# GREEN DESTINY

# PENN STATE'S EMERGING ECOLOGICAL MISSION

# PART I. THE SUSTAINABILITY CHALLENGE AT PENN STATE

Currently, while universities teach their students that the vital signs of the Earth are in decline, graduates continue to leave college to begin lives that generally contribute to, rather than mitigate, the growing array of environmental and social problems now plaguing us. Unless a great change occurs, by the time today's university graduates are middle-aged, the Earth's human population will have expanded by one-third and resource use as well as waste production may well have doubled--all this on a planet which is already groaning under the weight of the human enterprise. It is clear that humans still face the challenge of learning how to live in a manner that does not endanger the Earth. We believe that universities are in a unique position to address this challenge.

Because their mission is one of education, some may seek to excuse our colleges and universities from the call to embrace an expanded mission grounded in solutions to the ecological and social challenges of our times. But what is education for, if not to play a fundamental role in how our society moves forward in meeting its many challenges? As David Orr sees the problem, "The planetary emergency unfolding around us is, first and foremost . . .a crisis of thought, values, perceptions, ideas and judgments. In other words, it is a crisis of mind, which makes it a crisis of those institutions which purport to improve minds." Not only do universities educate our citizenry with interdisciplinary knowledge, they are also large, prestigious and influential institutions in their own right, capable of having large impacts themselves on the environment as well as an influence upon the local and global community.

The challenge faced by humankind will require a rethinking of values and a re-educating of our citizenry in many aspects of our society's way of life. We therefore contend that the time has come for the concept of *sustainability* --meeting present needs without compromising the ability of future generations to meet their needs--to become a new central organizing idea for higher education.[1]

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1 Fortunately, university leaders are beginning to recognize the importance of promoting sustainable practices. A recent report by the Association of Governing Boards of Universities and Colleges listed "creating a sustainable society and future" among the top public policy issues for higher education.

## Tracking Sustainability at Penn State

As a society we measure what we value. At Penn State we have traditionally placed special attention on our academic, research, and economic performance, while rarely concerning ourselves with our ecological performance. This is changing. Starting in 1996, a team of Penn State faculty, staff, and students began to collect data and develop indicators to gauge the ecological well-being of Penn State. In September, 1998, the team released the Penn State Indicators Report (www.bio.psu.edu/indicators), an examination of Penn State using 34 measures of sustainability.

How did Penn State do overall? For seven of the 34 indicators the University was clearly moving toward sustainability. But for 21 indicators (almost two thirds of the total) the situation was not sustainable. For the remaining six indicators, more information was needed before a judgment could be reached.

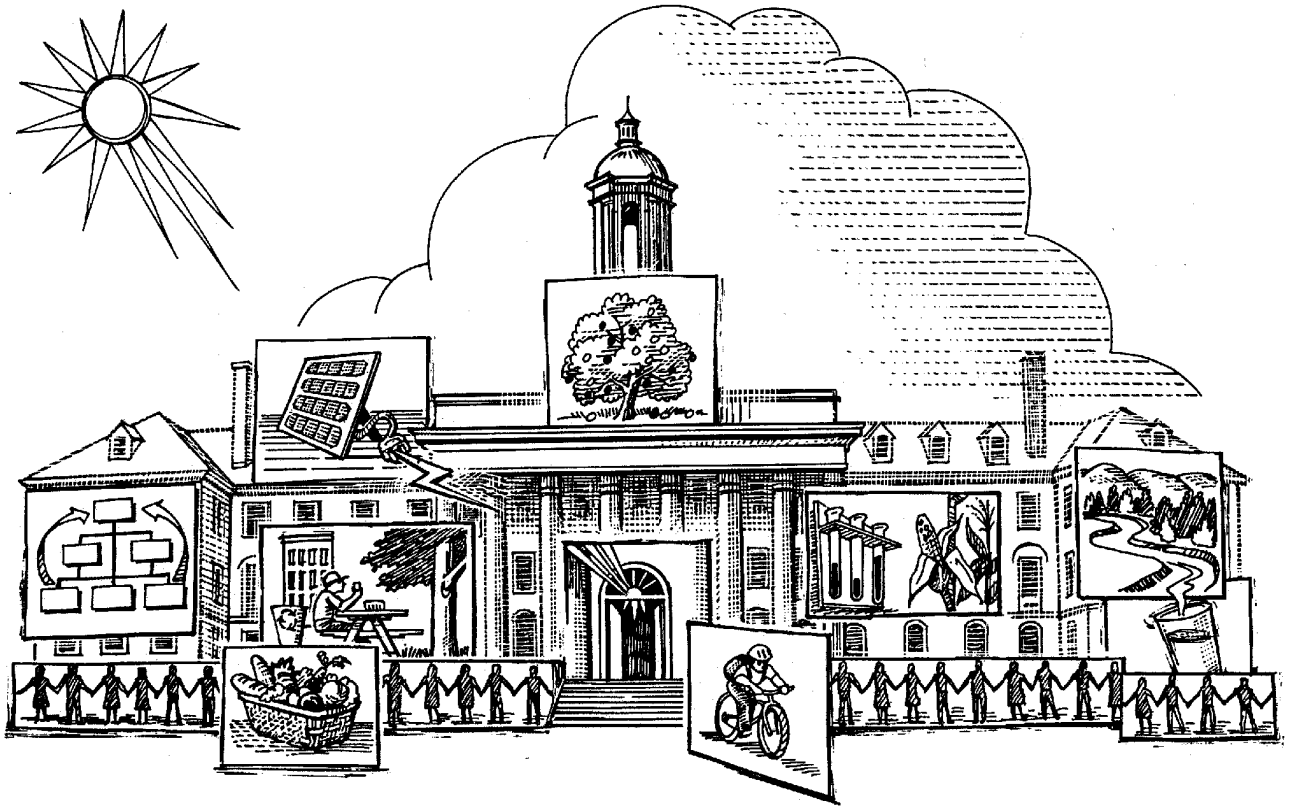
*******A Few Highlights from the Penn State Indicators Report*******

- Students living on campus consume about 60 gallons of water per person per day--40 in showers, 10 in toilet flushing, 3 in the sink, and 7 in clothes washing. They seldom drink water.
- Members of the University Park community (i.e., students, faculty and staff) consume, on average, about 7,000 pounds of coal per person per year, resulting in the emissions of about 10 tons of carbon dioxide per person.
- The food consumed in PSU's dining halls often travels more than 1000 miles from the last distribution point to our plates. The amount of energy required to process, package, and ship this food is many times greater than the energy contained in the food itself.
- Members of the University Park community consume, directly or indirectly, about 90 pounds of paper per person per year; a plot of forest measuring about 55 feet on a side is necessary to sustainably supply each of our paper needs.
- Close to half of the "trash" found in Penn State "dumpsters" doesn't need to be hauled more than 100 miles away to a landfill; it fits into categories that are currently recycled at Penn State.
- Each day in their daily commute back and forth from work, Penn State employees travel, collectively, 110,000 miles, and in the process release approximately 26,000 pounds of combustion-related gases into the atmosphere.
- Penn State produces about 240,000 pounds of hazardous and infectious waste each year. This amounts to about seven pounds per year for each full-time student.
- Penn State graduates a high percentage of students who are ecologically illiterate: 72% of

Indicators 2000, an update of the original Indicators Report, will be released in April, 2000. Although the University's performance continues to be lackluster in some areas, there are now many examples of Penn State responding in exciting and substantive ways to the sustainability challenge.

# PART II. SUSTAINABILITY: AN EIGHT-FOLD MISSION

The Penn State Indicators Project has attracted national attention. Rarely has a university sought to forthrightly examine itself through the lens of sustainability. Penn State now has the opportunity to play a pivotal role in leading the way from a wasteful throughput society to a conserving, sustainable society. In charting our path, it is helpful to view our university as composed of eight subsystems. We have "systems" for energy, water, materials, food, land, building, transport, and community (See Diagram).



For each of Penn State's subsystems, there is a giant ecological challenge before us (as explained in the following pages). Facing these challenges leads us to a sustainable future.

## *Subsystem 1:* Energy

## *The Goal:* Significantly Reduce Dependence on Fossil Fuels

***The Problem:*** At present we rely almost exclusively on fossil fuels to meet our energy needs. This is not sustainable. Prior to the Industrial Revolution--before mankind started burning oil, coal and gas--the atmosphere contained approximately 280 parts per million (ppm) carbon dioxide. Now the figure is about 360 ppm and it goes up a bit each year. If we continue on our present path, the air will test out at more than 500 ppm carbon dioxide in the lifetime of our current undergraduates. This matters. Carbon dioxide (and other greenhouse gases) trap heat from the sun that would otherwise radiate back out to space. There is a near consensus among scientists that this trapping is leading to the warming of the earth (IPCC, 1996). Our planet has already heated up by a degree since the beginning of the Industrial Revolution; the oceans that cover most of the planet's surface are clearly rising.

**Green Mountain Power is currently constructing a wind turbine field in**

***What Penn State Can Do:*** In response to this planetary problem, the world's governments have agreed to take steps to reduce greenhouse gas emissions. For example Pennsylvania's Governor Ridge has said: "State government must lead by example. . . We must shift toward sustainable [practices] including a goal of zero emissions achieved through pollution prevention and energy efficiency." Responsible institutions, like Penn State, can set an example for the state and nation by voluntarily reducing their energy use and emissions.[2]

Of course, Penn State cannot achieve significant fossil-fuel reductions in one bold stroke; but we could do it over the coming century in a relentless sequence of "green" steps. The way to begin is by reducing overall energy consumption by 10% by 2010 while increasing the sustainable (renewable) portion of our energy mix to 10% over the same period. How? First, Penn State needs to use energy much more efficiently. There is now little doubt that factor-four increases (many would argue factor-ten increases!) in energy-use efficiency are readily attainable with existing technologies (Hawken et al., 1999).[3] Second, the University needs to be much more creative in its energy purchasing decisions. Penn State pays

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2 Some large corporations provide a model: DuPont s technologists are already working on a plan to cut DuPont's greenhouse gas emissions to less than 50% of 1990 levels long before 2010 (Hawken et al., 1999). Some universities are also beginning to act. For example, Carleton University in Ottawa, Canada, has launched a $20 million energy conservation program that includes the installation of a cogeneration facility and the use of geothermal systems to heat buildings in winter. In addition to reducing greenhouse gas emissions, Carleton s savings are expected to be $2 million a year, allowing the program to pay for its self within 10 years. Moreover, it is possible to add new buildings (as Penn State is now doing) and also reduce energy consumption. For example, the University of Rochester has embarked on a program to reduce energy consumption by more than half without affecting university program delivery. So far Rochester has been successful in reducing energy consumption despite the addition of two new buildings and more intensive use of existing facilities (Pierce, 1992).

3 For example, opportunities exist for energy-efficient approaches to the heating and cooling of University buildings. The use of geothermal heat pumps can lead to significant energy and cost savings (www.eren.doe.gov/). PSU should engineer geothermal supplemental systems into all new buildings.

more than a million dollars a month in electricity bills, and it now has the freedom to choose its own energy provider. The University could begin to purchase a portion of its energy from a "green" supplier; [4] and at the same time use its considerable buying power to coax Allegheny Power to slowly move away from coal and toward less environmentally destructive energy sources (e.g., natural gas).


--Hawken, P., Lovins, A. and Lovins Hunter L. 1999. Natural Capitalism. Little, Brown and Company, Boston.

--IPCC (Intergovernmental Panel on Climate Change), 1996. Climate change: The Scientific Assessment . Cambridge University Press

--McKibben, W. 1998. A Special Moment in History. The Atlantic Monthly. pp. 55-78. May.

--Pierce, M. 1992. Campus Energy Management Programs. In Eagan, D,.J.., and Orr, D. (eds.) The Campus and Environmental Responsibility. Jossey- Bass Publishers, San Francisco, CA.


4 Public institutions have an important role to play in ushering in a future based on sustainable energy. In California, government agencies are now the largest buyers of energy from renewable energy suppliers (www.eren.doe.gov/).

## *Subsystem 2:* Water

### *The Goal:* End Water Waste.

***The Problem:*** More than half of the earth's renewable water resources are already being used by humans. Indeed, limited water availability might ultimately put a cap on the earth's carrying capacity for humans (Cohen, 1995). The quality of our water supplies is also a concern: Clean water is no longer part of our birthright because water in many parts of the U.S. is contaminated (Steingraber, 1997).

Water consumption at PSU is high with few significant conservation measures in evidence. Meanwhile, growth in the Centre Region (fueled, in part, by PSU's own growth) coupled with Central Pennsylvania's delicate limestone geology increases the potential for groundwater contamination. Recent water contamination episodes at Penn State (sink hole formation at the airport leading to pollution of Spring Creek; contamination of land in close proximity to PSU's Big Hollow well fields due to careless disposal of chemical waste and gas-tank leakage) are of concern to many at Penn State.

***What Penn State Can Do:*** At Penn State, clean water is among our most precious resources. As part of it's emerging ecological mission, the University should develop a comprehensive strategy to protect regional water resources--a plan that goes well beyond mere compliance with State and Federal regulations. The plan should include "best management practices" for stormwater mangement and the protection of our aquifers.

**A "living machine" processes wastewater**

In addition, PSU should become a model of water conservation by pledging to reduce water use to 75% of 2000 levels by 2010.[5] This could be done without significant inconvenience. For example, rather than using 40 gallons of water to bathe each day, we could still have enjoyable showers, while using just 10 gallons of water. How? Installation of high-performance, low-flow shower nozzles; they pay for themselves in a matter of months just from the savings on water heating.[6] Similarly, the amount of water used in the washing of dishes and clothes at PSU could be more than halved using appliances with water saving technologies (e.g., horizontal-axis clothes washers--instead of standard vertical-axis models--reduce water use by 40-75%; Lamarre, 1997). Significant water savings can also be achieved by reusing graywater rather than shunting it directly to sewage

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5 Many communities and universities have been able to significantly reduce water consumption. For example, in Goleta, CA (pop. 74,000), a combination of technical improvements, leak reduction, education, and rate restructuring cut annual water consumption by 30% and sewage flow by 40% (Hawken et al., 1999). And California State University/Northridge has adopted a combination of measures--including retrofitting showers, flush valves, and faucets with water-saving devices, posting water-conservation information, and using reclaimed water for landscaping purposes--aimed at reducing water consumption by 25% (Smith, 1993).

6 Penn State has begun to install low-flow show nozzles in some of its facilities.

treatment plants.[7] Finally, the use of "living machines" (Todd and Todd, 1993) to process building waste water on site offers a cost-competitive technological alternative to conventional waste-water treatment facilities with remarkable educational benefits.

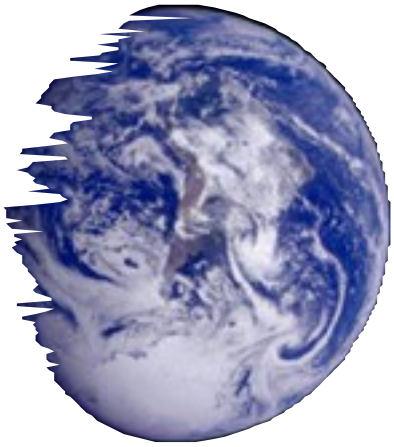
In sum, Penn State has the knowledge and technology to easily reduce water consumption and wastewater production by 25% over the next ten years. In so doing we might serve as both an example and inspiration for the Commonwealth.

--Cohen, J. 1995. How Many People Can the Earth Support? W. W. Norton & Co. New York.
--Hawken, P., Lovins, A., Lovins, Hunter L. 1999. Natural Capitalism. Little, Brown and Company, Boston.
--Lamarre, L. 1997. Less noise, less thirsty. Consumer Reports. pp. 42-45. January.
--Smith, A. 1993. Campus Ecology. Living Planet Press, Loss Angeles, CA
--Steingraber, S. 1997. Living Downstream. Addison-Wesley, Reading, MA
--Todd, J. and Todd, M. 1993. From Ecocities to Living Machines. North Atlantic Books, Berkeley, CA.

[7] A graywater recovery system at the Roseland III office park (360,000 square feet) in Essex County, New Jersey, cut water use by 62% (Hawken et al., 1999).

## *Subsystem 3:* Material Resources and Waste Disposal

### *The Goal:* Become a Minimum-Waste University



***The Problem:*** The view of the Earth from space is certainly awe-inspiri also sobering. It says, as no text can, that there are limits to growth, to resources, to consumption. The overall rate of consumption of the Earth's raw materials is increas a faster rate than population growth (Korten, 1995). With this steady rise in consum has come a concomitant rise in waste.

The situation at Penn State is not very different from the world at large: consumption here increases inexorably year after year. The University is constantly receiving materials from distant "sources," consuming these materials, and then shun enormous quantities of garbage to distant landfills. Rather than efficient material cycling--nature's model--most of the materials which we consume move from cradle grave along linear—non-sustainable--pathways.

***What Penn State Can Do:*** One way that PSU can begin to move toward minimum-waste status is to more effectively recycle such things as transparencies, electronic equipment, batteries, and building debris; but recycling, alone, is not the answer. Ultimately, the best way to reduce waste is to move "upstream" and change product design and manufacturing.

Many business people and engineers in Pennsylvania and elsewhere are now working to create industrial processes that eliminate waste altogether. These are referred to as "Intelligent Product Systems" (Hawken, 1993). One strategy is to design products that are wholly biodegradable--capable of being transformed into food for other organisms. When this isn't possible, such as with toasters, televisions, and cars, products can be designed for complete disassembly and reuse. Citizens lease such products from manufacturers and at the end of the products' lives, the manufacturers repossess them and return the contents to the manufacturing stream.[8]

The idea of almost totally eliminating waste may sound radical, but it isn't; rather it is a sensible and necessary pre-requisite to true sustainability. Here, as in other areas, Penn State could, if it chooses, be among those leading the way. We could make it our mission to use our buying power to leverage our suppliers, one-by-one, toward clean, "zero waste" production technologies.[9] The way to start is to substitute, at a rate of 5% a year, environmentally harmful purchases with environmentally friendly commodities (i.e., products which avoid the use of toxins, minimize the use of energy and virgin materials in their construction, have a long use-life, and are fully

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8 This Intelligent Products Systems approach is already under way: BMW, in Germany, is designing its newer car models with eventual disassembly in mind. Car parts are bar-coded to identify the types of materials they contain with a goal of 100% reusability.

9 How might universities use their buying-power to promote minimum-waste companies? Two examples:

1) Penn State might announce independently, or in concert with other universities, that it will only purchase products from companies that endorse the Valdez Principles (i.e., companies that publicly commit to waste reduction, wise use of energy, sustainable use of natural resources, and so forth) (Thorpe, 1999).

2) Penn State might endorse the concept of Extended Producer Responsibility (EPR) by announcing that it will give special preference to companies that take responsibility for taking back their products at the end of their useful life. EPR has been enacted or is under serious consideration in Austria, Germany, Belgium, France, Japan and the UK, as well as in numerous local jurisdictions.

recyclable). Some universities (e.g., SUNY-Buffalo) have already taken this step.

Because of its size and prestige, Penn State, alone, is capable of sending strong signals to its suppliers; and the combined economic power of America's 3,800 colleges and universities—$185 billion in annual buying and investments—coupled with their role as molders of vision and character, puts them in a unique position to promote a culture of minimum waste throughout the nation (Cortese, 1999).

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--Cortese, A., 1999. The univeristy as a model of sustainablily. www.2nature.org

--Hawken, P., Lovins, A., Lovins, Hunter L. 1999. Natural Capitalism. Little, Brown and Company, Boston.

--Korten, D. 1995. When Corporations Rule the World. Kumarian Press, West Hartford, CT

--Thorpe, B. 1999. Citizen's Guide to Clean Production. Clean Production Network, The University of Massachusetts Lowell.

## *Subsystem 4:* Food

## *Goal:* Eat Foods Produced Sustainably

***The Problem:*** We have a remarkable food system. Many U.S. farms produce twice as much food per acre as they did a half-century ago and they do it with much less human labor. Meanwhile, supermarkets offer food from all over the planet at affordable prices. There is only one problem: Our food system is not sustainable. Here's why:

- We are losing the productive foundation of our food system--our soil. Throughout the world, due to careless farming practices, we are essentially "mining" the earth's soil. The U.S. General Accounting Office reports that 84% of U.S. farms have soil losses greater than 5 tons per acre--they are losing soil more rapidly than new soil is forming. This is not sustainable.
- Our food system is running an energy deficit; considerably more energy (fossil fuel) is used to cultivate, process, package, transport, and prepare the food we eat than is actually contained in that food (Pimentel and Pimentel, 1979). This is wasteful and, ultimately, not sustainable.
- Our food system's high reliance on fossil fuels contributes to global warming, while the excessive use of fertilizers and pesticides contaminates aquifers, wells, and waterways. Excessive phosphates and nitrates from farms in Penn State's watershed, the Susquehanna Basin, pollute the Chesapeake Bay.

**Food supplied by Pennsylvania farms could help make PSU more sustainable**

The Penn State food system mirrors that of the nation: Food purchasing at PSU relies almost exclusively on cost and convenience criteria. We pay no attention to the distance involved in food transport. Nor do we concern ourselves with the non-sustainable farming practices often associated with the food we purchase, much less with the legitimate ethical concerns surrounding animal husbandry practices. Ironically, Penn State, a Land Grant Institution and one of the leading agricultural schools in the world, purchases very little of its food from the farms in its home region.

***What Penn State Can Do:*** The research and extension expertise in Penn State's College of Agriculture can go even further in its efforts to actively guide the university and the Commonwealth toward a food system which respects life and family farms and creates healthy soil, strong regional farm economies and wholesome food. Indeed, PSU could use its considerable financial leverage to directly support the Central Pennsylvania farm economy. PSU should begin by committing to purchase 10% of its food from regional suppliers by 2010.

A good place for PSU to start is with local beef and poultry production, together with crops such as onions, potatoes, winter squash, beets, and carrots (i.e., crops that grow well in Central Pennsylvania and that could be purchased in large quantities at the end of the growing season and then stored in underground "root cellars" on campus). If Penn State sent a signal to local growers clearly indicating that it was ready to buy significant quantities of these foods at prices that justly compensated farmers for their efforts, there is little doubt that our

regional farmers would respond.[10] Following Penn State's leadership, other institutions, such as hospitals, corporations, and government agencies, could become markets for regional food producers who use healthy and environmentally sensitive production methods.

--Pimentel, D. and Pimentel, M. 1979. Food, energy and society. Edward Arnold, London.
--Valen, G. L. 1992. Hendrix College Local Food Project. In Eagan, D. J. and Orr, D. W. (eds.). The Campus and Environmental Responsibility. Jossey-Bass Publishers, San Francisco, CA

10 Hendrix College provides a model for how an institution of higher learning can fortify the local farm economy while, at the same time, promoting sustainable agriculture and a healthy diet. Hendrix requires that food served in its cafeterias: 1) be local when possible, 2) be grown using sustainable agricultural methods, and 3) involve the humane treatment of animals. Hendrix strives to buy at least 50% of its food from Arkansas (Valen, 1992). Closer to home the Food Project at Wilson College in Chambersburg, PA, is working to re-direct 30% of Wilson's food budget to local growers.

## *Subsystem 5:* Land

## *The Goal:* Create and Abide by a Land Ethic

***The Problem:*** In the past, land carried deep meaning--tribal homeland, holy mountain, ancestral birthplace, mother earth; but as we become more unrooted from "place," land loses its deeper significance, often becoming a mere bargaining chip--a commodity--to be bought and sold at strategic moments. So it is that the farms in Centre County are sold off to developers. Land that grew crops for generations now spawns sprawling housing tracts, four-lane highways, malls, and parking lots.

**Old Main's Land Grant Frescoes remind us of the importance of caring for Penn State's**

When we think in terms of sustainability principles--respect for life, living within limits, respect for the local--we are challenged to become responsible stewards of the land under our care. Responsible land stewardship requires that we take measures to nurture our land, promoting its health and vitality.

***What Penn State Can Do:*** Centre County is losing approximately 800 acres of land--much of it farmland--each year to development. As a large landholder and responsible steward, it is time for Penn State to clearly articulate a University Land Ethic. Aldo Leopold's (1953) often-quoted remark might serve as a starting point: "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise."

A strong land ethic might also remind us to reduce to the maximum extent possible the use of pesticides on campus.[11] Indeed, we now know enough about the potential dangers of pesticides (Mitchell, 1997) that it behooves us to eliminate their use in realms where they are not absolutely necessary. By dramatically reducing pesticide use, Penn State could be among those setting an example for the Commonwealth and the nation.

A carefully articulated land ethic would also lead the University to use its grounds to teach important ecological lessons. For example, in an attempt to make our ecological dependencies more visible, the PSU campus might contain a "constructed wetland" that processes a portion of the University's waste water; or there might be a "global warming classroom" consisting of a plot of regenerating forest (e.g., Hort Woods) which sequesters a small fraction of PSU's $CO_2$ emissions (thereby illustrating how forested land is able to counteract the effects of global warming). In this same vein, academic departments might be challenged to use the land at their doorsteps to illustrate the links between their discipline and the earth. For example, the Geography Department might tend a living map of the vegetation zones of the United States; Agronomy, using biointensive methods, might farm a "Circle of Plenty"--i.e., a one-third-acre plot capable of providing all the food that a Pennsylvania family of four needs for a year. In these and many other ways, the Penn State campus could help

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[11] Only 10% of the pesticides in common use in the U.S. have been adequately tested for health effects (Steingraber, 1997).

students develop an ecological identity.

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--Leopold, A. 1953. A Sand County Almanac. Oxford University Press, New York.
--Mitchell, J. D. 1997. Nowhere to hide: The global spread of high-risk synthetic chemicals. World Watch, March/April, pp. 26-36. Worldwatch Institute, Washington, D.C.
--Steingraber, S. 1997. Living Downstream. Orion. Summer. Pages 64-75.

## *Subsystem 6:* Transportation

### *The Goal:* Create Compelling Alternatives to Car-Based Transit

***The Problem:*** We travel each day to get to our schools, workplaces, and shopping areas. In the past we traveled mostly on foot, by bike or by trolley and train. Today, we travel mostly along roads in cars. But our contemporary car-based transportation system is not sustainable. Consider:

- Car-based travel is expensive. In a landmark study, economists at the World Resources Institute, USA, concluded that if the many hidden costs of car-based transport (e.g., highway and parking area construction and maintenance, police protection, chronic health problems caused by car-generated pollution, loss of productive land to roads) were passed on to the public at the gas pump, it would raise the price of gasoline to about $6 dollars a gallon in the U.S. (Ohringer, 1992).
- Car-based transport is inefficient. If we were to divide our total annual car mileage (DISTANCE) by the sum total of all the TIME we spend earning the money to pay for our car, its maintenance, and its insurance plus all the time we spend stalled in traffic, looking for parking spaces, and caring for our cars, and so forth, our average car SPEED would be only about 10 mph (about the speed of biking).
- Car-based travel is a major contributor to global warming. Cars consume one-third of the world's oil extraction and account for about one-fifth of global carbon dioxide releases.

Penn State's transportation system, like that of the nation at large, is ever-more car dependent. As enrollments and staff sizes increase, total vehicle miles traveled by the Penn State community increases, as does the demand for roads and parking.[12]

***What Penn State Can Do:*** At present, Penn State exerts a huge impact on the Centre Region, catalyzing, in concert with other forces, haphazard growth. Instead of sprawling, inefficient, car-dependent land settlement, there is an urgent need for tight, compact patterns of land settlement and attractive alternatives to car transit.[13]

It is time for Penn State to use its expertise and vision to create a Central Pennsylvania with fewer rather than more roads, better public transportation, enforcement of urban growth boundaries, protection of open space--forests, farm land, and parks--in sacred trust for future generations, and vibrant, people-centered town centers that encourage walking and biking. To this end, there are four steps that the University could take: 1) move vehicle parking to the perimeter of campus with mass transit to shuttle individuals around campus; 2) create a true network of safe bike paths throughout the campus and town; 3) create a package of incentives aimed at reducing the number of vehicles operated by Penn State students and staff by 25% by 2010; and 4) conduct (in collaboration with the PA Transportation Institute) cost-benefit studies on public transportation alternatives, like light rail along major movement corridors. The studies should culminate with appeals to the Commonwealth for support of a sustainable

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12 Ironically, roads and cars fail to conclusively solve the very problem that calls them into existence. It has long been observed that cars will eventually appear to fill new roads. The resulting congestion increases the demand for more roads, setting in motion a vicious cycle.

13 Some major universities are already pursuing sustainable solutions to transportation problems. For example, Cornell University, when faced with a 2,500 parking space shortfall in the early 1990s, decided to figure out other ways to get the University's faculty and staff to and from work. They created a package of alternatives to single-occupant commuter vehicles and in the process are now saving about three million dollars a year, not to mention the beneficial environmental effects of 10 million fewer car miles traveled to and from Cornell each year (National Wildlife Federation, 1998).

public transportation system for Central Pennsylvania. With commitment and vision, State College and the University could develop an excellent public transportation system and could become the most pedestrian- and bike-friendly college town in America.

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--National Wildlife Federation, 1998. Green Investment, Green Return: How Practical Conservation Projects Save Millions on America's Campuses. National Wildlife Federation, Washington, D.C.

--Olringer, J. 1992. Our Beloved Cars: What a Price We Pay. In Context 33: 8-9.

## *Subsystem 7:* Buildings

## *The Goal:* Create "Green" Buildings.

***The Problem:*** America's buildings use immense amounts of energy for their heating and cooling and the materials used in their construction are among the most energy-intensive available (steel, concrete, glass, plastic, aluminum, asphalt). Buildings on the Penn State campus--even those recently constructed--likewise exhibit striking inefficiencies in material and energy use, stemming, primarily, from design shortcomings.[14] The technology and expertise now exist to create buildings that are many times more efficient than those of the past (Barnett and Brown, 1996; Hawken et al., 1999).

***What Can Penn State Do:*** Penn State is now in the midst of a major building campaign, the largest in its history. The way PSU's constructs its buildings can either ensure or undermine long-term sustainability. Designing ecologically-sound "green" buildings is sometimes more expensive at the outset, but, ultimately, it can offer tremendous monetary savings. For example, by taking simple energy conservation steps, such as the installation of highly efficient lighting, low-emissivity glass, and well-planned heating and cooling systems, the PA Department of Environmental Protection lowered energy costs in its new Harrisburg building from an estimated $1.54 to $0.74 per square foot (Pennsylvania's First Green Building, 1998).[15]

Now is the time for Penn State to challenge itself to combine its intelligence and experience to design and construct campus buildings that utilize sustainable materials, recycle their organic wastes, and heat and cool themselves using, to the fullest extent possible, renewable energy and natural air flows.[16] A way to begin is to require that all new buildings qualify as EPA "Energy Star Buildings."

Green Building construction is an enterprise that could involve the entire PSU community. There are aesthetic and cultural questions, as well as the technological challenges. In the cultural realm, it is important to consider what we want our buildings to say about us. What kinds of human relationships do we want them to encourage? How might we design buildings to foster civic competence and citizenship?

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14 Although Penn State has a detailed Design and Construction Standards manual, the items contained therein are pegged to conventional industry standards and, thus, fail to establish exemplary efficiency thresholds. In the end, building design is the chief determinate of building life-cycle cost. By the time only 1-2% of a building's life-cycle cost are spent (for design), 70-80-% of the structures total life-cycle costs have been committed (Romm, 1994).

15 These green design innovations need not be confined to new buildings. Citing one example among many: In 1996 the city of San Diego retrofitted its 73,000 square-foot municipal office building and in the process reduced building energy costs by 60%; the payback period was four years (Hawken et al., 1999).

16 Oberlin College in Ohio is constructing a "green" environmental science building that will be a net producer of energy (Orr, 1997). Another example: Northland College in Minnesota has completed a new residence hall that showcases its environmental mission and offers a living/learning laboratory for environmental studies. The building houses 110 students and contains community and classroom space, passive solar design, supplemental photovoltaic and wind generators for electricity, two greenhouses, composting toilets, low volume showers, and energy-efficient appliances and lighting. The construction cost per bed is comparable to buildings other colleges have built recently, but the operational costs are expected to be lower than average.

Given the range and depth of knowledge and creativity at Penn State, we surely have the means to build the most sustainable and life-affirming buildings in the history of Pennsylvania.

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--Barnett, D.L. and Browning, W.D., 1996. A Primer on Sustainable Building. Green Development Series. Rocky Mountain Institute, Snowmass, CO.

--Hawken, P., Lovins, A., and Lovins, Hunter L. Natural Capitalism. Little, Brown and Company, Boston.

--Orr, D. 1997. Architecture as Pedagogy II. Conservation Biology 11: 597-60.

--Pennsylvania's First Green Building. 1998. Video. Resource Communications Group.

--Romm, J. J. 1994. Lean and clean management. Kodansha, NY.

## *Subsystem 8:* Community

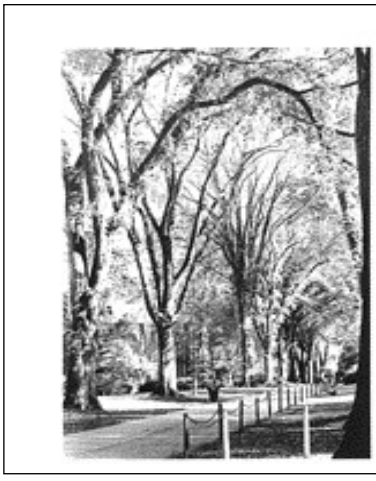
## *The Goal:* Promote Ecological Literacy

***The Problem:*** By the time a person reaches the university, basic literacy has been achieved. The university years provide an opportunity to both expand and deepen one's understanding of the world. A quality education should guarantee that students are helped to develop both an abiding respect for the biota and natural processes and a comprehensive understanding of our ecological dependencies. This type of literacy, known as "ecological literacy," is arguably just as fundamental to living fully and wisely as the capacity to read and write.

Unfortunately, our universities often tend to cultivate ecological indifference rather than ecological literacy. For example, the prolific consumption of materials on university campuses teaches (indirectly) that the Earth can supply our needs, no matter how grand they may be. Dining Hall food, arriving from all over the world, teaches that we need not concern ourselves with how or where our food is produced or with the loss of farm land close to home. And dumpsters bulging with refuse throughout campus teach that there is always an "away" where things can be thrown (Orr, 1994). In sum, university students are not learning enough about what it means to live, day-to-day, in a sustainable fashion.

***What Penn State Can Do:*** Universities are educating the people who will eventually run society's institutions. It is time for Penn State, through a spectrum of educational initiatives—AND MOST IMPORTANTLY THROUGH EXAMPLE--to ensure that all its graduates achieve ecological literacy. The aim should be to graduate seniors who are:

- Aware of their ecological dependencies: Graduates should come to know—wherever they may settle—the sources of their food, water, and energy, as will as the destiny of their wastes.
- Grounded in the natural world: PSU's graduates should be able to walk through fields and forests and along Pennsylvania's streams and recognize the commonly occurring organisms with whom we share the landscape and the fundamental ecological processes (e.g., energy flow, nutrient cycling, species interactions) that make our lives possible.
- Skilled at making ecological connections: Graduates should be able to take any ordinary man-made object (e.g., a magic marker, three-ring binder, pair of sneakers) and elucidate the principle "upstream" and "downstream" ecological connections associated with the manufacture, use, and disposal of the product.
- Mindful of "ecological footprints": Graduates should be able to calculate the size of their ecological footprint and be knowledgeable of steps they might take to minimize "footprint" size (Wackernagel and Rees, 1996).



**A symbol of the Penn State campus and community: the Elm Trees**

Of course, the ultimate test of ecological literacy is action; the ecologically literate person not only understands ecological principles but also lives lightly on the Earth.[17]

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[17] Other institutions are also beginning to emphasize ecological literacy. Tufts University has created the Environmental Literacy Institute and made ecological literacy a goal for all graduates. Meanwhile, the

--Orr, D. 1994. Earth in Mind. Island Press. Washington, D. C.
--Wackernagel, M and Rees, W. 1996. Our Ecological Footprint. New Society Publishers, Gabriola Island, BC, Canada.

President of Middlebury College has incorporated core ecological concerns into the college's mission statement: "Middlebury College. . . is committed to environmental mindfulness and stewardship in all its activities. This commitment arises from a sense of concerned citizenship and. . . a desire to teach and lead by example. The College gives high priority to . . . respect and care for the environment, sustainable living, and intergenerational responsibility."

## Summary

A great change is needed to move society toward sustainable practices. Penn State has a critical role to play in this process. It is time for the University to create a comprehensive and deep-reaching mission aimed at achieving sustainability in all facets of university life.

Penn State has begun to respond to the challenge. For each of the eight elements in the preceding pages there are current positive strides:

- Energy—Penn State's Continuous Commissioning Process is increasing energy-use efficiency in campus buildings through detailed building inspections and modifications.
- Water—Penn State's innovative Water-Land Treatment System protects the integrity of Spring Creek by spraying treated water on land rather than discharging it into the creek.
- Material Resources and Waste Disposal—The tonnage of recycled solid waste at PSU has increased significantly over the last ten years.
- Food—Penn State's napkin and food waste composting program ensures that dining hall leftovers enrich the land rather than being shunted to a waste dump.
- Land—Penn State's commitment to create the conditions for ecologically sound land settlement at its Circleville farm property is visionary.
- Transportation—Expanded university bus routes and the use of natural-gas fueled buses are significant measures aimed at reducing dependence on cars.
- Built Environment— The planned restoration of the Old Botany Greenhouse (Year 2000 Class Gift), complete with a "living machine" to process the building's wastewater is an outstanding "green design" project.
- Community—PSU's newly instituted Environmental Studies minor will enhance ecological literacy.

These measures, and others like them, are noteworthy, but Penn State can do better; We should and we can! Now, the time has come for Penn State to join its various environmental efforts into a comprehensive ecological mission (Table 1).

**Table 1. Leading the Way Toward Sustainability: Penn State's Emerging Ecological Mission**

| *Subsystem* | *Ecological Mission* | *Specific Short-Term Goal* |
|---|---|---|
| **ENERGY** | Significantly Reduce Fossil Fuel Dependence | Reduce Total Energy Use by 10% by 2010 |
| **WATER** | End Water Waste | Reduce Water Use by 25% by 2010 |
| **MATERIALS** | Become a Minimum-Waste University | Substitute Environmentally Sound Products for Harmful Ones |
| **FOOD** | Eat Foods Produced Sustainably | Supply 10% of Food from Regional Sources by 2010 |

| | | |
|---|---|---|
| **LAND** | Create and Abide By a Land Ethic | Incorporate Environmental Stewardship into PSU's Mission |
| **TRANSPORTATION** | Promote Alternatives to Car Transit | Reduce Number of Cars on Campus by 25% by 2010 |
| **BUILT ENVIRONMENT** | Create "Green" Buildings | Make All New Buildings Green |
| **COMMUNITY** | Promote Ecological Literacy | Model Sustainable Practices |

By following this eight-fold ecological mission, Penn State can create a ecologically responsible model for living--one which is highly energy efficient, produces little or no waste, is affordable to all, and fosters bonds between all members of our community.

Yes, there will be up-front costs involved in reducing waste in the realms of energy, water,
and materials; and it may cost more to construct green buildings and promote alternatives to the automobile. But businesses and universities are discovering that waste is also expensive and that up-front investments in sustainable practices often pay off handsomely over the long-term, especially when environmental and social costs are calculated and educational benefits are tallied.

## Endorsement Statement

*The undersigned person/organization encourages Penn State to develop a comprehensive ecological mission—as part of its STRATEGIC PLAN—that includes the following LONG-TERM goals:*

- *Significantly Reduce Fossil Fuel Dependence*
- *Dramatically Reduce Water Waste*
- *Minimize Solid, Liquid, and Hazardous Wastes*
- *Purchase, to the Fullest Extent Possible, Food Produced Using Sustainable Practices*
- *Create and Abide by a Land Ethic*
- *Promote and Use Sustainable Transportation Options*
- *Create Green Buildings on Campus*
- *Promote Ecological Literacy by Modeling Sustainable Practices*

General Evaluation of Penn State's Emerging Ecological Mission

**R E S P O N S E**

| **Subsystem** | **Element of Mission** | **Support** | **Undecided** | **Don't Support** |
|---|---|---|---|---|
| ENERGY | Seek 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 | | | |
| TRANSPORT | Promote Alternatives to Car Transit | | | |
| BUILDINGS | Create "Green" Buildings | | | |
| COMMUNITY | Guarantee Ecological Literacy for Graduates | | | |

**Specific Reactions to Elements of Penn State's Emerging Ecological Mission:**

1. The space below is provided for specific reactions to any/all of the eight mission elements. We are particularly interested in your responses to mission elements that you do not support.
(Please use additional pages if the space provided is inadequate.)

2. Provided this document is modified in ways that address your concerns, might you be willing to endorse it? (Note: See draft of endorsement statement, below.)

**Draft of Endorsement Statement:**

***We, the undersigned, encourage Penn State to develop a comprehensive ecological mission that includes the following long-term goals:***

- ✓ ***Fossil fuel independence***
- ✓ ***Water conservation***
- ✓ ***Zero waste***
- ✓ ***Sustainably produced food***
- ✓ ***A land ethic***
- ✓ ***Sustainable transportation***
- ✓ ***Green buildings***
- ✓ ***Ecological literacy***

**Signature** **Department** **Title**

**Thank you for reading and evaluating "Green Destiny: Penn State's Emerging Ecological Mission."**

**Respondent Information**

***Name***_____

***Email***_____

***Phone***_____

***Address***_____

**Please return this sheet to Christopher Uhl.**

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**863-3893**
**Thank you.**