

US EPA ARCHIVE DOCUMENT

**PROFILE** The college and university sector<sup>4</sup> includes a wide variety of campuses across the country, from small community colleges to large research universities. Funding sources for the sector include tuition, private donations, government grants, and, for public institutions, state appropriations.

Classroom education is only one of many activities taking place on college campuses. Campuses often maintain many types of facilities, including research laboratories, art studios, utility generation and transmission plants, dormitories, and water distribution systems. Many large research institutions also have specialized facilities, such as medical centers, agricultural centers, nuclear reactors, and high-security biomedical laboratories.

## Sector At-a-Glance

Number of Institutions:	4,168 <sup>1</sup>
Revenues:	\$270 billion <sup>2</sup>
Number of Employees:	3.2 million <sup>3</sup>

**TRENDS** Due mostly to demographic changes, colleges and universities are projected to serve more students each year over the next 10 years. Enrollment in degree-granting institutions is projected to increase from 16.9 million students in 2003 to nearly 18.2 million students by 2013.<sup>5</sup> This growth in the student population will add to the level of activity taking place on campuses and will likely lead to the construction of new buildings and other support facilities.

### KEY ENVIRONMENTAL OPPORTUNITIES

For the college and university sector, the greatest opportunities for environmental improvement are in reducing air emissions, managing and minimizing waste, conserving water, and improving water quality. In addition, some colleges and universities are planning and designing campus expansions that meet green building standards.

The colleges and universities sector has taken steps to develop performance metrics, collect data, and track performance. In 2003, six national organizations partnered with EPA's Sector Strategies Program to select key environmental performance indicators, determine appropriate methodologies to measure these indicators, and develop tools to assist institutions with the measurement process.<sup>6</sup>

In 2005, the sector partners launched a Web-enabled Self-Tracking Tool that allows colleges and universities to collect and analyze data on their campuses' environmental impacts.<sup>7</sup> The Self-Tracking Tool gathers four years of retrospective data on four environmental indicators – energy use, hazardous waste, solid waste/recycling, and water use. Schools can use the tool to identify and analyze trends in their data and benchmark their environmental performance against aggregated data from other schools of similar size and type (school names are kept confidential).

All colleges and universities are invited to input data and provide suggestions for improving the tool. To date, more than 100 institutions have registered to use the database (although far fewer have actually entered their data).



**REDUCING AIR EMISSIONS** Many colleges and universities are committed to reducing air emissions resulting from fleet vehicles and energy use on campus. Some campuses have developed energy conservation projects and commuting programs to decrease energy needs, while others have switched their campus fleets to compressed natural gas or biodiesel, a cleaner-burning alternative to diesel made from vegetable oil.

To reduce air emissions from electricity use, more than 41 institutions are currently participating in the Green Power Partnership, a voluntary partnership between EPA and organizations that are interested in buying green power. These institutions have pledged to purchase a portion of their electricity from providers using environmentally preferable, renewable energy sources, such as solar, wind, geothermal, biomass, biogas, and low-impact hydropower. Together, they account for purchases of more than 250,000 megawatt hours of green power annually.<sup>8</sup> The following case study highlights another multi-campus initiative to promote renewable energy.

As part of its performance measurement initiative, the sector is now beginning to collect data on its use of both renewable and non-renewable energy.

**Case Study: Pennsylvania Campuses “Getting to 10% Wind”** The Pennsylvania Consortium for Interdisciplinary Environmental Policy, through which 34 colleges and universities currently purchase wind energy, is the largest nongovernmental purchaser of wind power in the country. Moreover, the consortium accounts for nearly half of the renewable energy purchases by colleges and

universities in the U.S. To encourage member institutions to purchase even more wind energy, the consortium set a goal of “Getting to 10% Wind.” So far, nine institutions meet 10% or more of their total energy demand with wind energy purchases, equal to 92,200 megawatt hours. This translates to carbon dioxide reductions comparable to planting nearly 7.5 million trees, or not driving 96 million miles.<sup>9</sup>



## MANAGING AND MINIMIZING WASTE

Colleges and universities are using tools such as target goals and management plans to reduce the generation of hazardous and solid wastes and to increase recycling on their campuses. Target goals vary across campuses, from a 10% reduction in hazardous waste per laboratory student to a 50% recycling rate for solid waste.<sup>10</sup> In addition to their efforts to minimize wastes, a number of institutions are developing courses and degree programs in Green Chemistry.

**Hazardous Waste** EPA data on large quantity generators, as reported in the *National Biennial RCRA Hazardous Waste Report*, indicate that the colleges and universities sector accounted for less than 1% of the hazardous waste generated nationally in 2003.

In 2003, 257 facilities in the sector generated 9,100 tons of hazardous waste. Half of this waste was from laboratory operations. Other sources of hazardous waste at colleges and universities include medical centers, art studios, and operations and maintenance activities (e.g., painting). The waste management methods most utilized by this sector were incineration and fuel blending. The sector is beginning to collect information on hazardous waste generation and permitting as part of its performance measurement initiative.<sup>11</sup>

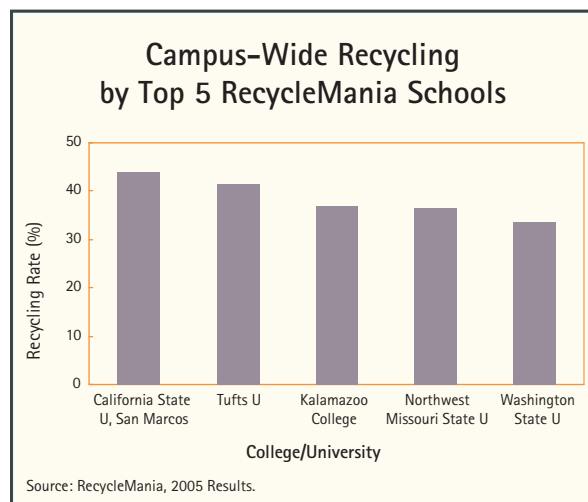
**Solid Waste Recycling** Solid wastes from colleges and universities include common recyclables, such as cans, glass, cardboard, and office paper, and compostables, such as food scraps, animal bedding, landscape refuse, and trash. An increasing number of colleges and universities are reducing their solid waste volumes through recycling. In addition to the following case study highlights, Seattle University's waste reduction and recycling program has achieved a 62% campus-wide recycling rate;<sup>12</sup> the University of Oregon consistently diverts more than 40% of its waste stream;<sup>13</sup> and the recycling rate at the University of Massachusetts-Amherst exceeds 50%.<sup>14</sup>

The colleges and universities sector is also collecting information on solid waste generation and recycling as part of its performance measurement initiative. Through the Self-Tracking Tool described above, institutions are gathering retrospective data on numerous recyclables (e.g., aluminum, glass, office paper, and newsprint).



**Case Study: RecycleMania** RecycleMania is a 10-week, intercollegiate competition between schools from across the country to raise student awareness of campus recycling programs.<sup>15</sup> Founded in 2001 by Miami University (Ohio) and Ohio University, EPA WasteWise partners and rival schools, the number of participating schools has increased from 2 to 47 in just five years. Over the last five years, the two founding universities have increased recycling on their campuses by 61% and 56%, respectively.

RecycleMania participants compete in two categories: the Residential Areas Contest (determined by the weight of recycled material per residential student), and the Campus-Wide Competition (determined by the amount of recycled material relative to the total waste produced on campus). In 2005, Miami University (Ohio) won the Residential Areas Contest by recycling 72 pounds per student, making it a three-time winner. As shown in the Campus-Wide Recycling bar chart below, California State University in San Marcos, CA, won the Campus-Wide Competition with a 44% overall recycling rate. In total, participating schools recycled more than 10.4 million pounds of materials in 2005.<sup>16</sup>



**Green Chemistry** As illustrated in the following case study, sector members are developing courses and degree programs in Green Chemistry, which aims to reduce or eliminate the use or generation of hazardous substances in the design, manufacture, and use of chemical products.

**Case Study: Green Chemistry at the University of Massachusetts-Boston** Dr. John Warner created the first Ph.D. program for Green Chemistry at the University of Massachusetts-Boston. Researchers and students in the university's Green Chemistry program take their "bioinspiration" by understanding how chemistry works in nature and applying these principles to real-world problems. As a result of its pioneering efforts, UM-Boston has experienced increased enrollment in undergraduate chemistry; received significant research funding in Green Chemistry program areas; found itself flush with highly qualified applicants for the Ph.D. program; and seen active interest by employers in the program's graduates.<sup>17</sup>



**CONSERVING WATER** With its student residences, athletic facilities, landscaping, research laboratories, and other activities, a typical college or university can use millions of gallons of water each year. With such a large volume of annual usage, even a small improvement in the efficiency of water use can translate into many gallons of water conserved. Water conservation is particularly important for institutions located in arid or drought-stricken regions of the country, as exemplified in the following case study.

Water conservation efforts on campuses often include activities such as increasing awareness of wasteful practices, using stormwater for landscaping, and implementing more efficient methods of heating and cooling buildings. The sector is beginning to collect information on water usage as part of its performance measurement initiative, gathering retrospective data on potable water and irrigation and other water usage over the last four years.

**Case Study: Conserving Water at Colorado College** Faced with drought or near-drought conditions for the past several years, Colorado Springs, CO, is one of many cities along the Front Range of the Rocky Mountains that has imposed water rationing. Colorado College, a small liberal arts college in Colorado Springs, has taken additional steps to significantly reduce its water consumption. Over the last few years, Colorado College has:

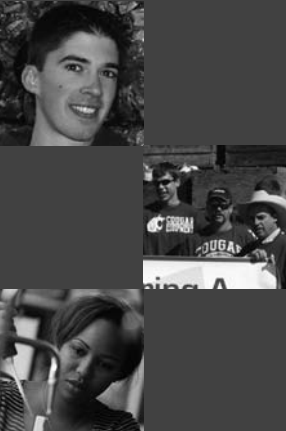
- Installed low-flow showerheads throughout the entire campus;
- Implemented a computer-controlled irrigation system that releases only the necessary amount of water dictated by weather conditions;
- Installed drip systems to water existing flowerbeds and incorporated the principles of xeriscaping (conservation of water) in new campus landscaping; and
- Used 100% non-potable water for irrigation – much of which would have been released into the Arkansas River.<sup>18</sup>

**IMPROVING WATER QUALITY** Stormwater discharges from colleges and universities can affect the quantity and quality of water that must be handled downstream. To help reduce stormwater runoff and pollution, Middlebury College and the University of Central Florida have developed vegetated or turf roofs on buildings. Other universities, such as the University of North Carolina at Chapel Hill, have implemented measures such as storm drain markings, porous pavements, and stream

cleanups.<sup>19</sup> The following case study illustrates another institution's approach to controlling stormwater.

**Case Study: Boston University's Stormwater Controls** In 1996, Boston University initiated a unique project to protect and improve the Charles River, which runs past its campus. The university undertook this project as a Supplemental Environmental Project to fulfill the requirements of an EPA Consent Decree. Partnering with EPA Region 1, the Charles River Watershed Association, and a local engineering firm, Boston University studied several best management practices to remove pollutants from stormwater and to minimize impacts on the river.

The university built three stormwater control systems at three large parking lots and tested their pollutant control efficiency from 2000 through 2002. A grassy swale surrounding a storm drain with a catch basin was the most successful technique for reducing stormwater pollutants, removing more than 50% of the total suspended solids during storm events. In addition, the practice is inexpensive, requires little maintenance, and occupies a small footprint, which is important in an urban setting.<sup>20</sup>



## ENCOURAGING GREEN CONSTRUCTION

To promote the development of sustainable buildings, the U.S. Green Building Council developed the Leadership in Energy and Environmental Design® (LEED) Green Building Rating System.<sup>21</sup> In order to attain LEED certification, a new building project must demonstrate performance in five areas: sustainable sites, water efficiency, energy and atmosphere, materials and resources, and indoor environmental quality.

Recognizing the environmental benefits of green buildings, colleges and universities have become a leading sector in this area, accounting for approximately 51 of the 342 LEED-certified new buildings in the U.S., including those identified in the following case study.<sup>22</sup> As colleges, universities, and others continue to construct green buildings, and new technologies and practices are proven effective, the overall costs of green construction are expected to decline, which should make green buildings more common in the future.

### Case Study: Harvard University's Green Campus

**Initiative** As part of its Green Campus Initiative, Harvard University is committed to adopting green building practices. The campus has completed one LEED-certified building and is working on four additional projects that are expected to achieve certification. As a LEED Silver certified building, Harvard's One Western Avenue Graduate Housing building accommodates more than 350 residents while demonstrating impressive environmental achievements. For example, the project:

- Purchases renewable energy certificates from landfill gas for 100% of its electricity;
- Restored 59% of the previously developed site to open green space;
- Diverted 90% of the construction waste from the landfill through recycling, reuse, or other means; and
- Used environmentally friendly building materials, half of which contained recycled content.

As green building practices continue to evolve, Harvard strives to ensure that future buildings meet the standards for certification and provide the maximum return on its investment. Through its work to date, the university has learned a number of valuable lessons that contributed to successful green building projects:

- Incorporate LEED goals as early as possible in the design process;
- Include building operations staff in the design process to ensure that the building will be functional;
- Hire construction professionals with expertise in green building design and LEED;
- Integrate LEED requirements into construction specifications and make contractors accountable for them;
- Have an internal staff member oversee LEED design and construction to save time and money; and
- Determine and quantify the benefits of LEED to both human health and productivity.<sup>23</sup>

