainability focus into operations, academics, building, and land-use for the campus.
- Coordinate sustainability efforts between campus, community, university, state, and peer institutions; serving as liaison to national and international sustainability groups (AASHE, ACUP, Bioneers, etc.).
- Write/Communicate on sustainability issues facing the campus; act as the ‘face of sustainability’ for external stakeholders (with contributions from the advisory group and others); produce a regular report of progress and issues facing the campus; maintain a sustainability website for the campus; produce newsletters and other regular communications on sustainability issues; and work on signage and other informal communication mechanisms.
- Coordinate student involvement in sustainability issues; direct campus internships, volunteer and co-curricular opportunities; coordinate service-learning opportunities.
- Organize high-visibility academic/community events related to sustainability (lecture series, workshops, student events, Earth Day events, etc.)

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Governance & Organizational Structure

Advisory Board. The Office of Sustainability will work closely with an Advisory Board, composed of faculty, staff and students, who will help set priorities, goals and objectives for the Office. The Advisory Board may also include *ex officio* members from community, alumni, and other stakeholders. The Office will coordinate the efforts of sustainability-themed working groups composed of Board members and others (similar to the themes addressed by the Sustainability Task Force Working Groups). The Office and the Board will also seek and act on input from other campus groups (BFC, Academic Leadership Council, IUSA, GPSO, Professional Staff Council, unions, etc.).

Governance Options

We envision a number of possible options for administration of the Office of Sustainability. Because of the unusual range of issues addressed by the Office, it must interact with many campus and system administrative offices. So the Office of Sustainability must fit as well as possible within the existing governance structures and traditions of IUB. One of the advantages of ‘starting in late’ is that we can rely on the experience of peer institutions in guiding the creation of a new sustainability program, and perhaps avoid some of the pitfalls of their experience. Here we examine four options, based both on IUB’s governance structure and on the experience and advice from counterparts at peer institutions.

Option 1: Office of Sustainability reports directly to President (as CEO of Bloomington Campus), with strong collaborative linkage to VP for Administration and Provost. Funding would come directly from President’s budget. This model assures some independence from campus politics, and facilitates involvement in decision-making at the highest level. This could also facilitate some coordinating role with sustainability efforts on other IU campuses. On the other hand, this model could have the potential to decrease direct engagement with operational and academic units at the campus level.

Option 2: Office of Sustainability has dual reporting to (and funding from) the office of the Provost (for academic issues) and VPAD (for operational issues). This option would assure direct engagement with key academic and administrative units at the campus level. It would require joint decision-making on hiring and funding/staffing priorities and a mechanism to resolve conflicts. This organizational structure might create an artificial separation between academic and operational responsibilities of the Office. It could also compromise independence on sensitive decisions.

Option 3: Office of Sustainability operates as an independent organizational unit with funding provided by administration, but reporting to Advisory Board. This would provide the Office with some independence from academic and administrative units and would empower the Board with administrative oversight. On the other hand, this structure might compromise administrative efficiency and weaken day-to-day oversight and influence on administrative practice within the University.

Option 4: Office of Sustainability operates as an independent organizational unit acting as a consulting unit to academic and operational units. Its role would be largely advisory and it might be isolated from administrative decision-making. In order for this model to succeed, campus clients must perceive value for consultation. Funding could be provided from a combination of consulting fees and funds retrieved from campus cost-saving efforts. This model has operated successfully at wealthy private institutions (as it does at Harvard), where cost-savings and external funding can be funneled back into support for the Office, but its efforts might be compromised by limited funding at a state institution.

Ultimately, the decision on governance of an IUB Office of Sustainability will rest with the campus and IU central administration. The consensus of the Sustainability Task Force, however, is that Option 1 represents the best opportunity to address campus sustainability issues in a systematic, organized, and efficient fashion. At this central level, the Office could provide support and input to other campuses seeking to address sustainability issues, each of which presumably could develop local governance structures to

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address issues particular to their campus. Whatever option is chosen, we underscore the importance of establishing close administrative linkages

with the Office of the Provost and the V.P. for Administration.

Staffing

We recognize that the success of an Office of Sustainability will depend, in large part, on the number and quality of staff assigned to this unit. The following staff needs are based in part on consultation with directors of sustainability at some of our peer institutions, as well as recommendations from AASHE.

We envision the following critical components of a staff are needed for a successful sustainability effort at IUB:

1. Director of Sustainability

Primary responsibility for oversight of sustainability efforts, coordination with campus operational and academic units, and long-range planning; close collaboration with academic director.

2. Academic coordinator

Responsibility for coordinating interdisciplinary and cross-school efforts in sustainability research, education, and outreach. Oversight for campus-wide academic hiring efforts. Possible appointment as director/coordinator of interdisciplinary center or institute for sustainability studies. Appointment as half-time administration appointment (through OVPR or Dean of Faculties/VPAA) with primary appointment in one of the academic units

3. Professional staff

Support for the Office's efforts in coordinating volunteer, co-curricular, and internship activities; collaboration with director on research, communication, service-learning and outreach activities.

4. Student interns

A group of 6-12 student interns (both graduate and undergraduate) will be hired each semester to work on specific sustainability-related projects, both operational and academic. The high quality of work performed by the student interns hired for the Sustainability Task Force gives us confidence that such a program will have great success both in supporting students with interests in sustainability education and in providing solid contributions to our operational efforts in sustainability.

5. Communications support (website, newsletters)

We envision at least part-time support for creation of high-quality representation of Sustainability materials, in both electronic and print form. This might be handled, at least in part, by student interns.

6. Clerical support

As the office and its activities grow, there will be an increasing need for at least part-time clerical support. This need might be handled initially through existing structures (e.g., VPAD, OVPR, etc.), but should eventually become dedicated support.

7. Hourly student/work-study support

One of the most cost-efficient ways for clerical & operational support, and at the same time supporting students with interests in sustainability, is the use of hourly/work-study support for undergraduate student assistants.

Institutional Commitment

As a concrete manifestation of its long-term commitment to sustainability, we believe that Indiana University should make a formal, public commitment by becoming a signatory of one (or more) of the nationally and internationally recognized documents in support of the sustainability movement. The *Talloires Declaration*, developed at an international conference in Talloires, France in 1990, is the first official statement

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made by university administrators of a commitment to environmental sustainability in higher education. The Declaration is a ten-point action plan for incorporating sustainability and environmental literacy in teaching, research, operations and outreach at colleges and universities. It has been signed by over 350 university presidents and chancellors in over 40 countries, and includes a number of our peer public institutions in the U.S., including the universities of Colorado, North Carolina, California, Arizona, and Florida.

A more recent, and perhaps more significant, document is the *American College and University Presidents' Climate Commitment*, a high-visibility effort to address global climate change by garnering institutional commitments to neutralize greenhouse gas emissions, and to accelerate the research and educational efforts of higher education to equip society to re-stabilize Earth's climate. Building on the growing momentum for leadership and action on climate change, the *Presidents Climate Commitment* provides a framework and support for America's colleges and universities to move towards climate neutrality. The Commitment recognizes the unique responsibility that institutions of higher education have as role models for their communities and in training the people who will develop the social, economic and technological solutions to reverse global warming. Universities signing the Commitment are pledging to eliminate their campuses' greenhouse gas emissions over time. This involves:

- Completing an emissions inventory.
- Within two years, setting a target date and interim milestones for becoming climate neutral.
- Taking immediate steps to reduce greenhouse gas emissions by choosing from a list of short-term actions.
- Integrating sustainability into the curriculum and making it part of the educational experience.
- Making the action plan, inventory and progress reports publicly available.

We believe not only that IU can achieve these goals, but that they will help garner broad-based support for our institutional contribution toward achieving a sustainable society. A list of major public university signatories is listed below, and a detailed assessment is provided as Appendix C.

Table I. Major Public University Signatories* of the American College & University Presidents' Climate Commitment

Arizona State University	University of California	University of Maryland	University of Rhode Island,
Ball State University	(10 institutions)	University of Minnesota,	University of South Carolina
Cornell University	University of Cincinnati	Morris	(8 institutions)
Indiana State University	University of Colorado	University of Montana	University of South Dakota
Northern Arizona University	University of Florida	(4 institutions)	University of Tennessee
Oregon State University	University of Hawai'i	University of Nevada	University of Washington
Penn State University Berks	University of Idaho	University of New	University of Wisconsin
State University of New York	University of Illinois at	Hampshire	(7 institutions, excluding
(5 institutions)	Chicago	University of New Mexico	UW-Madison)
University of Alaska, Anchorage	University of Maine	(5 institutions)	University of Wyoming
University of Arkansas	(5 institutions)	University of North Carolina	Utah State University
University of Arizona	University of Massachusetts	University of Oklahoma	Washington State University
	(4 institutions)	University of Oregon	(4 institutions)

* Principal campus unless otherwise noted

Finally, another option exists for institutions—both academic and corporate—to address climate issues in a formal way through market-based economic incentives. The *Chicago Climate Exchange* (CCX) is the world's first and North America's only legally binding rules-based greenhouse gas emissions allowance trading system. CCX members represent all sectors of the global economy, as well as public sector

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innovators. Greenhouse gas emission reductions achieved through CCX are the only reductions in North America being made through a legally binding compliance regime, providing independent third-party verification. Members make a voluntary but legally binding commitment to meet annual GHG emission reduction targets. Among our peer institutions, the University of Minnesota, Michigan State University, and the University of Iowa have joined the Chicago Climate Exchange as a formal expression of their commitment to addressing global climate change.

Communications Strategy

An effective communications strategy is essential to achieving the core objectives of IUB's sustainability initiative. Our communications strategy—ranging from printed reports to online communications and campus signage—provides a mechanism to engage the broad range of university stakeholders with the goals of our sustainability efforts. By providing clear and consistent messages to internal and external stakeholders about sustainability-related research, teaching, and operational initiatives at IU, the proposed Office of Sustainability will not only raise its profile on the campus and community, but also can help promote a culture of sustainability among students, faculty, and staff on the IUB campus. In order to ensure that sustainability efforts at IU are visible to both external audiences and the campus community, the Office of Sustainability will employ a multi-pronged communications strategy which will include (but not be limited to) a bi-annual 'State of the Campus' report, a regularly published newsletter, and the Sustain IU website.

The *Sustain IU website* will be the centerpiece of the Office of Sustainability's communications strategy. Currently hosted at <https://www.indiana.edu/~sustain/>, the website will serve as a clearinghouse for information on sustainability-related initiatives and activities on the IUB campus. In addition to providing the IU community and external audiences information about ongoing efforts to promote sustainability on the IUB campus, the website will consolidate information on sustainability-related activities – e.g. lectures, events, upcoming courses, and working groups – occur-

ring across IUB's academic and operational units. Additionally, the website will host a centralized database of courses related to sustainability offered at IUB as well as information on sustainability experts on campus – i.e. faculty members whose work intersects sustainability and staff charged with implementing sustainability initiatives on campus. The website will be complemented by a moderated LISTSERV, allowing for efficient email communication about campus events related to sustainability.

To complement the communications functions carried out by the sustainability website, we propose that the Office of Sustainability publish a regular *newsletter*. Produced on a quarterly basis, the newsletter will serve as a platform to highlight critical sustainability initiatives on campus and connect sustainability at IUB to local and global communities and trends. Additionally, the newsletter will present pertinent news, commentary, and conservation tips to faculty, staff, students, and external audiences. Currently, the Office of Campus Sustainability at Michigan State University publishes *footprints*, a monthly sustainability newsletter, which might serve as an initial model for IUB's publication.

We also propose that the Office of Sustainability publish a biannual '*State of the Campus' sustainability review*. In addition to providing the university an opportunity to regularly assess its performance against stated sustainability objectives, the biannual sustainability review will provide an opportunity to celebrate key sustainability successes on campus, identify areas for potential improvement, and chart a path ahead,

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based on our performance with respect to indicators identified in this report. A number of peer institutions, including Penn State, Michigan State, UC Berkeley, and the University of Colorado, publish periodic updates on their respective sustainability programs.

We envision the Office of Sustainability employing a variety of traditional communications strategies to specifically inform external audiences of sustainability initiatives on the IUB campus. In addition to engaging in the community outreach activities outlined in Section V of this report, the Office will issue regular press releases to highlight significant sustainability events on campus as well as recent research projects, grants, and institutional commitments related to sustainability. To further highlight IUB's presence in the sustainability sphere, faculty, staff and

administrators associated with the Office will also be encouraged to submit articles related to sustainability to university print media such as *Research & Creative Activity*, *The College*, *Teaching & Learning*, *Home Pages*, and others.

Finally, we propose to explore a plan of *coordinated signage* that highlights aspects of the campus infrastructure that reflect IU's commitment to sustainability. Examples of this might include signage on the exterior/interior of buildings that highlight green building techniques that have been incorporated in the building, educative signage related to storm water management efforts on campus, examples of green landscaping, interior displays of current and/or historical energy and water usage in the respective buildings, etc.

Funding Opportunities

The opportunities for funding potential sustainability related initiatives at Indiana University are varied, numerous, and growing. From corporations who are eager to develop capacity within their own organizations to address issues of sustainability, to passionate individual donors and foundations whose missions are in line with the concepts of sustainability, altogether new sources of support are becoming available to universities. These funding sources are working to broaden higher education curricula to create global citizens literate in the challenges of the 21st century, to blaze new research pathways in newly created centers and institutes focused on sustainable solutions, and help campuses themselves operate according to the newly emerging principles of sustainability.

External Sources of Funding

The \$8.6 million *Alcoa Foundation Sustainability Fellowship Program* is one example of a serious commitment on the part of industry to further sustainability as an academic discipline. In each round of awards, five host institutions are selected from a global competitive process and will host a group of up to 30 post-doctoral fellows. Fellows' projects are supported by top-rate academic partners in sustainability from around the globe, including the *Center for Sustainable Systems* and the *Erb Institute for Global Sustainable Enterprise* at the University of Michigan. Table 2 demonstrates the wide range of types and levels of support available by displaying a

sample of external funding of universities in support of sustainability initiatives that occurred just within the first 10 months of 2007.

William J. Clinton Foundation Loan Program. In a partnership between the Clinton Foundation, five large financial institutions, and leading energy service companies (ESCOs), a new \$5 billion loan fund has been created to retrofit buildings and undertake other energy savings projects on campuses of higher education. The program will be similar to other services provided from ESCOs, where the loans are repaid through savings created from reduced energy consumption; the projects pursued through the program

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will in effect be subsidized and the terms of the agreements are expected to be more favorable to participating universities. The intent is to spur initiative on more ambitious projects that will have a larger impact than window and lighting retrofits. One important stipulation in the program is that participating universities must be signatories to the American College and University Presidents Climate Commitment. Eleven institutions that have signed the commitment have already been identified as likely participants in pilot projects for the program. In addition program participants will be eligible for discounts of 20-70% from manufactures of energy efficient appliances.

As a Research I institution, Indiana University can expect to benefit from the interest of federal agencies in sustainability topics. The Departments of Agriculture, Energy, Defense, Commerce, as well as the Environmental Protection Agency and their many sub-agencies are funding sustainability efforts through countless research grants. They are also supporting larger efforts: the Department of Energy announced earlier this year that it will invest \$375 million in the creation of three new bioenergy research centers.

In addition to research funding, more support from the federal government for greening college campuses can be expected in the future. Current proposed bills in the House and Senate aim to do just that. Senate Bill 1115, the Energy Efficiency Promotion Act of 2007 authorizes the Secretary of Energy to award up to 100 grants of up to \$1 million to campuses for energy efficiency improvements and up to 250 grants of up to \$500,000 for campus energy sustainability projects. The program is authorized for each of the fiscal years between 2008 and 2012. On the House side, H.R. 3637, The Higher Education Sustainability Act of 2007 would provide \$50 million annually to support everything from research and curriculum development to creating new administrative structures and funding phys-

ical improvements to enable campuses to operate more sustainably. The Internal Revenue Service offers Clean Renewable Energy Bonds, which essentially act as zero-interest loans for the financing of renewable energy development. Navigating the many opportunities for external funding will require a coordinated effort. A campus sustainability office could work to identify potential external sources of funding and support the development of proposals to garner those funds. Competition for those funds will also be fierce. An Office of Sustainability can both demonstrate the university's commitment and the institutional capacity necessary to deliver successful outcomes which would certainly be considered by granting entities.

Internal Sources of Funding

Of course the decision to pursue sustainability initiatives will require some financial commitment from within Indiana University. Such a commitment need not be a significant drain on the University's general fund. A variety of funding mechanisms exist to generate new sources or to stretch one-time contributions far out into the future. A few examples follow below, but there are numerous other possibilities that exist for creative ways to address environmental sustainability without sacrificing financial sustainability.

Revolving Loan Funds. Several universities including University of Michigan, University of Maine, California State, Connecticut College, Macalester, Harvard, and Tufts have created revolving funds to pay the initial cost of energy efficiency projects. As the energy savings from these projects are realized, those savings are paid back into the funds, growing the funds over time. Initial funding amounts vary significantly from \$1,000 to \$3 million (Macalester and Harvard, respectively), and determine the scope of the projects undertaken. Projects are usually limited to those with payback periods of five years or less in the beginning until the fund begins to grow.

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Table 2. Support for Campus Sustainability Initiatives

University / Program	Support Level	Granting Organization	Activity Funded
Warren Wilson College	\$193,265	Arthur Vining Davis Foundation	Development of environmental curriculum in "full cost accounting"
SUNY Cobleskill	\$1 Million	Department of Defense	Construction of research & demonstration facility to create fuel from animal and food wastes
Brown University	\$200,000	Sidney E. Frank Foundation	Implementation of energy efficiency projects that also raise awareness and educate the community
University of Evansville	\$142,500	Alcoa Foundation	Support of the LEED certification of the Ridgeway University Center
Frostburg State	\$45,816	Appalachian Regional Commission	Development of a renewable energy certificate program
Skidmore College	\$140,000	Educational Foundation of America	Support to hire a sustainability coordinator and fund on campus projects
University of Wisconsin – River Falls	\$460,000	US Department of Agriculture	Establishment of a sustainable agriculture major and incorporate sustainability concepts into other programs
University of Arkansas	\$1.5 Million	Wal-Mart Foundation	Creation of the Applied Sustainability Center
Rice University	\$30 Million	Anne and Charles Duncan	Construction of an environmentally sustainable residence hall and support of residence hall programs.
Dartmouth & University of Massachusetts	\$300,000 each	US Environmental Protection Agency	Development of new projects to enhance the understanding of sustainability
Clarion University	\$163,996	National Fuel Gas Distribution Corporation	Establishment of an advanced energy laboratory
University of Illinois – Springfield	\$27,550	Illinois Dept. of Commerce & Economic Opportunity	Expansion of campus recycling efforts
All Ohio Public Universities	\$318,337	Ohio Dept. of Natural Resources	Support of recycling and waste reduction programs
Western Illinois University	\$249,870 (3 rd award)	Illinois Clean Energy Community Foundation	Energy efficient lighting upgrades
Duke University	\$1million	ConocoPhillips	Development of policies that address global climate change
Ohio University	\$250,000	Ohio Department of Natural Resources	Implementation of a full-scale composting project
Iowa State	\$22.5 Million	ConocoPhillips	Development of biofuel technologies
Arizona State	\$900,000	National Science Foundation	Develop alternative energy programs and courses in conjunction with community colleges
University of Kentucky	\$111,000	Kentucky Education Cabinet	Support of sustainability education in undergraduate curriculum
Furman University	\$35,000 annually	Compton Foundation of California	Support of two sustainability fellowships
Ohio State	\$18.6 Million	Ohio Department of Development	Creation of the Wright Center for Photovoltaics Innovation and Commercialization
UC Berkeley and UI Urbana-Champaign	\$500 Million	BP	Creation of the Energy Biosciences Institute and research to develop new energy sources and reduce the impact of energy consumption.

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Afterwards, more ambitious projects, feasibility studies, and other sustainability initiatives that do not pay for themselves can be funded through this mechanism. This type of arrangement could be applied to a number of projects that reduce costs for Indiana University such as landfill tipping fees, sewage treatment, reduced chemical purchases, etc.

Student Fees. Student fees can be an easy way to establish a funding mechanism for a variety of sustainability initiatives on campuses. Although

many are focused on energy projects, money raised this way could support any initiative. Such fees are generally approved by students in elections and can be structured in a variety of ways to ensure their feasibility. Options include mandatory or optional fees. Other people affiliated with the university who would benefit from investments in sustainability projects such as faculty and staff could also opt-in to such fees through a simple payroll deduction. A sample of successful student fee initiatives is presented in Table 3.

Table 3. Successful Student Fee Initiatives

University	Fee Purpose	% of Students in Favor	Fee Structure	Annual Funds Raised
Evergreen State	Purchase Renewable Energy	91	\$1/Credit	\$240,000
Middle Tennessee State	Purchase Renewable Energy	89	\$8/Semester	NA
Tennessee Tech	Purchase Renewable Energy	89	\$8/Semester	NA
University of Illinois, Champaign-Urbana	Purchase Renewable / Technology Upgrades	NA	\$2/Semester	\$140,000
University of Colorado, Denver	Purchase Renewable / On-site Solar Project	95	\$1/Semester	\$80,000
University of Oregon	Purchase Renewable / Conservation Projects	81	\$2/Semester	\$36,000
Appalachian State	On Campus Renewable Technologies	81	\$5/Semester	\$120-150,000
University of North Carolina, Chapel Hill	On Campus Renewable Technologies	75	\$4/Semester	\$185,000

Special Alumni Funds. Alumni donations are a vital source of revenue for the support of new and innovative initiatives. The creation of a Special Alumni Fund for Sustainability may be a way to solicit donations from alumni that have not been motivated to contribute in the past. An example of this is *The Berkeley Alumni Sustainability Fund* which seeks to reach 3000 prospective donors who do not currently contribute to the university to support sustainability initiatives that do not have a dedicated funding mechanism. Large potential for this type of fundraising at IU exists with the number of environmentally focused alumni graduating with degrees in biology, geography, geology, and environmental science and management.

Community Collaboration

Sustainability issues extend beyond the physical boundaries of the Bloomington campus. Given the dominating presence of Indiana University in the community, decisions affecting campus sustainability will affect the sustainability of the community, and vice versa. As the campus develops policies to promote sustainability,

collaboration between city and county staff, the Bloomington Commission on Sustainability, and the Bloomington Environmental Commission will provide benefits to all parties. Key issues to be addressed through collaboration include:

1. **Transportation.** Sustainable transportation to and from campus requires integration of city and campus

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transportation systems, including bus, pedestrian, and bicycle routes in order to make sustainable transportation an attractive option to students, staff, and faculty. As the university moves to update its campus master plan, input from the city and county is critical to ensure that the transportation systems are integrated and provide adequate alternative transportation options. The integration of the campus and city bus systems has led to a remarkable growth in public transit use, and this collaboration should continue as alternate bus routes and/or schedules and measures to decrease traffic congestion are explored. While the core campus is friendly to walking and biking, pedestrian and bike routes to and from campus need to be integrated into existing systems. A preliminary plan has been developed that should provide a starting point for addressing this issue.

2. Resource use and recycling. The Monroe County Recycling Partners group is composed of representatives of IU, the City of Bloomington, Monroe County Community School System, and Hoosier Disposal and Recycling. The group shares best practices and develops ways to improve recycling throughout the community. This collaboration is essential for the promotion of recycling in the community, and should be sustained. Current waste diversion efforts, including the “End of Year Collection” at residence halls, and the Indiana University Surplus Stores, represent successful ways integrate re-used goods into the community. Another potential partner for waste reduction is the Monroe County Solid Waste Management District. Such a partnership could aid in acquiring grant funding for community waste minimization projects.

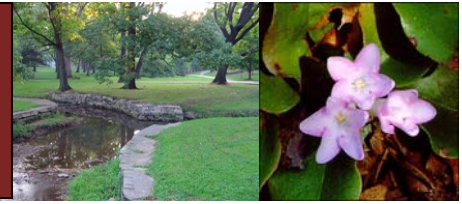
3. Built environment. IU owns property beyond the bounds of campus, and as it seeks to develop new properties, the city, county, and IU should work together to develop a smart growth plan—one that includes mixed-income neighborhoods, mixed rental and ownership neighborhoods, and mixed student

and non-student neighborhoods. Specifically, new student housing units provide an opportunity to benefit both the student experience and the economic development of Bloomington. The increased student housing downtown serves as a model of smart growth and should be drawn upon as new housing projects are considered. The mixed-use ground floor component of the Third and Atwater Garage is an example that could be replicated. Projects that address both university and community needs should be favored whenever possible.

4. Service-learning. The close proximity of campus and community offers remarkable opportunities for service-learning and co-curricular education. The community, like the campus, can become a living laboratory for student and faculty research and extended learning experiences. Students involved in research or data gathering on sustainability issues can assist in citywide policy development. For example, the Bloomington Parks and Recreation Department utilizes student resources to assess the economic and ecological benefits of maintaining trees on city streets. A number of IU students have worked as interns with the Commission on Sustainability, the Environmental Commission, and others. There are a number of service-learning classes that involve students with community agencies working on sustainability-related issues. These connections should be expanded and made more accessible to students.

Collaboration between the campus and the community will need to take place at many organizational levels, ranging from administrative long range planning efforts to the development of new service-learning opportunities. Continued collaboration will provide benefits to all parties involved and should be promoted as a holistic solution to fostering sustainability.

Indiana University Task Force On Campus Sustainability III Academic Initiatives



Academic Initiatives

Objective: *To build an integrated program of academic research, undergraduate and graduate education, co-curricular and service-learning opportunities, and community outreach that will move Indiana University Bloomington into a position of national leadership in sustainability studies.*

Introduction

As a community of scholars, we have an opportunity to use our creative skills to address the broad scope of challenges facing our world. With the growing recognition of the importance of global environmental challenges, the innovative power of academic research can be directed toward understanding, learning from, and responding to the complex interplay of physical, biological and societal processes that shape the relationship of humans with the natural world.

As a community of educators, we have a responsibility to provide our students with the critical intellectual skills necessary to meet the needs of their futures. In doing so, we must help them to comprehend and address the complex issues of human-environment interactions at local to global scales.

Our efforts to promote sustainability in campus and community life must challenge the outdated worldview that Earth's resources and capacity to assimilate wastes are infinite, and that each individual's environmental impact is disconnected from the welfare of other humans, other organisms, and the ecosystems in which we are embedded. This can be accomplished by fostering a deeper and more complex understanding of the ecological, social, and economic dimensions of human well-being and the ways that our personal and collective choices have both local and far-

reaching impacts. Achieving a sustainable society will depend in large part upon the ability of educational institutions to produce graduates capable of such critical thinking and able to apply it to solving both local and global issues of sustainability.

We believe that Indiana University Bloomington, as a leader in the creation, dissemination, and application of new areas of academic scholarship is well positioned to take on this challenge. Our expertise

in areas of environmental science and policy, in international affairs, in information technology, and in teacher education and community outreach positions us well to take on a leadership role in the emerging academic arena of sustainability. Moreover, we believe that a commitment to a solid program of research, scholarship, and creative activity related to sustainability

will allow IUB to successfully compete with peer institutions—who are themselves moving rapidly in this direction—for recruitment of students and faculty, creation of research and learning opportunities, and accrual of new sources of external funding.

We recommend that an academic sustainability initiative should be initiated at IUB. “Sustainability” in this sense should be taken in its broadest definition, including the interrelated aspects of ecology, economic and social equity, public health and wellness, globalization and international relations,



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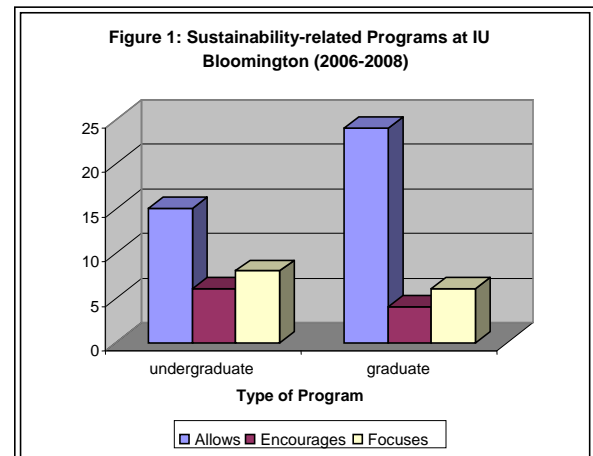
urbanization and poverty, and the politics and economics of food. The cornerstone of the sustainability initiative at IUB, therefore, must involve an effort to integrate the academic, co-curricular, and operational elements of campus life. It is hard to imagine any other academic paradigm that so clearly cuts across virtually all elements of our community of over 40,000 faculty, students, and staff. We believe that this integration of all elements of campus life could have a transformative effect on our academic institution.

Assessment of Current Academic Sustainability Efforts at IUB

Our present efforts toward a curriculum of sustainability build on an extraordinary array of academic expertise, infrastructure, and archival resources that extends across virtually all of IUB's thirteen academic and professional schools and a wide array of research centers, institutes, and interdisciplinary programs. At the same time, IUB's resources remain balkanized, split among different academic units and research institutes, with little support for coordinating academic efforts. However, we believe that, with a modest investment of academic resources, our university is in a strategic position to take a leadership role in this emerging academic endeavor.

A review of academic programs offered by IUB¹ reveals that sustainability-related studies are supported by some 29 undergraduate and 34 graduate level programs (*Figure 1, Table 1*). At the undergraduate level, 20 degree programs and 8 minor and certificate programs provide the opportunity to study various aspects of environmental sustainability. Graduate students can select from among seven masters and doctoral-level programs and five Ph.D. minors. Yet, while the majority of academic programs *allow* students to become literate about the natural environment (15 undergraduate and 24 graduate tracks), only

6 bachelor and 4 master programs *encourage* the study of sustainability. Environmental sustainability is the *primary focus* of eight undergraduate and six graduate academic programs (*Figures 1 and 2; Table 1*). These existing academic programs can offer the foundation from which a well coordinated and integrated sustainability program can grow.



Similarly, Indiana University is well endowed with the human infrastructure needed to make this academic initiative a reality. IUB currently has some 85 environmental science and sustainability-oriented faculty members distributed among 14 departments, with the majority housed at the School of Public & Environmental Affairs (SPEA), the School of Health, Physical Education, and Recreation (HPER), and the departments of Geography, Geological Sciences, Biology, and Anthropology in the College of Arts & Sciences. A total of 296 sustainability-related courses have been offered at IUB from 2000 to 2007 (*Figure 2; Table 2*). More than half of those classes are open to undergraduate students. Of particular note are new programs emerging for undergraduate students in Geography, Human Biology, and Business. In addition to formal curricular activities, some twelve student groups from the 500 registered campus organizations are involved with issues of environmental sustainability (*Table 5*). Over the past year, a number of new educational efforts related to sustainability have been initiated at the level of student residential and cultural life, showing a growing interest among our current student body.

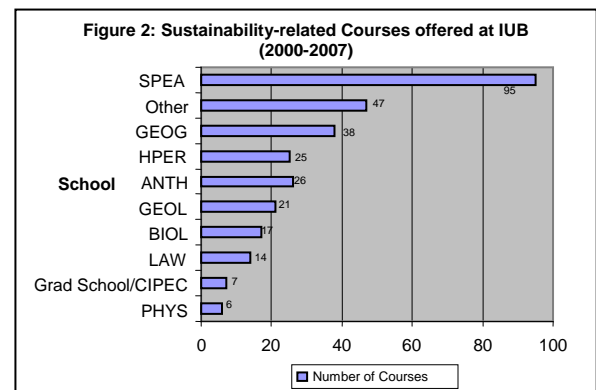
¹ At present, IUB offers 328 degree programs and more than 130 undergraduate majors.

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Scholarly activity associated with global environmental issues currently takes place within several IU schools and departments (listed above) as well as a number of research institutes and centers. Prominent IUB centers engaged in sustainability research include the Center for the Study of Institutions, Population, & Environmental Change (CIPEC), the Anthropological Center for Training & Research on Global Environmental Change (ACT), the Eppley Institute for Parks & Public Lands, the Population Institute for Research & Training (PIRT), the Workshop on Political Theory and the IU Research & Teaching Preserve (see *Box 1*). Together, these programs provide the necessary working structures to quickly bring IU's efforts in sustainability to a national-caliber academic program. We envision that the scientific issues addressed in sustainability research and education will build on IUB's strengths in these research areas. In addition Indiana University can expect to build on its strengths in the social sciences, linking scientific issues with political, social, and policy aspects of the global environment.

Among the assets central to a sustainability effort is IU's School of Public and Environmental Affairs, widely recognized as one of the leading programs in the country, which brings together scientific and policy approaches to environmental

issues. Similarly, HPER's program in Recreation & Park Administration brings a national-caliber program of research, graduate education, and public outreach to bear on issues related to environmental education. Furthermore, IUB is one of the few major public universities to incorporate a major school of education within a research-intensive university campus. This combination of educational research, teacher-training, and outreach to K-12 teachers offers an opportunity to bring sustainability research to address IU's mission of service to the state of Indiana and to sow a developing interest in concepts of sustainability to the next generation of university students.



IUB students, faculty and staff currently participate in a wide variety of sustainability-related service-learning and outreach activities that contribute

Table I: A Sample of Sustainability-Related Programs at IUB

<i>Program</i>	<i>Department/ School</i>	<i>Sustainability Focus</i>	<i>Level</i>
B.S. in Environmental Science (B.S.E.S)	COAS & SPEA	Focuses	Undergraduate
Minor in Environmental Management	SPEA	Encourages	Undergraduate
B.A. in Sustainable Education, Awareness and Development	IMP/ College	Focuses	Undergraduate
B.A. in Environmentally & Socially Sustainable Entrepreneurship	IMP/ College	Focuses	Undergraduate
B.A. in Environmentally Sustainable Design	IMP/ College	Focuses	Undergraduate
B.A. in Geography (Human-Environment Interaction)	Geography	Encourages	Undergraduate
Ph.D. Minor in Human Dimensions of Global Environmental Change	Graduate School & CIPEC	Focuses	Graduate
M.S. in Public Affairs: Sustainable Development concentration (newly approved)	SPEA	Focuses	Graduate
M.S. in Environmental Science: Student Tailored Specializations	SPEA	Encourages	Graduate
B.S. in Outdoor Recreation and Resource Management	HPER	Encourages	Undergraduate

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to the surrounding communities. We work on community-based sustainability issues in all aspects of the community, including: repre-

sentation on municipal commissions and boards (e.g., Environmental Commission, Sustainability Commission, Planning Commission, Zoning

Table 2: Sample of sustainability-related courses offered at IUB

<i>No</i>	<i>Course Title</i>	<i>Dept.</i>	<i>Instructor</i>	<i>Description</i>
G411/ G511	Sustainable Development Systems	GEOG	Evans, T.	Examines sustainable development as well as the manner in which it has been implemented in the areas of resources, agriculture, water, transport, cities, and tourism.
G442/ G542	Sustainable Energy Systems	GEOG	Barthelmie, R.	Explores current energy use and the role of renewable energy resources in meeting future demand, covering the physical and technological basis and the environmental, economic and social impacts of developing and utilizing these sustainable resources.
G415/ G515	Sustainable Urbanism	GEOG	Grubestic, T.	Examines modern cities and their growth dynamics, “green urbanism”, and sustainable urban development.
E555/ E400	Sustainable Forestry	SPEA	Fischer, B.	Discusses the science and policy of sustainable forestry.
V596	Sustainable Development	SPEA	Reuveny, R.	Examines theories and policies of sustainable development. Combines approaches from neoclassical economics, ecological economics, political science, and ecology.
S101	Sociology of Environment	SOC	Bartley, T.	Examines the organizational, political, and institutional conditions that lead to negative/positive environmental outcomes, and ecological sustainability.
R241	Wildflowers and Edible Plants	HPER	Price, K.	Hands-on, interactive introduction to the identification, cultural, medicinal, edible uses of local plants.
X220	Earth's Body: The Environment in Context	HPSC	Capshew, J.	Explores questions about the meaning of the Earth's body through historical accounts, materials from journalism, literature, folklore, art, and field trips.
GI16	Our Planet and Its Future	GEOL /SCS	Dunning, J.	Explores the interaction between geologic and environmental processes in the earth, with an emphasis on how these processes affect public policies and laws.
L100	Humans and the Biological World	BIOL	Hengeveld, S.	Covers topics ranging from the chemical foundation of cells, genetics, natural selection/evolution, animal and plant diversity and ecology & environmental issues.
A150	Adapting to the Future: Human and Environment in the 21st. Century	ANTH	Brondizio, E.	Examines key issues underlying the relationship between society and the environment and the challenges we face in the 21 st Century; including current trends in sustainable development (honors division).
I399/ I561	Human Computer Interaction Design II	INFO	Blevins, E.	Emphasizes sustainability as a core focus of interaction design and sustainability-centered design principles as the core foundation for service learning projects in design-oriented Human Computer Interaction (HCI/d)

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Board, Water Utility Board); volunteering in schools and for other outreach programs (guest lectures, involvement in environment-related K-12 programs, participation in the Indiana Junior Science Academy); participating in programs in conjunction with IUB-associated departments, programs, and institutes (Bradford Woods, Hilltop Garden and Nature Center); and integrating community outreach projects as part of

or in conjunction with classroom activities.

Ultimately, Indiana University is at a crossroad. We can, and undoubtedly will, continue to do research and training in a number of important, high-impact areas of sustainability-related scholarship. However, without some central, administrative catalyst to help provide academic leadership, foster interdisciplinary activity,

Box I: The IU Research & Teaching Preserve

In May of 2001 the Indiana University Board of Trustees, with strong support of students, faculty and administration, established the Indiana University Research and Teaching Preserve (IURTP) to enhance the research, teaching and service missions of the university. The Preserve currently consists of five sites totaling over 1150 acres of heavily forested landscape located only minutes from the heart of IU's Bloomington campus—Griffy Woods, Moore's Creek, Bayles Road, Kent Farm and the Lilly-Dickey Woods. The establishment of the RTP offers great opportunities for sustainability-related research, teaching, and service-learning.



View of University Lake from the Griffy Woods Preserve



Ravine in the Moores Creek Preserve

Both the Griffy Woods and Moore's Creek sites are adjacent to lakes and streams, offering outstanding access to aquatic habitats. Given the differences in accessibility, distance from campus, and nature of the sites, the Moore's Creek site is primarily dedicated for faculty and graduate research, while Griffy Woods is used for undergraduate education, student research, and public education. The Lilly-Dickey Woods site, a 550-acre property in Brown County, adds a unique habitat of mature highland forest. In 2006, Bayles Road and Kent Farm were added to the IURTP system. Both of these properties have been long time favorites of researchers from Biology and the Environmental Sciences. Bayles Road offers previous agricultural fields for a variety of plant research. Kent Farm has a wide array of successional habitats for multiple teaching and research opportunities.

Taken together, these sites have been used for teaching in nearly forty courses at both undergraduate and graduate level, and have served as research sites for numerous faculty and student research projects. As the university continues to expand its efforts in sustainability studies, the availability of these 'natural laboratories' will provide a potent resource for interdisciplinary study of the natural environment that surrounds Indiana University.

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develop new sources of major, external financial resources, our programs will remain uncoordinated and, therefore, in the shadow of our peer institutions, many of which are making rapid strides forward in these areas. We will be less competitive in our efforts to attract top-quality students and faculty and may miss out on new funding opportunities. On the other hand, we can build on IU's unique suite of academic strengths—its traditional strengths in the life

sciences, arts, and humanities, its unusual mixture of national-caliber professional schools, the quality of our faculty and students, our reputation in global scholarly activity, and the remarkable natural environment that characterizes the IUB campus—to build a high-profile interdisciplinary program in sustainability. We believe that, while IU is not yet recognized for its efforts in campus sustainability, it is poised to take on a leadership role in this national initiative.

A Vision for IUB

To move Indiana University towards its goal of leadership in the new academic arena of sustainability, we must develop an integrated program of exceptional undergraduate and graduate education, research and creative activity, and community outreach, one that builds on the academic strengths of IU's academic resources and that strategically addresses opportunities for growth. In this section, we describe a series of realistic academic initiatives that we believe could, in a relatively short period, help to make this vision a reality. We organize these initiatives into efforts focused on undergraduate and graduate education, academic research and scholarly activity, service-learning, co-curricular, and outreach activities,

though we recognize that success will depend on the degree to which these efforts can be developed into a broad-based and well coordinated academic program. Together, we believe that these efforts can have a transformative impact on our university. We identify a group of long- and short-term goals that can be accomplished with modest increases in resources and increased academic focus that will help to provide a critical focus on sustainability-related research and education at IUB. Together, this set of approaches encapsulates a strategy that we believe can situate IUB into the ranks of the universities leading in this new academic arena.

Environmental Literacy & Student Learning

We view environmental literacy—an understanding of the complex ecological, social, and economic dimensions of human-environment interactions—as a fundamental academic competency that should be expected for 21st century university graduates. The growing interdependency of environmental, social, and economic issues requires that our graduates will leave Indiana University with the information, skills, and values to help our complex, global society move toward sustainability. Environmentally literate graduates will have developed a basic understanding of the following areas:

- The fundamental life-support processes that ecosystems provide ("ecosystem services")
- The status of the global environment (humanity's "ecological footprint")
- The theory and practice of sustainability
 - A sense of place: personal, cultural, historical, ecological
 - An understanding of the social and environmental outcomes of individual behavior
 - The interrelationship of economy, environment and social equity
 - The role of policy and market forces (e.g. ecological economics)
 - Ecological design principles and their application to the built environment and to agriculture

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Environmental literacy and the enhancement of student learning in sustainability-related fields requires a multi-pronged approach involving faculty initiatives, new degree programs and additional coursework, and special incentives supporting faculty and student research. Although IUB has expertise in sustainability-related fields, the addition of core faculty in sustainability will energize and enable all other efforts. As a result, we recommend the following approaches:

1. **Develop a program for hiring new faculty** who can expand and enrich our current research, course offerings and mentoring in the area of sustainability. Faculty whose scholarship and teaching areas emphasize interdisciplinary and cross-cutting activities will provide greater depth and range to our current research and instructional efforts in sustainability. The process of identifying, recruiting, and bringing in a new group of faculty whose primary research expertise focuses on sustainability can in itself help catalyze and energize new, interdisciplinary and cross-school efforts in sustainability.
2. **Establish a faculty development program** that encourages faculty to infuse sustainability into their teaching. Stipends and course-development funds should be included. Experienced faculty and other "practitioners" of sustainability-focused curricula could teach workshops.
3. **Explore ways to incorporate literacy on environmental and sustainability issues into the educational program of all undergraduate students.** One straightforward solution would be to develop a freshman learning module that promotes understanding of the connections between environment and human well-being, including humanity's dependence on ecosystems and humanity's ecological footprint and the theory and practice of sustainability, from sense of place to ecological economics and ecological design principles. Additional efforts should focus on broadening impact campus wide. The current discussions on the General Education curriculum offer opportunities to incorporate sustainability-related coursework into the undergraduate experience of all IUB students. Other mechanisms include service-learning projects focused on projects to make our campus and community more sustainable (see also Service-learning, below).
4. **Establish an Undergraduate "Area Certificate"** in Sustainability. Sufficient coursework already exists for this certificate (area certificates typically require 25-30 credit hours), but a capstone course would be beneficial. A faculty member and professional advisor (part-time) would coordinate the certificate. A substantial component of the coursework should involve service-learning. As a result, the Certificate in Sustainability will provide a type of "Green Diploma" certification. The Certificate in Sustainability also could form a "core" set of courses for students to develop more-specialized Individualized Major Program (IMP) degree requirements.
5. **Establish a fellowship program to fund graduate and post-doctoral students** in areas related to sustainability. Students who have interests in cross-disciplinary studies and research should receive highest priority.
6. **Establish a Ph.D. Minor in Sustainability.** Sufficient coursework exists for a Ph.D. minor (Ph.D. minors typically require 9-12 hours of graduate credit.) The Ph.D. minor would be a multi-department and multi-school endeavor.
7. **Establish incentives to support student sustainability scholarship,** including awards for exemplary undergraduate research, Master's work, and Ph.D. dissertations that have a focus on sustainability. This would allow students who have gone well beyond fulfilling the curricular requirements to be recognized for outstanding scholarly work related to issues of sustainability.

Research, Scholarship, & Creative Activity

The academic reputation of Indiana University rests on the research, scholarship, and creative activity generated by IU scholars. Enhancement

of basic and applied sustainable systems research generated by IUB faculty and students can help support student learning while helping to cement IUB's image as a leader in environmental research, attract new faculty and students, and

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generate new external funding opportunities. Support for research, scholarship, and creative activity related to sustainability on our campus may be constituted in a number of ways, and could include one or more of the following (in order of increasing cost and increased potential impact):

- Incentives for existing units to develop sustainability studies as part of their regular research, scholarship, and creative activities
- The appointment of a sustainability coordinator within existing academic units
- The constitution of an office of sustainability with resources to support research, scholarship, & creative activity
- The constitution of an institute or center for sustainability studies
- The constitution of a department or school of sustainability studies.

Action Items

However constituted, the administration of research, creative & scholarly activity for sustainability should address three core issues of academic research: (i) developing a faculty of highest caliber; (ii) creating a rich and engaging research environment; (iii) providing new opportunities for exciting student research. The following action items could be used to implement the long-term objectives described above.

1. **Foster active affiliate faculty:** establish affiliations with faculty who presently conduct research related to sustainability; promote active participation by means of regular meetings, goal setting, evaluation;
2. **Hire dedicated new faculty:** a program in sustainability cannot thrive without the addition of new faculty with a dedicated focus on sustainability research. The establishment of a new program of academic hires with interdisciplinary connections would strengthen the bonds between participating units.
3. **Provide administrative support to obtain and manage grants:** assist faculty to obtain grants in their home units; create protocols for interdisciplinary grant sharing between affiliated faculty from different units; create a self-supporting office, center, or institute, primarily from grants that would not be available to other units.
4. **Foster interdisciplinary research collaborations:** foster local interdisciplinary research collaborations; foster external/international interdisciplinary research collaborations.
5. **Create incentives:** negotiate recognition of service commitments for faculty participation; provide summer funding opportunities for faculty; invite participation in multi-disciplinary grant proposals, especially those that would not necessarily otherwise be available to individual single-disciplinary researchers.
6. **Speakers Program:** invite high-profile external speakers; create a colloquium series for local speakers; maintain archive of talks; make talks available as a teaching resource on the sustainability web site.
7. **Mentor junior faculty:** create mentoring programs for junior faculty that support interdisciplinary and transformational research.
8. **Advise other units on sustainable practices:** set up unit to work internally with sustainable best practices; demonstrate effectiveness of sustainable best practices to other units and offer consulting on how to effect sustainability-related changes.
9. **Establish metrics of success and evaluation:** establish metrics of success; evaluate and report on performance in terms of these metrics.
10. **Establish center for degree programs:** establish formal graduate programs and Ph.D. minors in sustainability; the presence of a strong graduate degree program will support academic research efforts.
11. **Plan and implement conferences and dissemination:** create a web presence; hold conferences; create a journal.
12. **Provide seed funding:** as a special reserved allocation of programs such as Faculty Research Support Program and Multidisciplinary Ventures Fund as a distinct program.

Community Outreach & Collaboration

An effective program of campus sustainability must extend beyond the confines of the class-

room and laboratory. Community outreach is the process by which an academic institution reaches out to and collaborates with a

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community, identifies community needs from the community perspective, and strives to meet those needs. As an educational modality, community outreach helps students to become more aware of the world around them, and encourages ways to interact with and help make their world a better place for themselves and others. Thus, community outreach efforts are an integral part of any sustainable educational program and can be very effective teaching tools. For example, service-learning is a special, explicitly pedagogical, form of community outreach that we discuss separately in the following section.

Since its founding, Indiana University has been an integral part of Indiana's intellectual resources. Over time, IUB-affiliated faculty, staff and students have been major contributors to virtually all aspects of local, state, national and international communities as community leaders, as participants, and as volunteers. Integration between IUB and the surrounding communities plays a key role in bridging the local 'town-gown' divide. As the university itself becomes a more sustainable institution and as IUB students become more aware of what it means to exist and contribute to a sustainable society, our goal is that IUB students, faculty and staff will help promote a more sustainable environment within the broader community.

Community outreach experience is an important tool in training students to help create and maintain a community-oriented sustainable world of

the future. From the university's perspective, collaborative community outreach is one of the key mechanisms by which the university stays attuned to the broader community we serve. Therefore, we recommend the following long-term strategic goals: (1) The IUB community will be a true collaborative partner with the greater Bloomington community, working jointly towards creating a sustainable community of which the university is one part. (2) By the time they graduate, every IUB graduate will feel they are a part of the greater community, both within IUB and within the city, county, state, country and world, and they will have achieved this awareness, at least in part, through involvement in some form of community outreach or service-learning.

These goals will be encouraged by the following two specific approaches:

1. Instituting mechanisms to encourage both formal (for course credit) or informal (volunteer) participation in some form of community outreach, possibly as a component of graduation requirements for IUB students.
2. Establishment of a well-developed, web-based resource that enables community members and organizations to post opportunities for community outreach and concurrently enables faculty, staff, and student organizations to post expertise and interests to the community organizations. This would be an extension of the service-learning based networking tool under development by the Office of Service-Learning.

The following action items build upon efforts that are already in place or in development. They fall into three general categories:

I. **Strengthening linkages with the Community**

- Collaborative efforts with City and County government on sustainability issues, including Commission on Sustainability, Monroe County Solid Waste District, City Environmental Commission, Bloomington Transit, etc.
- Linkages with community non-profit organizations: Center for Sustainable Living; Caldwell Center on Community & Ecology, Bloomington Growers Guild, Bloomington Hospital, etc.
- Linkages with K-12 Schools: enhance connections through existing environmental education programs (Hilltop Garden and Nature Center, Bradford Woods, etc.) and encourage units that develop novel programs.

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- Generate and Support Broader Dissemination Opportunities: Expand access to environmental sustainability information through broadcast media (WFIU, WTIU), student media (IDS, WIUS), website development, highlighting sustainability efforts on the IUB home page, creating more on campus signage, and the publication of journal and news articles about IUB sustainability research, teaching and outreach efforts.
2. **Developing Resources for Outreach to Teachers**
 - Create a web-based clearinghouse for the dissemination of sustainability-related teaching material and to facilitate connecting community members and K-12 educators with appropriate IUB experts.
 - Develop an NSF K-12 Proposal to fund this effort. Relevant NSF K-12 funding programs include Dynamics of Coupled Human-Environment Systems and Informal Science Education.
 3. **Strengthening University Support for Outreach**
 - Host community meetings on-campus to address the need for collaboration between the university and the local community.
 - Formally recognize university programs that have extensive community outreach components.
 - Encourage informal education opportunities, expanding on existing IUB collaborations with Wonderlab, IU's Mini University, Extended Programs, the IU Research and Teaching Preserve, Chemistry and Physics Open Houses, and the Tulip Trace Girl Scout Council's Brownie Math and Science Day.

Service-Learning Opportunities

Because it connects meaningful community service with academic learning, personal growth, and development of civic responsibility, service-learning is a natural educational framework for promoting sustainability education on campus. Through service-learning, the campus and local community offer rich, multidisciplinary laboratories for applying coursework within and across fields towards sustainability-related problem-solving. Benefits include promoting deep understanding of theory learned in class, cultivating a sense of place and civic ethic in students, empowering students with skills as change-agents and advancing the university's mission of providing service to the community, state, and nation. Other advantages of this approach include cultivating town-gown partnerships, promoting interdisciplinary partnerships, and allowing faculty to simultaneously meet service and teaching goals.

Sustainability is inherently interdisciplinary, and service-learning projects with strong environmental, economic, and/or social emphases can be promoted among a wide range of disciplines and courses. IUB already has a strong service-learning presence on campus through the Office of

Service-Learning (<http://www.indiana.edu/~copsl/>), and is thus exceptionally well positioned to implement service-learning for sustainability.

Specific action items include:

1. **Compilation and maintenance of a database** of IUB members who work on sustainability-related issues and of campus operational units and community organizations who are interested in developing sustainability service-learning projects with the university.
2. **Coordinating efforts** with IUB Community Connections (<http://www.indiana.edu/~connect/vlntr/>). IUBCC is dedicated to building beneficial relationships with local government, private, and non-profit organizations and facilitating partnerships based on the university's educational mission.
3. **Providing financial incentives** for faculty and departments to develop new service-learning initiatives in sustainability.
4. **Recognizing departments and faculty** who have developed extensive community outreach components.
5. **Developing interdisciplinary projects** that would engage teams of students from different courses.

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This cross-disciplinary approach has been applied successfully at IUB and has the potential to develop as a powerful new pedagogical approach.

6. **Developing partnerships with K-12 educators,** offering significant new arenas for service-learning.

Table 4: Summary of Community Outreach and Service Learning Activities within the Greater IUB Community and between IUB and Bloomington

IUB Units and Programs currently participating in Sustainability-Related Community Outreach	Sustainability Related Bloomington Organizations, Agencies and Commissions With Links to IUB
Bradford Woods Outdoor Education Center Center for Environmental Health Center for Research on Learning and Technology Chemistry (Department of) Office of Service-Learning Eppley Institute for Parks and Public Lands Hilltop Garden and Nature Center Indiana Conflict Resolution Institute Indiana Junior Academy of Science Indiana Public Interest Research Group IU Green Campus Pervasive Technology Labs Physics (Department of) School of Informatics Summer Camp Science Olympiad Science Speakers Bureau Students Producing Organics Under the Sun	Big Brothers Big Sisters Bloomington Bloomington Commission on Sustainability Bloomington Parks and Recreation Bloomington Environmental Commission Bloomington Transportation Option for People Boys and Girls Club of Bloomington Caldwell Center for Culture and Ecology Center for Sustainable Living Greater Bloomington Chamber of Commerce Habitat for Humanity of Monroe County Indiana Forest Alliance Indiana Natural Builders Monroe County YMCA Mother Hubbard's Cupboard Nonprofit Alliance of Monroe County Sassafras Audubon Society Shalom Community Center Sycamore Land Trust United Way of Monroe County WonderLab

Co-Curricular Activities

Co-curricular programs provide opportunities for IUB students to directly engage with the community through organized volunteer and student organizations. Higher education research has demonstrated the intrinsic value of co-curricular engagement within a student's educational journey. Like service-learning, co-curricular involvement complements academics by allowing the direct application of classroom knowledge and concepts while at the same time increasing a sense of citizenship. In addition to enhancing the academic skills required for critical thinking and cognitive complexity, experiential education outside the classroom can be a primary variable for student retention.

Co-curricular opportunities related to sustainability at IUB can readily be implemented by taking advantage of organizational structures that are currently in place. These include the Division of Student Affairs (DSA) and the Student Activities Office (SAO), which focus on advising, leadership, and civic engagement services. The Student Activities Office supports a student growth model that includes community participation, connection, leadership and recognition. These organizations work in collaboration with the Office of Service-Learning and Indiana Campus Compact (ICC). This 27-year IUB - ICC partnership focuses on Community-Based Research as its foundation for engagement. ICC serves higher education to "advance citizenship and service as critical components of higher

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education”. The IU Student Organizations and Leadership Development (SOLD) office helps to facilitate the co-curricular education of student leaders within the student organization community. Currently there are over 500 registered student organizations at IUB. Some twelve environmental student organizations have positively influenced our university community by coordinating panel discussions, seminars and presentations, and by promoting eco-friendly building

policies, re-cycling efforts, food collaborations, and light bulb replacement efforts. The newly developed “Volunteers in Sustainability” project provides a mechanism to energize and coordinate these student activities. In summary, the co-curricular education of our students holds tremendous value. Their contribution toward sustainability can readily be phased in via current staff and programs.

Table 5: Selected Student Organizations Engaged in Environmental Literacy and Sustainability

<i>Student Organization</i>	<i>Category</i>	<i>Level</i>	<i>Description</i>	<i>Activities</i>
Environmental Management Association (EMA)	Special interest	Graduate	To promote professionalism, knowledge and service in the field of environmental management.	Energy Panel Discussion with SPEA Faculty (March 23, 2006); Earth Day series of events.
Environmental Business Club (EBC)	Special interest	All	To bring together like minded environmentally conscious business students and engage in projects throughout the Bloomington community.	Energy Star light bulbs in the Residence Halls, BUS/SPEA Library.
SPROUTS	Volunteer & service	All	To sustainably produce food for student consumption and education.	Collins LLC food court collaboration; Partnership with service-learning classes.
Environmental Law Society (ELS)	n/a	Graduate	To promote environmental awareness and involvement in the campus and community.	Hosted Presentation on Global Warming (March 22, 2007)
IU Green Campus	Activism	All	To work with students, faculty, staff and Bloomington residents to promote eco-friendly policies on IU's campus.	“Pups Against Pesticides” – anti-pesticide awareness public event.

The action items listed below fall into three broad categories of co-curricular activities related to campus and community sustainability:

- 1. *Increase awareness and recognition of sustainability issues within the co-curricular community***
 - Incorporate sustainability education during advising meetings with student leaders
 - Initiate staff partnerships with the campus community to encourage the purchase of recycling bins, CFL lights, grants applications, etc.
 - Create sustainability brochures for distribution at advising meetings, leadership programming, and Help Desks.
- 2. *Increase collaborative efforts between existing student organizations involved in sustainability***
 - Help coordinate activities of the registered student organizations who have a mission related to sustainability. Facilitate a mapping of missions and vision for a volunteer coalition and help to identify faculty and community contacts.

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- Support efforts by the Volunteers in Sustainability to:
 - Collaboratively create a local Sustainability monthly calendar of activities, events, lectures, meetings, etc.
 - Work with SOLD to publicize this calendar via the web, weekly distribution list, mailboxes, etc.
 - Create Monthly Sustainability Themes for the student organization community. (e.g., “Leave your car at home week”, “Alternative Transportation month”, “Green Christmas”, etc.)
 - Create an annual Sustainability speakers series for students and student organizations; identify funding sources and departments as potential sponsors.

3. *Increase initiatives for broader student involvement with sustainability issues*

- Work with SOLD to integrate the issue of sustainability as a topic for breakout sessions at Student Organization Orientation and Civic Engagement Orientations
- Involve IUSA student government volunteer directors
- Create awards and recognition for sustainability-related efforts at annual Student Organization and Greek award ceremonies, as well as state organization awards (e.g., Indiana Campus Compact).

Metrics for Assessment:

Evaluating progress through time is essential. Initially, we envision developing a survey to gauge the baseline level of environmental literacy at IUB (e.g. via random samples of incoming freshman and graduating seniors), with annual follow-up surveys to assess progress. This *Campus Sustainability Report* provides a preliminary assessment of the ongoing sustainability-related efforts at IUB, including a summary of much of the sustainability-related work carried on by stu-

dents, faculty, and staff, within the context of classes, as service-learning efforts, and as individual efforts as part of community-based sustainability-related activities. We anticipate that a new and more complete assessment will be undertaken as a part of the next phase of the Sustainability Task Force and related efforts at IUB.

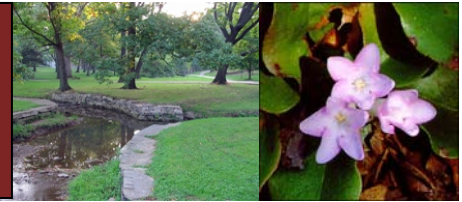
Goals for the on-going assessment of sustainability-associated educational activities at IUB should include:

1. Refining the Sustainability Task Force surveys carried out this past summer and issuing a revised “State of the Campus” report by the end of the 2008-2009 academic year.
2. Reassessment of progress in achieving the environmental literacy and sustainability -related education goals, as part of a “Sustainability State of the Campus” report to be produced on a 2-year cycle.
3. Longitudinal audits of IUB's course offerings, operations, and purchasing practices, which would be a complementary form of assessment, some of which could take place as a part of service-learning projects.

Appendix B lists a set of recommended metrics that can be used to quantitatively and qualitatively assess progress towards sustainability in education and community-related activities at IUB. Briefly, the metrics address both curricular and co-curricular activities, community outreach and service-learning activities, and research, scholarly and creative activity. In all cases, the metrics should be tracked both qualitatively and quantitatively, and be mapped to

faculty, staff, undergraduate students, graduate students, and administration involvement. The diversity value for each metric (e.g. the number of types of examples and the number of organizations or units involved) should be tracked in parallel. Since sustainability issues by their nature require a diverse perspective and collaborative interactions, the linkages between organizations and units should also be tracked and quantified.

Indiana University Task Force On Campus Sustainability IV Energy



Energy

Objective: *To raise awareness of IUB's energy use among faculty, staff, and students and implement strategies to maximize the efficiency of on-campus production and distribution systems as well as reduce energy consumption and greenhouse gas emissions.*

Introduction

Energy consumption on the Indiana University - Bloomington (IUB) campus is both unsustainable and climate altering. Thus, we seek to promote energy awareness on the Bloomington campus by creating an inventory of campus greenhouse gas (GHG) emissions, developing targets to reduce GHG emissions, and proposing a timetable to achieve carbon-neutrality. In order to plan for the future development of the campus, and support the proposed facilities master plan recently announced by President McRobbie, we recommend the development and implementation of an integrated *energy master plan* for the IUB campus that focuses on reducing energy waste, maximizing the practical use of renewable energy, exploring the use of biofuels, and optimizing the efficiency of IU's energy production and distribution facilities.



Upon the completion of a thorough GHG inventory, IUB can implement projects identified in the energy master plan to strategically reduce GHG emissions, including:

- reduced energy consumption (load management through building renovations that include window and roof replacement, better building insulation, and improved utility distribution systems, retro-commissioning of existing buildings)
- utilization of renewable energy sources – e.g. solar water heating and photovoltaic electric production

- evaluation of distributed energy production facilities
- investigation of biomass fuel for the central heating plant
- purchase of renewable energy credits

Background

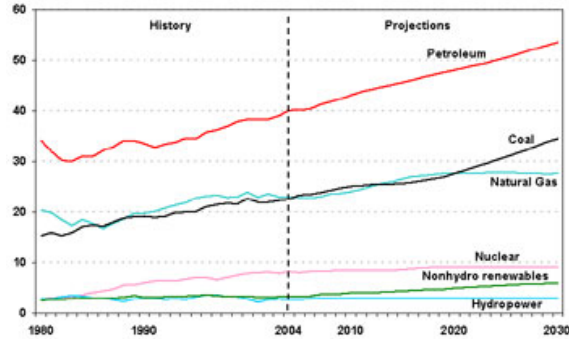
According to the 2007 US Department of Energy Buildings Energy Data Book, energy

consumption in the United States is largely fossil-fuel based, accounting for nearly 100% of all building heating, transportation, and Industrial energy and more than 70% of all electricity production in the United States.

The combustion of fossil fuels also releases carbon dioxide that traps heat in the earth's atmosphere. The "greenhouse effect" has been studied for decades and, while there is still debate about the extent of the problem, many Fortune 500 companies (General Motors, Ford, Wal-Mart, etc.) are taking steps to educate their customers as well as their workforce to reduce the release carbon dioxide and other greenhouse gases. The Energy Information Agency (EIA) publishes volumes of data related to all forms of energy production and consumption. Trends and forecasts of energy supply are also available that can be used to predict future emissions. Figure I shows the historical energy consumption of each fuel type as well as predicted future consumption.

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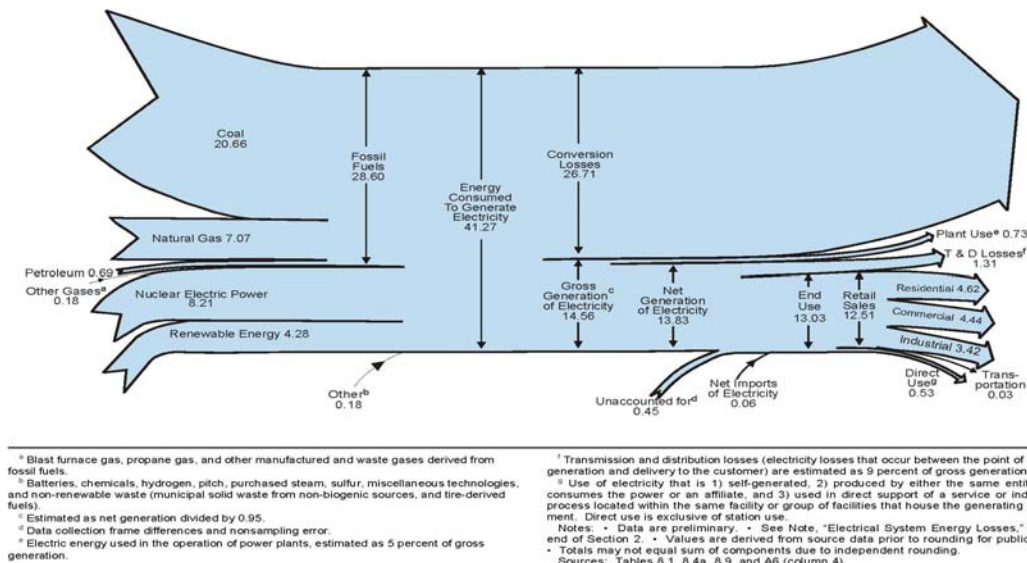
Figure 1. U.S. Energy Consumption by Fuel (1980-2030)



Energy sources from EIA-show percentage of each fuel type nationally.

The data in Figure 2 from the EIA indicates that more than 75% of the energy used to generate electricity is lost as heat before it is used to do work. This indicates that there is much to be done to improve the production, distribution, and consumption of energy. A portion of these losses can be regained through the effective use of cogeneration on the IUB campus.

Figure 2. U.S. Electricity Flow, 2006 (in quadrillion BTU).



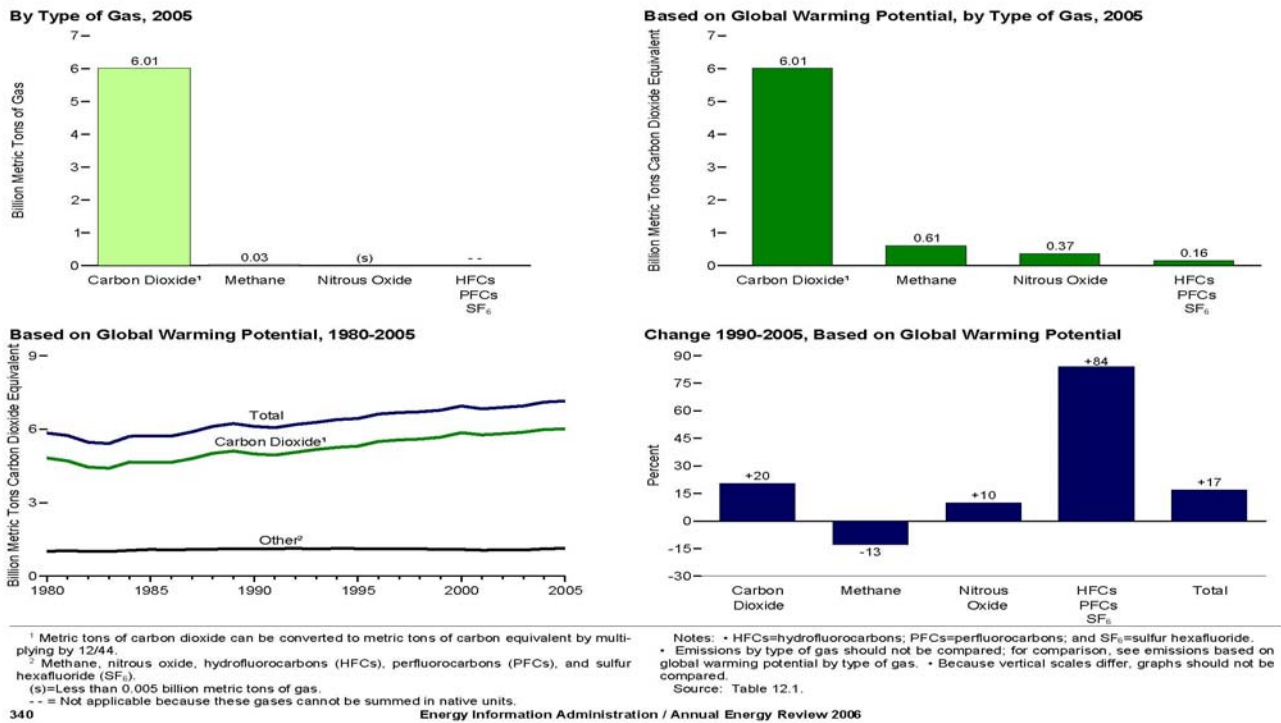
Alternative energy sources remain somewhat of a mystery to most consumers. Most U.S. homeowners know about energy efficient appliances and low-E glass for windows. However, public awareness or understanding of alternative technologies such as solar panels, geothermal,

Because the science is so compelling regarding the effects of greenhouse gases (GHG), five separate pieces of legislation are making their way through the United States Congress that will set emission targets for the release of GHG. Those targets will require certain percentage reduction of GHG emissions by a target date. As currently written, four of the five bills will reward companies and institutions that begin evaluating their "greenhouse gas footprint" in 2007 and take early action on their reduction of GHG's. The reward for early action includes the allocation of emission allowances for those who register their GHG emission reductions. By making reductions in GHG emissions anywhere through programs or initiatives sponsored by Indiana University, those reductions will be credited to Indiana University.

photovoltaic solar heat, and wind turbine systems was less than one percent according to a survey conducted by *Intellitrends* and *Geo-Renew Systems*. (The survey can be found at: http://www.georenew.com/alternative_energy_intelliview.pdf.)

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Figure 3. Emission of Greenhouse gases.



Energy Use at IUB

The majority of buildings on the IUB campus are heated with **steam** produced at IU's coal and gas fired Central Heating Plant. During FY 2005-06, the plant produced about 1.17 billion lbs of steam. Condensate, produced from the release of the steam energy within each building, is returned to the plant, treated, and re-heated and redistributed as steam to the campus. Condensate return percentages, which at one time averaged in the low 20's, is now consistently above 70%. The return of this condensate results in reduced coal combustion (and the associated reduction in CO₂ emissions), reduced water purchase from the City, and reduced chemical use to treat the raw water. Improving condensate return percentage is normally a very quick payback, typically 3 years or less for most projects.

Several buildings on the perimeter of the campus are heated directly with natural gas rather than steam because of the higher relative cost of improving the steam and condensate distribution

system. (Figure 4 shows IUB's natural gas consumption from FY 01-02 to FY 06-07.) As more buildings are built on the perimeter of the campus, it may be necessary to explore the development of satellite heating plants powered by natural gas. Extension of the steam distribution

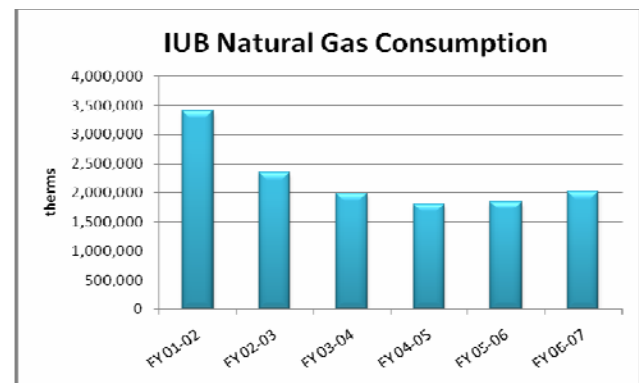


Figure 4. IUB Natural Gas Consumption, 2001-2006.

system is very expensive (\$500 - \$2000/foot) when compared to a satellite plant that could generate heating, cooling, and electricity.

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Electricity used on campus for lighting and power is purchased from Duke Energy, delivered to campus at 12,470 volts, and distributed from 2 main switching centers. For FY 2006-07, the university purchased approximately 239,827,780 kWh of electricity from Duke Energy. (Figure 5 shows IUB electricity consumption for FY 01-02 to 06-07). The university distributes power using both 12.47kV and 5 kV distribution voltages, and almost every major building on campus is served by two separate circuits. All electricity is metered at the building level although work needs to be done to improve the metering system. In addition to lighting and power, all campus cooling systems are driven by electricity.

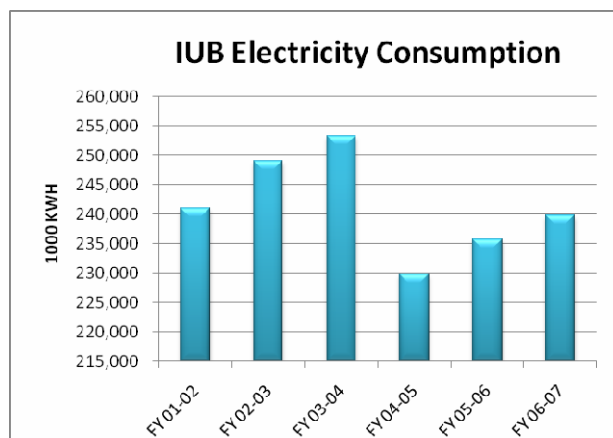


Figure 5. IUB Electricity Consumption, 2001-2006.

IUB's Energy and CO₂ History

Any effort to confront IUB's GHG production requires an understanding of the both the recent history and the present level of campus emissions. The majority of university CO₂ production comes from one of three sources: building heating, electricity generation/consumption, and transportation. In the summer of 2007, IUB completed an initial inventory of GHG emissions from 1990 to 2007 using the Clean Air Cool Planet Campus Carbon Calculator. According to this inventory, IUB consumed 4,511,319 million BTU of energy and emitted 418,043 metric tons of CO₂ equivalents. (For FY 2006-07, the

amount of carbon emitted equals 125,674 tons). Not surprisingly, most of our CO₂ emissions are associated with electricity consumption (280,649 Tons) with a smaller amount attributed to 'stationary sources' that heat the buildings by burning principally coal (147,241 Tons), and the least amount (27,569 Tons) from student, faculty, and staff commutation.

Figure 6 highlights IUB's total CO₂ emission from 1990-2007¹. Interestingly, this figure highlights the fact that while CO₂ emissions from purchased electricity slowly rose over the study period, the emissions associated with campus heating remained largely constant. Careful analysis suggests that the waste heat associated with the generation of electricity is comparable to the campus need for building heating, which is a good indicator of the potential for cogeneration on the IUB campus. While IUB's emissions increased steadily from 1990 to 2007, CO₂ emissions per student remained fairly constant² (Figure 7) Given the increasing use of personal computers in academia over the last decade, this trend is quite impressive.

Figure 7 indicates that IUB's total CO₂ emissions per square foot of building space have remained roughly constant over the inventory period. Again, this trend is impressive in light of the 15% increase in total building space (and a 21% increase in research building space) at IUB from 1990 to 2006³. Finally, Figure 8 indicates that IUB's emissions have decreased steadily in relation to the overall campus operating budget.

¹ As can be inferred from the graph, robust transportation data were only available beginning in 1999.

² Recall total emissions in the early years does not include transportation.

³ At the time of press, the 2007 building square footage data were not available.

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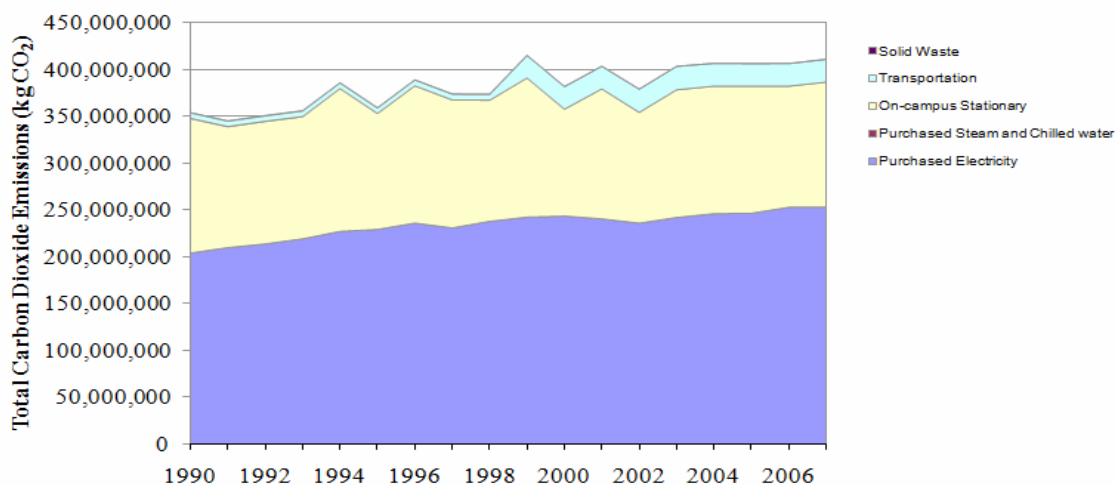


Figure 6. IUB CO₂ emissions, characterized by source, 1990-2007.

Comparison with Peer Institutions

Research institutions like Indiana University are uniquely positioned to take advantage of their scientific and academic resources to explore alternatives for the reduction of greenhouse gases.

Major universities around the country are recognizing the impact of fossil fuel combustion and its relationship to greenhouse gases. Over 400 university presidents have signed on to the American College and University Presidents (ACUP) Climate Commitment signifying their institution's readiness to accept the challenges of reducing global greenhouse gases. A more detailed discussion of the Presidents' Climate Commitment is presented in Chapter II and Appendix C.

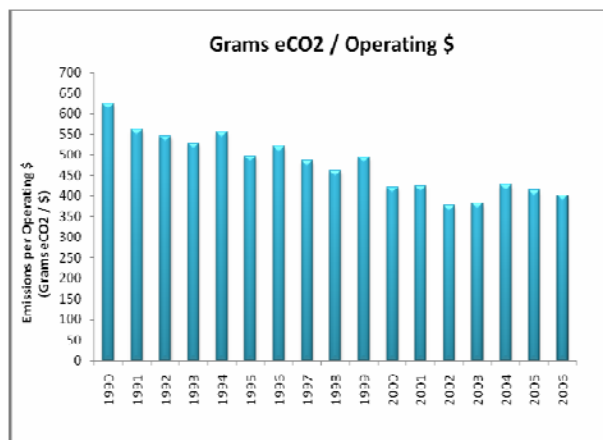
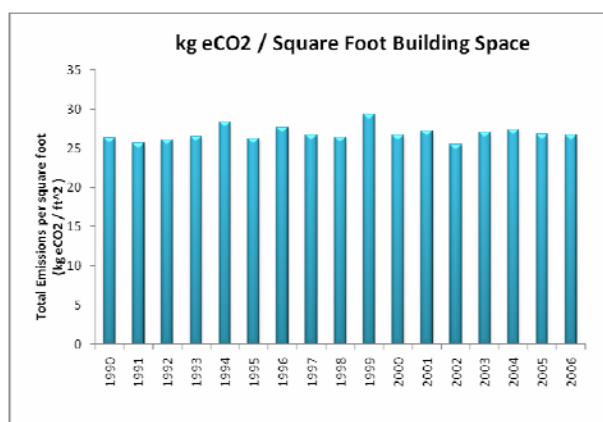
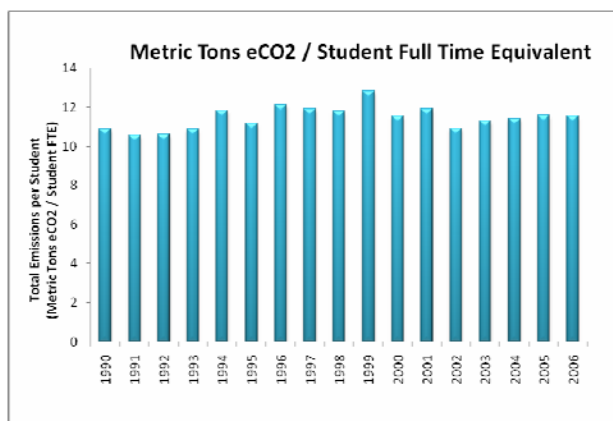


Figure 7. Estimates of campus CO₂ emissions, normalized by student FTE (left), building area (upper right) and operating expense (lower right).

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We note that four Indiana universities have signed the commitment: Rose Hulman, Indiana State, Ball State, and Goshen College. The Indiana University Sustainability Task Force has recommended that Indiana University become a signatory to the Climate Commitment. While there is work to be done to comply with the commitment, the outcome is a strategy with a self-imposed benchmark and timeline for ultimately becoming carbon-neutral.

Purdue University recently completed a Carbon-Neutral Study through the combined efforts of students, faculty and staff. This report returned the conclusion that Purdue was responsible for the release of 182,970 tons of carbon during the 2005-06 fiscal year. Furthermore, the report recommends that Purdue University can become carbon-neutral through a series of steps to curb energy consumption at the campus and individual level, evaluate alternative fuels at the central plant, purchase carbon offsets, install sub-metering of energy consumption campus-wide, and creation of an Energy Manager position to oversee an energy reduction program on campus.

Additionally, the University of Florida (UF) performed a carbon assessment in 2004 based on energy use on the UF campus in 2001. This analysis concluded the university emitted 519,623 tons of carbon during 2001, with more than 80% coming from the generation of steam and purchase of electricity. This suggests that significant on-campus reductions can be achieved cost-effectively through appropriately scheduled infrastructure renovation, equipment upgrade and advancing a new energy management approach. Enhancing carbon sinks on UF lands, initiating local projects and purchasing emissions reductions on the market can be used to offset any remaining emissions.

To make meaningful comparisons with other universities, it is valuable to look at energy density – i.e. the energy consumed per square foot of

building area on the IUB campus. Figure 8 shows our energy density since 1990. While the campus has added more than 2,000,000 gross square feet of space since 1990, the energy consumption per square foot has decreased. (Section VIII on the Built Environment contains a more detailed discussion of energy density at IUB.)

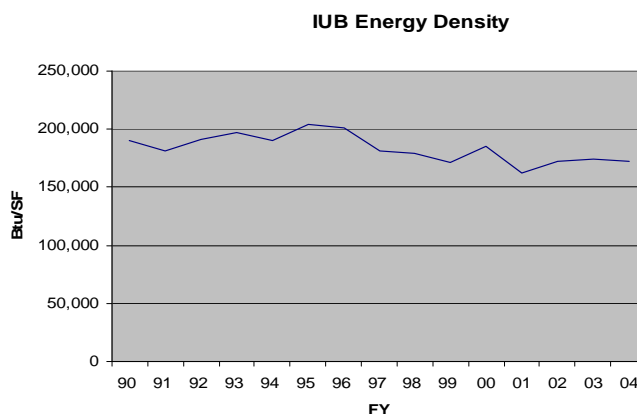


Figure 8. IUB energy density estimates, 1990-2004

As seen in Figure 9, Indiana University falls in the middle of the range of major Midwestern research institutions with respect to energy use per gross square foot. While IUB does not exhibit the highest electric use per gross square foot, this institutional comparison indicates that there is clear scope for improved energy use efficiency on campus. By developing and implementing high-performance building standards, improving building envelopes, and promoting energy conservation, we feel that IUB can achieve significant reductions in its building energy density.

Energy and Greenhouse Gas (GHG) Reduction Strategies

Strategies for reducing the release of GHG include conservation programs to reduce the overall consumption of energy. According to the Midwest Buildings Technology Application Center located at the University of Illinois-Chicago, university buildings account for almost 60% of all energy consumption through heating cooling,

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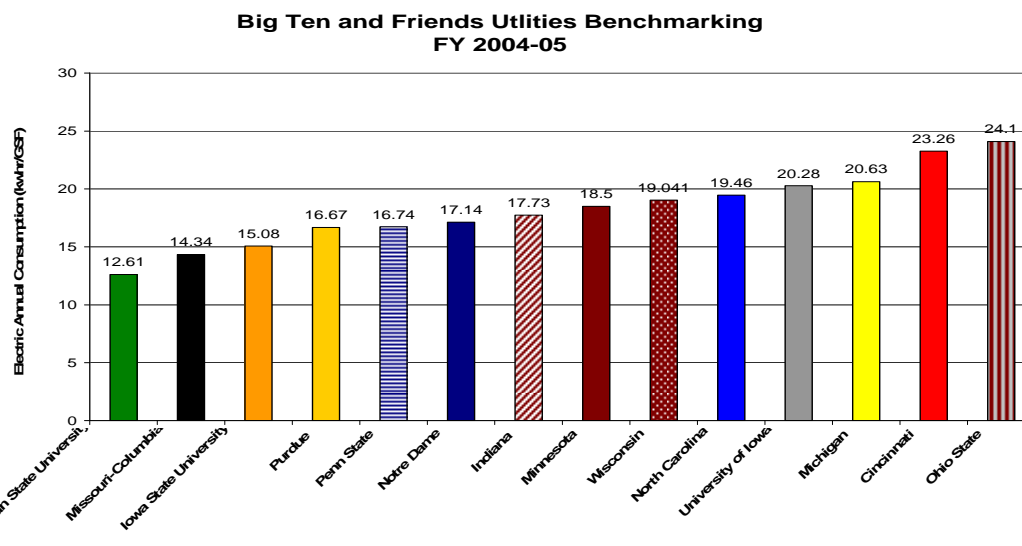


Figure 9. Comparison of energy density for Big Ten and other Peer institutions, 2004-05.

and lighting systems. Buildings can be made more efficient by making improvements in the building envelope, adding insulation to walls and roofs, installing more efficient lighting, upgrading HVAC systems, and retro-commissioning existing heating and cooling systems. Please refer to the Built Environment section of this report for additional detail.

All major buildings on the IUB campus are connected to the Physical Plant Control Center, an office responsible for the monitoring and control on a 24-7-365 basis. The computer control system allows remote monitoring and control of more than 20,000 points of control for heating, cooling, lighting, ventilating, and pumping systems. Modern direct digital control (DDC) allows operators to troubleshoot problems from a remote computer terminal, modify set points for heating, cooling or ventilating, and establish relevant trends. Computer controlled HVAC systems have proven to be a very reliable method of energy management. DDC controls will continue to be the desired method of HVAC control in the construction of all new buildings and renovations of existing buildings. However, barriers to installing full DDC controls on all projects are largely based on limited funding opportunities

and fixed project budgets that are not adequate to cover all the desired features.

Fuel switching also presents another opportunity to reduce or eliminate GHG emissions. The University of Wisconsin is currently testing the use of biomass (wood chips, pellets, etc.) as an additive to coal to reduce the carbon footprint⁴

Although Indiana University uses spreader-stokers, there is a strong possibility that pelletized wood mixed with coal is a viable alternative to reduce carbon emissions from the Central Heating Plant.

It should be noted that Indiana University is in the process of renovating the Central Heating Plant (CHP) on the Bloomington campus. The \$34 million project will include the upgrade the emissions controls and be accomplished in three phases. The first phase, which was started in January of 2007, will replace two coal-fired boilers with a single, larger gas-fired package

⁴ The carbon footprint is the measure of the impact human activities have on the environment in terms of the amount of greenhouse gases produced, measured in units of carbon dioxide. This includes the direct use of fossil fuel as well as secondary sources from the life cycle of manufacturing and disposal.

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boiler; completion of this phase is anticipated in February 2008. Emission reductions from phase one include significant reductions in SO₂ and particulate matter (PM). The second phase will add baghouse filter controls to three coal boilers. In addition to the baghouses which will control PM, lime and activated carbon injection will be installed to control the emission of SO₂ and mercury, respectively. Phase two is anticipated to be completed in the fall of 2008. Phase three is a collection of general upgrades to the CHP. The new emission controls will produce an overall reduction in emission of 68%, allow the CHP to continue to use Indiana coal, and meet all new air quality standards, specifically the Maximum Achievable Control Technology (MACT) regulation.

Indiana University currently has more than 35 diesel-powered standby generators located throughout campus. Biodiesel, made from organic oil feedstocks such as soybean, rapeseed, Jatropha, sunflower, palm, and waste vegetable oils, as well as animal fat and algae is an alternate fuel that could be used. Diesel engines operate without modification on 100% biodiesel or on any blend of biodiesel with petrodiesel. Eventually, biodiesel could be manufactured in sufficient quantities to allow IUB to use it for other functions besides the generation of electricity such as landscape machinery, construction equipment, tractors, etc.

Additionally, **solar water heating** offers a promising method of reducing energy use in new or renovated residence halls. Residence halls tend to consume more hot water because of the shower, laundry, and cooling facilities associated with these building types. According to the DOE Consumer's Guide to Energy Efficiency and Renewable Energy, using the sun to pre-heat water prior to storage can reduce energy consumption by as much as 50-80%. **Photo-voltaic cells** and **wind energy** may also have an application in northern Indiana, although current wind maps indicate marginal success for wind energy

in our southern Indiana climate. IUB could be a partner in these technologies through direct investment in renewable energy credits or through academic research in new renewable energy technologies.

Natural gas is often used to replace coal as a base-load energy source. While this is an effective means to reduce the release of GHG, the economics of natural gas combustion make this a very expensive and unpredictable alternative fuel for the Central Heating Plant. For the IU-Bloomington campus, switching to an all natural-gas fired heating plant could result in a 5-fold increase in fuel costs. However, there may be specific opportunities to heat buildings with high-efficiency gas boilers rather than electric resistance or steam-fired heating systems.

Landfill gas is another source of potential renewable energy. Currently there are at least 3 landfills in Indiana where methane gas from the decomposition of the organic matter buried within the landfill is harvested, purified, and burned in a natural gas engine to produce electricity or heating hot water. Landfills in Danville, New Albany and Indianapolis currently use this technology. Electricity produced at the Danville and New Albany locations is currently being sold as renewable energy through the South Central Indiana Rural Electric Member Cooperative. Indiana University is currently purchasing these renewable energy credits for the Bradford Woods Outdoor Educational Center for more than 30 electric meters that serve the property.

Combined cycle plants generate electricity more efficiently and consume less fuel per kilowatt-hour of output than conventional generators. A typical combined-cycle plant employs one or more gas turbines, a heat recovery steam generator (HRSG) and a steam turbine. Both the gas and steam turbines produce power. The Indiana University Central Heating Plant is already positioned to burn gas in all 5 of the existing boilers. Coal gasification and combined cycle

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electric generation should be explored as a method to reduce greenhouse gas emissions, produce electricity and steam to meet a portion of the campus energy loads, and reduce overall energy costs. Campuses like IUB have a substantial advantage over remote electric generating power plants in that the waste heat, typically dumped into a river at the remote site, can be used to heat campus buildings that are located within the campus. This process of "cogeneration" allows typical electric generation efficiencies of 40% to rise to cogeneration efficiencies at the 85% level with enormous reduction in campus CO₂ production.

Computer Technology and Sustainability

Due to the complex manner in which computer technologies have become woven into the fabric of our society, it is often difficult to measure the impact of these technologies on sustainability. On one hand, computer technology has enabled many of the innovations that are creating more efficient systems. Computer-controlled heating and air conditioning systems enable the Physical Plant to more closely control the energy use in buildings; sophisticated control systems also help monitor the efficiencies in the Central Heating plant and the Chilled Water Plant. At the same time, computing equipment is subject to frequent early retirement due to obsolescence or fashion, rather than exhaustion of useful service life. This early retirement creates an environmentally harmful waste stream. In addition, computing equipment is frequently left running, even when it is not in use. Computing servers need temperature-controlled environments and are seldom turned off. It has been estimated that "with more than 1 billion computers on the planet, the global IT sector is responsible for about 2% of human carbon dioxide emissions each year – a similar figure to the global airline industry."⁵ Such concerns notwithstanding, it is a reality that computers are playing an ever more prominent

role in our lives. The advances in computer technology over the last 20-25 years have created an environment where individuals can change the way we work and live that hold the potential to make it easier to live and work more sustainably. Specifically:

1. The ubiquitous presence of computers and high-speed networks, and the ease of access to critical documents now make it much easier to work from home, or away from the office.
2. The capabilities of the high-speed networks and the new "meeting technologies" allow for video conferences from many locations. IU has specifically targeted this technology and it is beginning to pay significant dividends. A great example is the Kauli project which is being developed at 10 different universities (including the University of Hawaii) while almost all communication is being done via videoconferencing and e-mail.
3. Computer technology continues to improve and become more efficient. The replacement of the CRT monitors with the LCD monitors cut power usage for a desktop computer by about 30%. Some calculations indicate that this is saving about 115kWh/monitor/year on the campus electrical bill.
4. Computers have the potential to provide mechanisms of awareness that inform people about power usage in a manner that may actually change behaviors. For example, Oberlin College completed an EPA award-winning project which made data visualizations available online about how much power was used by different dorms respectively in real time. The online information was accompanied by a contest to see which dorm could become the most energy efficient. The contest was reported in scholarly publications to yield a significant positive effect on energy conservation⁶.

Inspired by the work at Oberlin and other universities, IUB is currently planning a dorm energy and water conservation competition for the Spring 2008 semester. Requiring collaboration from student groups, graduate students in Informatics, RPS staff, and Physical Plant staff, this competition will mark an important step in

⁵ <http://environment.newscientist.com/article/dn12992-computer-servers-as-bad-for-climate-as-suvs.html>

⁶ <http://www.oberlin.edu/dormenergy/news.htm>

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IUB's effort to build a more sustainable campus. There are many other opportunities, including:

1. Computers are becoming more efficient, but there are many more of them (they are used virtually everywhere on campus). Conservatively, we probably have between 30,000 and 50,000 computers on campus. From recent discussions with departments, there appears to be a lack of understanding about utilization of the power saving features. If all computers were set to the optimal energy conservation mode (turned off or set to sleep/standby mode when not in use), we could save another 200 kWh/computer/year.
2. The university still spends a significant amount of money on travel. As we become more experienced with the "meeting technologies", hopefully, we can become more comfortable with the technology, and can make good decisions as to when it would be most appropriate. (We are still learning that there are times and situations where video conferencing just does not work well—there is a substantial and mature literature on this topic in the field of Human-Computer Interaction.)
3. The university still generates a huge amount of paper. As the technology improves (especially laptop and tablet computers), we should be able to reduce the amount of paper we generate. Whenever possible, portrait-mode capable monitors should be specified, as these may reduce the need to print on paper what can be read on screen.
4. A number of schools and departments run their local servers and there is significant nationwide research that indicates local servers are underutilized. Consolidating those servers in campus data center and using virtual server technologies could increase utilization and reduce the number of devices across campus. This recommendation is consistent with the EPA report to congress on Enterprise Server and Data Center Energy Efficiency Initiatives⁷.
5. Simple education programs addressing "low-hanging fruit" can have an effect on energy use on campus with respect to computing technologies. For example, a group of computer researchers have come

up with the following list of 10 easy ways to reduce carbon footprints in the IT world:⁸

1. *Power it down:* Set power options to power down monitor and hard disk when not in use. Use a network pc energy management tool to optimize your organization's electricity use.
2. *Turn it off:* Place all of your computing devices on a single power bar so it is easy to turn them all on or off.
3. *Print sparingly:* Choose double sided printing as default setting. Use a print optimization tool to reduce wasted paper.
4. *Make IT last:* Buy or make a protective case for your devices and consider purchasing refurbished products.
5. *Upgrade carefully:* Choose from environmentally forward thinking manufacturers and devices with an Energy Star label.
6. *Exercise your influence:* Support designs that are durable, long lasting, and easy to disassemble for material reuse.
7. *Research before tossing:* When disposing of devices look for services that handle e-waste in ecologically forward thinking ways.
8. *Re-energize your website:* Use an Internet Service Provider that uses energy efficient servers and alternate energy sources.
9. *Trek off the grid:* Use a solar bag to recharge your mobile devices
10. *Apply your interaction knowledge:* Design software that encourages ecologically responsible behavior.

A similar list can be created for the IU community context and conspicuously circulated and posted.

Metrics for Evaluation

In order for an energy reduction program to be successful, energy systems must be metered. While the IUB campus is not fully metered, campus-wide metrics such as energy use per gross square foot and an annual GHG inventory could be used to show trends in the performance of the campus energy reduction program.

⁷ http://www.energystar.gov/index.cfm?c=prod_development.server_efficiency

⁸ <http://sustainable-chi.pbwiki.com/Sustainable+CHI+website>

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Annual GHG Inventory

As part of our contribution to the Sustainability Task Force, we have undertaken a comprehensive inventory of IUB's greenhouse gas (GHG) budget. If IUB elects to become a signatory of the American College and University Presidents Climate Change Commitment, such an inventory is a required component. While this is a campus-wide analysis of the overall GHG emissions (and weather-dependent), this metric is a strong indicator of the success of individual projects that reduce energy consumption.

Energy Consumption per Gross Square Foot

A common metric used throughout the Big 10 is the energy consumption based on BTU/square foot of building space. A further refinement of this metric is to categorize buildings by type, recognizing that research facilities with 100% outdoor air requirements will use much more energy than a classroom, office, or residence hall. Indiana University is currently developing this metric by adding more energy metering systems and installing a management system to track this information on a monthly basis.

Service-Learning & Co-curricular Activities

Service-learning courses provide excellent opportunities for students to learn and apply knowledge related to sustainable energy and energy options both on campus and in the community. On the IUB campus, students can be a valuable resource and available for energy-related projects. There are a number of symbiotic projects that could be developed within SPEA and the College of Arts and Sciences including:

Evaluation of emissions from the Central Heating Plant. This project could track the emissions from the Central Heating Plant and establish the baseline from which future energy improvements will be measured.

Research biomass applications for coal boilers. Several large universities with stoker boilers are

experimenting with various forms of bio-fuel including wood biomass, oat hulls, sewage sludge, and bio-diesel. This project can search for results of these trials, including exploring the permitting requirements that accompany any modifications to the boiler facilities.

Research applications distributed generation.

The production, transmission and distribution of electricity results in more than 70% waste heat. Thus, students could explore the viability of local electricity generation at IU and current technologies employed to do so.

Research alternative building materials and construction techniques. This project could evaluate the success or failure of alternative building materials and construction techniques that are intended to reduce construction costs, reduce waste, enhance building performance, and lower operating and demolition costs.

In the community, students taking sustainability related courses could engage in both data collection and educational outreach. In such courses, students could assist community organizations in mapping their carbon footprints or working on enhanced efficiency and energy conservation programs. Those covering the interconnections of energy, economics, world politics and US policy could have students assist local public sector commissions and departments focused on energy efficiency, sustainability, and environmental stewardship. And, students learning about global climate modeling and modern energy systems could also play a role. An educational outreach component could also be included where IUB students present such information in local schools or offer a symposiums and public forums on the topic. In the spring of 2007, for example, students in a graduate level informatics course organized a sustainability 'unconference' for the surrounding community where such topics were discussed.

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A growing number of students interested in sustainability on the IUB campus are already participating in co-curricular activities such as the Student Environmental Action Coalition, the SPEA Environmental Management Association, and Kelley School of Business Environmental Business Club. These groups have demonstrated an interest in energy-related projects – installing Energy Star lighting in the Business/SPEA library—and show continued interest in energy and climate change issues.

Funding Opportunities

Opportunities for funding improvements to facilities are currently limited to state appropriations - either through direct capital projects or biennial operating funds - or by assessing student fees targeted for specific purposes. At this time, Qualified Energy Savings Projects are available on a limited basis that allow for paybacks for up to 10 years. The projects are developed by companies who evaluate buildings and identify heating, cooling, ventilating, and lighting systems that are inefficient. The cost to install these new systems is in turn paid for by the energy savings generated by the projects. Even if current legislation is not loosened to allow for a higher bonding limit, IU could negotiate with the IU Foundation to borrow money and apply engineering analyses to investigate, design, and implement Qualified Energy Savings Projects that have a maximum 10-year payback from the energy saved.

Federal funding for energy projects may become available as more research is proposed to study energy issues, carbon sequestration, and sustainable building materials. There are a number of Indiana University departments who are working on cutting-edge research that could have an impact on energy and greenhouse gas emissions. Student-led efforts to provide financial support for the purchase of renewable energy as well as other sustainable efforts have been adopted at other universities across the country. A list of

those initiatives and details of each program can be found in [Appendix IV-A](#).

Conclusions and Recommendations

Create a Carbon Neutral Campus

By improving our energy conservation and incorporating biomass, biofuels, solar power & carbon capture/sequestration on campus while purchasing wind power or other renewable energy credits (REC's) from distant locations, we feel IUB could move toward carbon neutrality by reducing the GHG emission rate from our 1990 average to present at the following schedule:

- 10% in five years, with major use of conservation, supplemented by REC's.
- 20% in 10 years, using all technologies, but only moderate use of REC's.
- 50% in 20 years, using all technologies, but only moderate use of REC's.
- 90% in 30 years, using all technologies, but only minor use of REC's
- 100%, or Carbon Neutral, in 40 years.

We view the above targets as aggressive, but achievable based on the assumption that during the mid-term period, carbon taxes may increase the cost of energy production and consumption and thus drive innovations in energy efficiency and conservation. Additionally, carbon tax dollars may go toward carbon capture and sequestration which will facilitate reductions in net GHG emissions.

Develop and Implement an Integrated Energy Master Plan

In FY 2006-2007, the IUB campus emitted 418,043 metric tons of carbon dioxide (CO₂) equivalents. In order to maximize the efficient delivery of energy to existing and proposed facilities, IUB must develop and implement an Integrated Energy Master Plan that is closely aligned with the overall campus Facilities Master Plan. Without this plan, and without its close connection to the campus master plan, the production and distribution of energy systems to serve the campus for the next 25-50 years will

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become an afterthought leading to higher costs and a crisis-management approach. We feel an Integrated Energy Master Plan for IUB must:

- Mirror the IUB Academic Master Plan so adequate utility infrastructure is in place when needed.
- Reduce demand for heating and cooling by improving building envelopes.
- Reduce losses in heating and cooling distribution system piping via leak detection and investment in regular inspection, maintenance, and insulation.
- Optimize the combined heat and power opportunities at the Central Heating Plant by incorporating co-generation.
- Maximize efficiency of central heating and cooling facilities.
- Incorporate strategies for distributed heating and cooling production facilities to accommodate new campus development.
- Develop renewable energy sources for select locations based on prudent application of technology – e.g. solar water heating for new and renovated residential facilities as well as photo-voltaic and wind-generated power technologies.
- Investigate opportunities to incorporate biomass, sewage sludge, and other organic byproducts into the fuel mix at the Central Heating Plant.

Identify and Promote Qualified Energy Savings Projects

In the absence of increased state funding for repair and rehabilitation of existing facilities, and with a backlog of deferred maintenance of more than \$300 million, Indiana University must find ways to use existing resources to fund repair projects. Qualified Energy Savings Projects, using money borrowed internally, provide a method to leverage existing financial resources to improve the energy efficiency of all campus buildings, restore or improve the performance of the mechanical and electrical systems, increase the life of the building, improve and enhance the academic and research experience, and reduce costs. As a result, we recommend that IUB identify Qualified Energy Savings Projects for the Bloomington campus that target HVAC,

lighting, and building envelop improvements with a 10-year or less payback.

Develop Campus-wide Guidance to Promote an Efficient Computing Infrastructure

Computers are now a part of everyone's business. Effective and efficient use of computing technology is required to maximize their use and minimize energy consumption. Thus, we recommend that IUB develop campus-wide guidance on computer use, including proper use of the power-saving features for all personal computers, shutdown of all printers and peripherals at the end of the day, and deployment of enhanced video-conferencing capability to reduce travel.

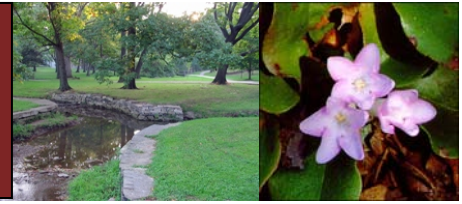
Support the Development of Clean Coal and Renewable Energy Technologies

Coal will remain a significant part of the electric generation portfolio for Indiana and all coal-rich states due to fuel supply and price. Therefore, clean coal technologies must be developed to replace older coal-fired generating stations that have higher emission rates for SO₂, NO_x, mercury, etc. Integrated gasification combined-cycle (IGCC) is currently the most promising clean coal technologies and should be developed and promoted through a partnership between the public and private sector.

We feel electric rate payers and the regulated utilities should support energy conservation, renewable energy, distributed generation, and carbon capture and sequestration. Thus, we recommend that IUB actively enter the discussions with the IURC, OUCC, and Duke Energy concerning the potential IGCC Project at Edwardsport, Indiana to obtain parallel commitments for:

- 1) Energy conservation rebate programs
- 2) Renewable energy and net-metering tariffs for commercial and industrial customers
- 3) Pilot programs for photo-voltaic electricity generation and carbon sequestration at the IGCC project.

Indiana University Task Force On Campus Sustainability V Environmental Quality



Environmental Quality and Land Use

Objective: *Through research, self-reporting, and adoption of environmentally sensitive land-use practices we seek to help IUB use resources sustainably and improve environmental quality and to protect the health of citizens on campus, in Bloomington, and beyond.*

Introduction

Environmental quality and land use is a broad, cross-cutting theme in the overall work of the IU Sustainability Task Force. The work of other parts of the task force – energy, transportation, and built environment, for example – all inform land use and environmental management efforts on campus.

As a category of sustainability, “environmental quality and land use” covers a vast array of environmental conditions activities on the IU Bloomington campus and in surrounding areas owned by IU, including locales that are comparatively undisturbed as well as those that are human-dominated. Prominent assets as varied as IUB’s core academic campus, its athletic facilities, residential areas, sports fields, multiple research and teaching preserves, the IU Championship Golf Course, myriad parking lots, roads, footpaths, and grassy areas between buildings, and built-up spaces themselves are constituents of IUB’s complex environs.

Activities taking place on campus affect the environmental quality and overall physical condition of these resources – and also affect conditions beyond campus. Pesticides and fertilizers, which enable IUB to have spectacular grounds, floral displays, and high-quality playing fields, must be carefully and sparingly applied so as to protect water quality, natural systems, and public health. Air quality locally and far beyond Bloomington

is affected by energy and infrastructure choices made on campus, and depends not only on the infrastructure and fuels adopted by the power plant, but also on the cumulative energy decisions and habits of thousands of students, faculty, and staff.



The Environmental Quality and Land Use Working Group recognizes a broad array of functions – from master planning to lawn mowing, from air quality to waste management – as part and parcel of the broader scope of policies, management strategies, and procedures

that affect environmental quality in and around campus. In this report, we focus on particular contexts that highlight priority concerns and that illustrate the natural environment/ built environment tension that underlies resource management and land-use planning on campus. We focus on four broad areas: campus master planning; watershed protection; campus ecological health; and environmental hazards associated with laboratory chemical use. Before doing so, we examine some indicators of IUB’s recent successes in environmental management.

Success Stories

It is worth noting that IUB has made great progress in many areas of environmental quality and land-use management, and these accomplishments should be recognized. Below, some notable successes are summarized.

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Range Road Coal Ash Pile

IUB is currently completing the voluntary remediation of approximately five acres of coal ash at Range Road disposal site. This project is being remediated under the Indiana Department of Environmental Management's (IDEM) Voluntary Remediation Program (VRP) and involves capping approximately 375,000 cubic yards of coal ash that was deposited at the site through 1979 in such a way that will virtually eliminate leaching of rainwater through the coal ash. The site will also include a constructed wetland at the base to treat stormwater runoff from the cap drainage basin and to provide additional environmental benefits by trapping sediment in the runoff before it affects an existing wetland between the site and Griffy Creek. This remediation will also serve as an outdoor classroom for environmental classes to support the academic mission of IU.

Range Road Gun Ranges

Three outdoor gun ranges were remediated by August Mack Environmental in 2001. This remediation removed lead bullets and shot and associated contaminated soil was scraped from the surface of the ground, consolidated, and capped on-site to reduce environmental risks.

IU Research & Teaching Preserve

In May of 2001, IU Trustees voted to designate three parcels of university land, including 185 acres of land located adjacent to the IUB campus northeast of the 45/46 Bypass, as a research and teaching preserve. This resource has now grown to over 1000 acres and serves as a series of outdoor laboratories and is accessible to the public with an existing trail system.

Bradford Woods Sewage Treatment Wetlands

In 2007, IU's Bradford Woods teaching facility in Morgan County transformed the treatment of all sanitary sewage from a traditional wastewater treatment plant to a constructed wetland and mound absorption field with prairie cover. This eliminated the energy and chemical burden of the traditional treatment plant and subsequent polluted discharge into Sycamore Creek and replaced it with a zero discharge natural system

that can be used as an outdoor classroom and as a model for other field facilities.

Stormwater Program

In April of 2005, IUB received permits for storm water pollution control from IDEM for the IUB campus and five branch campuses. Now, storm water is comprehensively managed as a pollutant with active construction site pollution prevention plans, preventative maintenance, and education and outreach components.

Campus Food Stores Ammonia Elimination

In 2004, IU decommissioned the ammonia based cooling system associated with Campus Food Stores located just northwest of downtown Bloomington. This was performed to eliminate the risk associated with a possible catastrophic release of toxic ammonia from the plant.

It is worth noting that while some of these areas such as storm water, hazardous materials usage, and waste minimization have already been substantively addressed on the Bloomington campus, sustainability measures have not been incorporated into regulatory compliance-based programs. This is function of a system that has emphasized regulatory compliance instead of proactive sustainability goals and measures, and current regulations generally do not call for sustainability measures.

Campus Master Planning

A key strategic dimension of environmental quality and land-use management at IUB is the concept of "master planning." Master planning involves decisions about the development of buildings, infrastructure, and grounds and should reflect the goals, values, and needs of the larger community that works and lives within and nearby IUB. For Indiana University, master planning must consider strategies for sustainable development that other communities have successfully adopted. Conscious attempts to integrate "smart growth" or "new urbanist" approaches could be integrated into new development plans in and around campus. Livelihood and lifestyle choices

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as varied as where to live, where to work, how to get to work, and where to purchase meals can be deeply influenced by decisions governing where to site new buildings and infrastructure and what functions those physical assets provide. Amenities in and near IUB structures, such as the availability of workplace showers, bicycle paths, and proximity to local eateries (serving locally grown food) can have profound consequences for communities that work and live near campus.

Watershed Protection

Indiana University's Bloomington campus is located in the Lower East Fork White River watershed. The main campus footprint, excluding IU's Research and Teaching Preserve and other off-site properties, occupies approximately 1,900 acres, and is in the vicinity of major water bodies such as Griffy Lake and Lake Monroe. A majority of local runoff drains into the Jordan River which bisects the southern part of campus, and continues through downtown Bloomington, merging with Clear Creek, which eventually empties into the East Fork of the White River. The northern portion of the IU campus, dominated by the Athletics complex, is in the Griffy Creek watershed, which flows into Griffy Lake, and thence to Beanblossom Creek and the North Fork of the White River. What occurs upstream has an effect on the biological, chemical and physical health of the downstream ecosystem which in our case is the Wabash-Ohio-Mississippi River flowing eventually to the Gulf of Mexico.

Campus activities that influence the watershed include: construction runoff, roadway pollutants such as salt, sand and other particulates, air particulates associated with mobile transportation and the burning of coal, pesticides, fertilizer, and stream erosion. A clear goal of the environmental quality/land use is to maintain the environmental health of these critical water resources, both within and beyond the boundaries of the IUB campus.

Jordan River Restoration

The Jordan River is a distinctive feature of Indiana University and is integral to IUB's reputation as one of the nation's most scenic campuses. It also serves as a symbol of IU's interconnectedness of the IUB campus to the environment that surrounds it, in this case the Clear Creek-Jackson Creek watershed. Environmental conditions in the river have improved in recent years. Beginning in 2000, discharges from the campus central chilled water plant have been rerouted to sanitary sewers and away from the Jordan; manhole covers near the river have been locked down; buffers around the river have been created, where fertilizer and pesticide treatments are forbidden. However, major rainfall events, periodic spills, sand salt and other road particulates, clippings from lawn maintenance, among other stressors, have taken their toll on the river ecosystem. Moreover, channelization of the river, installation of culverts, and other physical interventions have amplified the destructive force of storm events, causing erosion, increased sedimentation, turbidity, damage to habitats,

and death of organisms in and around the river, including trees. Conditions have deteriorated so badly along some stretches that both infrastructure and public safety are at risk. Figure 1 illustrates one such problem – a lamp post (approx. \$2,800 replacement cost) that, following years of erosion, effectively resides *on* the riverbank.



To clarify how to protect the Jordan and areas near the river, indicators of sustainability, baseline data, and targets have been identified (*Table I*).

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Table I: Indicators, Baseline Data, and Targets for Sustainability of the Jordan River

Indicator	Baseline	Target
Impervious surface on campus	16% of campus land area is impervious	Target: 11%-16% impervious area in all succeeding years (post-2007)
Water quality based on Pollution Tolerance Index (macro-invertebrate data) and other tests	Varying Scores (from “very poor” to “excellent”)	Scores of “excellent” in all succeeding years (post-2007)

The health of the river reflects the health of a broad land area beyond the river itself. As impervious surface increases in a given watershed, water quality suffers (*Figure 2*).

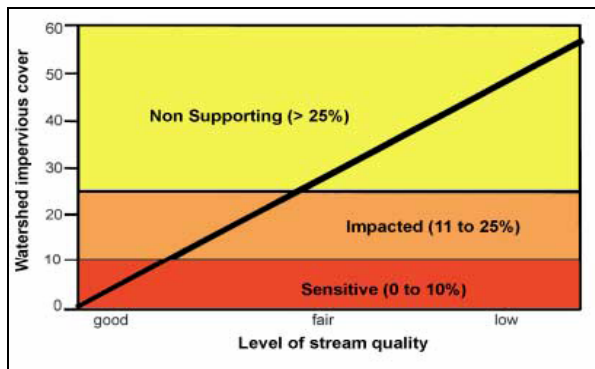


Figure 2: Relationship between Water Quality and Impervious Surface.

Impervious surface should constitute less than 11 percent of a healthy watershed¹. Indiana University’s impervious surface is around 16%, thus contributing to the conditions on the river.

Concerns over water quality in the Jordan River emerge from macroinvertebrate index studies (Pollution Tolerance Index) and scores of “fair” based on the Visual Stream Assessment approach. The target for the Jordan is to achieve consistently excellent scores, especially during non-storm event periods when higher water quality should be expected.

¹ Zielinski, J. January 2002. “Watershed Vulnerability Analysis” Center for Watershed Protection

We propose a number of projects to protect and rehabilitate the Jordan, including planting of water-loving or “hydrophytic” vegetation, planting of shade tolerant herbaceous vegetation and trees, planted wetlands along stretches of the river and elsewhere in the campus watershed. All of these efforts would serve to decrease flow variability and enhance water filtering effects. Restoration of the natural hydrography of the Jordan by, for example, removal of collapsing rock walls (replaced by native plants and trees) would also diminish the destructive, channelizing effects of past engineering efforts. Creation of porous pavements in new and existing built-up areas, including parking lots and pathways, would achieve reduced runoff, sedimentation, and pollution objectives.

Dedicated training programs for grounds crew focusing on no-mow zones in the riparian buffer are recommended, as is educational signage to raise awareness of the other remedies mentioned here.

Environmental Health of the IUB campus

Another indicator of the environmental health of the IUB campus is its trees. Trees provide habitat for terrestrial and avian creatures and shade for buildings, study and picnic areas. Trees clean the air and beautify curbsides and built-up areas. Trees capture and store atmospheric carbon, allowing IUB to help offset its own carbon emissions. Many trees on campus have “respect value” as they are accompanied by name plates that recognize friends of the university. And trees do nothing less than sell the school to prospective students, faculty, and parents who are enchanted by the landscape.

Using a variety of techniques, sustainability intern Brandon Schmitt inventoried IUB’s trees in 2007. His inventory of 2,110 trees in the main campus area found that IUB’s trees are, on the whole, in good physical condition. However, the overstory in Dunn Woods contains numer-

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ous snags and dying trees. This condition poses more risks to people passing through Dunn Woods than to the health of the woods, per se. Invasive species, on the other hand, clearly *do* affect the health of Dunn Woods and other wooded areas on campus, for example, forested areas to the east of the Kelley Business School and SPEA. Euonymous, honeysuckle, *ailanthus*, and other garden and introduced species are crowding out native vegetation and constitute a maintenance burden.

Species diversity on campus is rich in these and other areas; the tree inventory identified 58 species. Based on our inventory, we estimate that almost 1.8 million sq-feet of canopy is provided by IUB's trees – equivalent to around 41 acres. A variety of other benefits derive from these trees, including reduced energy consumption due to provision of shade (less need for air conditioning), stormwater runoff reduction, carbon storage, air quality, and aesthetic benefits. We calculate that IUB's trees in the core campus area provide direct annual benefits of \$158,000. This sum does not include various other services such as permeability and other soil conditioning properties, habitat, and reduced need for lawn care, or the more intangible aesthetic benefits afforded by the presence of these trees. Both the tree cover data and the monetary value of trees on campus represent two major sustainability indicators (*Table 2*). Indeed, they are proxies for a whole suite of values, described above. Baseline data for 2007 are provided for canopy cover and annual monetary benefits

Table 2: Indicators, Baseline Data, and Targets for Sustainability of IUB Trees

Indicator	Baseline	Target
Canopy cover (ft ²)	41 acres	Maintain or grow current canopy on IUB's already sylvan campus (all years, post-2007)
Net benefits from trees (\$/yr)	\$158,000 per year	\$200,000/yr. in constant dollars by 2017

derived from IUB trees. Targets are established, including maintaining IUB's comparatively large canopy cover, and secondly, increasing the value of standing and future trees.

Integrated Pest Management

In early 2000, in response to multiple requests for information about IUB's pesticide use, EHS initiated an effort to consolidate information regarding pest management practices and pesticide use on campus. Through this effort it was determined that, although IUB previously used fairly high toxicity pesticides and routine spraying to prevent pests, the groups on campus in charge of pest management had already started to move in the direction of using less or eliminating some pesticides, using lower toxicity chemicals and utilizing more targeted applications. Many of the University's pesticide applicators had even had training in IPM techniques as part of their continuing professional education and license renewal process. Some IPM practices found to be in use at the beginning of this effort were: targeted, as-needed applications instead of routine spraying; baiting for roaches; lower toxicity and narrow spectrum pesticides; timing of preventative pesticide applications to the life-cycle of the pest targeted to have the highest impact with the lowest amount of pesticide applied; and planting of pest tolerant species. The result of the EHS effort was not as broad in scope as had been hoped at the outset for a variety of reasons, but the effort did identify three key areas in which incremental progress could be pursued. These areas were continued training in IPM techniques for IUB pest management staff, a pest management awareness and education program for all IU students, faculty, and staff, and the use of EHS as a coordinating point or clearinghouse for pesticide use on campus. Since these efforts, EHS has been included in the bid process for pest management contracts to insure that contractors incorporate IPM principles to the degree possible. EHS has conducted spill management training with Campus Division and Golf Course personnel to enhance awareness of

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the risks posed by pesticide releases. EHS continues to act as the coordinating point for pesticide use information to the extent that it is documented and made available. Future efforts will concentrate on improving documentation of pesticide use and decision processes.

Green Chemistry

This component of the environmental sustainability project examines opportunities for 'green chemistry' in both research and non-research settings on the IUB campus. Green chemistry includes the elimination, reduction, and substitution of products to lessen the effects of chemical usage or associated waste. Opportunities for chemical management/inventory systems, green teaching and research labs, and green cleaning are being evaluated under this on-going project, with support from a Sustainability Internship project.

Chemicals in the lab can sometimes be eliminated, reduced, or replaced with less toxic substitutes. Our intern project demonstrated that many of our teaching labs could adopt a "less use microscale" chemistry model. One of the task force internships for fall 2007 is researching similar methods to minimize chemical usage and waste-production in various non-academic units such as building services, campus division, athletics, and physical plant. The intern will also research IPM practices.

Many colleges and universities have advanced chemical inventory systems to track and better utilize chemical usage. IUB currently does not have a campus-wide system. Much of the wastes received by Environmental Health and Safety (EH&S) are in the form of expired, unused chemicals. A chemical tracking system could reduce the waste stream by allowing researchers to better manage their chemicals. IUB is developing such an inventory system under the MAXIMUS initiative.

Comparison with Peer Institutions

IUB benchmarks its activities with peer institutions by attending conferences, networking and sharing program materials with colleagues, and participating in listservs. IU's Office of Environmental Health and Safety (EH&S) participated in benchmarking evaluations of various functions via the Campus Safety Health and Environmental Management Association (CSHEMA) benchmarking programs in 1995, 1997/1998 and in 2004/2005. Results from these benchmarking studies were used to assess program deficiencies in comparison to peers and used to better manage programs by managing operations differently or by obtaining more resources and personnel.

Other universities are managing environmental quality, health, and safety problems in ways that IUB can potentially learn from and adopt. Two examples are noted here. The University of Vermont has an active construction and demolition waste program. Traditionally, most of that university's building-site waste went to the landfill. However, the university has actively sought out recyclers and re-users of these waste materials in order to divert them from the waste stream.

The University of Wisconsin at Milwaukee has a 100 year plan for zero storm water discharge that involves incorporating rain-gardens, permeable pavement and other means to keep storm water on-site. IUB could set a goal to reduce storm water discharge to a certain level by incorporating similar management practices.

Potential Metrics

In several of the areas of environmental quality and land use described above, we are able to provide metrics for current performance. However, more metrics are needed to accurately track baseline sustainability conditions and to establish targets and timetables. The metrics listed in Appendix B are either being measured currently or are proposed as possible measures. All can contribute to our understanding of sustainability on

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campus. Data collection and reporting are performed by various groups on campus and in some cases are compiled at EH&S, e.g., storm water reporting. Some of these metrics can be converted to long-term targets as experience is gained and achievable trends are identified.

Opportunities for Service-Learning and Co-curricular Activities

Service-learning and environmental literacy opportunities abound in the environmental quality/land use area and much interest has been expressed by faculty in incorporating sustainability into existing curricula. HPER, SPEA and the College's departments of Geography and Geological Sciences already offer many courses that could incorporate environmental health,

safety, and land-use planning concepts and activities. Courses where environmental literacy is a strong component could incorporate service-learning to provide outreach to the campus and surrounding community, courses in inquiry methods could collect and analyze data to guide the University in environmental quality and land-use policy, and Geographic Information System (GIS) courses in the College and SPEA and environmental landscaping courses in HPER could assist with Jordan River restoration initiatives. Similarly, the university could benefit from employing students to research and assess opportunities for sustainability much as it did in the summer of 2007.

Recommendations

Environmental quality and land use cover a broad range of functions and environmental media at IUB, hence recommendations for next steps are necessarily broad and eclectic. In general, our recommendations for improvements are conscious of both cost and feasibility but also recognize that some initiatives might need to be implemented because they are 'the right thing to do'. Next steps are also informed by the work of the Sustainability Task Force interns whose work was thorough. Recommendations include:

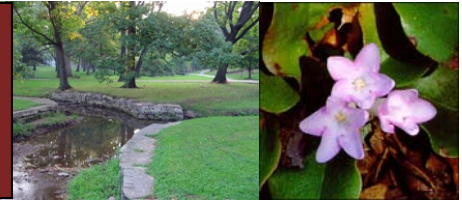
- In the short run, continue funding student interns to explore other environmental quality and land use projects and to compare/contrast successful initiatives at other major academic institutions. The payoff in such a strategy is already apparent in the outputs of the 2007 Sustainability Task Force interns.
- It is already apparent that the actual remediation work in the river will include planting of water-loving vegetation in and along stream banks and possibly planting of trees which can replace collapsing rock walls.
- Planting of riverside (riparian) native plants and the construction of wetlands and the creation of porous pavements in various parts of the watershed, including parking lots and pathways, are worthy next steps, following identification of the most promising areas for remediation. (Note also that the Jordan River Master Plan initiative will provide students with an outdoor classroom to observe restoration and will abet wetland research).
- Regular training of grounds crew to respect and maintain no-mow zones near the Jordan is needed.
- Educational signage for pedestrians in and around the Jordan River, and at constructed wetlands is recommended in areas that are remediated.
- IUB should declare targets for maintaining IUB's already comparatively large tree canopy cover and endeavor to increase the value of standing and future trees.
- There are potentially major improvements that can be made to reduce the use of toxic chemicals in non-research areas of the university, for example, use of cleaning chemicals and also application of pest control

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agents. More specific recommendations are likely to flow from the work of dedicated interns who will focus on non-research green chemistry and integrated pest management issues during the fall of 2007.

- Green chemistry in the laboratory setting offers possible educational opportunities for students. We propose creating incentives for professors and research scientists to promote reducing toxic chemicals in the lab or to identify less toxic alternatives to current chemicals.
- IUB can ramp up its recycling and reuse of waste materials from construction and demolition sites. This will reduce debris burdens going to the landfill, save on landfill costs, and help IUB earn coveted LEED points.
- Increasing pervious surface, use of rain-gardens, and other storm water retention strategies are recommended, and are also linked to LEED points. These strategies will also abet maintenance of the Jordan River.
- The Environmental Quality/Land Use working group or a comparable body should be involved in the process of land use master planning for campus. That way, actors on campus with considerable knowledge of land use, landscaping, drainage, construction, and building impacts can help make the master plan more sustainable.

Indiana University Task Force On Campus Sustainability VI Resource Use/Recycling



Resource Use and Recycling

Objective: *To raise awareness of resource use and recycling on the IUB campus among faculty, staff, and students, implement strategies to enhance campus recycling systems, and promote responsible resource use through green purchasing, conservation, and smart technology.*

Introduction

Recycling and resource use are critical components of a campus sustainability effort. In a world of finite resources, the ways we use resources to support university operations and campus life and the way we manage our waste products play a key role in defining the campus's environmental footprint. Although IUB has already made significant steps towards becoming more sustainable, we believe that increased recycling and more sustainable purchasing practices will not only help encourage environmental awareness among IU's community of faculty, staff, and students, but will also yield financial savings in the long term.



The Recycling and Resource Use Working Group examined the capabilities of IU Bloomington by first identifying key benchmarks for the campus. Next, we researched peer institutions and examined their recycling and resource practices. Finally, the working group developed recommendations for the campus based on the results of the preliminary work, in order for us to

move toward becoming more sustainable in our recycling practices and use of resources.

Specific areas researched include:

- Plastics, glass, aluminum, paper, newspaper – recycled at IUB and peer institutions
- Paper: institutional policies on paper and old growth forests
- Carpet purchasing and recycling, purchasing recycled fibers carpeting
- Packaging: office supplies and other items purchased in recycled packaging
- Green purchasing practices: institutional and departmental statements on green purchasing
- Lighting fixtures and bulbs with higher efficiency, including compact florescent bulbs
- Recycling system support network, on and off campus operations
- Incentive/creative methods to involve faculty, staff, and students in recycling systems

Recycling & Resource Use at IUB

According to university records, the amount of waste generation and recycling on the IUB campus has remained relatively constant over the past decade. Total waste generation has been at about 6,800 tons per year, with 4,900 tons going to landfills and 1,900 tons of waste recycled each year. While the fact that the amount of waste generation has not been increasing in recent years can be taken as a positive sign; the steady rates of generation and the portion of the waste stream being recycled suggest opportunities for the University to work more proactively to improve our resource use efficiency and increase the rate of recycling on campus. Further, we recognize the need to gather more detailed data concerning

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the amounts and types of wastes being handled by the various campus units to provide benchmarks for future efforts to reduce waste generation and increase recycling on a campus-wide basis.

Recycling and waste disposal is handled independently by several different campus operational units: Building Services for academic buildings; Campus Division for campus grounds; Residential Programs & Services' Environmental Operations for dormitories and dining halls; and IMU Facility Services for the Indiana Memorial Union. Their operations are coordinated to a limited degree. Different recycling practices, bins, and signage are used in each locality. There is significant potential for improved recycling efficiency, education, and cost-savings through closer coordination of efforts.

Education about recycling on campus could also be improved. Often recycling bins in academic buildings are indistinguishable from waste bins other than a paper sign which ambiguously indicates what is accepted such as "plastic". Hoosier Disposal, which processes most of IUB's recycling, has been accepting 1-7 numbered plastics for over a year (in the City of Bloomington system). This practice has only recently been implemented in the residence halls, but not anywhere else on campus. This opens a significant possibility to divert into the recycling stream a large volume of plastic food containers that would otherwise be directed to a landfill.

Within the IUB residence halls recycling efforts are comparable to those at peer institutions. Every floor has recycling bins (one for paper and one for co-mingled recyclables), while newspapers and batteries can be recycled in lobbies. Last year, Briscoe Hall piloted a successful program that gave small bins to students to use in their rooms. Based on the success of this program, IUB is planning to provide recycling bins to all



residence hall students who want them. Additionally, the residence halls have many "reuse-and-reduce" programs in place. Two programs worth highlighting include the "Go Green Challenge," where halls sell green water bottles for five dollars that can then be refilled for fifty cents anywhere on campus and at participating local restaurants. Second, IUB runs the "End of Year Collection," where students fill boxes (instead of dumpsters) with unwanted residence hall items, which are then donated to local charities.

Improved resource use provides the opportunity to both bring in revenue and save money by reducing purchases of items which are available within the University; a number of successful initiatives are already underway. Indiana University Surplus Stores provides an efficient method of turning unwanted assets on campus into marketable commodities. The Bloomington surplus store is comprised of computers (60%), furniture, office equipment, and miscellaneous items. These self-supporting stores sell items to the general public.

The Resource Redistribution listserv is another successful sustainability effort currently underway. The Bloomington and Indianapolis campuses have created email listservs to circulate information related to available resource items within the University. Any University employee may subscribe: <http://www.indiana.edu/~blpur/listserv/listserv.shtml>. Departments can offer equipment and materials that they no longer need for placement within another university unit. Also, a department can identify a need for an item, which can often be met by another department that has that item; relocating the item saves energy, money and potentially reduces the university's waste.

Hilltop Garden and Nature Center has recently initiated an innovative pilot program that seeks to enhance recycling efforts in the community and to use the revenue generated from aluminum and steel cans to support Hilltop's childhood

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gardening education programs. As their programs grow, they may become an increasingly significant role in recycling efforts on the IUB campus and in the Bloomington community.

With the exception of paper, green purchasing is not yet a priority at IUB. Departments are encouraged to purchase from green companies, but no formal requirements are in place. (See [Appendix VI-B](#) for current green purchasing efforts at IUB.) The purchasing department has started to encourage departments to purchase green office supplies by adding a special link on the purchasing website. According to IUB staff, the higher price of green products is the main obstacle to green purchasing. To address this issue, the IU Purchasing Department is in the process of negotiating a contract with a paper supply for discounted green paper products. At present, Purchasing is targeting those departments that buy the most paper and asking them to switch a portion to recycled paper. In addition, IUB currently has a purchasing policy which states that the campus will not buy paper or wood products made from old growth forests. And, when possible, IUB purchases wood products from companies that have a policy to “take an acre, replace an acre.”

Additional waste disposal and reuse efforts at IUB include:

- **Computers** - Surplus Stores sells 90% of IU's old computers to the general public. Those that do not sell are sold to Heritage Environmental on a per pound basis. Heritage recycles these computers back into the market. Recently concerns have emerged over the final destination of electronics sold in this way. Often electronics such as computers are shipped to developing nations without strong environmental and worker protections where components are recovered crudely, exposing both to large amounts of toxic chemicals and heavy metals. Surplus Stores has recently implemented a new policy whereby all buyers of "bulk computer equipment" are required to certify that they will not sell any of the equipment to overseas operators. Other options are also being investigated to see if we can do better in this area.
 - **Chemicals** - All research institutions generate hazardous waste and Indiana University is no exception. The health of workers and the community is ensured by the proper handling and disposal of this waste through the Office of Environmental Health and Safety. As part of the efforts of the Sustainability Task Force, two intern projects have focused on “Green Chemistry”, which seeks to minimize the amount and toxicity of laboratory and cleaning chemicals used on campus. Details are provided in chapter V.
 - **Batteries** - The Residential Program and Services (RPS), Indiana Memorial Union (IMU), and Building Services Division recycle batteries on the Bloomington Campus. RPS battery recycling began this fall with visible containers to collect batteries. The IMU collects and recycles batteries at the Custodial Office. The Building Services Division collects D size batteries or smaller household batteries in battery containers located by loading docks.
 - **Refrigerators & Freezers** - The Utilities Division on the Bloomington Campus currently uses R-123 refrigerant for its seven chillers, which is less toxic than the previous refrigerant that was used, although there is some capacity reduction that has been associated with switching to R-123.
- To date, there have been only limited efforts to divert construction/demolition waste from the landfill stream. Efforts to enhance recycling of these materials have the potential both to reduce environmental impact and to improve recognition for our environmental efforts. LEED credits are granted for recycling, with 1 point for 50% recycling and 2 points for 75%. IUB could implement these strategies at all demolition and construction sites, reducing the landfill burden.

Comparisons with Peer Institutions *Waste, Water, and Electricity*

When making an effort to reduce and reuse, the first thing a campus needs is a way to measure progress. The Ohio State University (OSU) has

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a system in place that allows the campus to measure savings in waste, water, and electricity. The OSU system has four steps: 1) Meter for a baseline to give the campus a firm benchmark; 2) create programs to increase efficiency; 3) implement these projects across campus; and 4) meter again to track savings and progress. This system creates an efficient way to track progress and encourages a campus-wide effort for recycling and reuse. This program has allowed OSU to establish and meet meaningful campus-wide goals. At IUB, auditing our waste and recycling progress could be facilitated by working with Hoosier Disposal. All campuses surveyed have programs in place to save water and electricity. Many campuses, including IUB have either already changed or are in the process of changing to compact-fluorescent light bulbs. At OSU, all new buildings are equipped with motion sensors and LED exit signs. OSU has also implemented a very comprehensive energy management program that saves the school an estimated \$3-4 million per year.

Penn State has a student-run program called "Friday Night Lights Out." Students go into all buildings on Friday evenings to turn off classroom lights. Additionally, Penn State also has bumper stickers and billboards that say "bright students turn off the lights." IUB just has begun to install light sensors in existing residence hall lounges areas that automatically turn on the lights when a person enters and exits the lounge. In the near future, light sensors will be installed in all of the twenty-two floor lounges in Forest Residence Hall.

A number of campuses also have water-saving measures in place and are continuously researching new ways to save additional water. Many residence halls on campuses across the country have installed water restrictors in showerheads, as we have done here and have low-flow toilets in the restrooms. Currently, OSU is looking into waterless urinals and touch-less sinks but has not installed this technology to date. The University of Michigan and Purdue have static decals on

ceramic tiles and mirrors reminding users to save water. IUB has tested a waterless urinal at its former service building and IUB Residential Programs and Services has a waterless urinal in place at Brown Hall. The test in the Service Building found the urinal to have a noticeable odor and the test was ended. The urinal at Brown Hall is still in place and under review.

Recycling

Big Ten universities tackle recycling programs in one of two ways: either one department oversees recycling for the entire campus or recycling is divided into different areas, such as housing and academic buildings. Purdue University, IUB, and the University of Michigan divide recycling efforts between different areas of campus. IUB is divided into three areas: housing, the Union, and all other academic buildings. OSU and Penn State have a department or person who oversees all recycling efforts on campus. This approach benefits from the presence of a uniform system. Students, faculty and staff can look for one type of recycling sign and know what to put in certain recycling bins.

Most Big Ten schools divide recyclable into several bins, including ones for paper, glass, plastics, and newspaper. For the most part, this is true for IUB, Penn State, Purdue, and Michigan. OSU, on the other hand, has just implemented an "all in one" recycling container (except for cardboard). This new approach has been extremely successful. The approach was designed to make recycling collection cost effective (less labor), more predictable, and more convenient for everyone.

Many schools also have started recycling at athletic events. Penn State is working on a plan to sell bins to the athletics department and have athletics sell ads to local business to be put on the bins. OSU and Michigan recycle inside their football stadiums as well as in their tailgating fields. IUB does not yet have a comprehensive recycling program in place for athletic events. IUB currently recycles cardboard from vendors

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before sporting events but does not yet have recycling bins for fans.

A second way to increase recycling is to provide a bin for every dorm room. OSU and IUB have both tried this in one or two dorms with great success. Students like the convenience of a small bin right next to their trashcan. A third way to increase recycling efforts is to place bins in key outdoor areas. OSU is implementing a one-year test program by putting bins in high traffic areas that have no convenient means to recycle.

The end of the school year triggers a large volume of items being thrown away by students. Penn State has a “Trash to Treasure” program, which involves a huge one-day yard sale, where unwanted student items are sold to the community. Beginning in 2002, IUB implemented the “End of Year Collection,” providing collection boxes within each hall during the last three weeks of the academic year to save items from landfills and to donate them for reuse, including clothes, furniture, books, and food. Two local agencies in Monroe County pick up all the materials. The food items are donated to the Hoosier Hills Food Bank. Backstreet Missions handles all the non-food items and makes it available to needy individuals in the community. Last year, IUB students donated twenty truckloads of items. OSU, while having a program for the end of the year, also has a program for the beginning of the year. It is a cardboard project in which students are able to recycle the boxes used for move-in.

Green Purchasing

For the most part, all universities surveyed have trouble getting departments to buy green products. Across the board, departments cite the higher price of green products as the reason for not buying them. Most universities do what they can to encourage departments to buy green but some campuses have created policies that actually direct departments to buy green products. For example, the University of Michigan’s housing department only buys recycled paper products and only uses the Johnson line of green cleaning chemicals. OSU buys highly recycled paper and

also just began the Environmentally Responsibly Purchasing Task Force which educates departments about green products and encourages departments to buy green products. At IUB, Residential Programs and Services, Indiana Memorial Union, and Building Services janitorial/sanitation departments use Johnson products, many of which are Green Seal certified. The IU Purchasing department has in place a green purchasing guideline: “Indiana University Purchasing recognizes the environmental impact it can make through purchasing decisions. To ensure that the impact is minimal, purchasing encourages the use of environmentally preferable products and services on all Indiana University Campuses”.

Paper Use at IUB

The university purchasing department is currently spotlighting recycled paper. (Spotlighting a product is designed to heighten awareness of the amount of recycled materials purchased.) This is an important initiative as paper accounts for 40% - 50% of the waste stream derived from a municipal campus. Overall, buying “post-consumer” recycled content paper instead of virgin pulp paper reduces the energy and

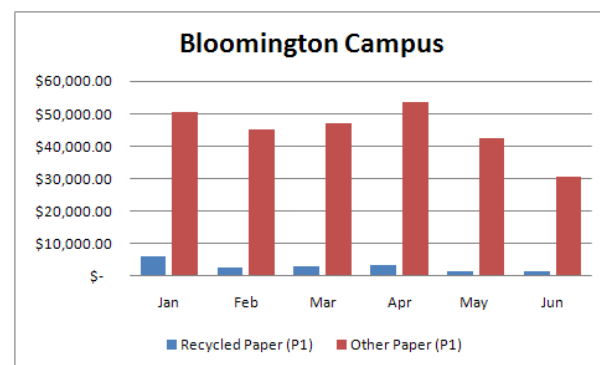


Figure I. Use of paper products on the IUB campus for the first half of 2007. Data from IU Purchasing.

resources needed for production as well as saves landfill space. *Figure I* shows the dollars spent in 2007 for recycled vs. non-recycled paper at IUB.

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Potential for Improved Recycling at IUB

Limitations

Separation of recycling efforts between the IMU, RPS, and Building Services may limit the campus's ability to handle certain items within one division. Economies of scale could be realized by combining and coordinating the programs to reduce the number of trucks entering campus. Storage presents another problem for finding appropriate means to deal with waste. Currently the carpet manufacturer IU uses will only accept carpet for recycling that is at least a full semi truck load in size. However, this amount of carpet is rarely removed at IUB in a single project. Storage issues also limit the options available to Surplus Stores, as they are frequently forced to sell mixed items by the pallet, reducing potential revenue, simply because

they lack the space to hold items for individual sale. The creation of a space for large items could greatly benefit the Surplus Store. Likewise such a space could be used to pool carpet waste for recycling until a switch to a supplier with better recycling and reuse options is completed.

Mandates

Key operational staff interviewed suggested that IU should implement a policy that requires departments to buy green and/or recycle. Purchasing decisions are largely made on the basis of price and will continue to be so unless a mandate or incentive structure is put in place. Alternatively, Purchasing could require that departments purchase only from approved manufacturers which have sustainability programs that meet IUB's standards.

Recommendations

Recycling (short-term):

- Conduct a comprehensive, yearlong waste audit of the campus. Analysis of the timing and characteristics of the material flows will be crucial in determining the feasibility and scalability of composting and other projects.
- Identify and measure waste streams that may not be otherwise counted, such as construction/demolition waste and from athletic events.
- Pilot outdoor recycling at athletic facilities similar to Ohio State project. Coordinate with Campus Division and the University Architect's office to plan and implement installation of outside recycling collection stations in key parts of campus to collect recycle material (plastic bottles in particular).
- Provide recycling bins in all residence hall rooms.
- Develop Greek and off campus recycling programs. Coordinate with vendor (Hoosier Disposal and Recycling) to coordinate and implement these programs.
- Design a system to recycle unused campus food through composting. Pilot this project in one dining Hall (Collins).
- Develop campus-wide battery recycling – campus wide system developed. Coordinate with all large units: RPS, IMU, and Building Services to establish a collection system with similar logos.
- Continue the green bottle project in RPS and sell bottles in RPS food operations to expand project.
- Develop and promote an “end-of-year collection” to manage all unused furniture, household items, and non-perishable food items. Current system in the residence halls may be expanded to include the Greek system and on-campus apartments.

Recycling (long-term):

- Explore the potential of combining the RPS, Building Services, and the IMU recycling material collection and handling system into a single, integrated campus system.

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- Explore innovative reuse strategies for construction/demolition waste.
- Unify recycling systems on IUB campus in order to make the system easier to understand for users. This may be accomplished through collection of the same materials and universal IUB campus labeling.
- Develop a “campus recycling center” for students, faculty, and staff, which may collect paper and containers, motor oil, etc. and serve a functional and educational purpose for the campus community.
- IUB should expand its program to recycle fluorescent bulbs – preferably taking advantage of existing comparable recycling programs that are already in place in Bloomington or Monroe County
- Provide a site on campus to recycle automobile motor oil. Many students and on campus apartment residents service their vehicles on campus.
- Expand plastics recycling to classes 3 - 7 to capture grab-and-go containers in food outlets and other previously non-recyclable plastics.
- Establish recycling goals for campus in terms of the amounts removed from the waste stream. Example: Ohio State’s goal of diverting 30% of waste from the landfill.
- Continue to research and consider recycling opportunities as they arise due to changes in the market and technology for recyclables.

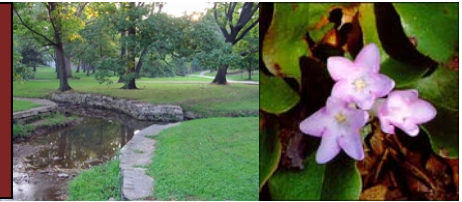
Resource Use (short-term):

- Expand use of water saving equipment in showers in Residence Halls, IMU hotel, Recreation Sports, and athletic facilities.
- Promote purchase of items that are recyclable or contain recycled content.
- Ensure rough paper (toilet paper and paper towel) contains recycled content.
- Promote resource and redistribution listservs as well as surplus store system.
- Promote use of Energy Star rated appliances among students, faculty, and staff.

Resource Use (long-term):

- Paper: encourage use of post consumer fine paper purchasing, duplex printing, and reading assignments on line.
- Lighting: expand use of light sensors in public areas. Emphasize when lighting fixtures are installed or replaced, that the fixtures use or are adapted to low wattage compact florescent bulbs.
- Initiate student programs to save energy and resources similar to Penn State’s “Friday night lights out”.
- Install metering to capture energy and water usage data. Use data to promote conservation.
- Promote Little 500 bicycle as a clean energy event. (Most years the event falls on Earth Day).
- Residence Hall opening period: emphasize recycling with cardboard collection.
- Develop an Environmental Community within the Residence Hall system.
- Investigate the use of LED exit lighting (similar to Ohio State).
- Develop a program and incentives for staff to monitor their use of office resources – e.g. paper, lighting, office products, etc.

Indiana University Task Force On Campus Sustainability VII Transportation



Transportation

Objective: *To promote a sustainable transportation system that will provide safe access and mobility for students, faculty, staff and visitors, and to ensure that individuals have a broad range of safe and convenient transportation options to walk, bicycle, carpool, or ride public transit to and around campus.*

Background

This report focuses on the transportation dimension of sustainability on the IU Bloomington campus. Commuting to and from campus is a significant contributor to the university's environmental footprint. The employees purchasing parking permits from IUB live cumulatively 44,000 miles from campus.¹ Assuming those commuters drive an average passenger car and make the round trip five days a week for 48 weeks a year, then they travel 21 million miles each year and emit 10,000 tons of carbon dioxide. Such trips actually contribute more carbon to the atmosphere through the extraction and refining of oil into gasoline. They also emit other pollutants, such as particulate matter, and nitrogen and sulfur oxides, which create serious environmental health hazards. More automotive use also results in more pollution run-off from streets and parking lots.

A sustainable transportation policy should support compact growth and multi-use development, where walking, bicycling, and bussing are more practical. For example, new campus development on the east or north side of campus could take the form of a mixed-use village

instead of a single-use office park. New campus developments could include employee housing options to directly reduce commuting impacts.

In addition, because the university is the largest employer in the region, the results of campus policies affect land use patterns beyond the campus. The beautiful, pedestrian friendly

campus core fails as a model for environmental sustainability if a high percentage of students and employees drive a car to reach it every day. Where people choose to live is based on many factors, but the lack of transportation options and our historic focus



on providing road capacity and parking for additional cars has played a crucial role in our culture's sprawling pattern of development. Building a house outside of town first requires at least one, and usually two parking spaces at the place(s) of employment. That same house then requires parking spaces at the grocery store, cinema, and most other destinations. While many causes of sprawl are beyond the university's control, campus transportation policy is an important tool in helping to shape more sustainable development in the region. Most students come to campus with little experience of transportation modes outside of automobiles. A sustainable transportation policy

¹ The data supporting this number are discussed in [Appendix VII-C](#).

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would encourage students to experience other modes and may influence their travel choices long after they have graduated. The attractiveness of Bloomington and the university are threatened by the sprawl and its corrosive effects on campus and the surrounding neighborhoods. The distinctiveness of the IU Bloomington experience is shaped largely by its focal position in the region. Unlike commuter campuses, most students enjoy the vibrancy of the campus and adjacent city culture. It is our belief that a sustainable transportation future will preserve the best attributes of the IU experience for future generations to enjoy while at the same time shrinking the university's ecological footprint.

Many aspects, especially the educational component, of transportation sustainability are difficult to measure. That does not diminish their importance, but this report focuses on measures that will indicate whether the university is making progress toward sustainability. The most important indicator, by far, is the modal split of people traveling to campus for study, employment, and business. Modal split refers to the proportion of transportation types used by people. Common modes of commuting to campus include walking, single-occupancy vehicles, car/van-pooling, taking buses, and biking. Directly measuring modal split is impractical, so careful surveying is necessary. For indicating sustainability, some modes may be subdivided. For instance, the university may distinguish among drivers of automobiles based on whether they carpool or use low emission vehicles. In general, the goal of a sustainable transportation plan ought to be to decrease the single-occupancy vehicle proportion of the commuting modal split. Over all, the university can claim progress toward transportation sustainability if it is significantly reducing the proportion of the campus population driving alone to and from campus. This is something many peer institutions are succeeding in doing.

Any successful sustainability effort will have to provide greater incentives for members of the IUB community to use their cars less. That will likely require significant enhancements for pedestrians, cyclists, bus users, and car/van poolers. It will also require reconsidering current policies that create incentives to drive, such as the cost and supply of parking.

The university's use of fuel efficient and non-carbon fueled vehicles is another important indicator of sustainability. In Fiscal Year 2007, university-owned vehicles from the Bloomington campus traveled approximately 3.0 million miles.² Therefore, even modest gains in fuel efficiency or non-carbon fuels could contribute to sustainability. Approximately half of the campus fleet's total miles are from on-campus trips. The university should minimize vehicular transportation within the domain of campus as well as between campuses.

This report begins with a brief assessment of the current transportation picture at IU-Bloomington. It then focuses on the key indicators of transportation sustainability and suggests some initiatives that may improve those indicators. We suggest a multi-pronged approach that involves pedestrian, bike, bus, and parking policies. Cross-cutting recommendations seek to improve coordination and accountability.

Assessment

A 1992 IU transportation plan ([Appendix VII-A](#)) traced the history of increased automobile dependence on campus over the past century and devised a five-year plan to reduce the automobile proportion of the modal split. Its recommendations included strengthening parking enforcement, limiting traffic on Seventh Street to buses and other specially authorized vehicles, shuttle

² Half this mileage is from the daily rental fleet (now outsourced to Enterprise Rent-a-Car) and the other half is from permanently assigned vehicles, such as police cars and physical plant trucks. It does not include approximately 120 IUB vehicles maintained by campus departments.

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bus service for the stadium parking lot, generally strengthening of all bus services, promoting car- and van-pooling, and encouraging bike/pedestrian modes. Since 1992, the improvement of bus service was the main positive result and is the strength of the current system. Another important success has been strengthening parking enforcement. Also, since 1992 parking permit fees have increased beyond the inflation rate.

A 1998 survey collected responses from 317 students, 99 faculty, and 163 staff. Table I summarizes the 'modal split' of students and faculty/staff commuting to/from campus, as well as the faculty's travel patterns within campus. A resurvey of students in 2001 provided similar results.

Table I. Modal split of travel patterns by IU students, faculty, and staff, conducted in 1998.

	Students	Fac/Staff	Fac/Staff on campus
Walk	44%	5%	69%
Bus	21%		1%
Drive	23%	79%	20%
Car pool	7%	6%	1%
Bike	4%	3%	2%
Drive w/ passengers	2%	4%	
Drive IU vehicle		1%	7%

The study described in [Appendix VII-C](#) finds that most employees purchasing parking permits live relatively close to campus. Some 70% live within 5 miles of campus, 86% within 10 miles of campus, and 92% within 15 miles of campus.

We are left with a picture of a campus that remains too reliant on cars for transportation and with few attractive alternatives. Planning options for improving this situation involve building on strengths, and beginning to repair weaknesses. Notable strengths are the campus and city bus systems, a fairly compact core campus, large numbers of students living on or near campus (or in relatively dense clusters), and attractive hous-

ing options for IU employees close to campus. Weaknesses include a lack of clear, low-stress pedestrian and bike routes to campus; a sprawling campus outside the core with poor pedestrian infrastructure; inadequate coordination and planning to consider bike/pedestrian improvements; and a fragmented approach to campus accessibility. Any effective plan will need to address the components of: education, enforcement, incentives, and infrastructure.

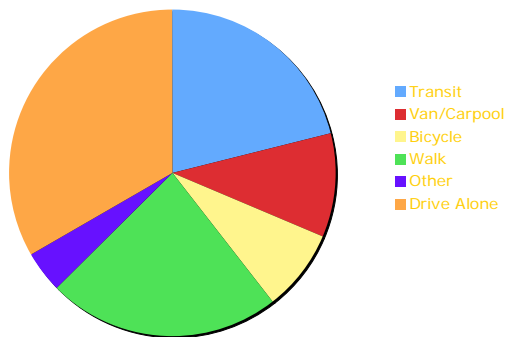
Context: Comparison with Peer Institutions

There are a significant number of North American universities that have a sustainable transportation plan. They are mainly concentrated on the west coast of the United States with a high number in Canada and the Northeast as well. These schools typically started their transportation planning with a survey of their current transportation situation and modal split. The survey data are then used to set benchmarks and develop programs to shift the university's transportation mix towards a more sustainable distribution. The University of Washington in Seattle combined a 50 percent raise in parking prices in 1991 with the introduction of a system that allows free rides on public transport for a quarterly fee. (Toor et al. 2004, 176, 178). This led to a decrease in the modal proportion of single-occupancy vehicle use, as illustrated below:

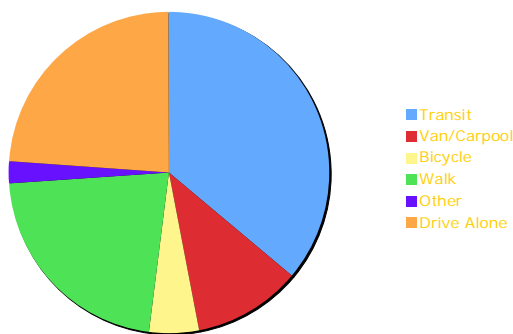
The University of California at Irvine pays employees to give up their parking passes, rather than charging more for the passes. Employees who voluntarily do not drive receive a monthly ten-dollar credit that can be used around the university and certain local businesses. They may also elect to receive 4 free days of parking per month for emergencies (<http://www.parking.uci.edu/AT/modes/walkorbike.cfm>)

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University of Washington 1989 Modal Split



University of Washington Modal Split 2002



Cornell University is a school with similar transportation demands (14,226 employees and 20,638 students) and surrounding community (Ithaca has around 30,000 residents) as Indiana University--Bloomington. Cornell has made great strides in reducing single occupancy vehicle trips to its campus. It has accomplished this with a comprehensive transportation demand management program. Since 1990 it has reduced the number of cars on campus by 2,600 each day, saving an estimated 400,000 gallons of fuel per year. The university did this by subsidizing local bus service with its OmniRIDE program (but only for those not holding a parking permit), adding alternative fuel vehicles to their campus fleet, encouraging bicycle use and participating in long term transportation planning efforts with the city of Ithaca and the surrounding county. It also offers reduced price parking permits to groups that surrender their individual permits. Both this system and the free bus service have 30

day trial periods to allow people to test their ability to use the alternative programs in lieu of driving themselves to campus. The people who opt for the OmniRIDE program also receive a book of day passes to perimeter parking lots every 6 months to allow them some flexibility. In 2001 the school adopted the Kyoto protocols to curb campus-wide CO₂ emissions. Cornell may exceed its target goals in 2010, partly in thanks to its successful transportation planning. (<http://www.sustainablecampus.cornell.edu/gettingaround/demand.html>, <http://www.cornell.edu/about/facts/stats.cfm>) Appendix VII-B reprints a more detailed summary of Cornell's experience from Toor et al. 2004.

There are several schools within the Big Ten that are currently working to create more sustainable campuses. Michigan State University has added 15 hybrid vehicles to the fleet and uses bio-diesel for all diesel powered vehicles. Off-campus bus ridership has increased 80% over the same time period. This is thought to be due mainly to the growth of apartment complexes to the north of the campus that offer free bus passes. On-campus bus ridership is also up 53%. The school has purchased hybrid electric busses for its fleet along with the hybrid motor pool vehicles. Student parking permits are down 6% and employee permits 8%. There has also been a 75% increase in bicycle registration. By gathering and reporting on these indicators the University hopes to make the employee and student populations aware of the campus's transportation situation and encourage further reductions in single occupancy vehicle use and a move towards buses and carpooling. (<http://www.ecofoot.msu.edu/c.s.report.htm>)

Iowa State University's Sustainable Transportation Systems Program seeks to:

- Improve transportation energy efficiency and reduce emissions through roadway design, traffic operations, and community design and planning

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- Advance the use of sustainable fuels, technologies, and energy efficient transportation modes
- Increase understanding of the economic and environmental impacts of renewable fuels and encourage use of sustainable transportation energy sources, and
- Investigate economic models that encourage more efficient passenger and freight movement

It works toward these goals through research projects that assess current conditions and develop workable alternatives (<http://www.ctre.iastate.edu/stsp/index.cfm>).

Some universities include prohibitions on some categories of parking as part of their transportation plans. For instance, Ohio State bans first-year students living in residence halls from bringing cars on campus or purchasing university parking permits. (<http://www.tp.ohio-state.edu/students/parking/firstyear.shtml>)

Identification of Metrics for Evaluation

Our principal metric for sustainability should be the modal split for transportation to and from campus. Overall, sustainability will require progress in reducing car-dependency. That may require different programs for different groups of people. For instance, students may have different behaviors and respond to different incentives from faculty/staff who are permanent residents of the area.

Surveys will be the principal source of data to determine modal split. However, counting the number of vehicles entering campus and traveling on roads surrounding campus, the number of parking permits, the ridership of city and campus buses, the number of parking spaces on campus, and the number of cars parked on campus all may also help track trends. Pedestrian counts at key intersections and bike counts at central sites may also contribute to our knowledge of the modal split.

Other metrics for transportation may include the fuel efficiency of the motor pool, intra-campus vehicular use, delivery service trips, and the proportion of all vehicles that employ low-emission energy sources.

Long-term Targets

In order to make progress on the modal split, I.U. will need to create attractive alternatives to driving single passenger vehicles to campus. This will require making walking, biking, and bus riding more convenient and safer. It will also require education and awareness of alternatives to car commuting. While the university can choose from many options to increase alternatives, the university must address the incentives created by its parking policies. The animating vision for targets to change the modal split is to provide people with options rather than to mandate changes in behavior.

Cross-cutting Recommendations

1. **Campus Planning**— Transportation is a critical component of any campus plan. We need to ensure that alternative modes of transportation are given as much importance as automobile travel in any plans for the future of the campus. The university should plan new campus development for walk-able mixed uses to minimize the need for car trips. It should consider a range of on campus or near campus housing types including non-student housing. Special effort should be made to introduce mixed uses in the parking areas at the campus perimeters where walking is unpleasant and feels unsafe due to a lack of human activity. The inclusion of the office for parking operations in the new Atwater parking garage is a small but positive step in this direction.
2. **Accountable Administration**— A single person and office on campus should be responsible for and have funded authority to make significant progress toward improving IU's transportation sustainability.
3. **Funding of transportation priorities**— Most transportation funding is generated by the parking passes, parking fines and the student

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transportation fee. We need to be able to make at least the parking pass and parking fine revenue “fungible” so that it can be spent on other transportation initiatives. Currently, parking operations does fund campus bike and pedestrian improvements, but at a level that could be significantly increased.

4. ***I.U. Fleet*** – We should minimize energy use by campus vehicles. The two principal methods to achieve this will be more coordination and planning to reduce trips and acquisition of more energy efficient vehicles.
5. ***Reducing travel*** – We should also look at ways to reduce travel both within and between IU campuses, such as telecommuting, distance education, and video conferencing. The technology now exists to make these options much more practical in the right situations. Saving travel time would be a bonus of this effort.

Pedestrian Policies

The core campus is pedestrian friendly, but outside of that central zone many areas lack pedestrian amenities. And, getting to campus is not as safe and convenient as it could be. The university can make walking more attractive by concentrating on three areas:

1. Work with the city to improve the walking routes to campus. Improve university maintenance of sidewalks outside the core campus area so that they are as safe and convenient as sidewalks on the core campus. Engineer improved pedestrian road-crossing via prominent crosswalk markings, bump-outs, pedestrian islands, signage, and traffic calming devices. Consider concepts such as road narrowing and enforcement of crosswalk laws.
2. Examine ways to encourage faculty, staff and students to live within walking distance of campus. Items to be considered could include more residence halls on campus, encouraging more apartments closer to campus, incorporating housing and commercial uses into new campus developments, helping first-time home buyers to live close to campus.
3. Improve communication about pedestrian walkways to and throughout campus. Publicize the

university contact responsible for pedestrian safety and sidewalk maintenance so that problems may be reported promptly. Promote a pedestrian oriented lifestyle to students, staff, and faculty. Emphasize the physical, financial, social, and educational benefits. Make this part of IUB's ‘niche’ marketing to prospective students and staff. Publish a map of walking routes with distances to popular destinations, etc.

Bicycle Policies

Like walkers, cyclists often have an easier time on campus than they do getting to campus. The university can make biking more attractive by concentrating on three areas:

1. Work with the city to improve the bikeways into campus, and be sure that they connect easily to bikeways within the campus.
2. Improve the bike “infrastructure” on campus, including better bike routes, especially from the north and east sides of campus, more bike racks, bike garages, and better delineated bike routes on campus. This may require a comprehensive plan. Coordinate with the city's system of signed bike routes and its greenways plan.
3. Improve communication about bike availability, bikeways, and bike safety to and throughout campus.

Bus Policies

The bus system has grown tremendously over the last 10 years, but there are still improvements that could be made. We want to make it as convenient as possible for people that are within walking distance of the bus routes. The university can make walking more attractive by concentrating on three areas:

1. **Traffic** – One of the factors that make the bus a less attractive option is the problems with maintaining bus schedules due to traffic problems. If buses could travel more quickly between stops, they would become more attractive to potential campus users. Among the ideas to consider for improving travel times are: establishing dedicated bus lanes, where right-of-ways permit; and opening 7th street to buses, bikes, and pedestrians only

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2. Bus Routes – The bus routes might be improved by:
 - a. Studying the Stadium Park-and-Ride and the value it brings to the mission of sustainable transportation, along with potential changes to routes and infrastructure;
 - b. Coordinating with other public transit providers to: create more express Bloomington Transit routes to campus, and more bus routes from areas outside of the city, such as Ellettsville and Greene County, to campus;
 - c. Ensuring the continued viability of East Tenth Street bus service by working with the city on ways to upgrade the railroad underpass between Union Street and the Bypass.
3. Improve communication about the available bus routes.

Parking Policies

The campus must also address the incentives created by parking policies in order to achieve significant reductions in the modal proportion of single occupancy vehicular commuting. Parking fees are a major factor in the mode of transportation commuters choose. The price of parking determines in large part what the demand for parking spots will be. In economic terms, this means that the parking-price elasticity is high; a price change will create a notable change in demand. Typical parking price elasticities range from -0.1 to -0.6 , with -0.3 the most frequently cited value, meaning that a 100 percent increase in parking prices leads to a 30 percent reduction in parking demand. (Millard-Ball et al. 2004.)

Of course, the quality of available transportation options is important; the better the options, the higher the elasticity. Campuses with high parking costs and good quality alternative modes have far fewer commuters driving to campus. Universities have found that controlling parking supply, price and providing quality transit have reduced the amount of driving to campus without a loss of ability to get to campus. In

fact, it commonly becomes easier to get to campus. (Toor et al. 2004.)

At IU, revenues from parking tags do not pay the full cost of creating and maintaining the parking places. Parking spaces that use valuable land and construction of parking garage spaces are commonly between \$15,000-25,000/space. The new garage at Atwater and Indiana Avenues is on the high end of this range. Drivers also do not pay most of the environmental costs of the pollution they create on and near campus.

Parking operations supplements the revenues from parking permit sales through enforcement fines, which constitute approximately one third of the department's budget. At other universities, including some Big Ten schools, citation revenues are commonly used for the full provision of all transportation modes. The University of California campuses do not allow use of citation revenue for parking facilities.

A 2005-2006 parking rate survey showed the following rates at Big-10 Schools:

School	Annual Cost
Purdue	\$200
IU	\$253
Michigan St.	\$285
Illinois	\$399
Penn State	\$408
Northwestern	\$426
Ohio State	\$550
Univ. of Michigan	\$666
Iowa	\$756
Wisconsin	\$1,025/\$685
Minnesota	\$1,368

Parking costs can be onerous for those who have few transportation alternatives, and there are important equity issues involving low-salary staff who live far from campus with few alternatives to driving. The concept of parking cash-out is to transfer the parking subsidy directly to the employee and charge him/her the unsubsidized price for parking. This gives the employee the

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choice of finding an alternative to driving alone and keeping the money, or purchasing the parking permit at no (or little) net additional cost to the employee.

Other options to provide IU employees with more options for commuting include: paying employees to car-pool or to forego parking permits; offering a number of free day-passes for employees who do not purchase an annual pass; and providing preferred parking (after disabled parking) for car/van pools, bikes, low-emission vehicles.

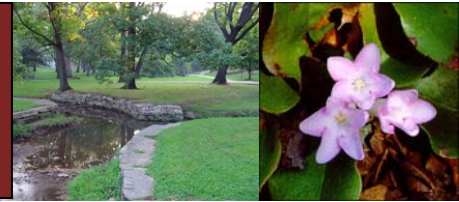
The parking supply on campus is the ultimate determining factor in how many cars can come to campus. Consideration should be given to reducing the supply of surface parking lots to create green space, or residential housing. This would have serious beneficial effects on surface runoff, nearby housing, car-use and infill development (sprawl reduction). Many of these suggestions should be considered for gradual implementation.

References

Adam Millard-Ball, Patrick Siegman, and Jeffrey Tumlin. 2004. Solving Campus Parking Shortages: New Solutions for an Old Problem. *Planning for Higher Education*. 33(1): 30–43. <http://www.scup.org>

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Indiana University Task Force On Campus Sustainability VIII Built Environment



Built Environment

Objective: *To promote campus sustainability through innovative building design and engineering principles that promote functionality, safety, and energy efficiency while respecting campus culture and heritage.*

Introduction

The landscape of the Bloomington campus presents an idyllic mixture of woodlands, green spaces, walkways, and buildings. The cluster of historic collegiate-gothic buildings in the center of campus has served as a template for the character and massing of buildings designed in recent times. Regardless of age, most buildings on the campus (over 15,000,000 square feet of space) are clad in a fine-grained white limestone that is locally quarried. Consequently, issues of sustainability in the built environment are intertwined with architectural integrity and preservation. The impression this campus makes on visitors and residents is connected inevitably to both constructed and natural factors. Innovative design solutions will be needed to extend the useful life of historic structures and to integrate new structures and technologies into the campus facilities framework. Stewardship of the historic Bloomington campus increases the challenge of addressing sustainability in the built environment.



The first critical steps toward a sustainable built environment on the Bloomington campus include the establishment of guidelines for maintaining the distinctive character of existing buildings in tandem with ensuring that historic buildings are safe, functional and energy

efficient; the development of site-specific metering and monitoring systems that promote awareness of energy consumption and provide data for informed decision making; and the promotion of green-building concepts in both commissioning and retro-commissioning of buildings.

Buildings & Energy Consumption in the United States

Over the last 15 years a dramatic shift in US energy use has taken place. While the percentage of energy used by buildings and in transportation has increased substantially, energy use by industry has dropped. Buildings now consume about 40% of the total energy used in the US. Table 1 from the Department of Energy Buildings Energy Databook 2006 shows the percentage of energy consumption distributed to buildings, industry, and transportation historically since 1990 through 2004, and estimated trends through the next 2 decades.

Table 1: Buildings Share of U.S. Primary Energy Consumption

	Res.	Comm.	All Blds	Ind.	Trans.
1990	20%	16%	36%	38%	26%
2000	21%	17%	38%	35%	27%
2004	21%	17%	39%	33%	28%
2010	21%	18%	39%	32%	29%
2020	21%	19%	40%	31%	29%
2030	20%	20%	40%	30%	30%

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Electricity and heat are the two major contributors to the energy consumed by our buildings. At present the two energies' contributions are roughly equal. By 2030, however, the electric energy demand is predicted to rise by 55% while the heating demand rises by only 13%. However, since electric power is generated at approximately 40% efficiency, every Btu of electric energy produces 2.5 times as much carbon dioxide as a Btu of heat energy. As highlighted in Table 2, the trend toward a higher percentage of electric energy greatly exacerbates the CO₂ problem. The ratio of CO₂ from building electricity to building heating is predicted to rise from its present value of 2.5 to 1 to nearly 4 to 1 by 2030, strongly focusing our attention on electric use in buildings.

From a different view, activity in buildings consumes 71% of all electricity generated in the US and accounts for 79% of all electric expenditures, as reported in the Department of Energy Buildings Energy Databook 2006. This suggests that a serious attempt to reduce CO₂ produced by a campus must focus on the reduction of electricity use in buildings. It is particularly important to notice that "internal gains" (people, lighting, and appliances in buildings) contribute up to 27% of the cooling load in both commercial buildings and homes. To the extent that the cooling load is electric, a reduction of electric use in buildings is doubly effective.

Lighting alone consumes 20% of the total electric output of the US and places a significant uneven load on the US electrical grid. At this time, lighting uses more energy than cooling in the residential sector, as a national average. This underscores the importance of breakthrough lighting technologies and the elimination of incandescent lamps.

The dramatic impact of electric production on CO₂ emissions is seen in Table 2 from the Department of Energy Buildings Energy Databook 2006 that shows the historical CO₂

Table 2: Carbon Dioxide Emissions for U.S. Buildings

Building Emissions (10 ⁶ metric tons of carbon/yr)					
Year	Electric	Site Fossil	Total	Bldgs % of US Emission	Bldgs % of Global Emiss.
1990	317.2	153.7	470.9	35%	8%
2000	426.2	167.4	593.5	38%	9%
2004	443.4	164.7	608.1	38%	10%
2010	502.5	168	670.5	39%	9%
2020	577.2	179.6	756.8	39%	8%

emissions since 1990 through 2004, and future trends of CO₂ emissions based on the forecasts of electricity consumption through the next 2 decades. The energy used to produce the electricity for U.S. buildings alone results in carbon dioxide emissions (608 million metric tons of carbon) approximately equal the combined total emissions of Japan, France, and the United Kingdom.

The IUB Built Environment & Peer Benchmarking

In preparation of this report, the Sustainability Task Force collected data from Big Ten universities and other nationally recognized research institutions to benchmark IUB's performance with respect to building energy density, building standards, LEED, and utility metering. The results of this exercise are summarized in the following subsections.

Energy Density

Energy density refers to the amount of energy consumed per square foot per year in a building measured in British Thermal Units (BTUs). Table 3 shows energy density data collected from 6 major universities by Laura Kunz, a summer sustainability intern. Because different types of buildings use energy differently, it is important to evaluate energy consumption based upon building type. Buildings at IU-Bloomington are also shown in comparison to the reported universities.

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Table 3: Comparison of Energy Density

Building Type	Avg. Peer Gross Square Feet	Avg. Peer Annual btu/gsf	All IU Bldgs. (btu/gsf)	IU High & Low btu/gsf	Building Name and Size
Classroom/office	110,962	135,910	120,990	120,990	Ballantine (305,420 SF)
Lab Mix	124,808	140,816	164,029	132,690 195,367	Swain (E&W) (214,912 SF) Student Bldg. (69,737 SF)
Offices	113,799	133,655	132,841	82,768 182,914	Poplars (150,420 SF) Rawles Hall (42,019 SF)
Research Labs	165,120	327,101	330,201	161,859 513,116	Psychology (155,246 SF) Chemistry (289,938 SF)
Residential Facilities	133,831	136,001	141,310	68,223 236,229	Tulip Tree Apts. (263,003 SF) Harper Hall (262,173 SF)

The above data suggest that, on average, IUB buildings exhibit below-average energy densities – i.e. they use less energy per square foot year than comparable buildings at the peer institutions we examined. Ballantine Hall (classroom/office mix), Swain East and West (lab mix), Poplars (office), and Psychology (research) are all below the average energy density listed above for their classification. However, the Student Building (lab mix), Rawles Hall (office), and Chemistry (research) are all above the averages, with Chemistry exhibiting an exceptionally high energy density. This study helps to identify target buildings for immediate attention in an energy conserving environment. Based upon this analysis, we feel that new buildings at IU-Bloomington should be given an “energy budget” and designed to achieve energy densities outlined in Table 4 below.

As design and construction techniques improve over time, building energy budgets can be reduced to reflect more efficient systems and

higher quality construction techniques. In order to verify that the building design will achieve these energy budgets, a full energy model of the building will be required as a deliverable during the design process.

Table 4: Energy Budget for New IUB Buildings

Building Type	Max BTU/SF/yr	kg eCO ₂ /SF/yr
Offices	125,000	17
Residential	125,000	17
Classroom/office	135,000	19
Lab Mix	140,000	20
Research Labs	325,000	48

Water Use at IUB

Water and wastewater treatment is furnished through the City of Bloomington Utilities. Indiana University is the largest customer of the City of Bloomington Utilities, accounting for more than 22% of the overall demand on both water and sewer services. Figure I highlights the amount of water purchased from the city for the

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last three fiscal years. From FY 04-05 to 06-07 IUB reduced its water consumption by approximately 47 million gallons, or 6.7%, which represents approximately 3700 metric tons of avoided CO₂ emissions associated with water treatment and distribution. These reductions can largely be attributed to leak repair in the water and condensate systems, a concerted water conservation campaign, and the installation of low-flow fixtures and shower heads in many campus buildings.

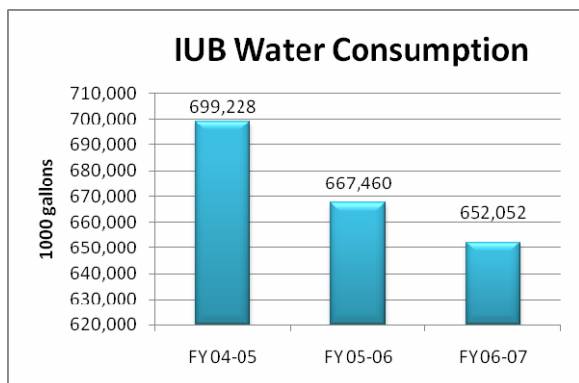


Figure I: IUB Water Usage

Currently, the Utility Information Group (UIG) uses water usage data to identify water leaks and wastage. By examining the percent change in usage from month to month, the UIG has identified more than 10 water leaks on campus since 2004. In most cases, the Physical Plant was able to address leaks shortly after there were identified. If not noticed and addressed, the leaks identified by the UIG would have resulted in 66,367,335 gallons of wasted water, an additional \$214,000 in water charges, and approximately 5250 metric tons of CO₂ emissions¹ annually. It should also be noted that the Bradford Woods Wastewater Treatment Facility received an Honor Award for Engineering

¹ Assumes 84 watt hours of electricity per gallon of drinking water and 2.08 lbs CO₂ per kWh. See Energy Information Administration. 2002. Updated State-level GHG Coefficients for Electricity Generation 1998-2000. <http://tonto.eia.doe.gov/FTP/ROOT/environment/e-supdoc-u.pdf>

Excellence from the American Council of Engineering Companies.

Building Standards

Indiana University has developed building design guidelines based on the Construction Specification Institute divisions. These standards are intended to guide the design team toward the development and implementation of high-performance institutional quality facilities lasting 75 years.

The application of IUB's building standards has led to the construction of a number of high-performance facilities and the application of energy saving technologies, including heat recovery systems on exhaust systems, variable frequency drives on all motors greater than 5 HP (these motors drive fans and pumps for heating, cooling, and water distribution), lighting applications that approach 1 watt/ square foot, water saving devices on faucets, and direct digital controls on HVAC equipment. However, the best mechanical and electrical systems cannot overcome shortfalls in the design and construction of the building envelope. Poor insulation in walls and roofs and poorly designed windows will lead to higher operating costs for energy, maintenance, and poor indoor air quality.

Although energy conservation is a quantifiable outcome from the application of the Indiana University Design Guidelines, it is not the only one. Indoor air quality and occupant comfort can be improved through a comprehensive approach to building design including proper ventilation rates, low-VOC coatings and furnishings, effective moisture control, and odor control from both internal and external sources.

Mitigation and control of chemical, radiation, and bio-hazards in laboratories as well as prudent use of chemicals for cleaning, facility maintenance, and pest control can greatly enhance the indoor environment. Though not currently used by IUB, the Indoor Air Quality Building Educa-

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tion and Assessment Model (I-BEAM), released in 2002, is a guidance tool designed for use by building professionals and others interested in indoor air quality in commercial buildings. I-BEAM updates and expands EPA's Building Air Quality (BAQ) guidance and is designed to be a comprehensive state-of-the-art guidance for managing IAQ in commercial buildings. I-BEAM contains text, animation/ visual, and interactive/calculation components that can be used to perform a number of diverse tasks.

By building upon the current design guidelines and providing standards for more sustainable features in new and renovation projects, all new buildings and renovations of existing buildings will become high-performance facilities that reduce energy consumption, enhance occupant comfort, and preserve the rich heritage of Indiana University. A recent study by Melissa Enoch in the Summer 2007 compared the IU building standards with those from other Big 10 and nationally recognized research institutions with strong sustainability programs and concluded that revisions to the standards for moisture control, doors, windows, mechanical, and electrical systems are necessary. Once implemented, all future buildings on the IUB campus will be more energy efficient and produce an indoor environment that is cleaner and safer for the occupants.

LEED

The United States Green Building Council developed the LEED (Leadership in Energy and Environmental Design) Green Building Rating System to provide a reliable building design and performance measurement tool for building owners and operators. LEED provides a complete framework for meeting sustainability goals and assessing building performance in six categories: Sustainable Sites; Water Efficiency; Energy and Atmosphere; Materials and Resources; Indoor Environmental Quality; Innovation and Design Process. Four progressive levels of LEED certification – Certified, Silver, Gold and

Platinum – can be achieved based on the number of points awarded to a building project. Certain prerequisites must be achieved in order to qualify for certification. Currently, there are over 1000 certified buildings and 7300 registered buildings in the United States. Over 280 of these projects are in the Higher Education category.

Indiana University is currently building the second multi-disciplinary science facility, MSB2, which will be the first LEED-certified building on the IUB campus. It is anticipated that this project will achieve a LEED-Silver rating.

The university should move as quickly as possible to adopt LEED standards as the minimum design standards for new buildings and major renovations on the campus. Incorporating the guidelines of LEED shows an institutional commitment to environmental stewardship. Although there are no LEED-accredited professionals (LEED-AP) on staff at this time, the university should promote the development of several staff to achieve this certification in the near future, and in the meantime should work with LEED-accredited professionals in Indiana.

According to a study submitted by Steven Winter Associates to the General Services Administration (GSA) in October 2004, the premium to build a LEED-Silver building ranged from 2.5% to 4%. The study also concluded that, depending on the design solution, market condition, and other contingency factors, a LEED rating could potentially be achieved within a standard GSA budget without the premium. Careful attention to the details of design, inclusion of all potential stakeholders early in the process, and a dedicated green building allowance in the budget will guarantee a successful LEED project.

Utility Metering

Adhering to the maxim that you cannot manage what you do not measure, utility metering provides a critical foundation for effective energy and water management and conservation. The

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collection, and subsequent analysis, of robust utility metering data provides information that can drive significant greenhouse gas reductions, and cost savings on campus. Specifically, a well executed utility metering program can support: the analysis of campus water and energy use, optimization of system and building performance, leak identification and building audits, identification of high return retrofit and conservation projects; and evaluation of investments in energy and water management and conservation programs.

In the summer of 2007, the Utility Information Group conducted an inventory of current utility metering coverage on the IUB campus. Whereas all utilities on campus are metered at the aggregate level, this inventory focused on building-level metering on campus. Accordingly, the UIG determined that approximately 35% of the buildings on campus are metered for all utilities that serve the respective buildings. Table 5 highlights the metering coverage for individual buildings on the IUB campus.

Table 5: IUB Metering Coverage

	Tot. Bldngs	Mtr'd Bldngs	Percent
Steam	99	36	36%
Gas	126	124	98%
Chilled H ₂ O	58	0	0%
Domestic H ₂ O	273	172	63%
Electric	263	133	51%

Recent funding authority has been approved to install chilled water meters in about half of the buildings on the chilled water system. Future projects will complete the campus meter installation and provide an opportunity to distribute energy consumption information to a wider audience.

In order to extract maximum value from utility usage data, the University should invest in data management software that can integrate utility data and facilitate analytical and billing functions. To accomplish this, the university

should explore a number of software procurement options ranging from: in-house development, integration with existing building automation systems (Siemens, Johnson, etc.), MMS, off the shelf vendor products (Cimetrics, OSISoft, etc.), or custom developed software. Critical components of a software system include: the ability to integrate a wide range of metering data (manual read, remote read, interval, etc.), building automation systems, and weather/climate data; an intuitive user interface; and centralized reporting/billing functions; etc. The price point for off the shelf software used at peer institutions is approximately \$250,000. Reputable vendors for utility management software mentioned by energy managers at peer institutions include: OSISoft (currently used at Yale), Cimetrics, Itron, Instep EDMA (currently used at Michigan and OSU), and Interval Data Systems.

Metered energy data is a valuable tool that can be used in many ways. Providing building energy consumption to users gives them an opportunity see the effect of their behavior as it relates to energy consumption. Coupled with an educational program, allowing users to see the trends in the energy consumption (either through phantom billing, in building displays, or via web-based applications) will raise the awareness of campus energy consumption, and make conservation efforts more effective and meaningful.

High-quality energy data gained through metering can also be used to prioritize and justify building renovations. When faced with decreasing support for repair and renovation projects, energy metering data can be used to identify buildings with the worst energy performance to ensure renovations reap the greatest possible financial returns.

At this time, most utility costs are paid through Physical Plant, which provide very little incentive for any individual or department to conserve energy. By re-directing the utility consumption costs using an enterprise model, individual de-

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partments will then become responsible for their own energy consumption, and have a greater incentive to conserve energy and implement energy conservation measures within the spaces they control. This increased awareness will be passed onto individual users and foster an ethic of conservation.

Indoor Air Quality (IAQ)

IU Environmental Health and Safety has been performing thorough IAQ investigations in response to complaints in accordance with American Industrial Hygiene Association and EPA guidelines since 1994. These inspections are generally performed on the same day or within a day of the complaint. Figure 2 shows the complaint trend since 1995. The number of complaints has been fairly consistent over the past 6 years with an average of 56 complaints per year. In 2006, there was a decline in mold related complaints from the previous year (17 vs. 51) by about 1/2, likely due to proactive moisture control measures such as timely clean-up of flooding events and timely remediation of mold growth resulting in fewer repeat complaints.

Metrics for Evaluation

The Built Environment Working Group identified a number of sustainability metrics to track the effectiveness of projects that seek to promote the functionality, safety, and energy efficiency of the IUB campus buildings. By examining trends in these key areas, staff and administrators will be able to make better informed decisions regarding the application of scarce repair and rehabilitation resources. Key metrics for the built environment include:

- Measure and produce quarterly energy density reports on poor performing buildings and distribute the results to appropriate administrators, faculty & staff.
- Where possible, design and construct new buildings using the LEED-NC criteria to achieve a LEED rating

- Incorporate recommendations for improved building standards into future project construction documents
- Expand metering program to include all buildings and all energy sources
- Log indoor quality complaints
- Use I-BEAM guidance tool and associated building metrics

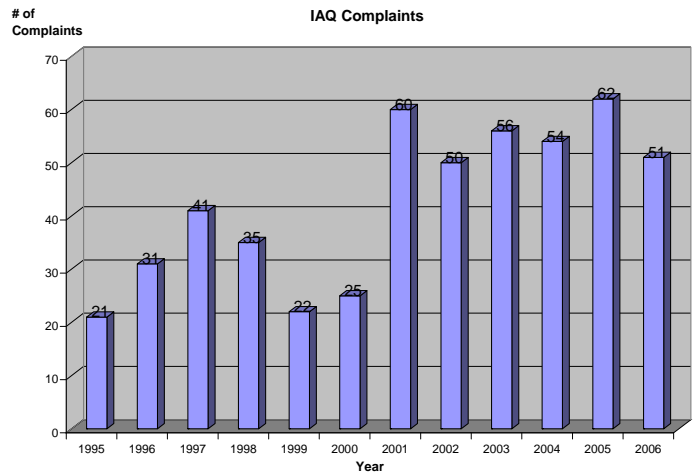


Figure 2: Indoor Air Quality Complaints at IUB

Potential Service-learning and Co-Curricular Activities

- Students focused on various types of communications can help IU publicize and market its green building activity through press releases, web page development, other creative writing and design assignments.
- Policy and public affairs students can apply their knowledge to research public benefit/other issues.
- Mathematics and students in quantitative disciplines can gain valuable experience in developing energy budgets, energy models, etc.
- Students can be used as a resource for a number of building-related projects. Students can track the progress of the LEED process during design and construction and evaluate the process and procedures that accompany LEED certification.
- Faculty can also incorporate building energy modeling into coursework. Using metered utility data, students can track historical trends in energy uses, model alternative scenarios, and develop energy/water use models.

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Long-term Targets

Reduce Energy Density by 3% Per Biennium

By applying standards for high-performance, energy efficient buildings to all new and renovation projects, reduce energy density in all building types by 3% each biennium. Incorporate energy modeling as a pre-requisite for all new construction and renovation projects to validate each design, and establish a baseline to influence future design decisions.

Construct and Renovate Buildings to LEED Criteria

Establish LEED certification goals for New Construction and Existing Buildings following the criteria set forth by the US Green Building Council. Following the guidelines will demonstrate Indiana University's commitment to sustainability and environment stewardship.

Develop a Utility Enterprise

Based on a comprehensive metering program for all energy and utility sources, the campus energy production and distribution services will be run as an auxiliary enterprise. Establish a billing procedure so each campus department is aware of their energy and utility consumption. Establish incentive programs for departments to fund energy saving projects.

Establish Accurate Project Cost Models

Currently, project cost models do not accurately reflect the actual economic, social, and environmental costs of a project. By first developing a program statement and estimating the costs to satisfy that statement, a more accurate budget proposal can be developed. Additionally, by incorporating a life-cycle cost/benefit and carbon dioxide emission analysis into this process, the university will construct facilities that optimize the economic, social, and environmental performance from construction through demolition.

Conclusion & Recommendations

Historic buildings are a highly valued component of the Bloomington campus. Maintaining IUB's

buildings in a state that reflects IU's commitment to sustainability will require a proactive approach to identifying and solving issues related to HVAC systems and building envelopes whenever there are opportunities for building upgrades. Retro-commissioning of older and historical buildings will establish high performance levels for HVAC systems and exterior materials and will lead to high quality indoor environmental conditions with the lowest possible long term energy costs. Addressing those goals will require that key university personnel are competent in the latest technologies and criteria for high-performance buildings.

A shift from a culture of energy entitlement to one of energy conservation is needed to encourage individuals to become more responsible for their own energy use. We feel that all members of the university should participate in the development of a campus utility as an enterprise. With this in mind, campus engineers will install equipment to meter and record the consumption and loss of energy in each building or building sector. As data is captured, trends can be analyzed and users can be informed about their energy use. Strategic use of metering data can raise awareness of energy consumption not only for electricity but also for steam, chilled water, and domestic water. A combined strategy of monitoring usage and increasing awareness will strengthen our collective willpower to upgrade systems and incorporate more energy and water saving technologies. We should begin immediately to identify staff, students, and faculty who will actively monitor energy information from government agencies and private organizations. Informed decision-making will be enhanced if we utilize the wealth of information on commercial building (including educational facilities) with regard to building characteristics, energy consumption, and energy expenditures. This type of information is gathered by the U.S. Department of Energy and distributed as the Commercial Buildings Energy Consumption Survey (CBECS).

VIII Built Environment

There are currently structural issues at Indiana University that hinder the development of more sustainable buildings and energy conservation. Whereas funds for capital projects are separate from the funds for operation and maintenance, project cost models for new buildings typically ignore operating costs. This low-first-cost fund-

ing model tends to place a financial burden on future operating accounts which is contrary to the development of sustainable buildings.

Specific recommendations include:

- Establish preservation guidelines that allow for informed stewardship of highly valued historic buildings on campus.
- Develop a systematic approach to retro-commissioning to identify and correct problems within existing buildings. Older buildings that are being considered for major renovation of HVAC or building envelopes should be immediately targeted for efficiency audits and upgrades.
- Establish guidelines for safe and efficient use of historic campus buildings by incorporating sustainable features throughout our Design Guidelines.
- Adhere to the following recommendations for energy density and equivalent carbon dioxide emissions on new construction and major renovation projects. These values for each building type must be verified with an energy model that is required as a project deliverable during design.

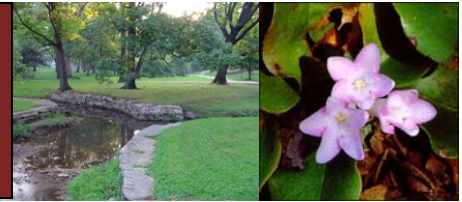
Building Type	Max btu/SF/year	kg eCO ₂ /SF/year
Offices	125,000	17
Residential	125,000	17
Classroom/office	135,000	19
Lab Mix	140,000	20
Research Labs	325,000	48

- Support at least 3 senior staff members in the University Architect's Office should achieve and maintain a LEED-AP (accredited professional) certification.
- Promote green-building concepts through an administrative decision to incorporate LEED sustainability guidelines to all new projects as well as renovation of existing facilities.
- Target, where possible, new academic facilities with a LEED-Silver rating based on the latest version of the LEED-NC criteria, with LEED-EB for all existing building renovations. The intent of the LEED guidelines should be incorporated into the design of smaller projects.
- Develop site-specific metering and monitoring systems for steam/condensate, chilled water, electricity, and potable water and a billing and administrative structure to collect metered utility data and distribute that data to users through a billing system.
- Create a strategy to develop a utility enterprise whereby utility costs are shifted to the consumer departments.
- Develop an institutional policy that requires departmental funding of Renewable Energy Credits (REC's) for new buildings and major renovations that do not meet the updated energy density requirements.

VIII Built Environment

- Develop a fast-track energy metering upgrade and energy audit program at the Chemistry Building, one of the largest energy consuming buildings on campus. Due to the building's high energy density, there are opportunities to implement qualified energy savings projects with strong paybacks.
- Promote the development of a methodology to perform life-cycle cost analyses on all new and renovation projects. This life-cycle cost analysis requires an understanding of the initial first-cost plus long-term operation and maintenance costs as well as disposal or reuse. Life-cycle analyses should incorporate the projected rise in energy costs and additional costs or carbon credit savings that may come into play with future carbon and energy regulations.
- Adopt EPA's I-BEAM, a Building Education and Assessment Model, as a proactive tool to promote better air quality in buildings and to reduce the number and severity of IAQ complaints.
- Analyze funding shortfalls for maintenance and repair issues that affect air quality in buildings and develop a strategy to address this shortfall by obtaining additional funds.
- Incorporate room-based monitoring and control systems in new and renovated buildings to ensure efficient heating and cooling.
- Install decentralized renewable energy sources to offset some of the building-related energy costs.
- Generate awareness-related materials for a long-lasting campus-wide energy conservation campaign, and incorporate energy conservation awareness information into orientation week activities.
- Encourage departments and other units to install energy drain-cutting surge suppressors on all equipment for which this is safe and will not affect the function of the equipment.

Indiana University Task Force On Campus Sustainability IX Food



Food

Objective: *To promote high-quality dining options for IUB's students, staff, and faculty that support sustainable agricultural and food distribution practices while minimizing energy use and waste generation.*

Note: For a access to a full version of the Food Working Group's report, see <http://www.indiana.edu/~sustain/working-groups/food>

Sustainability and Food

A campus food model is an integral part of an overall campus sustainability policy. The impact of food consumption is relevant to all aspects of sustainability, from greenhouse gas emissions, to preservation of natural resources, and generation of waste. As a result, a campus food model must carefully consider issues related to food transportation, packaging, storage, preparation, as well as waste disposal. Perhaps most importantly, a campus food model must consider how best to meet the nutritional needs of the students, faculty, and staff on campus. We recognize that the process of developing a sustainable food model is particularly challenging, given the great financial pressures and complex logistical challenges of feeding IUB's more than 40,000 students, staff, and faculty. However, there is ample room to improve upon the current situation in the short term and move towards this goal.

In addition to the factors outlined above, a sustainable campus food model must also consider the social, economic and environmental costs associated with food procurement. According to the United States Department of Labor's consumer price index, food prices went up 3.7%

between June 2006 and June 2007, and they are projected to increase an additional 7% by December 2007¹. As this section highlights, however, comparing the financial cost of food purchased from local growers and producers and wholesalers who draw from both national and international sources fails to acknowledge many other costs associated with large-scale food production and distribution. If we are to take a



global and long-term view of our food system, many additional factors, such as air pollution associated with food transport, environmental degradation of farmland, topsoil loss, and effects on local economies, must be considered when deciding what food products to purchase and offer.

As outlined later in this section, purchasing food from local growers, producers, and vendors provides an opportunity to offer the IUB community food that supports local economies, produces lower carbon emissions related to transportation, and is both fresh and has high nutritional value. Universities and colleges should be as concerned with students' physical well-being as with their intellectual development. As a result, implementing a sustainable campus food model will enrich students'

¹ <http://data.bls.gov/cgi-bin/surveymost?bls>

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experience at IU, both by promoting healthier lifestyles and educating students about the social, economic, and environmental impacts associated with daily decision-making related to food consumption.

Why Create and Implement a Campus Sustainable Food Model?

By adopting a food model based on local control of food production, IUB could 1) improve its image as a green campus, 2) reaffirm its commitment to local communities and businesses, and 3) provide a more robust educational experience for faculty, staff, and students. University campuses have a key role to play in promoting sustainable food systems. They are substantial centers of population with important roles in local and national economies and provide a unique environment in which students can develop healthier, more environmentally responsible food consumption habits. By implementing a sustainable food model, IUB has the potential to promote interdisciplinary understanding and civic engagement. Food production and consumption cuts across social, economic, and environmental dimensions at local, national, and global scales. It involves issues ranging from domestic farm subsidies, labor/immigration policy, and the health of local economies to world hunger, global warming, and the politics of food security and culture. Pressing environmental issues associated with food also include soil degradation, topsoil loss, over-pumping of aquifers, as well as the more general ecology and ethics of food production and distribution. Developing a sustainable campus food model, therefore, offers rich opportunities for both coursework and co-curricular activities both on campus and working with local community partners. Fortunately, excellent models already exist on the Bloomington campus, including the new Ph.D. program in the Anthropology of Food and a multi-course ser-

vice-learning project, "Food for Thought", which is organized around the theme of food literacy².

Current Practices

Student enrollment on the Bloomington campus is just over 39,000 students, 9,000 of whom are freshmen. IU dining facilities serve over 22,000 meals per day Monday through Friday and 10,000 to 12,000 meals per day on Saturday and Sunday serving diners that include students, faculty, staff, and others. Currently, RPS Dining Services has two primary vendors that supply over 70% of the food served on campus. In addition to the two primary vendors, the Bloomington campus is also served by on-campus franchises such as Taco Johns, Sbarros, Starbucks, and Homecourt Pizza, as well as outsourced operations that deliver the food at the IMU (Sodexo) and at Athletic events (Chartwells). Unfortunately, Indiana University currently purchases a small and insignificant amount of the food it prepares and serves from local vendors. *Box IX-I* contains a list of vendors with which IUB currently has food contracts.

At present, Indiana University does not have a comprehensive food model. By economic necessity, decisions are driven by student preferences and demands by IU for cost efficiency. Yet recent events may indicate some growing threats associated with food that is imported to IU from large distances: tainted spinach produced and shipped from California, contaminated pet food and seafood imported from China, several outbreaks of E-coli bacteria in meat served in fast food restaurants. While these risks are not restricted to imported food, there are several other reasons to establish a food model based on local suppliers including: food quality, the environment, the economy, food security, and hidden social and environmental costs.

² <http://www.cfkeep.org/html/snapshot.php?id=77934469262077>

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During the Fall Semester of 2007, University Dining Services agreed to fund an internship position to begin implementation of some of the recommendations set forth in the food report. Initial priority will be connecting and coordinating with local growers as they begin planning for next year's crops, and on instituting reduction and recycling programs for food packaging and food waste. Secondary priorities will focus on student education and motivation to participate in the purchase and preparation of locally produced foods.

Box IX-I. IUB Local Food Vendors:

- Gordon Food Service, a regional vendor servicing Michigan, Indiana, Ohio, Kentucky and Illinois.
- McConnell Convenience supplier, based in Fort Wayne, IN and serving Ohio, Illinois, Indiana and Kentucky.
- Prairie Farms, based in Anderson, Indiana. Milk is produced in Indiana but processed in Illinois.
- Interstate Bread Company, which supplies breads and Hostess products (Indianapolis).
- All Kitchens Beasley Produce and Wabash Foods supply our fresh fruits and vegetables. Beasley is located in Bloomington and Wabash Foods is located in Vincennes, IN.
- Scholars Inn Bakery - I.U. purchases 100% of its bagels from the bakery in Bloomington.
- Other local vendors - special items are purchased from local grocery stores such as Bloomingfoods and Sahara Mart

What Other Universities Are Doing

Before developing a food model for the IU Bloomington campus, it is helpful to examine how other colleges and universities are succeeding with sustainable food initiatives. Two indicators of the efforts of other universities stand out: (1) a report by the Sustainable Endowments Institute on the sustainability efforts of major U. S. universities, and (2) several university efforts to connect food served on campus with the farms from which they originated.

The 2007 College Sustainability Report Card

The Sustainable Endowment Institute graded 100 leading colleges and universities, including Indiana University, in seven categories of sustainability and assigned a cumulative grade to the college or university on overall sustainability. Sustainable food initiatives at leading universities and colleges share two fundamental strategies:

- increase the use of local (and, often, organic) food, and
- decrease the amount of food-related waste.

Appendix B in the full Food Working Group report contains schools that received an *A* or *B* ranking in the Sustainability Report Card. Interestingly, none of the top 100 universities reviewed by the Sustainable Endowments Institute has an extensively developed food model that also considers the full range of related factors both on and off campus. Below, we note a few prominent examples of innovative sustainable food initiatives.

Farm-to-College Initiatives both produce food for campus dining halls and create food production learning experiences for students. Farm-to-college program members are among the colleges and universities receiving an A grade for food and recycling in the 2007 *College Sustainability Report Card*. According to the Community Food Security Coalition³, Hamilton College has a student population of 1,000 and spends approximately \$20,000 a year on local produce such as tomatoes, apples, lettuce, potatoes, and carrots. The program's educational value is combined with nutrition education and classes that research dining service purchases. Cornell University also spends approximately \$20,000 a year on local produce for a student population of 20,000. Over 10,000 meals are served daily at Cornell, and the university features local food as a "seasonal vegetable of the week." Penn State University and the University of British Columbia also have active farm-to-college programs.

³ www.farmtocollege.org/list.php

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Other programs include Oberlin College's "Farm to Fork" and "Eat Local Challenge" programs managed by the Bon Appetit Management Company. The Farm to Fork program emphasizes the use of local foods, and the Eat Local Challenge program hosts single-day events in which all Bon Appetit cafes—190 restaurants in 26 states—offer an entrée made entirely of ingredients purchased within 150 miles.

The student-run FarmEcology program at the University of Pennsylvania also hosts local meal events and extends its focus on bringing healthier, local food to the campus through other outreach efforts and a FarmEcology food stand in Penn's student union that offers local and organic products⁴. Additionally, the Socially Aligned Partnerships program at the University of Washington procures nearly half a million dollars of local produce each year. And, the University of Michigan launched the Fresh Michigan program that has led to the use of local products and produce in many menus, including Michigan organic tofu and seasonal fruits and vegetables⁵.

A Sustainable Food Model at IUB

With access to a vibrant community of local producers, Indiana University is well positioned to develop and implement a sustainable food model for the Bloomington campus. A Sustainable Food Model for IU should focus on three primary elements and on five secondary, supportive elements:

Primary Elements:

1. Strive for sustainable production and delivery
2. Reduce/recycle packaging
3. Reduce/recycle food waste

Secondary Elements:

4. Create an educational component for the food model

5. Calculate the food carbon footprint to establish a benchmark
6. Develop an edible permaculture plan
7. Incorporate eco-friendly cleaning products in dining halls
8. Develop education and outreach materials to introduce students to the food model

We believe a plan combining these eight elements will create the foundation necessary to build a viable sustainable food model on the IUB campus. Specifically, these elements will combine in the following manner to create the model:

Strive for sustainable production and delivery. Sustainable production of food refers to food grown or raised following a system or a process that is minimally depletive of soil and water resources and that is not reliant on continuous chemical fertilizer and pesticide applications, which result in pollution from both their production and use. Sustainable delivery refers to food transportation methods from farm to consumer that result in the least amount of environmental damage. The closer the consumer is to the produce or food production, the less distance the food will travel, generally reducing the environmental damage from release of carbon dioxide and other atmospheric pollutants that occurs in the delivery process. We believe that sustainable production and delivery of food can both protect the environment and produce high-quality, safe, affordable food. A sustainable food model for Indiana University, then, will seek to increase food acquisition from farmers who follow sustainable production practices and live in the vicinity of the Bloomington campus.

Reduce/recycle packaging. The amount of food-related packaging arriving at IU can be reduced by purchasing locally produced food products. Items produced locally do not have to endure long stints in transportation or storage and thus will likely require less packaging than food procured from national vendors. Additionally, IUB can promote the reduction of packaging materials by purchasing food from vendors that

⁴ www.apics.org/Resources/Magazine/Past/Nov-Dec2005/novdec2005_feature_global.htm

⁵ <http://www.housing.umich.edu/dining/freshmi.html>

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use recycled and/or recyclable packaging and exhibit judicious use of packaging material.

Reduce/recycle food waste. In addition to promoting a reduction in excessive or non-recyclable packaging, IUB's food model should include strategies to minimize or eliminate food waste. Suggestions to eliminate and/or recycling this waste include:

- Donating unused but edible food to local food banks, and unusable food to local farms to be used as animal feed.
- Converting used cooking oil to productive uses such as biodiesel, possibly to fuel campus vehicles.
- Composting food scraps into mulch for use in campus gardens and landscaping or for animal feed.

With respect to the latter, as part of an interdisciplinary food literacy project involving four IU courses, "Food for Thought", students recently conducted an assessment of food waste at the Collins-Edmondson dining hall and found that the dining hall produces approximately 450 pounds of compostable food waste per week. Until recently, these food scraps were sent to an area landfill with other waste on campus. Currently, however, compostable food waste at Collins-Edmondson is being collected by kitchen staff and picked up on a regular basis for processing in the campus garden operated by SPROUTS (Students Producing Organics Under the Sun). *Box IX-2* provides some background on the SPROUTS program.

Maximize educational value. Integrating issues of food and sustainability into the curriculum has the potential to enrich our students' educational experiences in almost every discipline. Additionally, improving students' ability to make sound, sustainable food choices can improve their short- and long-term health, thereby enhancing their potential for academic success. Educational components of a campus food model might include academic courses, co-curricular classes

and activities, and work and volunteer opportunities in the following areas:

- Food sourcing: where does our food come from?
- How was our food grown or raised?
- Food ingredients: nutritional requirements and sources
- Food ingredients: recipes and menu planning
- The preparation and dining process/experience

Box IX-2. The SPROUTS Program at IUB.

The SPROUTS garden is an example of a successful, student-led permaculture project already in place on the Bloomington campus. SPROUTS successfully lobbied the architect's office for space on campus in which to build a student garden. An empty lot a few blocks away from the Collins-Edmondson dining hall was given to the group for a student-run organic garden. Construction of the garden plots began in the fall of 2005.



The main focus of SPROUTS is to promote environmental literacy and sustainability through the practice of small-scale agriculture. The group sponsors workdays to provide students and/or Bloomington residents with the opportunity to learn from one another about organic gardening. The produce generated from the garden has been shared among the volunteers and donated to local food banks. Garden output has also been sold at the Bloomington Community Farmer's Market and to local restaurants to help in covering operation costs.

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Calculate the food carbon footprint to create a benchmark for regular assessment of the model.

Calculating the food carbon footprint associated with food consumption at IUB provides a benchmark to measure the effectiveness of IUBs sustainable food model. In the summer of 2007, IUB completed its first attempt to calculate the carbon emissions associated with its food service by conducting a pilot carbon inventory for carbon emissions associated with the Collins-Edmondson dining hall during the 2006-2007 academic year. Taking into account only food transportation demands, the inventory indicated that the annual food carbon footprint of Collins-Edmondson dining hall was 172,000 pounds of CO₂, which equates to approximately 380 pounds of CO₂ for each of the 450 residents of the Collins Living and Learning Community. Additionally, the inventory indicated that of the 1,844,000 pounds of food ordered by Collins each year, 388,000 pounds (or ~21%) consist of individually packaged items. A complete report on the food carbon footprint for the Collins dining hall is available as Appendix F of the full Food Working Group report.

Develop an edible permaculture plan. The development of an edible permaculture plan to support the food supply on the IUB campus has the potential to provide educational and working benefits for students and contribute to the maintenance and improvement of the campus landscape. Specifically, implementing permaculture projects on the IUB campus can:

- Beautify prominent and “edge” areas of campus landscape.
- Yield edible annual and perennial food crops for the IU community at large.
- Provide new educational, experimental, and recreational sites for faculty, students, and staff.
- Create opportunities for recycling and composting “waste” products (leaves, grass clippings, food scraps, paper, etc.).
- Diversify the range of desirable plants, animals, and other living organisms on campus.

The following locations on campus have been identified as desirable for both short-term and long-term permaculture projects: residence halls (rooftops, common areas, and green spaces near building entrances); academic and departmental buildings/offices (green spaces, walkways and entrances); marginal areas (shaded fields, utility easements, and overgrown zones); waterways (streams and creeks on campus); undeveloped plots (parcels owned or rented by IU); large, open fields (characterized by grass and little or no other landscaping). More specifically, permaculture pilot projects could be carried out in the following locations:

- The SPROUTS Garden (behind Student Legal Services).
- Kinsey Hollow (the Jordan River floodplain near the School of Education).
- The John Foster Quadrangle (near the circle drive).
- The Mathers Museum of World Cultures (various sites).
- The McCalla Arts School (the field along 10th Street north of the building).
- The vacant IU-owned lot at the intersection of 12th and Fess (southeast corner).

Incorporate the use of environmentally friendly cleaning products into the dining halls. Several universities are experimenting with “green” cleaning products in general applications, but few are using them specifically in the kitchens. Indiana University Dining Services is in the process of investigating the possibility of switching over to more environmentally-friendly cleaning products in the dining halls.

Develop education and outreach materials to introduce students to the food model. Food represents a potent opportunity to introduce the concept of sustainability to all students and staff of Indiana University. One idea for doing this could take the form of a series of cooking shows created and aired through the Indiana University Television Network. Shows could also be avail-

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able as podcast downloads, and would be aimed at the many students who are not familiar with food preparation techniques. Shows could feature both student instructors as well as IU chefs.

Actual cooking demonstrations would encourage students by demonstrating what foods to purchase and how to prepare them; how to select and maintain kitchen utensils and equipment; as well as food nutrition and menu planning. Shows could also encourage students to begin cooking one meal per week using only locally produced foods (and then two meals per week the following semester, etc.). Students with limited cooking facilities could group together where they are available. Farming techniques could also be featured on cooking shows with possible visits to local farms. Students could be encouraged to begin growing their own foods; even the smallest apartment can support at least a pot of basil, rosemary, or parsley.

Create an interest group to communicate and promote the food model on campus.

Communicating a food model to a campus of almost 40,000 students plus associated faculty and staff requires a comprehensive strategy and effective engagement of campus constituents. In addition to official administrative support of the food model and advocacy by student groups and professional associations, the food model could be promoted in the following ways:

- Create official campus positions that promote student awareness and involvement in the food process. For example, Brown University has a 'local-food ambassador'⁶, and the city of Chicago has an official Director of Fresh Taste Initiative⁷.
- Organize a regular farmer's market on campus that would accept meal points.
- Launch a bicycle project that encourages students to shop for food on their bicycles.
- Develop 12-month menus and a 100-mile diet based on seasonally available foods and local

production facilities. (Refer to Appendix I in the full Food Working Group report for sample seasonal menus.)

Paradigm Shift

It must be noted that simply taking an active approach to changing the dining and nutrition habits of students will not, in itself, bring about significant lifestyle changes. Rather, such change requires a paradigm shift in how we think about food and food production. This paradigm shift requires examining how students view the eating process, challenging them to assume personal responsibility for their own health needs, and inviting them to look critically at the role of politics and advertising play in forming their eating habits.

Informal surveys and observations by IU dining hall and food service managers suggest that students do not think carefully about the implications of their food consumption. Often, they are unaware of the sources of their food, how it was grown or raised, or the availability of locally grown/produced food options. We feel that when students support sustainable food practices, they gain the opportunity both to eat in a more healthful way and to gain a deeper understanding of human-environment interactions. For this reason and others, we feel that strategies to facilitate a paradigm shift need to be incorporated into a food model focused primarily on local offerings.

We believe that experience with a more sustainable campus food model will promote a paradigm shift to a more holistic understanding of food, its significance in our lives and its effects on the environment as well as our local and global communities. As a result, we recommend that efforts toward a paradigm shift should include the following key goals:

- Increase student awareness of the role of advertising in their food choices
- Develop a 12-month (and/or 100-mile) diet based on local, seasonal offerings

⁶ <http://www.grist.org/comments/interactivist/2005/08/29/hill/index.html>

⁷ http://www.himmelfarbgroup.com/index_files/documents/FT.2reviseddate.pdf

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- Develop greater interest in and appreciation for food and food-related jobs (e.g. farmers, chefs, dining hall staff, trash, wait staff, custodians, etc.)

With this food model, we hope to promote the notion that eating can be both a cultural and social event. Additionally, we hope to foster an understanding and appreciation of the food production process (from farm to table) among students and encourage them to accept personal responsibility for their food-related choices.

Recommendations

Moving towards a more sustainable food system for Indiana University will require not only changes within IU, but also with contractors that currently provide much of the food served on campus. Informing our food service providers with our intentions to provide more sustainable dining options and working sustainability criteria into the contract awards process is a simple way to make progress in this area without adding any new administrative burden.

One perceived limitation on progress in sustainable food as compared to many of our land-grant peer institutions is the lack of an agriculture school. Several of the many open spaces on campus would provide ideal settings to begin exploring some of the growing options for on-campus consumption presented here. Hilltop Garden and Nature Center could assist with related pilot studies, and successful initiatives there would open the door to the many sustainability funding opportunities from USDA, which have not been sought previously at IU. Further, Hilltop's current role in HPER could be expanded to provide more hands on educational opportunities for the many different courses on the topic of human-environment interactions across campus, as well as expanded opportunities for campus-community interaction.

There are also a number of changes that could be implemented by the University to achieve some of the operational and co-curricular goals out-

lined previously in this chapter. The following recommendations are designed for immediate (pilot) implementation in the Collins-Edmondson dining hall, and for longer-term adoption campus-wide.

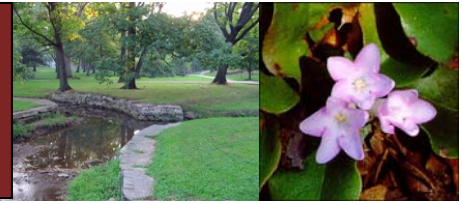
Immediate

- Develop and support relationships with vendors of locally-produced foods.
- Appoint a Sustainable Food Coordinator to work with student groups and with the Director of Sustainability to coordinate elements of the food sustainability model among dining halls, academic classes, and co-curricular programs.
- Seek out academic and co-curricular programs on campus to identify areas with potential for student learning related to sustainable food.
- Create comprehensive plans to reduce packaging on foods ordered for campus dining halls, and to recycle all unusable packaging materials.
- Create a comprehensive plan to reduce all food waste, and to recycle waste that's not reduced or eliminated.
- Create a comprehensive plan to incorporate environmentally-friendly cleaning products in the dining halls and kitchens.

Long-term

- Support a farm-to-college initiative to produce food for campus dining halls and to create food production learning experiences for students.
- Set up a regular farmer's market on campus that would accept student meal points.
- Lead in the establishment of an edible permaculture project on open areas of the campus.
- Work with outside vendors to create a labeling system, similar to the one now in place at Walkers Crisps in Great Britain to list the environmental impact on packaged food products.
- Institute a series of cooking shows aimed at students to be distributed through the IUTV network and made available for podcast downloading.
- Continue to monitor Collins' food carbon footprint (refer to Appendix C in the full Food Working Group report).

Indiana University Task Force On Campus Sustainability X Strategic Analysis



A Strategic Analysis

In order for the IUB administration to decide on the degree to which a campus-wide sustainability program is worthy of significant university investment, the IUB administration must conduct a strategic analysis of the potential risks, opportunities, costs and benefits of such a program. This section of our report represents a first, and admittedly incomplete, attempt to address the some of the potential long-term impacts of a campus sustainability program. We follow the traditional “SWOT” approach: examining the existing Strengths, Weaknesses, Opportunities and Threats associated with an undertaking of this magnitude.

Overview

We believe that Indiana University Bloomington is particularly well situated to take on a campus-wide sustainability initiative. Strong environmental science and policy programs are distributed across at least five schools and a dozen or more departments at IUB; our traditional strengths in international studies, the life sciences, social sciences, and professional programs in business, law, and public policy provide complementary strengths. Programs in environmental education and outdoor recreation offer remarkable opportunities for community and K-12 outreach. At the same time, we must acknowledge significant academic limitations that exist at IUB: the absence of agriculture and engineering programs limits research, teaching, and external funding opportunities in environmental engineering, agronomy, soil science, and other related fields.

In its operational side, the campus has taken some significant and positive steps toward building a sustainable campus over the last decade. However, these efforts have been modest and are not part of a strategic and sustained effort. There is a growing awareness across all parts of the IUB campus of the importance of addressing the issues of sustainability, and this awareness is starting to find its way into many areas of campus practice. The rapidly rising costs of energy, combined with a growing awareness of human impact on the global climate, have accelerated this movement. Many operational units have tried to improve their efficiencies, and most

initiatives have been focused on cutting costs, especially for utilities. Many of the academic departments, notably the College’s Department of Geography, the School of Public and Environmental Affairs, and HPER’s Department of Recreation & Park Administration, have identified sustainability as a rich area to attract student interest, particularly among students with increasing awareness and involvement in environmental issues. But, for the most part, these campus efforts have been isolated and disconnected and not part of an overall strategy. The creation of a new, campus-wide structure to address issues related to sustainability has the potential to effectively unify these isolated efforts into a high-visibility, focused effort that links academic, operational, and residential parts of campus life.

Strengths

I. Education, Outreach and Student Engagement

IUB already can claim approximately 300 courses related to sustainability, taught by some 85 faculty distributed across at least five of IUB’s schools. Some eight undergraduate and six graduate programs include a significant focus on sustainability-related issues. Our School of Public and Environmental Affairs (SPEA) is one of the nation’s first programs to integrate environmental science and policy. SPEA is consistently ranked among the top three environmental policy programs in the country. Well respected environmental science programs exist in several departments

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in SPEA, the College (Geography, Biology, Geological Sciences, Anthropology), and strong programs in environmental education exist in the schools of Education and HPER. The Indiana Geological Survey, housed at the IUB campus, has become a leader in new technologies for carbon sequestration. A successful new B.S. in Environmental Sciences offers a model for other new interdisciplinary programs in sustainability. Substantial infrastructure resources exist in the form of laboratory and teaching facilities, and field teaching and research facilities at the Bradford Woods, Hilltop Garden and Nature Center, IU Research & Teaching Preserve, the CO₂ flux observing tower at Morgan-Monroe State Forest, and the Judson Mead Geological Field Station, among others. The campus is in the process of making a major new investment in an interdisciplinary environmental science research center that could become a core part of the sustainability initiative. There is evidence of strong student interest in the sustainability initiative. At present there are at least a dozen student groups with interests in various aspects of sustainability, and under the umbrella of the Task Force, IUB undergraduate students have organized a “Volunteers for Sustainability” group, working to bring together the various interested groups already existing on campus.

2. Resource Use and Recycling

There is strong interest in, and support for, a significant recycling effort already in place around campus and at the residence halls, including recycling bins, recycling programs for large items at the end of the semester, and a formal re-use/disposal program at the Surplus Stores operation. Recycling removes over 1600 tons of waste from the waste stream annually. Recycling of computer hardware nets over \$350,000 in income for the university. Recycling is a particular target of student interest.

3. Energy

We have instituted a number of significant energy-savings initiatives, including use of compact fluorescent light bulbs in most office and residential buildings on campus, an energy management system to allow Physical Plant to dynamically monitor and adjust energy use, and low-flow shower heads in the residence halls. We are in the process of upgrading the Central Heating Plant to improve its energy efficiency and decrease stack emissions. The addition of a new boiler may allow alternate fuels to be added to the heating fuel mix. Issues related to energy use and climate change have also become a major focus of student interest and engagement. The presence of the new Richard Lugar Center for Renewable Energy (<http://lugarenergycenter.iupui.edu/>) offers a major opportunity for collaborative research between IU campuses, with important implications for service to the State of Indiana. Our location—in the middle of both coal and biofuels resource belts—may offer new opportunities for research and application in alternative and renewable fuels, as well as new opportunities for external funding. Finally, we note that IU is served by one of the more progressive utilities in the country, which could offer new potential for innovative public-private partnerships related to efficiency and energy conservation.

4. Built Environment

We are in the process of developing stringent building standards for new construction and major remodeling projects, and we are in the process of creating our first LEED certified building, MSB II, which we expect to be certified at the LEED silver level. Significant progress has been made in improving indoor air quality.

5. Food

There is strong and growing interest, both among students and the general population,

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in buying locally produced foods. The main food service providers, both within Residential Programs & Services (RPS) and the Indiana Memorial Union (IMU) are receptive to developing local and organic food options. We can build on the successes of the Bloomington Community Farmers Market and the precedent of local restaurants procuring food from local providers. The recent creation of a new Ph.D. program in the Anthropology of Food offers new teaching and research opportunities.

6. Environmental Quality and Land Use

The IU Bloomington campus is recognized as one of the most beautiful college campuses in the country, and much time and effort has been expended to preserve and enhance the natural environment. The natural beauty of the IU campus and the region that surrounds it is one of the major attractions for prospective students and faculty. The faculty expertise and student interest in ecology and environmental science offers opportunities for research and service-learning. The IU Research & Teaching Preserve now encompasses over 1000 acres of natural areas that are used for field-based research and education, including nearly 200 acres of land abutting the City of Bloomington's Griffy Woods Nature Preserve. A highly qualified and committed group of staff at IU's Office of Environmental Health and Safety oversee a number of large- and small-scale initiatives to improve environmental quality at IUB. Successful environmental remediation of heavy metals has been performed at the Range Road coal ash site and the Sycamore Valley shooting ranges. The water quality in the Jordan River has improved dramatically in the last decade due to water protection and grounds management efforts. New approaches to environmental management of both buildings and grounds have led to a significant decrease in use of herbicides and

pesticides in both the indoor and outdoor environment.

7. Transportation systems

By its compact layout, much of the IUB campus and the neighborhoods that surround it are readily accessible by all means of transit. The campus and community have a reputation (built in part on its role in the film "Breaking Away") as a bicycle-friendly city. We now have universal bus access for all students, faculty and staff, including both the campus buses and the Bloomington buses. A strong collaborative relationship has developed between the campus and Bloomington Transit operations. The center of campus is very accessible for both bicyclists and pedestrians.

Weaknesses

I. Education, Outreach and Student Engagement

Existing programs have largely taken place within academic units with little or no coordination between academic units. The reliance on the Responsibility Centered Management (RCM) budgeting model creates financial barriers to interdisciplinary research and teaching programs.

Although a number of informal interdisciplinary programs exist, we have not yet created any formal major (or even minor) programs specifically addressing sustainability issues. The lack of a strategic focus on global environmental issues (climate change, energy, water, etc.) results in significant 'opportunity cost' to the institution. Due in part to 'raiding' by peer institutions, we have had considerable trouble in recent years retaining high-quality faculty in environmental science and policy fields. An additional concern is the lack of a substantive educational and outreach component to campus planning, development, and rehabilitation. The potential for tying campus

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physical improvements to sustainability education would be a powerful way to use our infrastructure as a living laboratory for our students.

2. Resource Use and Recycling

The limited market for recycling materials in our area limits the financial support for recycling. At present, we have to subsidize the program at a significant level. We are currently recycling only a small percentage of our recyclable materials (for instance, we only recycle plastics 1 and 2) and we are not yet recycling at major athletic events or at construction sites. Signage on recycling receptacles on campus is often outdated or incorrect, leading to poor sorting of recyclable materials. We do not yet have in place a substantive program to encourage less use or reuse where possible. We have limited purchasing policies that encourage purchase of “environmentally friendly” products. Our recycling education efforts are far from adequate; a culture of ‘recycling responsibility’ is not pervasive among our students, faculty, and staff.

3. Energy

We are in an area of the country where coal is the prominent energy source, both for creating electricity and for heating the campus. Moving to any other fuel source in large scale would be highly cost-prohibitive. Currently, only 35% of buildings on campus are metered for all the utilities that serve them. Further, even where meters are in place they often remain unread. As a result, the campus currently cannot measure or monitor energy use in most of the buildings on campus, thereby constraining our ability to improve energy efficiency and promote conservation.

4. Built Environment

The campus was founded in the 19th century, thus we have many buildings which are far from energy efficient. Building

renovations often are limited to urgent-need items and funding constraints often limit our ability to address energy efficiency. Renovations in older buildings are sometimes limited by historic preservation guidelines. Our building standards, for both new and renovation projects emphasize efficiency from both an operational and energy perspective, but these standards are frequently sacrificed if the construction project is not funded at a sufficient level.

5. Food

At present, there exist significant limitations in the ability of local suppliers of food to provide us with the full range of the needed produce throughout the year. Concerns about reliability, price, and quality variability may limit the willingness of campus food providers to rely on local growers. Awareness of the benefits of local and organic food is not widespread among either IU’s student population or much of its faculty and staff.

6. Environmental Quality and Land Use

The campus is beautiful, but much of its beauty has traditionally relied on intensive maintenance, use of exotic plants, and pesticides, herbicides and fertilizer to maintain much of the campus landscape. The introduction of invasive species, such as euonymous groundcover has drastically changed the flora in Dunn’s Woods as well as other areas. As the campus continues to grow, it is not clear that we are using the land in the most sustainable ways. Increased construction and addition of impervious surfaces has led to increased runoff and loss of soil and infrastructure in the Jordan River corridor, resulting in ad hoc repairs.

7. Transportation systems

Even with the major improvements in the campus and community bus systems, we still have a preponderance of faculty, staff, and students who drive their vehicles to campus, frequently in a single-passenger mode. Major new projects are being undertaken to

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offer new parking options, which may decrease incentives for use of public transit. Although the closure of 7th Street north of the Auditorium improves the pedestrian and bicycle routes into campus, it limits east-west travel options for buses. The bicycle and pedestrian routes into campus are not sufficient, increasing hazard and decreasing comfort for riders and walkers, which in turn reduces the number of people who are willing to try alternative modes of transportation.

Opportunities

I. Education, Outreach and Student Engagement

We believe that major opportunities exist for IUB in four key areas: development of new research opportunities; recruitment and retention of faculty and students; enhanced student learning through access to cutting-edge course offerings and research experiences; and new funding opportunities. An explicit campus investment in faculty and research infrastructure would allow us to leverage our existing resources, and position us well to take advantage of 'hot' areas of new research, such as climate change, carbon sequestration, global water issues, and energy policy. Large student interest in sustainability-related fields highlights strong potential for student recruitment. With minimal effort we can develop an Area Certificate in Sustainability, Ph.D. Minors, and new interdisciplinary programs in sustainability. Creation of a new Sustainability Institute or Center could provide a focus for interdisciplinary research and graduate training. IU's reputation in environmental policy and science make it an obvious 'growth area' in the academic arena, as well as our focus on life sciences. The availability of strong laboratory and field research facilities could be a significant plus in attracting new students and faculty. The presence of a major School of Education on the IUB campus, as well as

programs in HPER, the College, and SPEA, offers new and exciting opportunities for K-12 and community outreach. An excellent potential exists to enhance our service-learning program to use the campus as a 'living laboratory' and the community as a classroom for academic and co-curricular projects. Potential also exists for collaborations between the Kelley School of Business and other academic units to create a Sustainable Business program, similar to that developed at University of Michigan. Significant opportunities exist for external funding, including state and federal grants, foundation support, and alumni donations.

2. Resource Use and Recycling

Although our successes in the recycling arena have been modest to date, recycling provides an excellent target for rapid improvement through modest increases in infrastructure, education, and collaboration with the city. We can build on strong student interest and high visibility for recycling efforts in students' residential and co-curricular lives. We are convinced that we can significantly reduce the amount of material sent to the landfills by creating a much more visible campaign for recycling and for re-use (or just less use) of products. For instance, the success of the students 'Go Green Challenge' could be extended to help dissuade more faculty, staff and students from using single-use plastic water and soft-drink bottles. With minimal effort, we could also focus on recycling at construction sites, as well as at the sporting venues. Student interest in recycling would make it relatively easy to enlist a significant cadre of volunteers to help improve recycling efforts at residential, off-campus, and Greek student housing. With increasing variety, quality, and price competition in 'green products, the University is well positioned to develop better purchasing policies, emphasizing the need to purchase products that are environmentally-friendly.

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3. Energy

A renewed focus on energy efficiency may offer major opportunities to leverage additional support for campus infrastructure (e.g., new \$5 billion fund for campus energy efficiency supported by the Clinton Foundation). As we proceed with new strategic efforts to expand our research infrastructure, this will offer a perfect opportunity for integrating an energy master plan with new building construction plans—and in turn, avoid increased energy costs in the future. We are in the process of upgrading the Central Heating Plant so that we can have more flexibility in fuel options for the future, including use of natural gas. As part of that project, we will be completing an energy audit of the campus that will provide a solid basis for future energy planning. We are prepared to move forward with investment in more utility metering so that we can measure our efficiencies and identify mechanisms for improvement. The advent of a campus sustainability initiative would encourage us to set formal goals for the reduction of our carbon footprint. At present, utilities are by far the largest component of our carbon dioxide emissions. The advent of improved utility metering will greatly expand our ability to respond to changing energy needs, and ultimately, to reduce our energy use. IU's prominence in high-performance computing offers new opportunities for the University to lead research into models for energy-efficient computing.

4. Built Environment

We are building our first LEED certified building and we believe that the university should move as quickly as possible to adopt LEED standards as the minimum design standards for new buildings and major renovation on the campus. Renovations of older buildings allow for efforts to improve energy efficiency in lighting, reduction of energy loss through windows and doorways,

and improvement of HVAC systems. Building renovation may offer an opportunity to reduce the environmental footprint of existing buildings as an attractive alternative to demolition and reconstruction. Improved monitoring of indoor air and water quality should lead to significant improvements in this arena. Increased use of integrated pest management and better management of laboratory air handling in the indoor environment should decrease chemical exposure to building residents. All of these efforts offer the opportunity to turn infrastructure planning and implementation into research and learning opportunities for our students.

5. Food

As the local food movement grows, there should be increased opportunities to work with farmers in the Bloomington area to purchase as much local food as possible, and to educate the students, faculty and staff as to the real costs of purchasing foods that must be transported great distances and/or those that are grown with the use of significant pesticides and/or herbicides. We can capitalize in great student interest in this area as well as growing national and international resources to support education related to the benefits of whole and locally produced food.

6. Environmental Quality and Land Use

As the campus takes on a new Campus Master Planning update process, we can address the broad issues of campus land use issues, and explore solutions to other sustainability-related problems associated with air and water quality, traffic congestion, energy use, and resource use. This may offer an opportunity to explore "New Urbanist" concepts, which seek to integrate residential, commercial, and business construction into more functional community-based design. We can take advantage of a national movement that offers more natural ways to maintain the campus landscape, including integrated pest management, and the use of

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native and drought and pest resistant plants which will result in the reduction of the use of pesticides and fertilizer on campus. New techniques are available to help reduce the amount of impervious surfaces, including the introduction of green roofs and pervious pavement such as is used in the parking lot in front of Assembly Hall.

7. **Transportation systems**

We can collaborate with the City and County to develop better routes for pedestrians and bicyclists to get into campus. We can encourage more car- or van-pooling for those that live outside the city, by using a combination of effective transit alternatives and pricing incentives. We can look at expanding the bus system to cover some of the major population areas outside of the city. For those living closer to campus, there are significant opportunities to reduce single-automobile transport, through more attractive and safer access to campus by foot, bike, and public transit, in combination with pricing incentives through parking operations.

Threats

I. **Education, Outreach and Student Engagement**

The major threat here is inaction. Our peer institutions are moving rapidly in this direction. A failure, or significant delay, in moving our academic sustainability movement forward may result in significant 'opportunity cost' to the University. The Universities of Michigan, Wisconsin, Penn State, and Minnesota have strong academic programs related to sustainability, and we must compete with them for the top students. Sustainability-related issues are becoming a larger and larger factor for prospective students, faculty and friends of the university. IU currently carries some negative baggage (e.g., a "failing grade" from Sierra Magazine's ranking of the most environmentally friendly schools) as a result of its low grades

in sustainability. Much of this relies on good communication of our successes, but also relies on the creation of visible new initiatives in sustainability. Significant opportunities to attract external funding may be missed as other institutions work aggressively to seek such funding. We need to approach this from a much more coordinated fashion, and develop integrated and highly visible, sustainability programs.

2. **Resource Use and Recycling**

The cost of recycling is a significant barrier to expanded recycling efforts. Also, successful recycling is dependent on the voluntary efforts of everyone on campus. The failure to adequately communicate and educate may significantly degrade the success of any recycling program. In addition, problems with markets for recycled materials may limit the opportunities for the products of our recycling efforts; some of our recycled material may end up in the waste stream.

3. **Energy**

Funding is always an issue as energy prices continue to rise. Efforts to reduce energy costs often require significant investment for new infrastructure, which is returned only over relatively long time scales. This may require rethinking some of our financial arrangements within the University, including the creation of revolving funds that will allow reinvestment of cost savings into new campus infrastructure. Historically, we have focused on the short-term costs of equipment as opposed to the life-cycle costs. We need to change our perspective and take the longer term view. And we are concerned about reliance on natural gas to heat the campus, because of the relatively high cost and the history of supply problems. Alternative renewable energy sources (e.g., wind, solar) are in limited supply, and could add significantly to energy costs.

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4. Built Environment

Funding is always the central issue for building projects. Adding any improvements for energy efficiency, indoor air quality, or other sustainability-related issues can significantly increase upfront cost, and thus may have to be balanced against other functional requirements. Presently, there is not a good mechanism to incorporate the life-cycle operating costs (including the utility costs) into the building construction and funding estimates. The funding model almost always emphasizes the initial construction cost over the operating costs.

5. Food

Limited and highly variable supply of locally grown food is an issue for dining halls and other food suppliers. The campus food providers require a reliable, safe, and cost-effective source for campus food. Passing on higher costs will always be a major issue for students and their families. Will the costs of these foods deter some from purchasing them? Again, the success of these efforts will depend largely on our ability to educate consumers on their value. Perhaps the biggest threat is a failure to move forward with a strategic plan for alternative food production and consumption options while they exist; we risk creating a vulnerability to

energy supplies and farming policies that many consider to be entirely unsustainable in the long run.

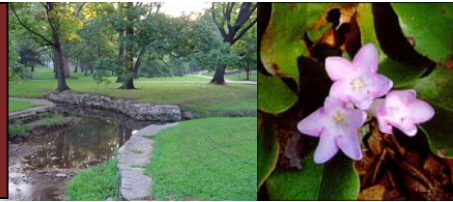
6. Environmental Quality and Land Use

An effective land-use plan is critical to the success of this project. As the campus grows, the land use plans become critical to the long-term sustainability associated with new campus expansion and new construction projects. There could be conflicts that result from differences in aesthetic interpretation of native plantings compared to traditional landscaping approaches.

7. Transportation systems

The costs of public transit options will always be a barrier to expansion. Also, the increase of bus use on campus may have the potential to increase some other degradation in environmental quality (e.g., noise pollution, congestion, diesel fumes), but this could be mitigated through the gradual retirement of older vehicles and replacement by quieter and more fuel-efficient electric and hybrid buses. As bicycle use increases, there is potential for increased hazard to bicycle riders and a need for a strong bicycle safety education effort, combined with improved infrastructure for bicycle travel.

Indiana University Task Force On Campus Sustainability Appendix A



Mission Statement

Indiana University is committed to the preservation of a healthy, vibrant, and sustainable global ecological system. We seek to engage the entire university community—including students, faculty, staff, administrators, and the greater Bloomington community—in efforts to contribute to solutions to global, regional, and local environmental challenges. We strive to build the campus into a sustainable community to support state-of-the-art research and creative activity that helps understand and identify solutions to global environmental challenges; to incorporate issues of sustainability into students' learning experiences throughout their academic, residential, and personal lives; to create a campus environment in which all members of the campus community are encouraged to further sustainability in their personal and professional lives.

Working Group Objectives

Academic Initiatives: *To build an integrated program of academic research, undergraduate and graduate education, co-curricular and service-learning opportunities, and community outreach that will move Indiana University Bloomington into a position of national leadership in sustainability studies.*

Energy: *To raise awareness of IUB's energy use among faculty, staff, and students and implement strategies to maximize the efficiency of on-campus production and distribution systems as well as reduce energy consumption and greenhouse gas emissions.*

Environmental Quality and Land Use: *Through research, self-reporting, and adoption of environmentally sensitive land-use practices we seek to help IUB use resources sustainably and improve environmental quality and to protect the health of citizens on campus, in Bloomington, and beyond.*

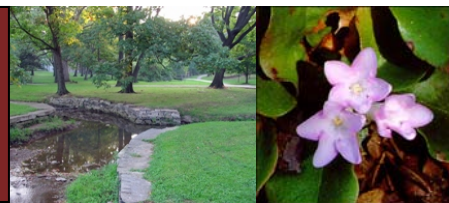
Resource Use/Recycling: *To raise awareness of resource use and recycling on the IUB campus among faculty, staff, and students, implement strategies to enhance campus recycling systems, and promote responsible resource use through green purchasing, conservation, and smart technology.*

Transportation: *To promote a sustainable transportation system that will provide safe access and mobility for students, faculty, staff and visitors, and to ensure that individuals have a broad range of safe and convenient transportation options to walk, bicycle, carpool, or ride public transit to and around campus.*

Built Environment: *To promote campus sustainability through innovative building design and engineering principles that promote functionality, safety, and energy efficiency while respecting campus culture and heritage.*

Food: *To promote high-quality dining options for IUB's students, staff, and faculty that support sustainable agricultural and food distribution practices while minimizing energy use and waste generation.*

Indiana University Task Force On Campus Sustainability Appendix B



Proposed Metrics for Sustainability Analysis

In this appendix, we summarize the metrics proposed by each of the Working Groups that will be used to provide benchmarks of IUB's current state of sustainability and our progress toward a more sustainable campus operation. We recognize that these metrics are highly preliminary, and will be subject to review and modification by an IU Office of Sustainability.

Academic Initiatives

*For each metric, track the number and diversity of the metric, as well as the % infiltration (e.g. the percent of departments and schools represented).

Curricular Education

- Courses with sustainability as a main theme
- Courses that include sustainability discussions/topics
- Number of schools, departments with sustainability as a main theme
- Sustainability related programs: (Graduate/Undergraduate)
- Sustainability related majors: (Graduate/Undergraduate)
- Sustainability related minors: (Graduate/Undergraduate)
- Sustainability related certificates: (Graduate/Undergraduate)
- % campus units (departments, schools, etc) with sustainability-related course
- % campus units with at least one sustainability-related degree program
- % campus units with at least one sustainability-related major
- % campus units with at least one sustainability-related minor.
- % campus units with at least one sustainability-related certificate.

Co-Curricular Education

- Sustainability related campus clubs and organizations
- Student participation in sustainability related activities

- Community participation in sustainability related activities
- Sustainability-related conferences (co-sponsored by IUB units)
- Funding sources for sustainability related student activities
- % sustainability related activities linked directed to community activities
- % sustainability related activities linked to K-12 research
- Sustainability-related speakers invited to campus
- Outreach venues used to disseminate sustainability-related information
- Sustainability-related informational products generated by IUB members
- Sustainable IUB web page hits
- Sustainable IUB web page downloads
- Sustainable IUB expert web database searches
- Sustainable IUB expert contacts initiated from outside IUB
- Sustainable IUB e-newsletter subscribers (once the e-newsletter is initiated)

Research, Scholarly and Creative Activity

- Grants and contracts in sustainability-linked fields
- Grants and contracts on sustainability-linked topics
- Sustainability-related grants and contracts to interdisciplinary IUB teams
- Sustainability related grants and contracts to interdisciplinary inter-university teams that include IUB

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- Students (doctoral, masters, undergraduate) working on sustainability-related research and activities as a part of their thesis work
- Student (doctoral, masters, undergraduate) paid to work on sustainability related research and activities
- Total income (direct, indirect) to IUB due to sustainability-related grants and projects
- Total new income (direct, indirect) to IUB from sustainability-related grants and projects initiated by IUB research incentive support
- Inter-unit and inter-departmental linkages created to work on sustainability-related research and creative activity
- Inter-university linkages created to work on sustainability-related research and creative activity
- Sustainability-related Best Practices books, guidances and protocols generated and published
- Sustainability-related peer reviewed publications
- Sustainability-related presentations at meetings, conferences and workshops (local, state, regional, national, international)
- Sustainability-related presentations at public meetings and venues
- Sustainability-related consulting projects
- Mentorship programs generated to foster interdisciplinary communication and activity
- Mentored faculty participating in interdisciplinary pairings

Community Outreach and Service Learning

- Courses using service learning
- Courses encouraging community outreach as a part of the educational goals
- Courses developing inter-course linkages as a part of the sustainability-related education goals
- % students participating in service learning classes at least once by graduation
- % students participating in community outreach activities at least once by graduation.
- % departments with service learning classes

- % departments with service-learning using programs
- Collaborative projects between IUB members and extra-IUB organizations or agencies.
- Types of organizations and agencies collaborating with IUB members and units.
- IUB members (students, faculty, staff) working with K-12 educators on sustainability-related teaching projects
- IUB members (students, faculty, staff) working with K-12 educators on extra-curricular and co-curricular sustainability-related projects and programs (including summer and holiday programs)
- IUB members (faculty, staff, students) acting as experts or guest lecturers for K-12 classrooms
- IUB members (faculty, staff, students) acting as experts or guest lecturers for sustainability-related projects, organizations or agencies
- IUB members (faculty, staff, students) participating in local, state, regional, national, international sustainability related boards, commissions, panels, etc.
- IUB members (faculty, staff, students) volunteering in sustainability-related activities not represented by the descriptors above
- Publications generated by evaluation of community outreach and service learning projects
- Grant and contract funds (direct, indirect) generated for community outreach and service learning projects.
- Grant and contract applications generated for community outreach and service learning projects.

Energy

- Green House Gas Inventory
- Energy Consumption per square foot
 - By building type
- Energy Consumption per student FTE
- Energy Use
 - Heating (coal, gas and fuel oil)

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- Cooling (electricity)
- Electricity
- Use of alternative sources of energy
- Qualified Energy Savings Projects
- Computer efficiency standards??
- # of video conferences??
- Decentralized Energy Systems
- Number of new, high efficiency surge suppressors

Environmental Quality

Land Use

- % of green space
- % of forest/shrub cover
- % of native species
- % of wetlands or retention basins
- % of mowed grass
- % of pervious surface
- % of impervious surface by type
- % of impervious converted to pervious
- % decrease in Jordan River sediment load
- % of riparian buffer

Integrated Pest Management

- # of pesticide applications /yr
- # of less toxic product substitutions/yr
- # hours of IPM training

Chemical Use

- Amount of chemicals purchased/yr/research \$
- Amount of hazardous waste generated/yr/research \$
- Lbs of chemicals/year reduced by reduced use or replacement with non-toxic alternative
- Lbs of waste reduced/yr

Environmental Education

- # of service learning opportunities created
- # of service learning sessions/yr
- # of students provided service learning opportunities
- # of educational signs posted (already have ~200 storm water buttons on sewers)

Stormwater (All currently measured under IUB's stormwater program)

- # of catch basins marked
- Educational literature distributed
- Community/student group collaboration
- Illicit discharges detected
- Illicit discharges eliminated
- Citizen reports
- Citizen requests for information
- Percent of conveyances mapped
- Material received at household hazardous waste collections
- Citizen participation in household hazardous waste collections
- Employee training
- Contractor training
- SWPPP reviews
- Construction sites permitted
- Construction site inspections
- BMPs inspected
- BMPs maintained or improved
- BMPs utilized
- BMPs cleaned
- Open space preserved & mapped
- Percent of citizens aware of stormwater issues
- Citizen participation in stormwater projects
- Outfalls mapped
- Outfalls screened for IDDE
- Citizen locations for automotive fluid drop-off
- Pervious & impervious surfaces
- Refueling areas with BMPs
- Facilities with accidental releases
- Area of pesticide/herbicide application
- Percent of MS4s cleaned/repared
- Percent of roadside shoulders/ditches stabilized
- Outfalls remediated from scouring conditions
- Type of storage for salt/sand supply
- Salt/sand used on roads
- Salt/sand stored onsite
- Snow disposal
- Material collected from catch basins

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- Material collected from street sweeping
- Macroinvertebrate survey Modified Family Biotic Index
- Visual Stream Assessment
- Litter picked-up; floatables, organics, sediment
- Spills contained
- Fuel used
- Hydrant/fire suppression tests
- Recycling: cardboard, paper, aluminum cans, plastic, batteries, glass, toner carts.

Resource Use/Recycling

- Amount of Recycling as a percentage of waste stream
- Number of Recycle bins
- Events where recycling is available as percentage of all events
- Categories of recycled material
- Utilities usage
 - Water
 - Electricity
 - Cooling
 - Heating
- # of Green Purchasing Policies
- % of recycled paper vs non-recycled
- % of green chemicals vs non-green chemicals

Transportation

- Modal Split
- Fuel Efficiency of university vehicles
- Total intra campus mileage of university vehicles
- Percentage of university vehicles that employ low emission energy sources

Built Environment

- Energy Density
 - By building type
- Number of LEED certifiable buildings
 - New Buildings which are not LEED certifiable
- % of buildings with utility meters
 - By type (electricity, water, sewer, steam, chilled water, gas)
- Indoor Air Quality Complaints
- I-Beam metrics

Food

- Carbon Footprint for food
- Amount of locally produced food as a percentage of total
- % of waste stream diverted to composting
- Amount of food produced on campus
- Amount of food composted/percentage of total
- Appointment of a sustainability food coordinator
- Creation of a “farmer’s market card” from meal points
- Number of academic courses and co-curricular activities related to sustainable food

Appendix C

Assessment of the Benefits & Impact of Joining the ACUP Climate Commitment

This document reviews the American College & University Presidents' (ACUP) Climate Commitment and the potential for Indiana University Bloomington to become a signatory to it. If the President or Provost of IUB decides to sign the commitment, it will become only the second institution in the CIC (following University of Illinois at Chicago) to do so. However, many of the nation's leading public universities have already become signatories to the ACUP letter, including the universities of California, Washington, Oregon, Florida, Arizona, North Carolina, Colorado, Maine, Oklahoma, and Tennessee, as well as four other institutions within Indiana (Indiana State University, Ball State University, Goshen College, and Rose-Hulman Institute of Technology).

The following review examines the actions universities agree to undertake by signing the commitment. In addition to a point-by-point discussion of the commitment's requirements, we also highlight aspects of the commitment which may raise concerns for the University. Overall, this review indicates that, if the IU administration supports the recommendations made by the Sustainability Task Force, we could meet the requirements of the declaration with marginal effort. However, doing so will require an explicit recognition from the administration that achieving climate neutrality is both a desirable and viable goal for Indiana University.

We should emphasize that the review here focuses only on Indiana University-Bloomington (IUB) and does not assess climate-related issues for other campuses of the IU system. In some cases, the signatory of the ACUP Climate Commitment has been the president, representing an entire university system (e.g., California, Montana), while in others, each chancellor/provost has been given responsibility for their own campus's climate commitment (e.g., Minnesota, Wisconsin, Penn State).

Overview of Benefits

There are significant potential gains for the university in becoming a signatory to this agreement. First, and perhaps most important, it sends an important message of institutional commitment on a course towards sustainability. While the agreement at this stage is largely symbolic, it places the university in alignment

with many of the leading universities of our nation who have committed to addressing, in a formal and public way, their concerns regarding a major societal challenge. Failure to sign—or to identify some other demonstrable commitment to addressing issues of global climate change—could result in significant negative publicity for the University (e.g., IU's 'barely passing grade' from the Sustainable Endowments Institute and recent article in the *Sierra* magazine's ranking of college campuses). Conversely, the commitment has significant potential benefits in terms of recruitment and retention of faculty and students. Finally, there are potential benefits in terms of soliciting external support for our research and teaching mission, as described in the report's section on Funding Opportunities.

University Climate Commitments

The ACUP identifies three broad objectives to which signatory universities must commit: the development of a comprehensive plan to achieve climate neutrality, taking tangible actions to reduce greenhouse gas emissions, and providing public access to the action plan, GHG inventory, and periodic progress reports. For the sake of brevity, each objective and its corresponding requirements are outlined below.

Appendix C

1. *Initiate the development of a comprehensive plan to achieve climate neutrality as soon as possible.*

Here, ‘as soon as’ possible appears to be the critical language. The inclusion of this qualifying phrase suggests that the commitment allows universities to account for financial and political constraints (e.g. financial differences between private vs. public institutions and realities of regional energy politics) in setting a target date for climate neutrality. Thus, the commitment would allow IU to factor the reality of the region’s reliance on coal-based energy and its public funding into a target date for achieving carbon neutrality. Recognizing that the task of achieving carbon neutrality is fraught with uncertainty, Chancellor Peterson of CU Boulder offered the following perspective upon signing the ACUP commitment:

“We realize that meeting the PCC goal of climate neutrality—zero net greenhouse gas emissions—will require major improvements in the technology necessary to reduce the carbon emissions associated with coal-based electrical production. But we are working on the premise that, with support from the state and federal government and a growing national and global commitment to alternative energy, these improvements in technology will come sooner rather than later, making what we do today all the more important and far-sighted.”

2. *Within two months of signing this document, create institutional structures to guide the development and implementation of the plan.*

Assuming that the university would sign the commitment after supporting an Office of Sustainability, this requirement would easily be met.

a. *Within one year of signing this document, complete a comprehensive inventory of all greenhouse gas emissions (including emissions from electricity, heating, commuting, and air travel) and update the inventory every other year thereafter.*

The Energy Working Group has already conducted a preliminary GHG emissions inventory for the university using the Clean Air Cool Planet emissions calculator. Presumably, the Office of Sustainability will be charged with refining this inventory and updating it on a periodic basis to track IUB’s progress towards state sustainability objectives. Thus, this requirement does not create significant additional burdens for the university and provides an incentive to ensure that this inventory is conducted.

b. *Within two years of signing this document, develop an institutional action plan for becoming climate neutral, which will include:*

i. *A target date for achieving climate neutrality as soon as possible.*

As mentioned above, the clause ‘as soon as’ provides ample leeway to accommodate IU’s financial and political constraints. Participating universities have set target dates for climate neutrality as proximal as 10-15 years (Middlebury College, Johns Hopkins University), or as distal as 2050 (University of North Carolina, New York University). Many institutions have deferred on setting a specific date pending completion of a thorough energy audit.

ii. *Interim targets for goals and actions that will lead to climate neutrality.*

Interim targets can be back calculated from the set target date with maximum reductions set for commitment out years, when the energy and technology landscape will likely make such gains more achievable.

Appendix C

iii. Actions to make climate neutrality and sustainability a part of the curriculum and other educational experience for all students.

The STF has already made this recommendation. However, the administration may object to the phrase ‘all students’, which could imply the creation of a sustainability/climate change general requirement. The inclusion of the phrase “other educational experience” allows for significant flexibility in incorporating co-curricular and informal educational experiences.

iv. Actions to expand research or other efforts necessary to achieve climate neutrality.

Whereas sustainability and climate science are emerging areas of research, the university will likely promote this research on campus. Active research programs in SPEA, the College, Informatics, and HPER are already directed towards this goal.

v. Mechanisms for tracking progress on goals and actions.

This could be carried out by the Office of Sustainability and is a proposed component of the State of the Campus Sustainability Review.

3. *Initiate two or more of the following tangible actions to reduce greenhouse gases while the more comprehensive plan is being developed.*

The Climate Commitment provides six tangible actions for the university to choose from. These can be viewed in the attached table. Of the six options, IUB could adopt the actions related to public transportation and purchasing with little additional burden.

c. *Adopt an energy-efficient appliance purchasing policy requiring purchase of ENERGY STAR certified products in all areas for which such ratings exist.*

This appears to bear very low risk for the University and may generate net gains via energy cost avoidance over the life of the products.

d. *Encourage use of and provide access to public transportation for all faculty, staff, students and visitors at our institution.*

This is currently done by the University.

4. *Make the action plan, inventory, and periodic progress reports publicly available by providing them to the Association for the Advancement of Sustainability in Higher Education (AASHE) for posting and dissemination.*

Whereas IU is a public institution, the administration should not object to providing public access to the action plan, GHG inventory and progress reports. However, they may be less willing to agree to provide these documents to AASHE for posting and broad distribution.

If the University embraces the suggestions outlined in the STF report, the University can comfortably sign the ACUP Climate Commitment. To do this, IU would need to conduct a careful analysis of its projected growth and energy future to set a realistic goal for achieving climate neutrality. While the IU is well positioned to be the first in the Big Ten to sign the commitment, there are aspects of the commitment to which the administration might object. In particular, the administration may not accept the underlying premise of the commitment – i.e. that climate neutrality is a desirable and viable goal for Indiana University. Additionally, there may be concerns regarding the requirement allowing AASHE to post and disseminate IU’s action plan, GHG inventory, and periodic progress reports.

Commitment	Consideration
I. Initiate the development of a comprehensive plan to achieve climate neutrality as soon as possible.	Clause 'as soon as possible' provides ample leeway.
<i>a. Within two months of signing this document, create institutional structures to guide the development and implementation of the plan.</i>	Office of Sustainability and/or STF could fulfill this function.
<i>b. Within one year of signing this document, complete a comprehensive inventory of all greenhouse gas emissions (including emissions from electricity, heating, commuting, and air travel) and update the inventory every other year thereafter.</i>	Cursory review has already been conducted by Energy Working Group. Office of Sustainability would presumably refine and periodically update the emissions inventory.
<i>c. Within two years of signing this document, develop an institutional action plan for becoming climate neutral, which will include:</i>	
<i>i. A target date for achieving climate neutrality as soon as possible.</i>	Contingent upon administration's recognition of climate neutrality as a desirable and viable goal for IUB. Careful analysis of projected growth and potential technological progress may be required.
<i>ii. Interim targets for goals and actions that will lead to climate neutrality.</i>	
<i>iii. Actions to make climate neutrality and sustainability a part of the curriculum and other educational experience for all students.</i>	Suggested by STF; strategically advantageous to IUB - i.e. facilitate the attraction of high quality students and faculty.
<i>iv. Actions to expand research or other efforts necessary to achieve climate neutrality.</i>	Strategically advantageous to university; existing STF recommendation.
<i>v. Mechanisms for tracking progress on goals and actions.</i>	May be done by Office of Sustainability as part of the proposed biannual State of the Campus Sustainability Review.
2. Initiate two or more of the following tangible actions to reduce greenhouse gases while the more comprehensive plan is being developed.	Public transportation and purchasing actions are currently possible.
<i>a. Establish a policy that all new campus construction will be built to at least the U.S. Green Building Council's LEED Silver standard or equivalent.</i>	Requires change in current funding for infrastructure - i.e. preference for low-first cost structures. Would need approval/acceptance from the state or additional funds from private donors.
<i>b. Adopt an energy-efficient appliance purchasing policy requiring purchase of ENERGY STAR certified products in all areas for which such ratings exist.</i>	Minimal to low risk; price premium may be recouped over product life due to energy cost avoidance; purchasing practice already states a preference for sustainable appliances (see memo).
<i>c. Establish a policy of offsetting all greenhouse gas emissions generated by air travel paid for by our institution.</i>	Potentially expensive; must examine current air travel trends at university and price of carbon offsets.
<i>d. Encourage use of and provide access to public transportation for all faculty, staff, students and visitors at our institution.</i>	Easily achieved; currently done by the university.
<i>e. Within one year of signing this document, begin purchasing or producing at least 15% of our institution's electricity consumption from renewable sources.</i>	Potentially expensive; easy commitment to fulfill if funds are available.
<i>f. Establish a policy or a committee that supports climate and sustainability shareholder proposals at companies where our institution's endowment is invested.</i>	IU Foundation would be key actor here; action does not require supporting all shareholder proposals related to sustainability or sponsoring them.
3. Make the action plan, inventory, and periodic progress reports publicly available by providing them to the Association for the Advancement of Sustainability in Higher Education (AASHE) for posting and dissemination.	Whereas IU is a public institution, this should be quite easy to fulfill.

Appendix D

Photo & Design Credits

Cover design: Nancy Webber, Instructional Support Services

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Left: Jordan River photo: Unknown source

Right: Trailing Arbutus: Keith Clay, IU Biology Dept.

http://www.indiana.edu/~preserve/flora/flowers/e_repens.html

Library/Arboretum: Chris Meyer, University Archives

Farmers Market: Benjamin Schulz, Food Working Group

Jordan River cleanup: Steve Ewing, Indiana Daily Student

Central Heating Plant: Mike Farris, Utility Information Group

Campus Bus: <http://busexplorer.com/PHP/MidPage.php?id=166>

Student Planters: Heather Reynolds, IU Biology Dept.

Contributors page:

Prairie grasses: Heather Reynolds, IU Biology Dept.

Limestone trident: Nancy Webber, Instructional Support Services

Chapter headers:

Jordan River & Trailing Arbutus, as above

Executive Summary:

Library/Arboretum, as above

Preamble:

IMU photograph: IU Visitors Center, Electronic Postcards

<https://www.indiana.edu/~iuvis/cards/images/imu.jpg>

Introduction:

Ballantine Hall: IU Home Pages:

http://info.iu.edu/pub/libs/images/usr/401_h.jpg

Administration & Governance:

IU Trident, as above

Academic Initiatives:

Intro photograph: IU Research & Teaching Preserve

<http://www.indiana.edu/~preserve/teaching/default.html>

Box I:

Moores Creek: IU Research & Teaching Preserve

<http://www.indiana.edu/~preserve/about/default.html>

University Lake: IU Research & Teaching Preserve

<http://www.indiana.edu/~preserve/preserve/griffy.html>

Energy:

Central Heating Plant: Mike Farris, Utility Information Group

Environmental Quality:

Jordan River: IU Home Pages: Chris Meyer/ Indiana University

<http://homepages.indiana.edu/2005/10-28/story.php?id=169>

Jordan River lamppost: Nancy Arazan, SPEA

Resource Use/Recycling:

Recycling bins: Mike Steinhoff, SPEA

Nalgene Bottle: Steve Akers, Residential Programs & Services

Transportation:

Campus Bus: http://www.iubus.indiana.edu/campus_bus/index.html

Built Environment:

Lindley Hall: Alan Keahey:

<http://www.cs.indiana.edu/~dgerman/52ndMTD/lindley-hall-by-alan-keahey.jpg>

Food:

Farmers Market, as above

Sprouts Garden, Benjamin Schultz, Food Working Group