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Making Environmental Change Happen:
The Essential Ingredients

Regardless òf whether a university is on the forefront of environmental stewardship or just beginning to carry out a few isolated changes to protect the environment, there are many opportunities to improve the university policies that affect the environment: Often the actions needed require that people change routines they have used for years, and this makes these actions inherently difficult. Changing habits requires information, commitment, encouragement, and feedback. And these key factors require the time, energy, and enthusiasm of individuals if environmental stewardship is to spread throughout the university. The thinking behind decisions must be flexible to make significant progress in reducing the environmental footprint of any institution.

Five ingredients are key to successful university environmental action: (1) understanding how the institution works, its players, and its decision making; (2) university commitment and demonstrated support for environmental action, often articulated in an environmental policy; (3) a university-wide environmental planning committee or smaller issue-specific committees; (4) individual leaders; and (5) an understanding of the basic principles of environmental protection. Not all university efforts have all of these components, but the most successful efforts, especially those making progress on more than a single isolated project, include many of these institution-wide support systems.

The business of greening the university also requires careful and directed gathering of data that contribute meaningfully to change. Finally, greening the university requires attention to the economic realities of proposed actions, an acknowledgment of existing university priorities,

a willingness to try projects on a small pilot scale, attention to publicity, and an understanding that priorities may need to be set along the way.

This chapter provides the leaders of a campus environmental effort with background information about the way universities work and some of the elements common to successful campus environmental stewardship projects.

How the University Works

To effect change—for example, to increase the use of recycled paper or improve the pest management practices on campus—campus environmental leaders must understand the way that universities make decisions. Some colleges and universities have a strong sense of community, others are bureaucratic, and still others make decisions based on internal political power.[1] The better that campus environmental leaders understand how the institution is organized and makes decisions, the more likely that they will be effective.

Universities and colleges that have existed as institutions for many years have well-established systems of operating, and they tend to be fiscally and operationally conservative. Moreover, they are the purveyors of ideas and the teachers of classic methods, history, and a body of knowledge that is often more theoretical than practical, making these institutions less than adept at the pragmatic thinking needed for implementing campus environmental action. Although by virtue of their role as research institutions, some thinking at colleges and universities is innovative and experimental, but little of this seems to rub off on the institutions themselves, which are often run much the way they have been for years.

University Players and Decision Making

Five major groups make up the university community: the trustees and overseers, the administration, the faculty, the staff, and the students. The surrounding community may be an important sixth player, but typically is considered an external influence rather than a member of the university family. Environmental stewardship at the university requires understanding the roles and interests of each of these groups. For example, a com-

mon mistake on many campuses is to fail to develop action plans in concert with university staff. Students sometimes demand action rather than finding ways to use their time and energy to research or pilot-test options. Faculty may see the implementation of environmental concepts as inappropriate work and become frustrated when change is slow or nonexistent. Working together for environmental stewardship requires developing an understanding of the needs and expectations of each member of the university. For example, students must take final exams, and grounds managers are rewarded for a campus that looks like a country club. A cooperative atmosphere is essential for successful change.

Trustees   The board of trustees is responsible for selecting and managing the president and for determining the institution's mission, long-range plans, and educational program.[2] It is responsible as well for the university's financial health, community welfare, fund raising, and arbitration of disputes. Although historically boards were intimately involved with running the university, they are increasingly less involved,[3] so it is rare that boards of trustees are actively involved in greening the university, although their involvement will depend on the character and experience of a particular university's board.

The long-term nature of the work to protect resources, save money, and build on the innovative educational opportunities that the environmental field offers should put these issues high on the agenda of a creative board. Trustees may be interested in the competitive and financial advantages of environmental programs, and their attention to these programs can bring prestige and credibility to the efforts.

Administration   College and university administrators—the president, vice presidents, provost, and the deans—are responsible for the multitude of day-to-day demands that come with running an institution. In addition to fund raising and alumni relations, they are attentive to community affairs, public relations, housing, student discipline, and the concerns of faculty. Administrators are particularly interested in how environmental initiatives can complement other university initiatives, such as those with financial or public relations benefits. Universities that have a high-level administrator who takes an interest in the environmental action on cam-

pus tend to have greater campus-wide participation and cooperation than schools where the administration is ambivalent or reluctant.

Faculty The faculty is responsible for teaching, student advising, and research. Many faculty have job security offered by tenure or are in tenure track positions requiring three to six years of service and a final evaluation based on their teaching, research, publication in journals of record, and community service. The tenure system tends to foster specialization at the expense of the interdisciplinarity and interconnectedness that are so essential to solving environmental problems. For this reason, Ball State University's "Green" Committee's Final Report recommends rethinking the existing traditional faculty tenure and promotion system in order to promote the interdisciplinary, short-term projects needed to make gains toward implementing the university environmental goals.[4]

Some faculty may be part-time lecturers; others may be on a term contract. Most have doctoral degrees and have completed extensive academic research. In general, they teach and conduct their research independently or with others from their own department or discipline, so the interdisciplinary nature of campus environmental action may not attract them. In some departments, faculty receive a portion of their salaries from externally funded research grants and are under intense and increasing pressure to generate research funds. Preparing research proposals can be a major drain on a faculty member's time.

The university's faculty have their own committee and decision-making structures, and often these structures do not include staff or students. Faculty committees oversee most aspects of university life and curriculum and are often active in defining and overseeing university environmental academic programs such as environmental studies and research on environmental problems, technology, or policies, but they are less likely to be involved directly in environmental stewardship. Faculty committees that have direct environmental impacts include the budget and planning committees.

Staff Universities and colleges employ a range of staff from highly trained and salaried professionals who run the libraries and manage the physical plant, to custodians and warehouse attendants paid by the hour.

Some staff jobs, such as human resources and accounting, are readily interchangeable with the business sector; others, such as fund raising and grant administration, are more likely found only in universities or other nonprofit organizations. Regardless of the job, most staff differ from faculty and administrators in that their jobs are usually more defined, their departments are often more hierarchical than the academic departments, and they are rewarded, evaluated, and paid in a system that is entirely separate from those of the faculty and most of the administration. Staff provide support to the academic and residential life but often do not have a direct impact on students' formal education.

The staff is often the element of the university community that undertakes significant and long-lasting environmental initiatives to reduce waste, improve conservation, and save (or cost) money. In particular, decisions with major environmental consequences tend to be made by departments such as the facilities management (buildings and grounds), materials management and purchasing, and dining. These departments manage large budgets, construct new buildings, heat and maintain existing facilities, buy materials, negotiate contracts, and prepare and clean up after millions of meals a year. Despite this potential to make a difference, many staff do not readily see the connection between their work and its environmental consequences. Similarly, many students and faculty seeking to improve their campus environmental footprint often fail to see the importance of staff involvement.

Students Students are the university's customers, and their education is the primary reason that most colleges and universities exist. Since the 1960s, students have gained increasing influence with university trustees, administrators, and faculty, yet they are often still held at arms length by these upper-level managers and staff employees. Students nevertheless may have more influence than they realize over the practices and policies of university staff, such as food services and housekeeping staff, who are generally very responsive to student interests and requests.

Students bring energy and creativity to solving campus environmental problems, finding resources, and collecting detailed information. They are eager and energetic and contribute a unique perspective to the process of environmental action, although they are often overlooked as a resource

by staff and administrators. Students' own systems of governance can be effective vehicles for promoting environmental change. Students across the country have advocated for recycling programs and other environmental initiatives at many schools. Commonly, they provide the volunteer labor to begin and promote a program. The most successful and lasting programs are partnerships between students and university staff and administrators. At Tufts, student pressure and activism led to divestment from a utility company because its planned hydroelectric plant threatened sensitive ecosystems and indigenous people. A student lawsuit at UCLA forced improved ventilation in the art studios.

Student participation in campus environmental activities takes many forms, varies widely from year to year, and yields results that depend on the particular student group. Undergraduate and graduate students, residents and nonresidents, younger and older students, as well as environmental and campus leaders all respond differently to calls for action, volunteerism, and personal responsibility. Student turnover from graduation and annual matriculation results in both renewed energy and a lack of institutional memory. Each year students new to the campus or new to campus environmental issues are likely to raise some of the same issues that were evaluated and resolved the preceding year, a phenomenon that can be tiresome for staff who are called to respond.

At Tufts, students prefer to work on projects from their own agenda. On a number of occasions, Tufts CLEAN! staff asked the environmental student group to join in planning, promoting, or carrying out a project. The initial response was always positive and enthusiastic, but the outcome usually depended on the project's autonomy for students or with the way it fit with their own goals. Just as successful environmental stewardship led by students needs to seek staff input in the planning phases, staff, administrators, and faculty must also invite students into the planning and project development phases of their initiatives.

Other Players   Certainly there are many other members of the university family: alumni, parents, funders, vendors, and the surrounding community. Comprehensive environmental initiatives can complement and use the skills of each of these groups. For example, college alumni or parents may be good sources of expertise about energy efficiency or alternative energy and may be willing to donate their services. The neighboring com-

munity may also be a resource, providing space, expertise, or partnership opportunities. Universities should be sensitive to neighbor concerns where environmental programs may pose a burden. For example, neighbors may bear the burden of increased traffic to a composting pile on the edge of campus, or object to the storage of recyclable materials in a parking lot near their homes. It is important that neighbor relationships be cooperative rather than adversarial if long-term trust and working relationships are to develop.

Essential Ingredients for University Environmental Change

University Commitment

Corporations such as Bristol-Myers Squibb, Dow Chemical, Dupont, and 3M have learned that top-level institutional commitment to environmental stewardship efforts is valuable to the success of their programs to reduce chemical waste and improve their environmental track records.[5] Top-level commitment is as important for universities as it is for corporations. University staff, faculty, and students often look to the university administration to articulate and follow through on commitments to environmental stewardship. At many schools, faculty and staff are skeptical about their administration's commitment to environmental initiatives and may even delay their own actions until they see top-level administrators demonstrate their intentions through actions, policies, and the investment of resources.

For environmental stewardship programs to be successful, the institution's leaders—the president, provost, vice presidents, and deans—must make a visible and meaningful commitment to environmental action. Sometimes this leadership begins with the top administrators; at other institutions, student, faculty and staff environmental leaders need to seek and cultivate this support. Ideally the first step in this commitment is a recognition by the administrators that:

- The university has varied environmental impacts.
- Reducing these impacts is in the long- and the short-term interest of the institution.
- The impacts go beyond the creation of trash, and thus the strategies must go beyond recycling.

• Some of the strategies save money, others reduce liability, and still others do neither but are nevertheless worth doing because they have long-term benefits for health, safety, the environment, or the community.
• Appropriate and creative solutions may require rethinking some current operating norms.

Demonstrated commitment to pollution prevention and natural resources protection requires both personal action and institutional support. In fact, once an administrator states that he or she is committed to environmental stewardship, everyone else tends to measure any actions against that standard. A failure by top-level administrators to assume personal action can stymie more comprehensive efforts and discourage participation. For example, a mailing from the president's office that is double-sided and printed on recycled paper is a clear symbol of consciousness and a model. Of course, administrators must take care that their visible commitment is more than symbolic. The goal is to ask of every decision what the environmental implications are and what can be done to reduce or eliminate adverse impacts.

Campus environmental advocates may find that they can build on this general commitment by offering their assistance to top administrators rather than by demanding action. Advocates, for example, can convene a fact-finding committee, make recommendations, and perhaps even draft letters for the president and the provost to review and distribute on official letterhead. In addition, advocates can provide opportunities for top administrators to demonstrate commitment with symbolic gestures such as tree plantings or an Earth Day visit to a department that has a model waste reduction program.

University or college administrators have the power to make the necessary commitment to environmental stewardship and to demonstrate it. Those other players outside the administration can also work to create the feeling and demonstration of commitment.

Environmental Policy Statement
This policy statement is a public declaration of university commitment to environmental protection and serves as the framework for decision making and goals. In addition, the development and subsequent announcement of a policy statement can be instrumental tools for raising

issues of substance and developing consensus on policy. When a policy is absent or is developed without broad input, efforts are likely to be uncoordinated, and the result will be unfocused and short-lived. A policy statement is generally most effective if it is backed up by specific goals and implementation strategies. Specific policies that are well directed make implementation easier, since the responsibilities of end users are clear.

Many proactive corporations have well-established environment, health, and safety policy statements that articulate the corporation's position on environmental issues with varying levels of specificity. The chief executive officer or the board of directors usually endorses these policy statements. Universities, because their impacts are less understood and often less regulated, are much less likely to have a comparable policy statement or well-established mechanism for carrying out the directives provided in such a statement. Nevertheless, some universities have adopted broad environmental policy statements; among them are Tufts (see box 2.1), St. Lawrence University, and the University of Georgia.[6] Dartmouth's statement is short and simple but is backed by detailed objectives. Over two hundred presidents and rectors from thirty-five countries have signed the Talloires Declaration, a statement of principles that support environmental education and stewardship (see appendix A). Others have adopted specific directives for targeted issues as part of a general policy or as part of department- or issue-specific policies.

At Tufts, the process for developing the policy statement was nearly as important as the statement itself. In 1991, about twenty-five staff, faculty, deans, and students from throughout the university were appointed to a policy committee by the President's Council of vice presidents and deans. With a request for an environmental policy from President Jean Mayer and the knowledge that Tufts' policy would be the first of its kind at a university, the committee studied corporate environmental policy statements. Committee members submitted written drafts of policy statements individually, and Tufts CLEAN! staff and a student volunteer condensed similar policy language from each of the dozen individual policies into a large draft. The committee reconvened and examined the draft, selecting and crafting the language from each section to reflect their intent. The final document was submitted to the deans and vice presidents for ap-

Box 2.1
Tufts University environmental policy

We, the Tufts University community, affirm our belief that university faculty, staff, and students have a responsibility to take a leadership role in conducting activities as responsible stewards of the physical environment and using educational activities to promote environmental awareness, local action, and global thinking.

In our university functions, Tufts University will strive to:

• Conserve natural resources and support their sustainable use.
• Conduct affairs in a manner that safeguards the environmental health and safety of students, faculty, staff and communities.
• Reduce the use of toxic substances and the generation of wastes and promote strategies to reuse and recycle those wastes that cannot be avoided.
• Purchase renewable, reusable, recyclable, and recycled materials.

In our education and research missions, Tufts University will strive to:

• Foster an understanding of and a responsibility for the physical environment.
• Ensure that individuals are knowledgeable about the environmental and health issues that affect their discipline.
• Encourage environmental research.
• Conduct research and teaching in an environmentally responsible way.
• Provide a forum for the open flow of information among governments, international organizations, industry, and academia to discuss and study environmental issues and their relationship to other social issues.

In our student and employee relations, Tufts University will strive to:

• Delineate individual responsibility and guide action for ensuring safety and minimizing adverse environmental impacts in the implementation of this policy.

Tufts will consider full compliance with the law to be the minimally acceptable standard and will exercise whatever control is reasonable and necessary to avoid harm to public health and the environment, whether or not such control is required by regulations.

Tufts will initiate, promote, and conduct programs that fully implement this policy throughout the university and the global community.

proval and was signed by the president on Earth Day 1991. When Tufts' new president, John Di Biaggio, joined the university in 1993, representatives for the environmental committee met with him to introduce the policy. At that time he asked the committee to review it. One minor modification was made, and he signed the policy soon after.

University policies and the subsequent implementation of those policies in the departments of food services, purchasing, and facilities management offer powerful opportunities to implement and institutionalize environmental stewardship efforts. Policy statements that are department or issue specific can be more effective than general university-wide policies. For example, some institutional purchasing departments have a great deal of latitude to make or carry out policies that require the purchase of recycled paper, the use of designated vendors, or requirements by vendors of some products to take back spent product or packaging. Tufts dining services developed a detailed statement of their environmental actions as part of their strategic planning process (see chapter 5). The University of Buffalo has adopted a series of issue-specific policies covering issues including air conditioning, third class bulk mail, campus newspapers, recycling, and purchasing. Even the U.S. government, through presidential executive orders, mandates the procurement of recycled paper; Energy Star (energy-efficient) personal computers, and alternatively fueled vehicles for many government applications and government contractors.[7]

Environmental Committees

Many people in a university have environmental responsibilities yet may not fully understand these obligations or see how they are related to their jobs or to others at the university. A university-wide committee can help institutionalize environmental stewardship efforts and bring stakeholders to the table. It may oversee broad-based environmental action or take a strong hand in shaping detailed plans of action. The committee membership should reflect the university community (students, faculty, staff, and administrators).

The committee should be sanctioned by top university administrators. If this commitment is unavailable, for whatever reason, organizers should nevertheless charge ahead. If the administration can provide a specific

and progressive mission or task for the committee, such as policy development or meeting energy reduction goals, the committee's job is easier. For example, West Chester University's president asked the environmental committee to develop a plan for environmental improvement on campus.[8]

Many universities are experimenting with university-wide committees or smaller issue-specific committees. Whatever the structure, a well-run committee can be effective for securing ideas, motivating, and rewarding change. The committee may also provide an open forum for the university community to raise issues and learn about ongoing actions. Each university or college will find that the makeup and mission of its committee is unique, but the most successful committees draw on interested and willing members of the community and try to gain wide representation from staff, faculty, and students.

Forming the environmental committee may be easy; leading and directing it so that its meetings are productive is more difficult. Committees that are most successful discuss policies that affect many departments and assign detailed implementation of projects and programs to subcommittees. The committee can also be effective in bridging communication gaps among faculty, staff, and students or for advocating for new ways of thinking across the university. Information exchange can be effective if committee members carry the information they learn back to their departments. Tufts established the University Environmental Improvement Committee to oversee the development of the Tufts environmental policy statement and then to focus on its implementation. Tufts CLEAN! staff identified the need for the committee and suggested that the university president ask the deans to designate representatives to this committee. It was somewhat surprising that the Tufts Environmental Improvement Committee operated effectively for nearly four years; despite the fact that it was ineffective at addressing many concrete and specific actions after the policy was developed. Committee members continued to come to regular bimonthly meetings during the school year, several traveling from other campuses as much as forty miles away, perhaps because they felt that the top administrators were committed to the issue. Furthermore, committee members repeatedly told Tufts CLEAN! staff that one of the most valuable parts of each meeting was the members' updating each other on their environmental actions or problems to date. This discussion

provided them with opportunities to share their successes, learn from each other, identify common problems, and feel that their efforts were important. In addition, it provided staff, like the director of community relations, with opportunities to identify potential problems before they became actual problems. The committee as well provided valuable feedback to Tufts CLEAN! and other environmental groups throughout the university. We debated mandates for recycled paper, energy-saving initiatives, divestment from polluting companies, carpooling, and safety concerns.

The initial leadership of Tufts Environmental Improvement Committee was provided by an academic with lots of good ideas and enthusiasm. The committee was later and most effectively chaired by the director of physical plant, a good manager who called himself a "reformed environmental abuser." He fully understood how the university works, saw the connections between operations and environmental stewardship, and was able to conduct a well-run meeting.

In all cases, Tufts CLEAN! staff worked behind the scenes to prepare agendas, background material, meeting minutes, and desired meeting outcomes. The Tufts committee ceased to meet when funding for Tufts CLEAN! ceased, an event nearly coincident with the departure of the committee's chairperson. However, in a recent "earth summit," students, faculty, operations staff, and administrators who gathered recommended that Tufts reconvene a university-wide environmental committee, which they saw as the best way to support ongoing environmental efforts and foster support for new initiatives.

Like Tufts, Brown University launched its campus-wide program (Brown Is Green) with a large university-wide committee, chaired by the provost. Now that Brown Is Green is well established, the larger committee rarely meets and instead has subcommittees that work on the various objectives. Among the other campuses that have university-wide committees are Ball State University, St. Lawrence University; the University of Vermont, the University of Buffalo, and Bates College.

Several schools have used specific waste reduction or solid waste committees. Subcommittees of the University of New Hampshire's Committee on Energy Conservation and the Environment include groups on building systems, education, bicycling, precycling (using materials a second time

prior to recycling), and electric vehicles. MIT has a committee that works to develop strategies to reduce, reuse, and recycle hazardous materials; its members include the vice president; environment, health, and safety staff; and purchasing agents.[9] Many schools have waste reduction, solid waste, or recycling committees to help address the logistical and educational needs of solid waste and recycling issues.

At Tufts, we found that safety issues, especially those that focus on chemical safety, are often best dealt with outside the large campus-wide environmental committee. Safety committees on the Tufts medical school campus and the main campus included participation from faculty and teaching assistants from departments with laboratories, art studios, buildings and grounds, and others who regularly use hazardous materials (see chapter 7). The environmental, health, and safety staff play a large role in these committees.

Individual Leaders

Most successful environmental efforts on college and university campuses rely on leaders throughout the institution. While the university community's awareness of and motivation toward acting on environmental problems ebbs and flows, the catalysts for the essential broad-based action almost always stem from one or several dedicated leaders in the effort. These leaders of university-wide action can come from anywhere within the university, from the level of the provost to the faculty and students, or even a member of the staff. In all cases of university action, individual leaders play an essential role in making a difference.[10] Buy-in and leadership from a variety of levels within the university are necessary because many environmental initiatives must be integrated into the everyday operation of the university. In the green university, administrators, faculty, staff, and students take responsibility for their own actions and have an understanding of the ways that their actions affect the environment. They are informed by environmental leaders: people who spend time teaching others, investigating opportunities, and executing projects.

At many universities, individuals take on initiatives that are outside their job responsibilities to demonstrate commitment to conservation, waste reduction, and recycling. For example, at the Tufts medical school,

an administrative assistant took her environmental commitment so seriously that she ordered and used recycled paper in the entire department for two months before letting anyone know, thereby anticipating and diffusing the department chair's resistance to the use of recycled paper. She used her knowledge of the department's decision-making structure to inform her environmental stewardship action. At Rutgers University, the senior buyer, Kevin Lyons, went well beyond the strict definition of his job responsibilities and initiated extensive procurement standards for the university, resulting in a dramatic increase of recycled products and an improved recycling program.

Key faculty members can lead the campus environmental efforts. David Orr at Oberlin College is an outspoken leader for innovative thinking and action, on his own campus and on other campuses across the country. Anthony Cortese, former director of the Center for Environmental Management and dean for environmental programs at Tufts, was influential in helping Tufts' president to embrace environmental education and stewardship as leadership opportunities for the university. Harold Ward, at Brown University, and other environmental studies directors across the country are instrumental in linking campus-based environmental action with environmental studies curricula.

Students can also be leaders for campus action. There are many examples of student-led initiatives that have reduced waste, expanded recycling programs, and developed innovative and far-reaching solutions to campus environmental problems.

Campus Jobs with Environmental Leadership Responsibilities

Only a few schools have established an environmental leader position, or environmental ombudsman, with the responsibility for researching, catalyzing, and influencing environmental stewardship action on campus. An environmental ombudsman can be dedicated to addressing unregulated impacts, serve as a resource, and provide a link between the academic and the operational parts of the university. The ombudsman should have both academic and operational responsibilities—rare in most universities—to articulate the commitment needed, influence the financial and personnel resources, promote efforts, and assist where needed. An ombudsman can serve as a catalyst for action and

provide assistance to others throughout the university who are taking action.

The environmental ombudsman's position is probably the best model for leading and achieving far-reaching campus stewardship. If the individual is well respected and diligent, he or she can influence and support academic and operational policies. However, few universities have been successful in maintaining this position as a dedicated, university-supported, long-term position.

Until 1995, the University of Kansas's environmental ombudsman reported directly to the provost and provided guidance and assistance on issues ranging from the use of ozone-depleting chemicals to the purchase of recycled products. The success of that office, evident in the number of actions it influenced and the breadth of its effectiveness, was probably related to degree of the commitment from the administration and the personality of the ombudsman and his staff. Tufts CLEAN! was funded by a grant from the Environmental Protection Agency and was located in a research center well outside the university operations. A small staff and graduate students identified and studied problems and came up with solutions, led the university environmental committee, and provided assistance to other members of the university interested in environmental action. When outside funding was no longer available, however, the office could not be sustained. At Brown University, the Brown Is Green ombudsman's role is an outgrowth of an academic position to teach a course using campus-based student projects. The position was originally funded by the environmental studies department and the operations departments. Now the position is funded entirely by the academic side of the university, although the ombudsman continues to pursue many operational issues. In contrast, at the University of Wisconsin, Daniel Einstein, the environmental management coordinator (officially an administrative program manager), is funded by the physical plant department despite his large role working with students on academic projects.

Increasingly universities are hiring recycling coordinators or energy managers, some of whom have assumed personal responsibility for spearheading environmental action campus-wide. These positions are extremely valuable, but their existence does not substitute for members of

the entire university community taking responsibility for their part in the problems and their role in the solutions. Recycling and energy managers should be expected to help motivate and lead others; as well, the recycling coordinator, the environmental health and safety staff, and the energy manager are charged with specific responsibilities—for example, the collection and marketing of recyclable materials, the disposal of chemical wastes, and the efficient use of energy. Because these responsibilities have environmental as well as regulatory and financial benefits, the university tends to defer to the people who fill these positions for all environmental issues.

Environmental Protection Principles

Keeping the principles of energy efficiency, waste reduction, safety on and off site, and long-term and comprehensive (or life-cycle) cost accounting as overarching objectives can guide most decision making to conclusions with lower environmental impacts. This understanding of environmental protection principles then empowers members of the university community to make decisions. For example, staff members in the purchasing department can evaluate similar products and choose the one that best reduces waste or improves safety without needing specific guidance on each and every product. These principles inform decision making that must occur on the product-by-product and decision-by-decision basis.

Energy Efficiency
Using energy (electricity, oil, natural gas, etc.) only when needed or with the most efficient technology possible helps to reduce the impacts on air quality, resource depletion, global warming, and acid rain from burning fossil fuels for heat, cooling, hot water, and electricity. Energy-efficiency practices can save money in all climates. Efficiency practices should be applied to new construction as well as small- and large-scale renovations and to electrical equipment (e.g., motors) and lights, as well as heating and cooling systems. Even when fuel costs are low, efficiency is a good investment for the future, for energy costs are likely to rise. Implementing

energy efficiency on campuses usually requires careful attention to existing conditions and systems and a knowledge of new technologies. Nevertheless, there are many low-tech opportunities to improve efficiency through behavior change, such as turning off lights and equipment, and institutional policy, such as temperature targets and heating and cooling policies.

Waste Reduction

Waste reduction is the principle of efficiency applied to other materials, such as packaging, chemicals, food, and water, and can reduce the generation of solid and hazardous waste, as well as the resources and pollution from the manufacture and transport of goods. Successful waste reduction is often incremental; as long as any waste exists, there is room for improvement.

People most often think of waste reduction with regard to hazardous waste, such as reducing the generation of hazardous wastes (e.g., paint thinner and used oil), but the principle of using only what is needed and avoiding spills or other waste translates to water use, fuel use and storage, packaging, and paper products such as copy paper and paper towels. Successful waste reduction requires a combination of technology (such as the substitution of less toxic chemicals), policy (including prohibitions in the purchasing of certain chemicals or materials), and individual behavior change in everyday practices.

Safety

Safety is an important and familiar principle that usually dovetails with environmental protection objectives. On-site safety and environmental issues coincide on issues such as the handling, use, and disposal of paint thinner, pesticides, and concentrated cleaning or degreasing products. Chemical, asbestos, and PCB handling have safety consideration for workers and building occupants. Off-site impacts are less visible than on-campus impacts but nevertheless should be considered when making decisions. It is important for campus environmental advocates to combine safety with environmental considerations; safety is compelling and usually has benefits for environmental protection as well.

Life-Cycle Costs

Life-cycle costs refer to the costs of a product from its manufacture to its disposal. Outside environmental circles, people may think of this same principle as "thinking long term." When a product's life cycle is considered, often the lowest initial cost is not the lowest overall cost. For example, a small, unreliable copy machine may not be as cost-effective over its lifetime as a larger, energy-saving, double-sided model even though its purchase price is lower. The second machine may waste less paper and use less electricity. Life-cycle costing also considers off-site effects in the product's manufacture and disposal as waste even if these effects are not evident to the product's users. Information about off-site impacts is often difficult to find, but university decision makers can work with student researchers to investigate these questions. On-site but harder-to-quantify impacts, such as hazard to workers using a cleaning product or the danger of a spill from a chemical, should also be considered in life-cycle decision making.

Using life-cycle analysis tools is a useful exercise, although it can be time-consuming and sometimes academic. Most environmental decisions need to be made more quickly than a complete life-cycle analysis allows, but the basic principles can still be applied to university decision making. One difficulty in thinking about life-cycle costs is that it often requires comparing unlike impacts—for example, the impacts to air as compared to those on the water. The Center for Regenerative Studies at the University of California at Davis used some life-cycle analysis in the design of its innovative new dormitory building. The members selected a copper roof because it has a long life despite the energy-intensive nature of its manufacturing process—a trade-off that is difficult to quantify and compare even when there was a commitment to evaluate the available quantitative measures.

Gathering and Using Data

In order to make campus environmental change happen, targeted and detailed data of several types must be gathered. These data will inform change, provide a baseline for measuring progress, and allow realistic

solutions to emerge. Despite this need for data, many who are undertaking campus environmental stewardship are collecting the wrong types of data, collecting data without understanding how they will help make change happen, or spending more time collecting data than implementing programs. The academic climate of universities often allows the collection of data for the sake of data, sometimes at the expense of change.

Data are important for informing decisions and evaluating solutions. They are needed to make decisions about the outlay of capital or to change a waste disposal method. Nevertheless, some solutions to university environmental problems depend little on the magnitude of the problem. For example, increased carpooling and more bike racks will be part of the transportation solution in any place where people drive to and/or live close enough to bike to work. The total electricity or water used does not change the solutions needed to use them more efficiently, especially when a program is starting. To make truly informed decisions, decision makers need to know in detail the nature of existing technology, available solutions, and the infrastructure (e.g., the lighting and the locations of older toilets and inefficient shower heads, available replacements, and the condition of the plumbing or building wiring). A broad-based audit will be useless if it neither compares the track record of the college or university to other similar institutions nor provides the detailed information needed to make change.

Data gathering should be part of the process of environmental improvement rather than an end unto itself. The key to collecting the right data is to be clear about the project goals and match data collection to that objective. Many people gather far more data than is useful simply because the information is there. Students and other environmental advocates must realize that data gathering puts demands on others, especially buildings and grounds, purchasing, dining services, and accounting staff members, who will be essential when the time comes to carry out change.

Environmental Audits

Across the United States, students and others are undertaking broad-based environmental audits of their college and university campuses, quantifying the university's environmental impact by gathering information about resources used and wastes produced by the university and col-

lecting general information about opportunities to reduce or eliminate those impacts. Environmental audits are valuable for raising awareness of university environmental impacts. For example, aggregate data that put annual demand for electricity in terms of the number of days that the nearby nuclear power plant must operate can attract attention to electricity use and its consequences. The environmental audit can be labor intensive as students collect mountains of data from the departments of facilities, food service, purchasing, safety, and community relations.

The Tufts campus environmental audit found that annually we threw out 65 tons of used paper towels, burned 1.1 million gallons of heating oil, used 110 million gallons of water, and produced over 2,000 tons of solid waste. Determining these figures was not easy. Many of Tufts' purchasing, utility, and water records were incomplete, not computerized, or in a form not suited to the audit. Tufts staff were sometimes hesitant to provide the information because compiling it took time, data provided for some previous project had been misinterpreted, and the purpose of the data collection effort was unclear. After nearly a year gathering general and descriptive data, the Tufts CLEAN! team finally concluded that a broad-based audit was of little use in informing action because we had not gathered the information that we really needed. For example, instead of detailed data about the specific use of resources and technologies in a building or even a room, we had gathered aggregate information about total energy and water use. In addition, despite many interviews, we had not asked university staff to help identify opportunities, relying instead on environmental literature and general concepts. Furthermore, Tufts concluded that the broad-based campus audit could actually be detrimental to environmental action because of the general nature and heavy burden the audit places on university administrators whose time is better channeled into implementation of environmental actions.

Detailed audits of particular problems, however, are essential for measuring progress, informing decisions, and evaluating the project in environmental terms, such as pounds of waste reduced or kilowatt-hours of electricity saved, as well as to measure financial savings. Measurement schemes can vary from basic program-oriented measures (e.g., the existence of a program), to activity-based measures (e.g., specific processes

or operating activities), to quantitative measures (e.g., tons of solid waste as compared to a baseline).[11]

The appropriate measurement scheme to use in a given decision at the university depends on measurement objectives—to motivate individuals, justify expenditures, create publicity, or determine effectiveness of action. Corporations' measurement schemes depend on the process and the industry.[12] In a university, numerous processes result in a wide range of environmental impacts, and although data may be plentiful, they are often too poorly organized to measure progress. Broad campus audits provide a quantitative and often aggregate snapshot of environmental impacts but may not be suited to measuring pollution prevention progress.

The key to an audit is to gather appropriate measures. Data should be used to inform a decision or determine progress. For example, a measure of total electricity use does not tell how to reduce that use or if progress has been made. Instead, components of that electricity use (e.g., from lighting in one building, from computer use, or from a specific facility) are useful for determining success.

Data for Measuring Progress

Progress on campus environmental initiatives can be measured in a variety of ways ranging from simple to sophisticated. To measure and promote progress requires attention to the data that are available and the ways to make sense of them. Quantitative, qualitative, purchasing, and normalizing data can all be useful in measuring progress (see box 2.2). For example, an effort to measure the success of a program to curb the generation of solid waste in residence halls should determine if there is a way to collect data on the relevant portion of the waste stream as distinct from the data on the waste stream as a whole. Furthermore, if the data are available by weight, it would be foolish to measure the progress of the program by volume. The effort to measure progress should also identify factors that confound a program, such as changes in hours of operation or special events.

Quantitative Data   Measuring progress quantitatively is the most appealing measurement scheme. Knowing how much waste was reduced or the dollars saved is appealing, and the figures are readily understandable.

Box 2.2
Data to measure progress

Quantitative data
Measured change on net
Measured change from specific action
Utility data (electricity, water, oil, solid waste)

Qualitative data
Lists of actions

Purchasing data
Paper
Food
Chemicals
Equipment
Contracts (e.g., pesticides, fertilizers)

Normalization data
Students
Faculty and staff
Square feet
Acreage

However, many environmental actions cannot be accurately quantified—for example, the reduced risk of accident or the benefits of reduced air pollution. Furthermore, to measure change accurately, the data must reflect the results of the action alone with all other factors constant. For example, electrical efficiency gains may be achieved through lighting retrofits in many projects, but the savings do not keep pace with the increasing electricity demand from new computers and equipment. Often it is more effective to measure the magnitude of change from the specific action or project itself. For example, one department's efforts to reduce the generation of waste will be imperceivable in the campus-wide solid waste tally despite dramatic reductions in the department's own solid waste.

Data on a college's use of utilities are important quantitative measures for environmental stewardship programs because the use of electricity, oil, natural gas, and water and the generation of solid waste have direct environmental and financial consequences. All institutions collect utility data in some form for billing and payment purposes; however, the billing

files may not be useful for determining the success or failure of an environmental program. Aggregate utility data are difficult to use in assessing the success of many initiatives, because the changes that result from direct action may be only a small portion of the total bill. In fact, the successes of some efforts will be totally unnoticed if they are measured only in their effect on total electricity, oil, or water use.

Measurements of an institution's use of water, electricity, and heating fuels offer a snapshot of the vast amounts of resources that a single entity uses. Analysis of the relative magnitudes of the use and cost by year and by building type gives a sense of trends, successes, and areas for improvement. A detailed look at utility data can also help identify billing errors or problems with building systems. Clearly an analysis is only as good as the numbers and data inaccuracies are commonplace, but the net totals are still useful for spotting unusual patterns. For example, monthly examination of the water meter can help identify large leaks, and comparing the electricity used per square foot of two buildings with similar uses can identify irregularities or problems with overuse of equipment. Revising utility records in a way that will help future analyses can be very useful for comprehensive environmental efforts.

Qualitative Data   Qualitative data are lists of actions that have been undertaken to reduce waste or improve conservation without specific quantitative measurements of their results. Examples of these qualitative measures might be the establishment of a waste reduction committee, the adoption of an environmental policy, or the addition of language requiring the recycling of waste paint in a painter's contract. The Environmental Program at the Park Plaza Hotel in Boston gained a great deal of publicity for its more than sixty-five environmental initiatives. Although detailed analyses and quantitative background are available for some of these, others were publicized and listed simply as action taken. At Tufts, we found that publicizing and praising the existence of an effort or initiative, even if we could not quantify it, was a powerful motivator for the actions of others and the continued commitment of the staff who had taken the initiative. The actions discussed in detail in chapters 3 through 9 could be used as a list of qualitative actions for a university to embrace in its future environmental stewardship program.

Purchasing Data   Data about the amount of material purchased by the university can be a useful measure of environmental change and the effectiveness of environmental stewardship programs. Data about goods and services purchased can provide quantitative and qualitative information to measure progress and inform change. When the university purchasing department provides a centralized purchasing function, the department records hold information about quantities of material used. Thus, the department can be a valuable source of information about the characteristics of the products—the recycled content of paper, for example, or the gas mileage of university vehicles. In most institutions, the purchasing department also negotiates contracts for items and services such as double-sided copy machines or the disposal of waste motor oil.

Purchasing records are not always designed for analysis by item and may simply be a file folder of purchase order slips rather than a computerized database that is ready for analysis. In some schools purchasing practices are highly decentralized, so data will be nearly impossible to assemble and evaluate. As with other data, it is important to determine the purpose of data gathering before taking time to put the data in a form that is usable for analysis.

Normalization Data   Data used to put other data in forms that can be fairly compared are called *normalization data*. To compare departments or buildings, or the success of one recycling program to that at another school, it is important to measure progress by a metric that accounts for the size of the program or school or the change in size over time.

Many universities have a good accounting of the size of each building (in square feet), so size may be a useful metric for normalizing information on energy use by building for comparison. To normalize some data, it may be most appropriate to use annual graduates, since they are a university's "product" and the reason for a university's existence. However, measuring progress by the number of graduates or enrolled students can be problematic since this measure does not account for the research that a university may conduct since the quantity of research is not usually a function of the number of students. Nonetheless, comparative analyses—between schools, departments, or even over time—should be

Table 2.1
How normalizing data changes the conclusions.

	University A: Private, Ivy League	University B: Public state school
Total electricity use	100 million kWh	50 million kWh
Total square feet of space	50,000 square feet	10,000 square feet
Total student population (full-time equivalents)	5,000 students	10,000 students
Electricity per square foot	2,000 kWh per square foot	5,000 kWh per square foot
→ Electricity per student	20,000 kWh per student	5,000 kWh per student

measured in some way to ensure accuracy. The choice of this normalization scheme can be important in learning the outcome of the analysis. Table 2.1 provides a hypothetical example of how normalized comparisons between schools might show that an Ivy League school uses more energy and water resources per student than a community college because the more prestigious school has more facilities for each student and tends to use its facilities less intensively (fewer evening and weekend classes, for example), even if these facilities are more efficient on a per unit (square foot) basis.

Data for Informing Change

Data for informing change are essential and must accompany every action. Box 2.3 summarizes examples of these data. Successful environmental programs reflect the reality of the university: how it works, what its goals are, and how the existing constraints may limit action, including the physical, financial, and human constraints met by the existing equipment or procedures. Faculty and student environmental audits often overlook data that inform change, such as data about the details for a project, the attitudes of those who must undertake or oversee a project, and anecdotal data, from which much can be learned.

Sometimes students and academics tend to favor quantitative data at the expense of data that inform change and are essential to implementing environmental action. The Tufts CLEAN! research staff spent countless

Box 2.3
Data to inform change

Detailed data
Lighting: lamps, ballasts, switches
Heat: thermostats, radiators, distribution
Hours of use
Hours of need

Attitudinal data
Perceived needs
Willingness to change
Surveys
Evaluation

Anecdotal data
Why past efforts have failed
Historical information
Opportunities

hours understanding and analyzing data on the historical use of electricity. What we needed instead were detailed data about each lighting fixture in targeted buildings. The goal of recycling cardboard from dining services was more successful; we relied on crude estimates of cardboard generation, made by collecting all cardboard for a single day, in order to determine the amount of storage and the size of the baler unit we needed. We spent the most time meeting with unit managers, loading dock staff, kitchen personnel, and truck drivers to understand what would and would not work. Cardboard generation, consolidation, storage, and hauling to the baler were all worked out with the staff. In that effort, the quantitative data we did collect—the measurements of the baler unit bought to consolidate the material—failed us. When the seven-foot-high unit was delivered to the loading dock with an eight-foot ceiling, we discovered it had a piston that extended to ten feet high. A hole in the ceiling solved the problem.

Gathering the data needed to inform change is less systematic than compiling data that measure progress. To gather these data, we must find answers to a number of questions:

How are things done now, and why?
Where does waste occur?

- How can that waste be reduced or eliminated?
- Has a potential solution been tried before?

Detailed Data   Data about the details of a process or practice are often the most useful information for informing change, conducting cost-benefit analyses, or determining actual costs. For example, improving the efficiency of campus lighting can save money and avoid the emissions that result from the generation of electricity. Knowing the detailed specifications of the existing and desired light levels, the lamps, the ballasts, and reflectors are necessary for success. Without this information, informed and cost-effective decisions cannot be made.

One of the most common mistakes that students make as they audit their campuses for environmental improvement opportunities is to assume that aggregate information can inform successful decisions, so they often overlook the need for detailed information. Students who are trained in the specific data collection techniques needed for a particular project (perhaps in a for-credit internship) can be a cost-effective resource for gathering detailed program information. They can be particularly effective in counting equipment such as computers, incandescent lights, flush toilets, and electric ovens. They can also make many detailed observations and identify needs and constraints. For example, to learn how to improve systems, students might ride the recycling truck to see where parking or access limits collection or where curb cuts are inadequate for the dollies. The Nebraska State Energy Office has trained student auditors to perform in-depth energy audits in public buildings, schools, and universities. This combination of expertise through training and close supervision and student enthusiasm is a good model for successful student audits.

Information about the way that people use buildings, computers, ovens, equipment, and other resources is invaluable for designing programs and initiatives. Often a simple reduction in use, such as turning off equipment when it is not in use, can decrease the demand for resources and save money. A single Tufts dining hall discovered it could save $1,000 annually by shutting off equipment or turning it on only as needed. To determine these opportunities, we talked with people about what they needed to use equipment for and compare that information to how the equipment was actually used. Asking the people who use equip-

ment *and* observing on a spot-check basis is most effective. Often the results of these anecdotal and observed data collection methods vary widely.

Attitudinal Data   Information about perceived needs, willingness to change, and barriers to change are important for designing realistic programs. Attitudinal data are invaluable too for assessing and revising a program after it is up and running.

To gather attitudinal data, ask the affected people directly. For example, one might ask the safety officer responsible for traffic and parking violations about the best way to enforce a policy of preferential parking for carpoolers. Written surveys can be helpful in gathering information about general receptiveness to change, such as the willingness to carpool, collect recyclables, or share magazine subscriptions. Surveys also serve the purpose of conveying information to the respondent and can be useful as a communications tool by asking questions such as, "Did you know that our university has a carpooling program?"

Surveys can sometimes be unreliable and difficult to analyze or collect in-depth or anecdotal data. But universities are rich with expertise in designing and analyzing information from surveys, and a survey can be a wonderful student project.

Making a distinction between people's needs (e.g., the need to have adequate light or the need to arrive at work in a timely fashion) and the means of achieving these needs (e.g., energy-efficient lighting or carpooling) is important when collecting information about attitudes. Many cling to the status quo because they believe that it is the only way to meet their needs. Successful programs meet the needs of the community but may change the means of meeting the needs.

Anecdotal and Observation Data   Anecdotes and observations about the way things work and why or about past efforts to address problems are often undervalued, particularly in an academic environment that values quantitative data. But for those who are concerned about a university's green policy, these anecdotes are invaluable for gathering information about the way a university has historically interacted with its environment and for identifying opportunities to improve—opportunities that are often overlooked by the very individuals who are striving to create

a better policy but are relying too heavily on quantitative data. Anecdotes helped Tufts CLEAN! to learn why a 1970s carpooling program failed and why neighbors were likely to object to an on-campus compost pile. Anecdotes teach a great deal about the practical (and impractical) reasons for the existing way of doing business.

Far too often, quantitative data gathering is more detailed and time-consuming than it needs to be. Simple observation may be sufficient for gathering the information that is needed to make a change. For example, many environmental efforts begin with "dumpster diving": efforts to sort, categorize, and quantify trash in the dumpsters. A truly thorough analysis of a 'dumpster's trash would examine the trash at several different times of the school year and on different days of the week (a dormitory dumpster will have more pizza boxes and less paper on the weekends). An often overlooked trick for gathering data about solid waste generation or information about the presence recylables in the trash and materials that frequently go to waste is to ask the people who frequently look in the dumpsters—the custodians—or to look at the dumpster and observe the relative quantities of materials. Records of complaints about rooms or buildings that are too hot or too cold, often recorded by buildings and grounds departments, are another example of an easy way to gather data and pinpoint areas where conservation can occur or where improvements in thermostat control, thermopane windows, or insulation are needed most. By looking around for quick and easy ways to assess program needs, environmental stewards can spend less time collecting data and more time designing and carrying out programs that work.

Data About Products and Technologies
Information and data about specific products, services, and technologies that are in use or installed at the university, or could be installed, are important for understanding the university's impacts on the environment and the opportunities to change those impacts. Information about the size, cost, and performance of new equipment is important. Which equipment will fit the space? What will be effective at solving the problems and reducing impacts? How durable will the product be? These are only some of the questions that need to be answered in purchasing decisions.

In environmental decision making, the environmental consequences or the environmental performance of a product may confound the issues. Furthermore, the needed information may be incomplete, unavailable, or unreliable. For example, little, if any, regulation guides the labeling of products as recycled, biodegradable, nontoxic, or environmentally friendly, so data gatherers need to scrutinize the ingredients or manufacturing processes whenever possible in order to assess their environmental impacts. In the end, decision makers will have to settle for incomplete information and realize that new science or engineering in the future may change decisions made today. Nonetheless, the business of environmental stewardship is one of continuous learning and improvement.

Data Gathering and Action
Regardless of the accuracy and amount of data collected, data collection alone is insufficient. Rather, action on this information is the most important step for environmental change. This advice may seem self-evident; yet consider the bookshelves that are full of thorough academic studies with good ideas that have never come to fruition. Implementing projects requires the direct involvement of the affected people, often university staff, in data collection and the development and testing of recommendations.

Making Environmental Change Happen

There is no formula for making environmental change happen, and there never will be one. Hard work, dedication, and money do not ensure that change will happen or last, although they may be the most important ingredients. The seemingly slow pace of change can be especially frustrating for students who are on campus for only thirty weeks a year for four years. Most often, in fact, change happens in surprising ways. Several addition factors are helpful in greening the university.

The Economics of Environmental Stewardship
Like it or not, the language of the world is money and thus we must often communicate our efforts to green the university in financial terms. It is clearly impossible to assign a dollar value to the benefits of clean air,

potable water, and open space, but, happily, many of the most important environmental initiatives can have real financial benefits that are usually related to cost avoidance or avoided liability.

Universities and colleges receive their operating funds from four major sources: tuition and fees, research funding from government or foundation grants, donations, and interest on the endowment. Major expenses are salaries, operational expenses (utilities, trash removal, grounds and maintenance, etc.), capital·expenses, such as the investment in a new boiler, and equipment. Universities and colleges vary widely in the extent to which they rely on tuition and can augment their operating expenses with income from the endowment or outside research grants.

College and university business and financial officers understand both long-term and short-term cost avoidance and the benefits of avoiding costly fines and potential liability problems. It is important for environmental leaders to quantify the financial benefits and costs of a new environmental technology, such as new photocopiers, or of a new policy, such as a mandate for the purchase of recycled paper campus-wide. It is usually better to complete a project for less money (or greater savings) than originally predicted than the other way around. Project costs must include the cost of existing and additional labor (salary and benefits). Operational costs, such as electricity, waste, and water, are important in order to educate the university that these are in fact costs of many decisions (such as building a new laboratory) that are often overlooked.

Finding the Biggest Opportunities   The opportunities for financial savings from environmental stewardship activities differ from one campus to another, but on most campuses improving energy efficiency will offer a dramatic return on the university's investment, as well as decrease on- and off-site pollution. For example, in regions where electric power is more expensive (seven cents per kilowatt-hour and up), installing new technologies to improve the efficiency of lighting and motors can have payback periods of as little as three months; and more comprehensive projects that combine the installation of rapid and slower payback technologies will pay back in three to five years. Some electric utility companies offer rebates to subsidize efficiency measures, such as the installation of efficient technologies, dramatically reducing the costs to the institution.

(Rebates are cost-effective for the power companies because the new technologies reduce demand for electricity, effectively gaining capacity for additional electricity users more cheaply than by building additional generating capacity.) Reducing liability from chemical accident, hazardous waste spills, and oil storage can also save a great deal of money in avoided fines, suits, and liability. Although most schools begin their environmental initiatives with recycling efforts, solid waste programs will not accrue major savings unless they can succeed in reducing waste generation in the first place.

Long-Term and Comprehensive Accounting   Since most colleges, universities, and schools plan to be in business in ten, twenty, or even one hundred years, it pays them to think in the long term whenever possible. Certainly most facilities planning has two-, five-, and ten-year horizons, but often the payback periods must match those of more traditional investments in financial markets, stocks, and bonds. Often overlooked is the cost of redoing work or delaying work until the future, when materials are more costly, the cost of fuel may be higher, and the availability of capital scarce. Without a comprehensive approach to accounting and budgeting, the savings from many projects cannot be realized. This problem is most evident in construction and renovations that fail to take advantage of the newest technology, such as energy management systems or materials with good insulating properties in favor of lower construction costs but higher maintenance costs.

Full Costs to the University   The costs of electricity and the generation of solid waste in a special project or new facility are often overlooked. For example, when a department builds a new computer room or electronics laboratory, the cost of the increased electricity demand rarely figures into the costs of construction or facility operation. Furthermore, many campuses have centralized or antiquated meters for assessing the electricity demand in a building or school, and therefore they may not actually be able to see these increased costs. When university administrators and managers fail to look comprehensively at overhead costs, such as waste disposal, heat, water, and solid waste handling and disposal, and apportion these costs accurately to the departments that use them, they

overlook a portion of the financial and the environmental costs of conducting any single department's business.

Often environmental initiatives will save the institution money overall, but the savings accrue to one department while another department must pay a cost or expend labor to implement a program. For example, the efforts of Tufts' dining services staff to separate corrugated cardboard for recycling and purchase a baler to consolidate the material resulted in cost savings for the buildings and grounds department, which saved on waste disposal, yet the daily labor costs were borne by the dining department. Without an understanding of the full costs of environmental stewardship efforts, there is often little incentive for any one department to undertake the expense or the effort. Universities should find ways to encourage and reward waste-cutting initiatives by considering them on their full cost and benefit to the institution rather than to individual departments or schools.

The Shortage of Capital   As in any other institution, only a finite amount of capital is available for environmental policy and technology improvements, even if the projects have rapid returns. Furthermore, emergency or higher-priority projects can sometimes tie up the available cash. Universities are generally reluctant to, issue bonds or borrow money for capital improvements that don't involve major renovations. Although university endowments may have massive reserves from which an institution can borrow, few universities allow borrowing from the endowment for environmentally related projects, probably because these investments are not well understood and are perceived as unreliable as compared to stocks and bonds.

Return Savings to Other Environmental Projects   When environmental efforts result in savings, returning a portion of the savings to fund other environmental initiatives helps keep the initiatives self-funded. While this concept is tenable, implementing it can be difficult since savings, mostly in avoided costs or avoided liabilities are difficult to quantify. Public institutions may be prohibited by law from repaying capital expenditures from operational (monthly utility or disposal charges) accounts because utility costs and capital expenditures are ap-

propriated separately in the state legislatures. However, in private schools, experience shows that savings from environmental projects are difficult to quantify and are rarely used to seed new projects. As a result the savings return to central budgets. Where it is allowed, universities can explore paying back capital costs from the savings that accrue to operational budgets.

Financing Alternatives   Shared savings plans, leases, and grants are among the financing options that may help universities carry out environmental programs. With a shared savings plan, a third party finances the upgrade project, and the university pays back the loan based on the calculated savings that result from the efficiency improvements. Shared savings programs are used extensively in electrical efficiency programs. Energy saving, alternatively fueled, or solid waste disposal equipment can be leased rather than bought, thereby reducing the capital needed up front. Gifts and grant money from local and national governments, private companies, and foundations are sometimes available to cover equipment or initial investments, although grants are typically small and earmarked for equipment. The University of Illinois was able to secure over $600,000 in funding from the state to cover the costs of its recycling program for five years. On a much smaller scale, Indiana University at Bloomington received $6,000 to start its recycling program.

Finding Connections to Other University Priorities

At corporations throughout the country, institutional commitment to the principles of pollution prevention has widespread benefit: public relations, cost reduction regulatory compliance, and worker productivity. Although a university's environmental impacts differ from those of a manufacturing company, the experience of the for-profit sector should serve as an example for university action.

Environmental concerns can complement existing university priorities. Likewise, environmental stewardship can, in part, be included in existing university structures, such as committees on planning, safety, renovations, and parking. Tufts CLEAN! staff took advantage of open invitations to the general university community and joined the traffic committee and the university facilities planning committee, among others. In

the process, we learned a great deal about university priorities and were able to make suggestions and proposals that fit within existing structures.

Cost Containment   Containing costs is a priority for most universities, so environmental leaders should point out where their efforts complement this goal. Identifying aggressive waste reduction opportunities is usually the best short-term strategy for containing costs and meeting environmental objectives.

Competitive Advantage   Few universities have taken full advantage of the opportunity to attract students and funding through environmental stewardship action, perhaps because no university is yet able to declare that it is a truly green university. Nonetheless, current and potential students, alumni, and foundations are likely to be attracted by innovative and progressive programs. In seizing the competitive advantage, it is important that promoters of environmental achievements are accurate and humble, consistent, and open to new ideas. Part of what is required in the environmental stewardship movement is openness to ideas and a constant willingness to reexamine decisions.

Community Building   Most colleges and universities benefit from the loyalty and pride of students, parents, alumni, and employees. Environmental stewardship efforts, especially those that are campus-wide, can help build a sense of community and purpose. Environmental leaders can use these positive aspects to their benefit through publicity that recognizes important and innovative efforts and provides positive messages to the university. For example, Tufts CLEAN! used the university's monthly staff newsletter to publicize issues and actions that were underway or completed.

Time   Time is a limited resource for nearly everyone, and university faculty and staff are no exception. Many university projects (not just environmental projects) suffer from time constraints.
Students are passionate about environmental issues, and this passion, if channeled, can save time. For example, university purchasing departments can benefit from student commitment to environmental concerns by putting interested students to work on identifying, researching, and

testing products made of recycled fibers, packaged with less material, or manufactured locally. Independent study or environmental studies students are a ready resource for university managers with limited time as well.

The university's calendar can work to the advantage or disadvantage of environmental stewardship projects. The start of a term is often the freest time; exam time is the most difficult, for both students and faculty. Grounds and dining staffs work long hours before graduation and other special events. Purchasing and accounting departments do not have a spare minute as the end of the fiscal year approaches. And many students and faculty are not on campus in the summer. Planning environmental projects to complement the calendar will make them more successful.

Pilot Programs
Problems arise in even the best-laid plans. Pilot programs to test the effectiveness of a program, new piece of equipment, policy, or other changes on a small scale can be invaluable for identifying unforeseen problems and working them out before a program is instituted university-wide. Departments or environmental leaders can test new equipment in a single location before installing it throughout the campus. Pilot programs can test new policies or procedures and use employee and student feedback to revise and improve programs before they are implemented on a widespread basis.

Publicity, Involvement, Information, and Rewards
Well-placed publicity can help to motivate and reward individual action, as well as inform the university community about new policies. Rewards are helpful for motivating change. Easiest and perhaps often overlooked is a letter of thanks to the helpful person and his or her supervisor. Students respond well to t-shirts, mugs, and even green socks for recognition of volunteer service or other jobs done well.

At Tufts, we tried a number of publicity vehicles, and each was successful in raising consciousness and increasing participation in environmental stewardship activities. Early in the project, we wrote a weekly column of tips for action in the student paper and later, a monthly story for the staff newsletter to highlight actions and accomplishments by individuals

at the university. We also experimented with a newsletter, available electronically and on paper, with stories that highlighted campus action and provided action suggestions. In each case, staff commented that they were energized by being featured or by seeing others featured for taking actions similar to their own. In addition, the publicity materials provided us with opportunities to evaluate and test new programs by requesting volunteers or gauging interest in other ways. We also produced a university environmental poster, intended to provide motivation and inspiration. Throughout the duration of the project, we were pleasantly surprised to find it hanging in unlikely places as a source of inspiration and personal commitment. Many campuses work with dining services department to create a reusable mug with an environmental message as well.

Publicity and rewards need not always be one way. Some corporations have tried to elicit cost-saving ideas through the use of employee contests and suggestions that offer cash rewards. E-mail and suggestion boxes are more passive but are effective if the suggestions receive prompt responses. For example, West Chester University selected projects from suggestions submitted by members of the entire university community to develop a targeted environmental action implementation plan.[13] In April 1996 Tufts ran an environmental contest and attracted 120 ideas for reducing waste, recycling, and improving energy efficiency and water conservation. Many of the ideas were valid, but few of the entries contained enough detail about the implementation of the project to warrant the cash prizes offered.

Setting Priorities

Setting priorities for implementation and focusing on a target area, such as energy or waste, will help environmental leaders accomplish something. Environmental committees can be helpful in setting priorities, determining the most achievable strategies, or coordinating the actions occurring simultaneously in several departments. Often priorities are set by picking what is perceived as the biggest problem, but this problem may not be solvable with the resources, expertise, and time available. To embark on a project because it is big and needy may overlook the several projects that can be realistically accomplished and the momentum created that may, in time, put the bigger projects within reach.

At Tufts, large water cannons were used to spray water across the fields, resulting in large losses to evaporation. However, the grounds manager had spent nearly twenty-five years perfecting this watering system and was uninterested in changing it. On the other hand, we discovered that the dining manager was willing to have us work with her staff to develop some water-saving techniques, such as changes in pot washing techniques. The theoretical potential to save water in the kitchen was much less than on the athletic fields, but the real potential was greater in the kitchen because the project could be accomplished.

Planning projects comprehensively helps to avoid accomplishing only the easiest part while leaving the more difficult portion undone. Projects to upgrade lighting to improve efficiency run this risk since the projects with very rapid financial payback are often done first instead of coupling them with initiatives with longer paybacks.

Projects should build on one another, and environmental projects can do this as well. However, the projects that will succeed on any given campus are unlikely to follow such a nice progression.

Conclusions

Institutions of higher learning have varied and often large environmental impacts. The changes that are required to minimize or eliminate these impacts are complicated and require participation and commitment at all levels. Formal committees, policy statements, and individual leaders will help make change happen. Nevertheless, each member of the university has a role to play in the efficiency, waste reduction, safety improvements, and long-term or life-cycle thinking of environmental change.

In theory, change is easy; in practice, it takes years to effect. Careful documentation of data and rigorous, realistic economic calculations are helpful tools. In addition, university environmental leaders need to remember that the process can take time and that the answers to all of our environmental choices are not known. As new understanding of these issues emerges, priorities and solutions will change. Universities are at the forefront of this evolving understanding.