

**Publication Date:** March 2008

**Author:** Dr. Joseph J. Romm, Executive Director, Center for Energy and Climate Solutions

**ID Number:** T007031908

# The Green Building Imperative: Understanding the Impact of Workplaces on the Environment

Investments in green building strategies consistently result in significant benefits for organizations today. Green buildings not only reduce the environmental impacts of natural resource consumption and green house gas emissions, they also provide economical benefits such as reduced costs, improved bottom-line performance and higher shareholder value.

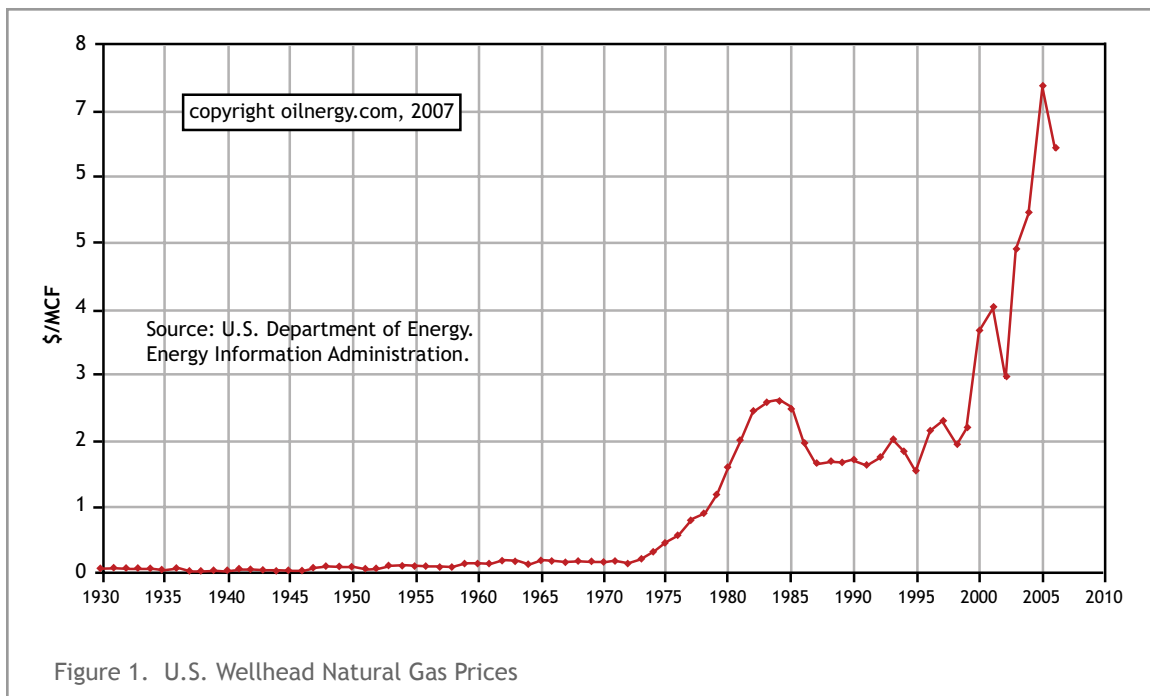


## The time is now for green buildings

Corporate environmental sustainability initiatives are more valuable and necessary today than ever before. There are five major reasons for this: compelling evidence of human-induced climate change; escalating costs of energy; imminent regulation and controls on greenhouse gas emissions; stakeholder-driven environmental reporting mandates; and the positive returns that make environmental sustainability a sound business practice.

The first reason, clear and compelling evidence of global climate change, is driving corporations and federal agencies to reduce greenhouse gas emissions by at least 50 percent over the next 30 years. To achieve that goal, they must take action *now*. The evidence of global climate change includes documented record increases in numbers of major weather-related disasters and wildfires, receding polar ice caps and a rise of ocean levels that threatens vast populations and current coastal landmasses. The most definitive report on global warming to date, the 2007 scientific Synthesis Report by the United Nations Intergovernmental Panel on Climate Change, warned that “reductions in greenhouse gasses had to start immediately to avert a global climate disaster.” It cites the probabilities of major low-lying coastal inundations from rises in sea level, widespread drought and desertification, and the loss of up to 70 percent of all species on the planet today.

The second reason impacts public organizations and corporations right at the bottom line: operational costs. Energy prices have reached record levels (see Fig. 1) and only continue to escalate due to the increased demand of an expanded global economy. Energy prices, especially oil prices, have surpassed peak levels such as those during the energy crisis of the 1970s, but energy economists warn that after 2015, the global supplies of gas and oil will be insufficient to keep up with demand—a trend projected to drive up energy prices with adverse impacts on an organization’s operating costs.



Third, mandated caps on carbon dioxide emissions are now a matter of when, not “if,” and will continue to drive the cost of nonrenewable energy higher, not lower. Each of the major party candidates in the 2008 presidential election campaign have proposed aggressive policies to reduce emissions by corporations and public organizations, and the U.S. Senate is poised to vote on a 70 percent cut in carbon emissions with interim goals set for 2020 (Senate Bill S.2191, also known as the Lieberman-Warner Climate Security Act).

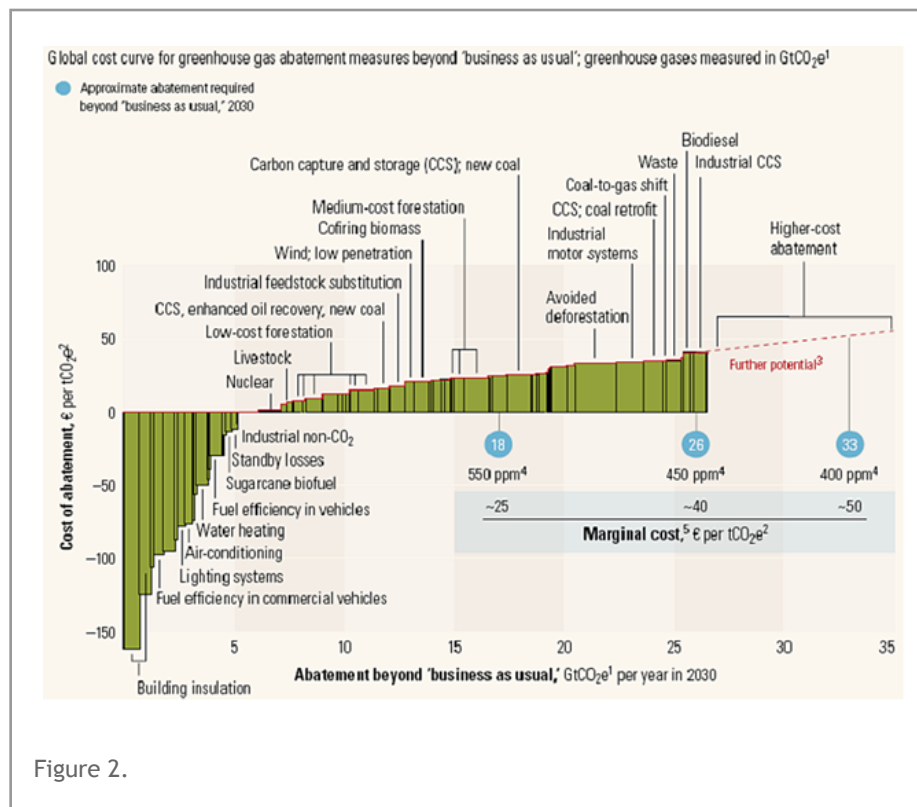
The fourth reason is that investors are pressuring the world’s largest companies to disclose carbon emissions. In 2003, 300 institutional investors formed the Carbon Disclosure Project to compel the largest companies from the Fortune 500 to disclose their carbon emissions as a factor of their revenue and EBITDA. In 2007, more than one third of the Fortune 500 reported their carbon emissions, and revenue to carbon emissions is becoming a fundamental valuation criterion for investors.

The fifth, and perhaps most compelling reason, is simply this: environmental sustainability makes good business sense. Corporations, such as GE, Johnson & Johnson, IBM, Wal-Mart and Nike have achieved tremendous returns on their investments in green strategies that reduce carbon dioxide emissions. Many companies yield lifecycle savings of as much as ten times the initial investment.



## Buildings generate nearly half of all greenhouse gas emissions

For most corporations and federal agencies, buildings are the biggest emitter of greenhouse gases and represent the best opportunity to cost-effectively reduce environmental impact and achieve sustainability (see Fig. 2). In fact, the U.S. Energy Information Administration and the United States Green Building Council (USGBC) each report that buildings are responsible for 39 percent of carbon dioxide emissions and 71 percent of commercial electricity consumption.



Investments in green building strategies consistently result in significant benefits for organizations today. Green buildings not only reduce the environmental impacts of natural resource consumption and green house gas emissions, they also provide economical benefits such as reduced costs, improved bottom-line performance and higher shareholder value. Green buildings also enhance occupant comfort and health and improve worker productivity, which in turn improves financial performance. The net result is that organizations reduce costs as much as \$1.00 per square foot of building space and can increase revenue by up to \$10.00 per square foot based on improved worker productivity.

## Three ways to reduce greenhouse gases generated by buildings

Corporations and federal agencies typically implement three key strategies to achieve environmental sustainability objectives. These strategies include green improvements with retrofits to existing buildings and workplaces; implementation of a continuous commissioning process to ensure ongoing sustainability efforts; and the design and development of new workplaces with sustainable design practices.

A recent report from GreenBiz.com, [The State of Green Business 2008](#), dubbed 2007 the start of a new era that will be known as the year green buildings became the cornerstone of corporate strategies to address global warming. According to the CoreNet Global 2007 Survey, nearly 80 percent of workplace and corporate real estate executives cite environmental sustainability as the major issue for today's businesses. More than half of the corporate respondents in the study own, manage or lease a green property.

The three key strategies are as follows:

**1. Building retrofits and renovations.** Such activity is not only on the rise, but widespread as a result of a number of environmental sustainability initiatives geared to compel organizations to specifically target and conduct retrofits for existing buildings. For example, the Clinton Climate Initiative's Large Building Retrofit project in 2007 committed more than \$5 billion to make existing buildings more efficient. The U.S. Environmental Protection Agency (EPA), to use another example, developed a widely-adopted five-stage process to reduce energy consumption of buildings. This EPA Energy Star certification for buildings is a key component of the USGBC's LEED\_EB (Leadership in Energy and Environmental Design for Existing Buildings) certification process. Energy Star rated buildings on average result in 30 percent less energy use and provide an average initial rate of return of 22 percent among the buildings documented by EPA.

The five stages recommended by the EPA require the following critical operations and maintenance tasks:

- **Stage One** - Upgrade buildings with energy-efficient lighting and maximize the use of natural daylight. "Daylighting" is especially valuable, not only because it cuts energy use, but because it has been documented to increase worker productivity.
- **Stage Two** - Tune up buildings with initial checks, adjust building equipment, then monitor on a continuous basis to *keep them in tune*. A computerized energy management control system (EMCS) can be extremely valuable to install at this stage.
- **Stage Three** - Repair or improve building exteriors (e.g., windows, insulation, roofs) to stop leaks and reduce heating and cooling loads. Installation of double-pane windows, window films, shades, and awnings serve to conserve heat in winter months and reduce heat gain in warm weather months.
- **Stage Four** - Examine building fan systems to discern which are oversized or need motor speed controls. Proper-sized fans and variable-flow-control fan systems can save significant amounts of energy required to heat or cool an entire building.
- **Stage Five** - Upgrade the building's heating and cooling plant equipment to optimally-sized, energy-efficient systems. This step is often the most costly, but investments can be minimized with implementation of each of the preceding stages.



In addition to generating energy savings, the sale price and rent value of energy-efficient buildings also benefited: averaging a 30 percent per square feet increase in sales price and yielding higher rent values of at least \$2 per square feet. Occupancy rates increased 2 percent with a \$0.54 per square feet reduction in operating costs (e.g., \$1.27 per square feet vs. \$1.81 per square feet).

**2. Implementation of continuous commissioning.** The best way to optimize energy efficiency savings and minimize operations and maintenance costs over time is through a process called continuous commissioning. Pioneered by the Texas A&M Energy Systems Laboratory, continuous commissioning serves to monitor on a periodic basis (even down to an hourly basis) the whole-building measurements of energy consumption. This is done by installation of building management systems that monitor and record energy consumption.

The results showed that continuous and/or periodic commissioning can achieve energy savings even greater than those projected by professional engineering audits—by accurately and automatically identify opportunities to reduce energy consumption. Among 28 buildings commissioned using Texas A&M’s guidelines, the operations and maintenance savings achieved through continuous commissioning amounted to 25 percent of the total building energy consumption. Measured savings averaged \$90,000 a year (\$0.54 per square feet per year) with a payback period of less than 18 months.

**3. Sustainable design with new construction.** The modern trend of sustainable design creates new buildings that are optimized holistically from the drawing board with energy-efficient technology. This means that newer facilities are optimized as whole buildings, rather than constructed as separate pieces and parts inside the same facility. For example, a building designed for extensive use of daylight reduces the amount of heat given off by lighting fixtures and reduces the demand on the air conditioning system. Newer buildings can also benefit from design that can adapt to the steady increase of innovation in technologies that provide energy-efficient lighting, such as electronics and office equipment, which can reduce overall energy use and green house gas emissions.

The financial benefits of constructing new sustainable-design buildings are enormous. A recent study conducted by Capital E for a dozen California state agencies (see Fig. 3) revealed just how much on a per-square-foot basis (as much as \$65 per square feet over 20 years) an organization can save from environmental sustainability considerations at the outset of new construction planning. Other recent studies of buildings designed with U.S. Green Building Council (USGBC) guidelines show they cost only 1 to 2 percent more than traditional buildings to build—and achieve similar results to those detailed in Figure 3. As a result, the number of certified and registered projects for LEED has grown over 700 percent with LEED-NC projects grew 62 and 72 percent respectively in 2007 with the square footage growing more than 500 percent.

Financial Benefits of Green Buildings Summary of Findings (per square feet)	
Category	20-year Net Present Value
Energy Savings	\$5.80
Emissions Savings	\$1.20
Water Savings	\$0.50
Operations and Maintenance Savings	\$8.50
Productivity and Health Value	\$36.90 to \$55.30
<b>Subtotal</b>	<b>\$52.90 to \$71.20</b>
Average Extra Cost of Building Green	(-\$3.00 to -\$5.00)
<b>Total 20-year Net Benefit</b>	<b>\$49.90 to \$66.30</b>

Source: Capital E Analysis  
www.cap-e.com

Figure 3.



## **The need for an integrated environmental management system**

Corporations and public organizations today understand the benefits and returns of green buildings and have set aggressive environmental sustainability goals to reduce greenhouse gas emissions over the next three to five years. Some have already implemented building retrofits for existing buildings and sustainable development of new buildings and have invested millions of dollars at a premium.

Very few organizations, however, can effectively measure and manage their actual progress to these goals. They miss critical opportunities to reduce environmental impact and increase financial returns because they lack an effective system to identify environmental opportunities. Instead they depend upon manual processes that are far too time-consuming, data-intensive and complex to collect massive amounts of data across multiple geographies, locations and data sources. These manual approaches are inefficient and ineffective, and often result in inaccurate information, miscalculated savings and costs of environmental programs. As a result, organizations lack the critical information they need to select and implement the right environmental programs and to accurately monitor and effectively manage performance to their goals. Implementing the right environmental management system has become a critical component to achieve environmental sustainability. Organizations that do not consider and implement a system as part of their overall strategy struggle to achieve their goals with the following three challenges: The collection and measurement of energy and emissions data; identification and prioritization of environmental opportunities to reduce environmental impacts; and finally, specific actions and required reporting to measure impact of environmental actions.

### **Collection and calculation of energy consumption**

Many corporations today struggle to collect energy consumption and emission data because they need to compile this information from many different sources: utility companies for electricity, gas and water consumption, building management systems, and even financial systems. In addition, the information collected is often provided at different levels covering multiple buildings to even different floors and systems within a building. These varied sources make it hard to collect and calculate energy and emissions data even for a single building, which then becomes compounded when calculating the overall carbon footprint of a real estate portfolio. The amount of data required is enormous and companies today are spending millions of dollars with third party environmental consultants to compile and calculate this information and then have no system to manage and maintain this data so it can be continually monitored.

### **Measurement and management of energy consumption**

Once the data is collected and the carbon footprint is calculated, corporations struggle today with no automated or systematic way to identify and prioritize environmental opportunities across their real estate portfolio to reduce energy consumption and emissions. Again, corporations and public organizations often use manual and data-intensive processes such as desk checks to calculate and assess environmental opportunities return on investment, overall savings and costs. Once these projects are implemented whether new sustainable construction, building retrofits or critical operations and maintenance tasks identified through continuous commissioning, organizations have no systematic way to track and log the impact of these actions and measure progress towards their environmental sustainability goals. They lack systems to help them implement and ensure procedures and processes enforce workplace operations and actions that are compliant with their environmental sustainability goals.



## Actions to reduce and report energy consumption

Corporations and public organizations alike, as mentioned above, are under increasing pressure to report on environmental actions and performance—not only with the Carbon Disclosure Project, but with such programs as the Global Reporting Initiative with Triple Bottom Line Accounting. Corporations also need to submit and provide proof of corrective action or sustainable new development to be certified for Energy Star and LEED\_EB/NC ratings.

This means that for most corporations or public organizations today, a simple financial report is no longer acceptable to shareholders, investors, or larger governing bodies the organization is a part of. They are now accountable to provide clear documentation of compliance with new key reporting principles and specific indicators and checklists now established for environmental sustainability, all of which require systematic measurement and reports on environmental performance and the actions taken to reduce carbon emissions. Corporations need an integrated environmental management system to provide the ability to proactively monitor and accurately measure the impact of workplace actions. Without such a system, organizations can not effectively measure, manage and reduce green house gas emissions and accurately monitor and achieve progress towards goals.

Environmental metrics show a company where it stands. Data and indicators are critical to fact-based decision-making and sound environmental management. They drive continuous improvement and allow managers to mark progress against pollution control and resource productivity goals. Sustainability is more a journey than a destination, but it still pays to know where you are on the path. - Daniel Esty and Andrew Winston, in [Green To Gold](#)

Fortunately, environmental management systems are available today to reduce the impact of buildings. A product such as TRIRIGA Real Estate Environmental Sustainability (TREES) automates and consolidates energy and emissions data, then measures, manages and reduces energy consumption and greenhouse gas production of workplace operations and assets.





## Conclusion

Corporations realize the importance of buildings to achieve environmental sustainability goals. Buildings are the largest consumer of energy and the largest producer of carbon emissions and therefore provide the best opportunity to reduce environmental impact. Green buildings also provide proven returns across the triple bottom line: profit, planet and people, especially in operating costs and shareholder value as energy prices continue to escalate and carbon restrictions are mandated. An environmental management system for workplace assets and operations has become a critical component to achieve environmental sustainability goals.

