

PROCESS AND PRACTICE: CREATING THE SUSTAINABLE UNIVERSITY

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I. INTRODUCTION

When I first began teaching Environmental Science at Penn State, 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 weren't, 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 rainforest. 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% of our forest intact. You guys in the States have already cut 95% 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 the 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" which 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 on money, acquisition, and instant gratification—is colonizing the psyches of the world's people. The U.S. is the model and right now the United States' compass points the entire world toward a non-sustainable future. But the U.S. 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—namely: 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 didn't 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 of indicators which 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, in turn, 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.

In this paper, I will use our experience at Penn State to illustrate this three-step process of developing sustainability indicators, then a mission, and finally sustainable practices.

II. MEASURING SUSTAINABILITY: DEVELOPING 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 didn't 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--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 talking about the state of the environment, these students were able to engage 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 Box).

Amy's Dorm Room

When Amy was a Penn State junior, she wanted to know how much coal she and the other students in Beaver Hall were consuming each day as they flicked their lights and computers and stereos on. So 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 12 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 eight 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 three 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 eight-pound chunk of coal be placed on all dorm room desks and a ton of coal set by the entrance to all dorms.

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. Then, one day, while 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 (Fig. 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.

Fig. Drawing of Old Main showing the various University subsystems. SEE www.bio.psu.edu/greendestiny for a copy of this figure.

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 40 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 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 non-polluting. 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 33 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 Penn State's 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.

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 pre-existing University maps, Nate determined that the proportion of green space covered by impervious surfaces on campus had increased by 50% between 1970 to 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% 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 our 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 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 which 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 provided data but we also invited the University community to reflect on technology's problematic aspects (See Box)

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 the University'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 fast (machine) pace rather

than natural pace, noise rather than quiet, polluted air rather than clean air, and so forth. Of course, these things--fast pace, polluted air and noise--can negatively affect the frequency and quality of our social interactions (i.e., the quality of community life). Leaf blowers are an obvious case--but if we think about it--almost all of the technologies (answering machines, computers, motor vehicles, televisions, etc.) that we have adopted at PSU in recent decades 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).

The first Penn State Indicators Report, released in 1998, depicted an institution whose performance, measured by sustainability indicators, was not exemplary. For 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 over consumption in the United State, in particular.

Using ecological indicators to give the University a "report card" was unsettling to some Penn State administrators. After all, they didn't 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 wasn't to win arguments but to effect long-term change.

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 didn't mince words, with a top administrator. He complained that the Report was excessively negative. This created an adversarial 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 you change things is with persistence, not insistence; you do it by showing how problems are actually opportunities; you create a dynamic tension which 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 first Indicators Report was formally released to the University in a large open-air public ceremony on the steps of Old Main in September, 1998. Copies were sent to all department and unit heads. Leaders from various sectors of the University's Office of Physical Plant (e.g., the energy czar, the head of landscaping, the chief of waste management, the transportation coordinator, etc.) 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 thereof 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 only measure what is important to them. Of course, 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, church. Sustainability is, after all, a whole new way of seeing and relating to the world and just the act of measuring it legitimizes it.

III. INSTITUTIONALIZING SUSTAINABILITY

I remember the sense of satisfaction our sustainability group experienced 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 requesting copies of the Report. Meanwhile, Penn State's President requested that a copy of the Report be sent to all the 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, didn't have the power to transform Penn State into a sustainable university, but it did, at least, provide the language to begin to talk about sustainable practices at Penn State. As with any 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 website, 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. Indeed, 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 multi-year one-billion dollar 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 Indicator Report's 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." Then 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) went into hibernation for three months to draft Penn State's ecological mission. On the one hand, 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 didn't 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 Box).

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

We knew, of course, that it wouldn't work for us to simply 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, facilities chief on campus. At Penn State this comes to almost one-hundred and fifty leaders. The conversation 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?

-Yea, 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?

-Yea, 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 "Joe" and the other 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--e.g., "support", "don't support" or "undecided". We also encouraged reviewers to include specific reactions to any/all of the mission components.

Support ran high (>70%) for all eight of the mission elements. The second most frequent response was "undecided". The "don't support" response was less than 10% 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 to 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.

At last, 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.

IV. MAKING SUSTAINABILITY A REALITY: OFFERING A BLUEPRINT

After the Faculty Senate and Penn State President endorsed Green Destiny's Ecological Mission proposal, we again asked ourselves, "What's next?" It seemed like 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?"

The Mueller Report

"Blueprint" work is "nuts and bolts" technical stuff--e.g., it's about 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 in the midst of 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 which 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 (i.e., "footprint") 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 (e.g., electricity, steam, paper, computers, printers, toners, furniture, carpeting, paints, cleaners, pesticides, coffee, etc.). 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 weren't 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 Mueller Report (www.bio.psu.edu/greendestiny) offered the University a blueprint for halving the ecological impacts of its current building stock. In the box below we offer an abbreviated excerpt (stripped of accompanying tables, calculations, and footnotes) which offers a taste of the Report's breadth and analytical approach.

Mueller Paper

The 123 faculty and staff occupying the Mueller Building consume, collectively, 5.3 tons of chlorine-bleached, 0% 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% 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% 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 CO₂ emissions. Moreover, although recycled paper costs more per sheet, the potential reduction in paper use could reduce per capita paper expenditures by \$25/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% 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/greendestiny).

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 (n = 123 building residents) per year. However, we determined that Mueller's energy consumption could be reduced by half [e.g., by switching to energy-efficient computers, printers, lighting fixtures, etc. and by subjecting Mueller's Heating Ventilation and Air Conditioning (HVAC) system to a comprehensive "tune-up"]. These changes would save approximately \$50,000/year. When scaled to the entire University, potential cash savings from Mueller-style energy-efficiency retrofit are in the vicinity of ten million dollars. (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 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% 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 current building stock, the broader message was that current buildings on the Penn State campus 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 when almost no one had made the connection between fossil fuel use and climate disruption. Now we live in a different time. We know much more which means that we need to do much more. Now, by employing green design technologies, it is possible to achieve eight to ten-fold reductions in energy use. For example, the State 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 of these reviewers 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., 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 dramatically reduce Mueller's energy consumption.

During this same period (2001), and, in part, as a result of Green Destiny's efforts, Penn State's released its first-ever Environmental Stewardship Strategy. As noted on the University webpage (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, in the realm of 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 University is now taking within designated time frames:

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

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

V. 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 change movement, we have met resistance. At first, the University's administrators assured us that Penn State was already "doing all this environmental stuff"--i.e., everything was under control and we didn't need to worry ourselves. This, of course, 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 "trigger" 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 had to smile 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.