

# Green buildings: An overview and recent developments

BY EDNA SUSSMAN

**R**ecognition of the depletion of our natural resources and the pollution of the planet at the Rio Earth Summit in 1992 inspired a whole range of sustainability initiatives in the United States and around the world. Since then, various ways of measuring sustainability have been developed. The United States fares poorly in these analyses.

In 2004, Redefining Progress issued its report on ecological footprints and reported that the United States expends almost twice its regenerative capacity; moreover, U.S. consumption per capita exceeds that of any other continent. Rankings developed for the World Economic Forum to measure overall progress toward environmental sustainability showed that the United States ranked 45th worldwide, behind countries ranging from France, Australia and Canada to Estonia, Uruguay, Panama, Peru and Namibia.

In the context of this ecological imbalance as well as the current concerns about energy independence and costs, the green building movement in the United States has gained increasing urgency and momentum.

## Impact of buildings on the environment

Green buildings, as they are commonly known, are high performance buildings that (1) increase the efficiency with which buildings use energy, water and materials and (2) reduce building effects on human health and the environment through better siting, design, construction, operation, maintenance and removal. There are more than 76 million residential buildings and nearly 5 million commercial buildings in the United States. By the year 2010, the nation is likely to build another 38 million buildings. The greening of these buildings is critical to the sustainability movement because of the enormous impact that buildings have on our environment. In the United States, buildings:

- use one third of all the energy consumed and two thirds of all the electricity
  - are responsible for 35 percent of the country's emissions of carbon dioxide, the principal cause of global warming
  - account for 49 percent of sulfur dioxide emissions, 25 percent of nitrous oxide emissions and 10 percent of particulate emissions, all of which degrade air quality
  - produce 136 million tons of construction and demolition waste annually, as compared to 208 million tons of municipal solid waste
  - use 40 percent of the raw materials consumed globally
- The trend to date has been away from sustainability:
- developed land in the United States has increased 34 percent from 1982 to 1997
  - an American household uses on average 146,000 gallons of water per year, 42 percent indoors and 56 percent outdoors, a tenfold increase over the last 100 years
  - mass transit ridership is down from a peak in 1946 of 23.4 billion to 9.4 billion in 2001 with a consequent increase in vehicle miles traveled

- house sizes have more than doubled from 1950 to 1999
- The green building movement seeks to reverse these trends and diminish the impact that buildings have on the environment.

## Green building features and LEED

Green building design addresses all aspects of a building, including siting, energy conservation, water conservation landscaping, materials used and indoor air quality. Founded just over a decade ago, the United States Green Building Council (USGBC) has emerged as the leader of the green building movement in the United States. Using a membership consensus process, the USGBC developed a green rating system for new commercial construction and major renovation that is increasingly used as the national standard for green buildings.

The LEED (Leadership in Energy and Environmental Design) Green Building Rating System, version 2.0 released in 2000, establishes a system that ranks buildings as certified, silver, gold or platinum based on the level of sustainability achieved by construction and renovation projects. In late 2004, the USGBC issued a LEED Green Building Rating System for Existing Buildings, which creates a system for measuring upgrades, operations and maintenance. Other LEED rating systems are in progress or being planned for interiors, core and shell, homes and neighborhood development. The LEED criteria serve the critical purposes of promoting sustainable design features and creating a standard that can be applied universally and credibly.

The LEED system is gaining wide acceptance. LEED has been mandated for government construction by the U.S. General Services Administration (GSA). A growing number of states and municipalities are also requiring construction to LEED standards. California, Maryland and Michigan require LEED certifications for government construction; other states, including Pennsylvania, New York, New Jersey and Maine, have begun to encourage and use LEED as a guideline for state-owned buildings.

Communities all over the country, including Portland, Ore.; Atlanta; Houston; Dallas; Chicago; Los Angeles; San Francisco; Seattle; Kansas City; Boulder, Colo. and Arlington, Va., are requiring LEED construction for government buildings, though some set size or cost minimums. Some cities, including Boulder, Colo.; Frisco, Texas; and Greenburgh, N.Y., have also mandated certain green standards for private residential construction.

## Costs of green buildings

One of the major disincentives to the construction of green buildings has been the prevalent view that they are more expensive. Several recent comprehensive studies have demonstrated that this is simply not the case. A report issued in October 2004 by Davis Langdon Adamson studied the actual construction cost of 45 LEED and 93 non-LEED buildings and concluded that there was no statistical difference in construction costs for LEED versus non-LEED buildings.

A comprehensive study published in October 2004 conducted for the GSA by Steven Winter Associates Inc. concluded that a “LEED rating could potentially be achieved within a standard GSA project budget without a green building budget allowance.” A report released in October 2003 by Greg Kats, commissioned by the state of California’s Sustainable Building Task Force (the “California Study”), found a minimal average cost increase of about 2.00 percent. When the many ancillary benefits of green buildings are added to the analysis, the case for building green is compelling.

### Benefits of green buildings

The California Study addresses not only construction costs but also benefits, using a life cycle costing perspective. Life cycle costing is a much more accurate way to measure true cost and is being increasingly applied, not only in the private sector but also by governmental entities concerned about sustainability. This approach often enables public institutions to make more sustainable and healthier choices without being faulted for sacrificing a seemingly cheaper alternative that might otherwise be politically or even legally compelled.

Applying life-cycle cost, the California Study concluded that while energy savings alone – which are typically in the order of 30 percent for green buildings – would more than pay for any additional construction cost, when the value of water conservation, emission reduction, waste reduction, commissioning operations and management and health and productivity gains is added, the additional costs to support green design would on average result in life cycle savings of more than 10 times the initial investment in the green features.

What may prove to be most compelling to the marketplace are the conclusions in the California Study as to the impact of green buildings on human health and productivity. Based on a thorough review of the numerous studies conducted on this question, the California report concludes that a conservative value to attribute to the benefits in human health and productivity is a 1 percent overall increase.

This attribute of green buildings is not only supported by numerous studies, but also makes sense intuitively: People work harder and more efficiently in work environments with more comfortable thermal, light and ventilation levels. In the case of the California analysis, the conservative 1 percent increase in human productivity resulted in a per square foot benefit of \$36.89 to \$53.33 depending on the LEED level achieved over a 20-year life of the building, a number many multiples higher than the additional cost of \$3-\$5 per square foot for the green building features.

With the many benefits of green buildings, incentives to promote green building have already been initiated in many jurisdictions. These incentives can often be used to drive down the costs of building green even more.

### Green building incentives

Many jurisdictions offer design and consultation assistance and a variety of incentives for specific technologies to encourage green buildings. Direct subsidies are offered for green features

such as low-flush toilets, solar hot water heaters and other solar installations and energy smart appliances. These incentives change over time and each jurisdiction must be consulted for its current offerings. Some examples of additional innovative incentives include:

a. *Tax credits* – New York led the way with a green building tax credit enacted in 2000 keyed to performance guidelines. Several other states have followed with similar inducements.

b. *Expedited permitting* – Scottsdale, Ariz., has implemented a highly successful green building program by offering a fast track plan review service that cuts building permit time in half. The program is so successful that about 21 percent of the residential permits in 2004 were for green buildings. A similar program is in place in Santa Barbara, Calif.

c. *Density or height bonus* – Arlington, Va., offers bonus density of between 0.15 and 0.35 FAR (floor-area ratio) or an additional three stories in exchange for a LEED silver rating or higher. Portland, Ore., offers three additional square feet for every square foot of vegetated roof in the project.

d. *Home financing incentives.* Energy-efficient mortgages (EEMs) are available through Fannie Mae, the Federal Housing Authority, Freddie Mac and the Veterans Administration. Many private mortgage lenders have signed up to become Energy Star Mortgage Partners; these enable home-

owners to qualify for a larger mortgage as a result of projected energy savings.

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### A look to the future

Spreading the word about the attributes of green buildings is the key to expediting their growth. The many benefits of green buildings are leading to increasing market demand. Building appraisers and lenders are beginning to equate higher performing buildings with greater value, rents and resale values. Insurance companies are beginning to talk about premium credits and building code enforcers are beginning to understand green building features and are able to process permit applications more quickly.

Growing sensitivity to sustainable development by government and corporate America, increasing interest by homeowners in energy efficient and healthy homes and increasing knowledge of the low costs and many benefits of green buildings are setting the stage for the burst in green building activity essential to reducing America’s ecological footprint and enabling the United States to move toward living within its ecological means.

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**Edna Sussman**, of counsel at *Hoguet Newman & Regal, LLP* in New York City, chairs the firm’s environmental law practice and is certified by the United States Green Building Council as a LEED professional. She is vice chair of the Section’s Renewable Energy Resources Committee.