Environmentally Conscious Campus Development

It can be win-win-win — for campus, community and cost control — when there is environmental planning

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Colleges and universities have widely responded to the expectation that we should work toward, operate under, and live by principles of sustainability. Eighty-nine of the 260-plus institutions of higher learning in New England (34 percent) have signed the *American College & University Presidents Climate Commitment* to guide their institutions and their programs toward climate neutrality. Public institutions have been significant leaders, with more than half of New England's public colleges and universities (57 percent) participating.

Interest in sustainable development comes from many sources, but first and foremost, from the interest of students, faculty, administration and the wider community in moderating or reversing climate change. A recent survey of college presidents and executive officers identified the following reasons for developing environmental programs on campus. They fit in with the culture and values of the campus; they are good public relations; they are cost-effective, and they help recruit students.

Given that buildings consume 40 percent of all U.S. energy, construction is a major focus of improvement. On a typical campus, up to 90 percent of direct greenhouse-gas emissions come from buildings. While interest in sustainable development is strong, justifying expenditures for sustainable development in a difficult economic environment can be challenging. Nevertheless, there is a strong economic and community-relations rationale for pursuing sustainable goals.

Defining Sustainability

While a variety of guidelines focus efforts on sustainable operations and development, the most referenced is the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system. According to a recent survey, 44 percent of New England projects achieving LEED certification were built for colleges and universities, and more than half of those (57 percent) were for public institutions.

While many institutions follow other guideline systems or their own definition of "sustainability," the *Presidents Climate Commitment* and LEED are commonly recognized as rigorous systems of evaluation requiring a committed effort. New England's public colleges and universities are clearly leaders in this pursuit.

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Public institutions in Connecticut, Maine, Massachusetts and Rhode Island, are required by state law or executive orders to meet LEED standards in major construction projects. While not all New England public institutions are bound by this requirement, New England communities in the table below have adopted ordinances or bylaws mandating or encouraging LEED certification. In addition, the New England universities listed have explicitly adopted policies guiding their institutions toward LEED certification.

Institutional Cost Saving

One of the most pragmatic goals for campuses to pursue is to reduce energy costs. Energy conservation measures have a direct, measurable impact on reducing campus operating costs, while reducing the campus carbon footprint. Energy reductions reduce carbon footprint, whether the energy comes from on-campus sources such as co-generation systems, or is purchased from a utility. Both have carbon emissions to avoid.

Many basic energy conservation measures do not involve mechanical systems and cost almost nothing. The way buildings are sited to respond to microclimate — wind, shelter and solar orientation — can have significant impact on long-term energy demand.

"Leeding" Communities and Colleges

Communities Adopting LEED	Colleges & Universities Adopting LEED
Acton, Mass.	Bowdoin College
Arlington, Mass.	Brown University
Bangor, Maine	Connecticut College
Bar Harbor, Maine	Dartmouth College
Berlin, Conn.	Harvard University
Boston, Mass.	Massachusetts Institute of Technology
Mansfield, Conn.	University of Connecticut
Portsmouth, N.H.	University of Vermont

LEED Initiatives in Governments and Schools, U.S. Green Building Council, July 2008.

Careful massing of buildings can employ seasonal microclimate variations to provide a part of energy needs by:

- admitting daylight as widely as possible, to reduce the need for artificial illumination;
- encouraging absorption of solar heat during cool heating months; and
- shielding the building from solar radiation during warm cooling months.

Massing strategies include careful placement of windows, shielding of openings through window depth or overhangs and strategic landscape plantings. A skilled architect can incorporate these strategies while developing a sensitive design.

In all New England states, building codes require design professionals to develop building envelope designs to meet minimum energy efficiency standards; skilled application of these principles can result in long-term payback at minimal additional cost. A white roof, for example, reflects solar heat that would be absorbed by a black roof. Significant savings result from nothing but the color. A reflective film on window glass has a similar effect. Other options, such as increased insulation and insulating window glass, add some initial cost, but return that cost quickly through energy savings.

Careful consideration of program needs can also provide energy savings. When the University of Rhode Island realized that a large atrium in a new center for biotechnology and life sciences would be used only briefly (by people walking to other spaces in the building) and that two floors of teaching labs would not be used in summer months, these spaces were built with provisions for automated natural ventilation, not air conditioning. These measures reduced long-term energy costs and reduced up-front capital costs, since major building energy systems — chillers, pumps and switchgear — could be downsized on the assumption of reduced loads.

The most common energy system improvement is upgrading the efficiency of lighting systems. Changing light bulbs to compact fluorescents in existing fixtures is inexpensive and cost-effective. Major mechanical equipment — fans, pumps, boilers and chillers — can be bought in energy-conserving models, at a small premium. All New England states have utility and state-funded programs to subsidize and support the cost of such improvements.

As a campus develops over decades, it acquires a panoply of building control systems. Contemporary control systems stop and start equipment when needed, monitor space conditions and occupancies with accuracy, and implement sophisticated strategies to reduce overall energy use. A professional evaluation of building controls can identify places where controls can be upgraded to harmonize systems and return energy savings — while reducing carbon footprint.

Community Cost Saving

A range of sustainable measures can benefit the community surrounding the institution through avoided infrastructure costs. Storm water mitigation is a clear example of this. The sustainable principle is that rainfall should be retained on site, rather than sent out to community storm-water systems or local wetlands. Storm water places demands on community infrastructure that may impel construction of new storm drain systems. Storm water sent to wetlands can overwhelm and damage fragile ecosystems.

Water-retention systems — retention ponds — enable a new building project to avoid creating off-site storm-water runoff. In an academic environment, these features can be upgraded to create wetland habitat and even become teaching opportunities. They do take

space on campus, however. A measure that takes no space and may cost no more than conventional methods, is to use permeable pavement — asphalt, concrete or stone, produced with voids that let rainwater and melted snow percolate through to the groundwater. The University of Massachusetts, as a part of its integrated sciences building at Amherst, incorporated an underground 20,000 gallon storage tank that collects water from roofs and the underground foundation drainage system. Rather than discharging this water to storm sewers, the building uses it at cooling towers to supplement water lost to evaporation. For the cost of a tank and a pump, the university has reduced long-term water supply cost and the potential strain on campus storm water systems. Other projects have used similar "grey water" systems for other water needs that do not require treated potable water — such as flushing toilets, or lawn irrigation.

One measure that can cost the same as conventional systems but reduce water needs is the use of waterless urinals. Maintenance procedures are similar, but can take less time than maintenance of standard urinals. Another method, called xeriscaping, is a landscaping technique using native plants, reduced or no turf, and careful planning to minimize landscape water usage. Maintenance costs are also reduced, as lawn areas are costly items in groundskeeping budgets.

Campuses working toward carbon footprint reduction must also focus on vehicle traffic. Students, faculty, administration and visitors traveling by car to and from campus create significant emissions and energy use. The expansion of on-campus housing options in recent years addresses traffic directly. On-campus housing also benefits student life and can address town/gown relationship issues.

Master plan development can have significant impact on use of automobiles on campus. Cars are a major component of campus carbon footprint. Many university campuses have been developed for the convenience of cars. They offer broad roadways and dispersed parking lots that make access by auto convenient to university buildings. They also spread buildings apart and introduce traffic between them, making access by pedestrians inconvenient or dangerous. Such campuses promote use of autos to navigate between classes and meetings. Forward-looking campuses are developing pedestrian-friendly centers, with greens, walkways and courtyards between buildings. Parking facilities are relocated to the perimeter. This keeps traffic out of campus; promotes development of larger, more cost-effective parking facilities; reduces pollution from emissions; and encourages healthy walking activity. A campus shuttle system facilitates leaving the car behind for the day. If the shuttle reaches out to public transportation points-of-contact, even more car reduction is accomplished.

The more public transportation routes that serve a campus, the less need there is for autos and parking facilities. One effective strategy is to partner with local communities to develop transportation alternatives; it may even be economical to subsidize community efforts, in lieu of investment in car accommodations on campus.

There are many other measures, and many other goals encompassed in sustainable development. As a starting point for conversation, the benefits to campus and community are resonant.

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