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Process and Practice: Creating the Sustainable University

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The Pennsylvania State University is situated in a fertile limestone valley, surrounded by forest-covered sandstone ridges. The main campus, covering almost 300 acres, is located in State College, a town of about 60,000. PSU is the land grant school for the commonwealth of Pennsylvania and has an enrollment of 34,500 undergraduate students and 6,300 graduate students.

When I began teaching environmental science at Penn State in 1982, I imagined that the environmental problems that I was teaching about were "out there" in the "real" world and had little to do with the day-to-day operations of my university. Indeed, because universities are powerhouses of knowledge and expertise, I assumed that they would be solving our environmental problems and modeling sustainable practices. Even if they were not, I was too busy with "important" research to pay attention to something as mundane as the day-to-day physical operations of my university.

My research at that time (1980s through mid-1990s) was centered on the human activities leading to the biotic impoverishment of Amazonian ecosystems. Then (and, lamentably, still today) humans were aggressively extracting Amazonia's riches. Miners were digging up gold and bauxite, loggers were scouring the forest in search of high-value hardwoods, fishermen were depleting the rivers of fishes, and farmers and ranchers were replacing the verdant forest with cassava fields and weedy pastures. Little of what I saw in Amazonia was sustainable.

In the evening, I would often hang out with Brazilian friends, and we would sometimes discuss the myriad threats to the rain forest. One night when I was feeling particularly despondent, Ana Cristina said, "Hey, things aren't so bad here, my friend. At least we still have 75 percent of our forest intact. You guys in the States have already cut 95 percent of

your primeval forest, and now you are hacking down the last few percent in the Pacific Northwest." Of course, she was right.

Later that night, I went to a movie by myself. The film was *Pretty Woman* (the movie houses along the Amazon usually show popular Hollywood flicks). I decided to watch the movie not as a lonesome American but, instead, imagining I was a native of Amazonia. Hence, what I saw depicted on the screen was not the little love story featuring Julia Roberts and Richard Gere, but instead the glorification of a whole way of life based on materialism, speed, and shallow relationships—all packaged in a way to make it seem fun and glitzy. Suddenly, the United States wasn't a country but a "brand" that was being marketed to the world. I left the theater knowing more clearly than I had known before that the American approach to life—based as it so often is on money, acquisition, and instant gratification—is colonizing the psyches of the world's people. The United States is the model and right now its compass points the entire world toward a nonsustainable future. But the United States could be leading the way to creating a sustainable world. Furthermore, U.S. universities, as centers of innovation and learning, could be in the forefront, leading the charge.

Eventually, I decided to shift my attention from distant and exotic Amazon ecosystems to the seemingly ordinary ecosystem right in front of my nose: Penn State University. I reasoned that a necessary first step to encourage sustainability at Penn State would be to take a baseline measure of university operations, with an eye to ecological performance. Although I did not foresee it at the time, this early work would attract other faculty members as well as students and lead to the formation of a research team, and this team would develop indicators that would reveal the degree to which the university was moving toward or away from sustainable practices. Once our team had pinpointed where the university stood, we were positioned to articulate a clear vision for where the university needed to go to become ecologically sustainable. This understanding prompted us to develop strategies to incorporate this vision into an ecological mission for the university. The final step, which continues to occupy us, is to translate the university's newly adopted ecological mission into concrete policies and actions.

Our experience at Penn State illustrates this three-step process of developing sustainability indicators, then an ecological mission, and finally policies to institutionalize sustainable practices.

Developing Sustainability Indicators

As I was leaving the biology building late one winter evening in 1996, I looked up and saw lights on in many of the labs. Biologists often get their best work done in the still of the night. Often they work alone. I too was accustomed to doing research alone, but I wanted this new research initiative on sustainability to have a more open and inclusive quality about it. I believed that the research *process* would be as important as any final research paper or report. And I knew from the start that the results of the research were not so much intended for scientific journals as they were for the students, staff, and faculty of Penn State and other universities.

I inaugurated the new initiative by posting an announcement on a bulletin board in the Penn State Student Union, inviting students to participate in a study of the "ecological sustainability of Penn State." Nine students expressed an interest in the project, and we met to hatch a plan for measuring sustainability. I was candid with the students, telling them that although I knew how to measure the dissolved oxygen concentration of a lake and the acidity of soil, I did not know how to measure sustainability. Indeed, there is no equipment manufacturer that sells a "sustainability meter."

In an effort to invite the students into the problem, I asked them to think about Penn State as an ecosystem. In what ways was the university similar to—and in what ways different from—a natural ecosystem? The students observed that in nature, everything cycles. In contrast to natural ecosystems, the flow of materials in human-engineered ecosystems, like Penn State, is mostly linear—one way. Indeed, our universities are constantly receiving materials from distant sources, consuming these materials, and then shunting the wastes to distant "sinks."

The students believed that these linear pathways of material flow were extremely wasteful, and this bothered them. They complained about the way that people at Penn State wasted water, electricity, paper, and food. I invited the group to spend time thinking about how we might measure consumption and waste at Penn State. We continued to meet over the next two months, but then interest began to wane. When I asked why we were losing our momentum, the students made it clear that they were tired of hashing things out; they wanted to take action.

Making the Invisible Visible

We began by looking at the university's underbelly or backside. Both individually and in small groups, students visited the landfill that receives Penn State's trash, journeyed to the open pit mines that provide Penn State's coal, and walked through the well fields supplying the campus with water. They looked into dumpsters to see what Penn State people were throwing away, traced the sources of the food served in university dining halls, studied land transactions at the county deeds office, conducted botanical surveys of the campus grounds, and much more.

Rather than sitting in classrooms and talking about the state of the environment, these students were engaging in face-to-face interactions with Penn State's complex and often invisible support systems and the people responsible for running them. As they conducted their investigations, they realized that many of the ways in which the university relies on the environment are hidden from view. Hence, as a team, we decided to center the first phase of our work around the theme of "making the University's invisible ecological dependencies visible." We thought that a good way to do this would be through personal stories (see the box).

Using Sustainability Indicators

The stories, like Amy's, were a useful starting point for looking at Penn State through the lens of sustainability, but something more comprehensive was needed. It took our team a while to figure out what that would be. One day while I was walking past Old Main at the heart of the Penn State campus, it struck me that universities are like entire societies in miniature—they have their food system, their energy system, their water system, their transportation system, and so forth (figure 1.1). If we could develop markers, or indicators, of sustainability for each of the university's subsystems, then we could gauge the ecological health of the university.

Our team soon discovered that we were not alone in our quest for sustainability indicators. Governments, organizations, and cities around the world are beginning to develop ways of tracking their progress toward sustainability. We were particularly inspired by a report that described how citizens in the city of Seattle had agreed on forty indicators of sustainability <www.sustainableseattle.org>.

As our work became more focused, more people began coming to our meetings and planning sessions. Several dozen Penn Staters participated

Amy's Dorm Room

When Amy Balog was a Penn State junior, she wanted to know how much coal she and the other students in their dorm, Beaver Hall, were consuming each day as they flicked their lights and computers and stereos on. She began knocking on doors and asking fellow students if she could count the number of plug-in devices in their rooms. She found that a typical dorm room had twelve plug-in devices: micro-fridge, television, VCR, computer, printer, alarm clock, CD player/radio, answering machine, video game unit, and several lamps. Some rooms had as many as 19 plug-ins.

Amy then administered a questionnaire to gauge the number of hours that the various plug-ins were in use each day. Next, she used a watt meter to measure the energy consumption for each category of plug-in. Crunching the numbers, she determined that, on average, 10 kilowatts of electricity—or 8 pounds of coal—were used to supply the daily electricity needs of each dorm room. Scaling up to the entire dorm, Amy estimated that a little more than a ton of coal is required to supply Beaver Hall's total electricity needs each day. The burning of this coal releases about 3 tons of the greenhouse gas carbon dioxide to the atmosphere.

As students considered the implications of Amy's findings, they discussed ways of making this invisible connection—between electricity use and fossil fuel consumption—visible. One student suggested that an 8-pound chunk of coal be placed on all dorm room desks and a ton of coal set by the entrance to all dorms.

in defining the sustainability indicators. We began this process by defining best or sustainable practices for each university subsystem. For example, we concluded that a sustainable energy system should be based on renewable energy and be highly efficient and nonpolluting. Hence, our energy indicators measured if Penn State's energy system was becoming less dependent on fossil fuels, less wasteful, and less polluting over time.

In all, we developed thirty-three indicators for gauging sustainability <www.bio.psu.edu/greendestiny>. Guided by these indicators, we scrutinized Penn State's policies and performance in water conservation, recycling, purchasing, landscaping, energy use, building design, and research ethics. We critically evaluated the food and transportation systems and asked if the university was moving in a sustainable direction. We checked to see if Penn State's institutional power was being used to strengthen regional economies and promote corporate responsibility, and much more.

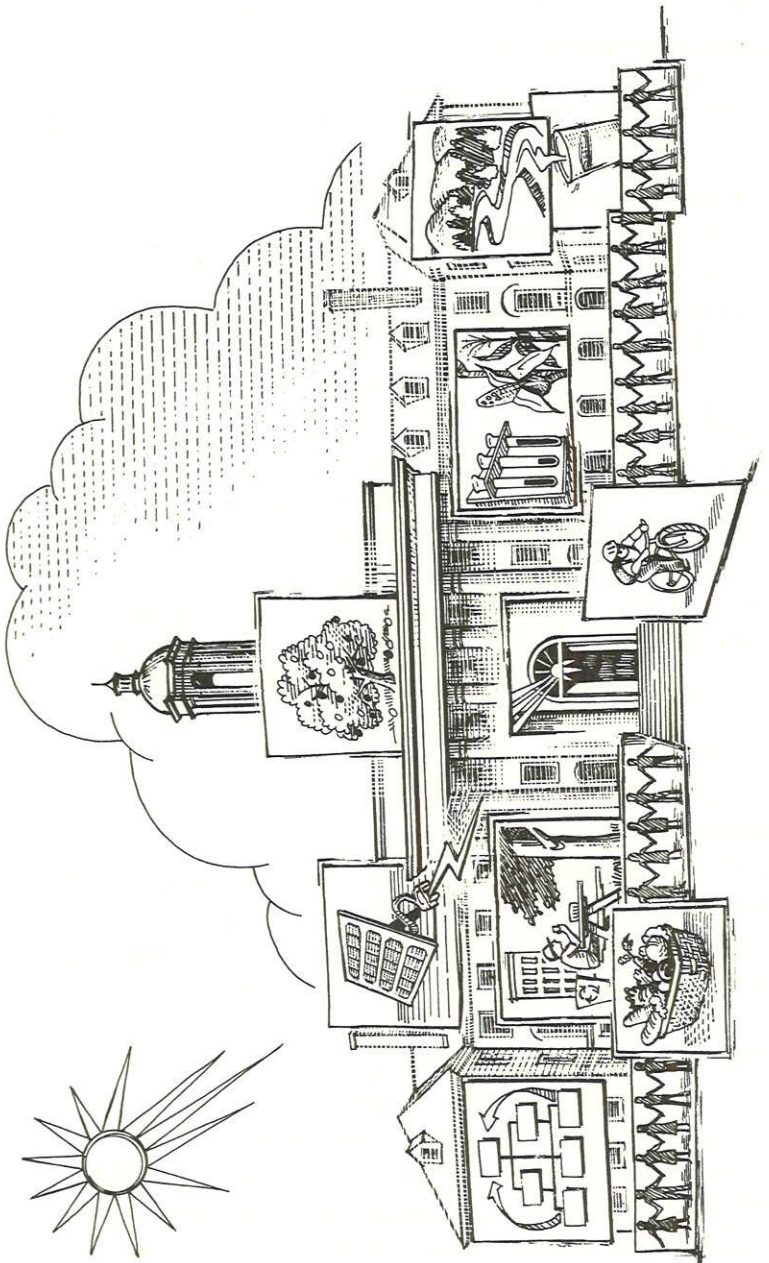

Figure 1.1
Drawing of Old Main showing the various university subsystems

Students did most of the initial work. They picked an indicator that they were interested in and developed a plan of study. Sometimes these were independent study projects undertaken for credit with faculty guidance; sometimes they were part of the content of an environmentally oriented course.

In most cases, the data for the indicators already existed but had never been used to assess sustainability. For example, by studying a sequence of preexisting university maps, a Penn State senior, Nate Hersh, determined that the proportion of green space covered by impervious surfaces on campus increased by 50 percent between 1970 and 2000.

Often the data for the various indicators could be plotted, and, depending on the trends over time, indicated a movement toward or away from sustainability. For example, total waste production increased by over 20 percent at Penn State between 1989 and 1999 (more than two times the increase in the Penn State population for the same period).

Early on in this indicators study, I had a meeting with the university provost to tell him about our project. He listened attentively while I described the various sustainability indicators we were using. When I finished, he expressed support but cautioned against using qualitative indicators, saying that the inclusion of such indicators would compromise the rigor of the work. His words affected me deeply. As a scientist, rigor is important to me. I know that my colleagues are quick to denigrate qualitative inquiry, often characterizing it as soft or fluffy.

It was tempting to follow the provost's counsel and define sustainability in strictly biophysical terms, as many have done. But this would have meant restricting our work to an auditing exercise. In the end, our team decided against this approach because we felt that a significant part of what is important and worthy of attention in life cannot be expressed in numbers. Indeed, sustainability is about much more than millions of Btus saved or tons of paper recycled. It is a heartfelt way of looking at the world that encompasses mindfulness of place, respect for natural processes, discernment of true needs, honesty, and civic responsibility.

By including qualitative indicators, we have been able to raise questions that get at the soul of sustainability. For example, we thought that it was important to pay attention to the effects of technology on sustainability so we created an indicator called "Technology: Enhancing vs. Undermining Community?" In our analysis for this indicator, we pro-

vided data but also invited the university community to reflect on technology's problematic aspects (see the box).

The first Penn State Indicators Report, released in 1998, depicted an institution whose performance, measured by sustainability indicators, was not exemplary. In category after category (energy, food, materials, transportation, building, decision making), Penn State practices departed little from the national status quo. The university's official posture appeared to be in accord with the national view that we can continue with business as usual—growing and consuming—without worry. And yet in private conversation, people in all sectors of the university were concerned about the deterioration of the environment worldwide and overconsumption in the United States, in particular.

Using ecological indicators to give the university a report card was unsettling to some Penn State administrators. After all, they did not commission this study, and there was legitimate concern that our findings might tarnish the image of the university. Indeed, we were tempted to assume a highly critical posture because the university's environmental performance was lackluster in many areas. In the end, though, we decided against a highly confrontational posture because we came to see that our goal was not to win arguments but to effect long-term change.

Can Some Technologies Undermine Community?

The choice to adopt a technology to do something that we previously did on our own is not always trivial. Consider Penn State's decision to replace the hand rake with the leaf blower. The leaf blower technology has certain characteristics and affirms certain values. When we use it, we are opting for a fast (machine) pace rather than a natural pace, noise rather than quiet, polluted air rather than clean air, and so forth. These things—fast pace, polluted air, and noise—can have a negative effect on the frequency and quality of our social interactions (i.e., the quality of community life). Leaf blowers are an obvious case, but almost all of the technologies (answering machines, computers, motor vehicles, televisions) that we have adopted over the last century have the potential to affect the quality of our community life for better or worse. So far, we at Penn State have been disinclined to critically examine the possible negative effects of our myriad technologies on the quality of community life <www.bio.psu.edu/greendestiny>.

Nonetheless, sometimes our ardor and insistence on transparency caused problems for us. After all, it takes a good deal of ideological commitment to sustain such an effort, and the same ideological commitment caused us, at least initially, to say what we felt was right, regardless of the political consequences. For example, we made the mistake of sharing the first draft of the report, which did not mince words, with a top administrator. He was clearly perturbed and complained that the report was excessively negative. This created a testy climate that took a long time to overcome. From that point on, we attempted to cite the positive things that the university was doing while also making the university's shortcomings transparent.

We gradually learned that each organization has its own change model, its particular way of changing. At Penn State, significant ideological shifts are effected very slowly. The way to change things is with persistence, not insistence. Showing how problems are actually opportunities creates a dynamic tension that is pregnant with energy and excitement.

As we prepared to release the first Indicators Report we invited university leaders (e.g., deans, department heads, unit heads) to supply written endorsements in an effort to create a positive buzz around the report. The associate dean of liberal arts had this to say: "This report is a demonstration of the kind of exciting and relevant learning that can take place when students and faculty work collaboratively. The sustainability project demanded methodological rigor and an interdisciplinary, integrated systems approach to the problem. But it also required the participants to grapple with ethical and moral questions involving distributional justice and the responsibility of the University to society. Penn State should be proud of the result." These endorsements were included on the front and back covers of the report and in the announcements heralding the report's release.

The report was formally released to the university in a large open-air public ceremony on the steps of Old Main. Copies were sent to all department and unit heads. Leaders from various sectors of the university's Office of Physical Plant (the energy czar, the head of landscaping, the chief of waste management, the transportation coordinator, and others) were on hand to receive copies of the report. They were the unsung heroes of this effort because they and their staff had spent immense

amounts of time tracking down data, talking with students, and checking over early drafts of the report for accuracy.

After the report's release, some faculty members from across the university—in agriculture, engineering, landscape architecture, ecology, political science, and communications—voluntarily began to use the entire report or parts of it to teach about sustainable practices, environmental ethics, place-based research, rhetoric, citizenship, and so forth.

An important general lesson of this sustainability indicators work is that institutions measure only what is important to them. And there is nothing more important for humanity's future than moving forthrightly from practices that harm the earth to practices that are sustainable. This means it is time to measure sustainability not just in universities, but in all realms of society—government, business, education, religious institutions. Sustainability is a whole new way of seeing and relating to the world, and the act of measuring it legitimizes it.

Our sustainability group experienced a sense of satisfaction in the fall of 1998 after releasing the Indicators Report. We were in the news. Reporters were calling us from all over the East. Pennsylvania's Department of Environmental Protection was requesting a box full of the reports to distribute to their personnel, and students and faculty from dozens of universities were contacting us to request copies of the report. Penn State's president asked that a copy of the report be sent to all members of the board of trustees, and he was passing the report on to his vice presidents, instructing them to study its recommendations. With all this activity, it was tempting to imagine that our work was finished. After all, the report clearly documented the gaping sustainability deficit at Penn State and prescribed thirty concrete steps that Penn State needed to take to erase this deficit.

But six months after the report's release, very little had ostensibly changed. Reluctantly, we acknowledged that the Indicators Report, by itself did not have the power to transform Penn State into a sustainable university. Nevertheless, it provided the language to begin to talk about sustainable practices at Penn State. As with any other attempt to change the status quo, persistence would be essential.

Up to this point, we were just a couple dozen university folks (mostly students) who had come together around a common concern. We eschewed formal membership, a constitution, rules, or official university

standing and in this way avoided many of the problems that institutionalization and bureaucratization might have created. It was our allegiance to sustainability and our desire to transform PSU to "Pennsylvania's Sustainable University" that united us. Although our internal structure was very open and informal, we did establish a Web site, and when the occasion demanded, we were ready to portray ourselves with formality.

We also spent a long time coming up with a name for ourselves. Names matter a lot. When the folks in Seattle hit on "Sustainable Seattle" for their fledgling group, they must have known that they had a winner: the name of their town plus the name of their mission, linked by alliteration.

After trying out lots of possibilities for our group, we finally hit on "The Green Destiny Council." This name was inspired by Penn State's multiyear $1 billion fund-raising effort dubbed "Grand Destiny." By substituting the word *green* for *grand,* we signaled that ours was a group concerned with ecology and the environment; by playing off "Grand Destiny," we had a name that people would remember (especially decision makers); and by using the word *council,* we conveyed the egalitarian character of our organization.

One year after the release of the first Indicators Report, we made a commitment to release an updated and expanded version of the report in the year 2000. This allowed us to keep the university's environmental performance in the spotlight.

Developing an Ecological Mission for the University

In the period following the release of the first Indicators Report in 1998, the big question before our group was, "What's next?" Toward the end of one of our Friday afternoon meetings, a faculty member said, "What we really need to do is institutionalize sustainability." A student asked, "How would we do that?" After a long silence, the faculty member responded, "We could do it by making sustainability central to Penn State's mission." Immediately, there was ripple of excitement; this was an idea that offered us traction.

A small group (myself and two students) spent three months drafting Penn State's ecological mission. On the face of it, this seemed ludicrous—two students and a professor drafting the university's ecological mission:

we had no vested authority to do this. But we had learned that we did not need to wait for permission; we could just begin the process.

We called the mission document, "Green Destiny: Penn State's Emerging Ecological Mission" <www.bio.psu.edu/greendestiny> to signal that we were working as midwives to birth a mission for the University. Each of the document's eight core pages proposed a facet of the new ecological mission (see the box).

We knew that it wouldn't work for us simply to declare what we thought the university's ecological mission ought to be. We would have to open up the process and cultivate support, especially among faculty and staff in positions of leadership. In other words, we would have to schmooze.

I began the schmoozing process with personal phone calls to every department head, dean, assistant dean, unit head, and facilities chief on campus—almost 150 leaders. The conversations typically went something like this:

"Hi, Joe. This is Chris Uhl over in Biology."

"Hi, Chris."

"Listen, Joe, I don't think we have met, but I wonder if I could ask your help with something. It has to do with Penn State."

"Sure. What is it?"

"Well, I have been working with a group called Green Destiny Council—you know the folks that released the Penn State Indicators Report a while back."

Green Destiny's "Emerging Ecological Mission" for Penn State

Energy:	Move Toward Fossil Fuel Independence
Water:	End Water Waste
Materials:	Become a Zero-Waste University
Food:	Eat Foods Produced Sustainably
Land:	Create and Abide by a Land Ethic
Transportation:	Promote Alternatives to Car Transit
Built Environment:	Create "Green" Buildings
Community:	Guarantee Ecological Literacy

"Yeah, right. I recall hearing something about that."

"Well, as a follow-up, Green Destiny has put together a much shorter document that attempts to lay out an ecological mission for Penn State. Do you follow?"

"Yeah, I'm with you."

"Joe, I have never been involved in drafting a mission, and this is where I need your help. I wonder if you would look over what we have put together and perhaps comment on it?"

"Sure, Chris. Send it over."

The mission document that the 150 leaders (including all top administrators) received was eye-catching. There was a cover letter with a formal Green Destiny letterhead, and the cover of the document had a color photograph of the Earth along with the Penn State official logo, and a red silk ribbon. On the last page, we asked reviewers to place a check next to each mission element indicating their stance: "support," "don't support," or "undecided." We also encouraged reviewers to include specific reactions to any or all of the mission components.

Support ran high (over 70 percent) for all eight of the mission elements. The second most frequent response was "undecided." The "don't support" response was less than 10 percent in all cases. We modified the language to address what we judged to be legitimate concerns and then summarized the results and sent a short report back to all the leaders. Then we called a meeting with the provost. He expressed genuine support for Green Destiny's mission document and encouraged us to take it to the faculty senate for endorsement.

Meanwhile, the Office of the Physical Plant issued a fifteen-page, generally positive, critique of the Green Destiny's ecological mission proposal, and Penn State's president was beginning to mention sustainability in public. It was also at about this time that *Penn State Research*, a university publication that is sent out to approximately fifty thousand alumni, carried an article about Green Destiny's Sustainability Indicators initiative.

After spending six months in committee and undergoing minor language modifications, Green Destiny's Ecological Mission statement was put to a vote before Penn State's faculty senate and approved unanimously. Next, it went to the president's desk. He quickly added his approval.

After four years of persistence, Penn State now had a comprehensive set of sustainability indicators telling it where it stood and an ecological mission telling it where it needed to go.

After the faculty senate and the Penn State president endorsed Green Destiny's Ecological Mission proposal, we again asked ourselves, "What's next?" It seemed that the time had come to figure out a way to put the lofty ideals and good intentions embodied in Penn State's ecological mission into concrete actions. Specifically, we asked ourselves, "How could we create a detailed blueprint for sustainable practices at Penn State?"

Sustainable Practices: The Mueller Report

Blueprint work is nuts-and-bolts technical stuff; it concerns heating and cooling systems, the design of urinals, the margin settings on printers, the volatile organic compounds in paints, and so forth. One afternoon when we were discussing this, a faculty member said, "These details are pretty boring, but if it was my own house, I'd be interested." We were sitting in the Penn State Biology building, Mueller Lab, at the time. Suddenly I realized that we could create a sustainability blueprint for the very building that we were in.

At the time of these discussions (September 2000), I was teaching a five-credit ecology course in the biology building. It had been my custom to devote the last six weeks of this course to what I called "the ecology in action" project. Instantly I knew I had my action project for the semester. I would give these biology students, with their concern for the complexity and intricacy of life systems, the opportunity to join their knowledge of life with actions in their "home" building that respect and nurture life.

When it came time to initiate this project in early November, I told the twenty students in the class that their assignment was to cut the ecological impact of the Mueller building in half while creating healthier working conditions for all Mueller occupants."

Students began by considering all the inputs to the building: electricity, steam, paper, computers, printers, toners, furniture, carpeting, paints, cleaners, pesticides, coffee, and so forth. Each student took one input and determined (1) Mueller's annual consumption for that item, (2) the environmental impacts of this consumption, and (3) alternatives that would significantly reduce ecological impacts.

They set to work examining the records in the Mueller purchasing department, conducting inventories of the computers and printers in the building, characterizing the floor coverings and the lighting technologies, interviewing the janitorial staff, and so on. They also searched the library and the Web for examples of ecologically benign approaches to carpeting, computing, paper production, and so forth. On the final day of class, they presented their findings to representatives from Mueller, as well as staff from the university's Office of the Physical Plant. Although the students were not able to do an exhaustive analysis, they did a fine job of gathering data and presenting preliminary results.

Next, a new team composed of four recent Penn State graduates, a Ph.D. graduate student in engineering, and myself went to work fleshing out the analysis. Five months later, we had a solid document, which we entitled, The Mueller Report: Going Beyond Sustainability Indicators to Sustainability Action." This report <www.bio.psu.edu/greendestiny> offered the university a blueprint for halving the ecological impacts of its current building stock. The box provides an abbreviated excerpt (stripped of accompanying tables, calculations, and footnotes) that captures a taste of the report's breadth and analytical approach.

In the process of conducting the Mueller study, we learned that the lion's share of the building's ecological footprint was in energy consumption. Indeed, this building requires more than 2,200 tons of coal per year for its operations, the burning of which releases over 5,750 tons of carbon dioxide. On a per capita basis, the numbers are sobering: 18 tons of coal and 47 tons of carbon dioxide per person (123 building residents) per year. We determined that Mueller's energy consumption could be reduced by half—for example, by switching to energy-efficient computers, printers, and lighting fixtures and by subjecting Mueller's heating, ventilation, and air-conditioning system to a comprehensive tune-up. These changes would save approximately $50,000 annually. When scaled to the entire university, potential cash savings from Mueller-style energy-efficiency retrofit are in the vicinity of $10 million. <www.bio.psu.edu/greendestiny>.

In addition to energy analyses, we detailed ways of significantly reducing Mueller's waste associated with the use of water, transparencies, diskettes, printer cartridges, computers, carpeting, and furniture. We also drafted model policies for all Mueller materials. For example, the proposed carpet policy reads as follows:

Mueller Paper

The 123 faculty and staff occupying the Mueller Building consume, collectively, 5.3 tons of chlorine-bleached, 0 percent post-consumer-content paper each year. Mueller's paper comes from Willamette Industry's paper plant in Johnsonburg, PA. In 1998 that plant released 338 tons of pollutants, including 61 tons of sulfuric acid and 148 tons of hydrochloric acid.

Mueller could significantly reduce its paper "footprint," first, by purchasing 100 percent post-consumer-content paper that is chlorine free; and, second, by more fully utilizing the paper that it purchases. At present, Mueller documents are often printed without considering how font size, margin width, and line-spacing decisions affect paper needs. Paying attention to these "details" can dramatically reduce paper consumption. For example, a hundred-page "standard" print job (i.e., 12-point font, standard margins, double spaced, one-sided) can easily be reduced to less than 20 pages by reducing font size to 10-point, extending top, bottom, and side margins to 0.75", and using single spacing and 2-sided printing.

By buying 100 percent post-consumer recycled paper and fully using that paper, Mueller could reduce its annual paper use by two-thirds, from just over 1 million sheets to approximately 300,000 sheets. Expressed on a per capita basis, a Mueller occupant adopting "best" paper practices would decrease his/her paper consumption from over 8,000 to approximately 2,700 sheets, and, in so doing, save over 555 gallons of water, about 360 kWh of electricity, approximately 2,650 square feet of forest land, and almost 800 pounds of CO_2 emissions. Moreover, although recycled paper costs more per sheet, the potential reduction in paper use could reduce per capita paper expenditures by $25 per year.

Adopting even the most simple paper conserving strategies at the scale of the entire University could result in significant monetary savings. For example, if Penn State was to change standard computer/printer margin settings to 0.75" on all sides (making 19 percent more area available on each text page), the University would reduce annual paper consumption by 45,000 reams and save $123,000 each year <www.bio.psu.edu/green destiny>.

Mueller Laboratory, through its strong commitment to environmental stewardship, seeks to reduce the environmental impact of its carpet use. In order to accomplish this objective, the following steps will be taken during the procurement and disposal of carpeting:

- Give preference to pre-existing tile rather than carpet.
- Purchase carpets having 100 percent post-consumer recycled content and solution or vegetable dyed fibers.
- Purchase modular, as opposed to broadloom, carpet to the extent that the quality and end-use of the floor covering remains uncompromised.

- Purchase carpets and adhesives having the lowest VOC level available.
- Lease carpet from Interface Inc. or a similar company, or send old carpet to a recycling center.

Detailed policies like this are essential for creating a sustainability blueprint. Indeed, policies are what give an ecological mission its traction.

Although the Mueller Report was ostensibly about how to reduce the ecological impacts of the university's campus building stock, the broader message was that the campus buildings squander massive amounts of energy and money. These buildings were constructed at a time when most people imagined that U.S. supplies of energy were nearly inexhaustible and almost no one had made the connection between fossil fuel use and climate disruption. We live in a different time. We know much more, which means that we need to do much more. By employing green design technologies, it is now possible to achieve eight- to ten-fold reductions in energy use. For example, the Commonwealth of Pennsylvania has just completed an office building in Cambria County that uses only one-eighth as much energy per square foot for heating and cooling as the Mueller building requires.

Prior to the release of the Mueller Report, we asked twenty respected university leaders to review and comment on it. All endorsed the report with enthusiasm. A professor from landscape architecture had this to say: "My hope for this report is that it's read from cover to cover by all Penn State students, faculty and administrators. Why? Because so many of us learn, work and live in wasteful, ugly and in many ways 'unwell' environments. With meticulous investigation and spirited reason, this report shows how a single, rather mundane building—and an entire campus—can be revitalized for the 21st century."

In October 2001, Green Destiny Council released the Mueller Report to the university in a public ceremony. University officials from the Office of the Physical Plant, who had played a key role in providing and interpreting data, were on hand to formally receive the report.

After the report's release, we moved quickly to set up meetings with key decision makers (e.g., the chair of biology, vice president for business and finance, head of university operations). Receptivity was high. Everyone likes win-win situations, and the report was being seen in this light. The Office of the Physical Plant announced its readiness to institute the suite of energy recommendations necessary to reduce Mueller's energy consumption dramatically.

During this same period (2001) and in part as a result of Green Destiny's efforts, Penn State released its first Environmental Stewardship Strategy. As noted on the university Web page <www.psu.edu/oldmain/fab/dstrat/strategy8.htm>, "The Environmental Stewardship Strategy was created to identify specific actions and objectives aimed at conducting the University's business in a manner that demonstrates a commitment to environmental stewardship." The strategy articulates principles of environmental stewardship in the realm of (1) responsible purchasing, (2) efficient use and conservation of energy, water, and other resources, (3) minimization of solid waste production, (4) minimization of hazardous and toxic materials on campus, and (5) environmentally responsible campus design. For example, regarding responsible purchasing, the strategy commits to making environmentally and fiscally responsible purchasing choices that consider life cycle costs, energy use, and long-term disposal implications. To this end, the strategy "encourages obtaining goods that minimize waste products, have high recycled content, use environmental production methodologies, demonstrate maximum durability or biodegradability, repairability, energy-efficiency, non-toxicity, and recyclability."

The strategy contains specific actions that the university is now taking within designated time frames:

- Join the Energy Star Buildings Program by March 2001 (completed).
- Acquire and evaluate the use of waterless urinals by July 2002 (completed).
- Evaluate the purchase of a portion of electric load from renewable energy sources by July 2002 (completed).
- Identify products that can be returned to the manufacturer at the end of their useful life for reuse or recycling by July 2002 (completed).
- Develop or Integrated Pest Management policy by July 2001 (completed).
- Design new facilities using Leadership in Energy and Environmental Design (LEED) criteria to achieve LEED certification of every major campus project (in process).

At long last, Penn State is beginning to operationalize sustainable practices. It is a small but important beginning. Our Green Destiny Council will continue to raise the bar . . . with persistence, not insistence.

Conclusion

Over the years that I have been working on sustainability issues, I have come to understand that sustainability is a social change movement. In this context, Green Destiny's work has really been about alerting Penn State to a problem, as well as an opportunity, and encouraging the university on to a new path. Our success, to the extent that we have had any, has been hinged to our understanding of power and the process of social change and our use of an array of tools and strategies.

As with any other change movement, we have met resistance. At first, the university's administrators assured us that Penn State was already "doing all this environmental stuff"—in other words, everything was under control, and we did not need to worry. This is the way most institutions respond to the prospect of change.

Given the culture of our institution, we needed numbers, indicators, and benchmarks to begin the awakening process. As is true of all social change movements, we also needed trigger events to heighten awareness about the problem and the opportunities. The fanfare we were able to create around the public release of our various reports has served this function.

Now, after five years of persistent effort, it appears that the Penn State population and administration recognize the importance of instituting sustainable practices. Indeed, I smiled when I received a recent note from our president in which he wrote, "I appreciate your efforts to enhance Penn State's sustainability efforts." What I especially liked about this sentence was not the president's sentiment of gratitude but his phrasing: "Penn State's sustainability efforts." You know you are making progress in a social change movement when the target of your efforts begins to assume ownership of the very goals and ideals you have been endeavoring to promote.