

THE HIDDEN ECONOMICS OF CAMPUS SUSTAINABILITY

by John P. Morris

As the manager of facilities operations at Colorado State University (CSU) I had the opportunity to lead a variety of work units including Utility Services, Energy Management and Water Conservation, Trades Services, Custodial Services, Trash and Recycling, Outdoor Services (Grounds), and Transportation Services. Each of these work units has actively implemented numerous sustainability programs. However, the purpose of this article is to discuss some of the less obvious benefits of campus sustainability efforts that are often overlooked.

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Most of us are familiar with the obvious economic and environmental benefits associated with utility cost avoidance programs. For example, Colorado State University has actively encouraged energy management and water conservation efforts since the early 1970s. Since the mid 1980s, CSU has had a utility cost avoidance of over \$35 million. Associated with these programs is an estimated emissions avoidance of over 1 billion pounds of carbon dioxide (CO₂), over 6 million pounds of sulfur dioxide (SO₂) and over 3 million pounds of nitrous oxide (NOX). However, some of the less obvious benefits of these efforts include the avoidance of expensive utility plant investment fees; emission equipment installations or upgrades, utility infrastructure upgrades; maintenance savings; improvement in the quality of the indoor environment; free publicity; and a recruiting tool.

Utility Plant Investment Fees

CSU's conservation efforts have delayed and deferred the need to purchase expensive plant investment fees from the local utility supplier. For example, since 1990, the student population has increased by 5,000 students (a 25 percent increase) and building square footage has increased nearly 1.4-million gross square feet (a 19 percent increase), while potable water use has decreased over 108-million gallons (a 22 percent decrease). The equivalent cost of water and wastewater plant investment fees is in excess of \$2 million.

Emission Equipment Installations or Upgrades

The university is required to have air emission permits under Title V of the *Clean Air Act*, which imposes limits on the quantity of specific emissions. Growth due to campus expansion could potentially require the university to incur the capital cost of implementing best management practices to control emission levels. Reducing the current emission levels through conservation efforts defers or potentially eliminates the need to invest the capital required to implement additional emission reduction best management practices.

Utility Infrastructure Upgrades

Conservation efforts have also deferred for decades the need to increase the capacity of expensive utility infrastructures. During the late 1980s, a major sanitary wastewater line experienced surcharge problems. As can be expected, a sanitary line that raises a manhole cover and overflows onto the campus is not a desirable situation. The cost to increase the capacity of this sanitary system is well over \$2 million. The reduction in campus water consumption has not only eliminated the surcharge problem, it has also deferred the need to invest the capital required to increase the size of this system, even with the addition of several new buildings.

CSU also has a steam district heating system with three main boilers. Again, in the late 1980s, the university steam demand was quickly approaching the firm capacity of the boilers. Energy conservation measures have delayed the need to upsize the plant capacity for nearly 20 years, even with the

addition of over 800,000-gross square feet (GSF) of building space. The deferred cost to increase the smallest boiler is well over \$2 million.

Maintenance Savings

In the early 1980s, Colorado State University investigated the use of an energy service company (ESCO). It was determined that the best option was to issue certificates of participation or bonds, in the order of \$12 million and to use internal resources to implement a similar program without the assistance of an ESCO. After a decade of implementing conservation programs, the bonds were completely paid off using the cost avoidance to the utility budget, leaving the university with nearly \$2 million annually available for other opportunities. Nearly \$1 million per year was reinvested into facilities needs such as building system renovations. Another million dollars was available for such things as faculty salary increases and other academic or administrative needs.

Other benefits related to conservation efforts included a reduction in lighting system maintenance costs. For example, replacing a 40-watt exit light with a life of about 1,000 hours with a 2-watt exit light with a 10,000-hour life significantly improved the maintenance staff's ability to ensure properly functioning exit lighting systems. Similar benefits were experienced with main building lighting systems.

Improvement in the Quality of the Indoor Environment

Lighting system improvements not only reduced maintenance costs but also improved the quality of the work environment with the advantage of increased worker productivity. It is difficult to put an exact number on the economic benefit of improving the quality of the indoor environment but these numbers do exist. It is well known that the cost of an employee per square foot is at least one order of magnitude greater than the cost of the utilities for that same space.

For example, if an employee making \$30,000 per year occupies an office of 100-square feet, the unit cost of that employee is about \$300 per square foot. The cost of utilities for that same space is less than \$3 per square foot. Improving the productivity of that employee by only 1 percent is worth \$3 per square foot. A conservation project that reduces the utility expenses by 10 percent, or \$.30 cents per square foot, could result in an

improvement in worker productivity by \$3 per square foot if the savings is reinvested into the facility. At Colorado State University, reinvestment of the utility savings into the older campus buildings helped to revitalize numerous facilities that were quickly exceeding their functional purposes.

Similar studies have shown that the classroom environment can impact the learning ability of students. In cooperation with academic departments such as the department of Construction Management, various classrooms were renovated using sustainable concepts, not only teaching sustainable concepts to the students, but also making these spaces less institutionalized and more conducive to a positive learning experience.

In July 1997, Fort Collins, Colorado experienced a 500-year rainfall that caused nearly \$100 million worth of damage on campus. Nearly 40 buildings experienced water damage, including several lower levels that were completely inundated with water. One outcome of this rainfall was an increased awareness and sensitivity to the effects of mold and other indoor air quality concerns. The loss of worker productivity related to the indoor environment of these buildings could be costly. Incorporating sustainable or green products into building construction and campus operations can reduce or eliminate the negative impacts of indoor air quality-induced illnesses.

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Free Publicity

CSU spends a significant amount of money on marketing to attract new students. Energy conservation programs can assist with this marketing effort at no additional expense. When the university offered students in the residence halls the opportunity to purchase 100 percent of their electrical needs from wind power, the news was reported in more than 25 newspapers nationwide, including the *New York Times*. Colorado State University has also been listed in several trade journals relating to partnerships in programs such as the EPA Green Lights program and Climate Wise. Publicity of this type is

priceless and requires minimal effort beyond implementing conservation measures.

Recruiting Tool

Many institutions are vying for national and international recognition. To do this, they compete for students, faculty, and research funding. As the next generation becomes more focused on reducing their environmental footprint, having a sustainable mindset can be a significant recruiting tool. More than ever before, university building designs are viewed as enhancing and preserving our institutional heritage while creating an attractive environment in which to learn, discover, and live.

We do not just build or renovate structures; we create a 'sense of place.' It is important that the university actively demonstrates this concept within its mission and values. Active support for energy management and water conservation is one way to demonstrate this commitment.

Conclusion

Energy management and water conservation have the direct benefit of utility cost avoidance and reduction in emissions. They also have some less obvious and often overlooked significant cost benefits such as the avoidance of expensive utility plant investment fees, reduction in expensive emission upgrades, avoided, or deferred utility infrastructure upgrades, maintenance savings, improvement in the quality of the indoor environment, free publicity, and a powerful recruiting tool. I encourage facilities managers to consider and take credit for these less than obvious benefits. 🏢



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