# Existing Buildings: It's Easier Than You Think to Green the Triple Bottom Line

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**This paper addresses the application of green practices in existing buildings from a triple bottom line perspective. It describes the most widely used benchmark for assessing green practices, the U.S. Green Building Council's LEED Rating System, and provides a "road map" for pursuing LEED certification. It concludes with a consideration of the triple bottom line, highlighting the economic, environmental, and social benefits of implementing green practices in existing buildings.**

**The broad umbrella of green practices includes a wide range of applications. It encompasses developing high-performance buildings utilizing cutting edge technology to implementing management strategies in existing buildings that result in improvements to the economic, environmental, and social bottom lines—the triple bottom line. As the built environment of cities is largely old construction and not "green" by design, the benefits of green buildings remain largely untapped. It would not be practical to tear down all existing buildings and erect in their places high-performance structures. However, that does not mean the advantages of green practices remain outside the grasp of any real estate owner.**

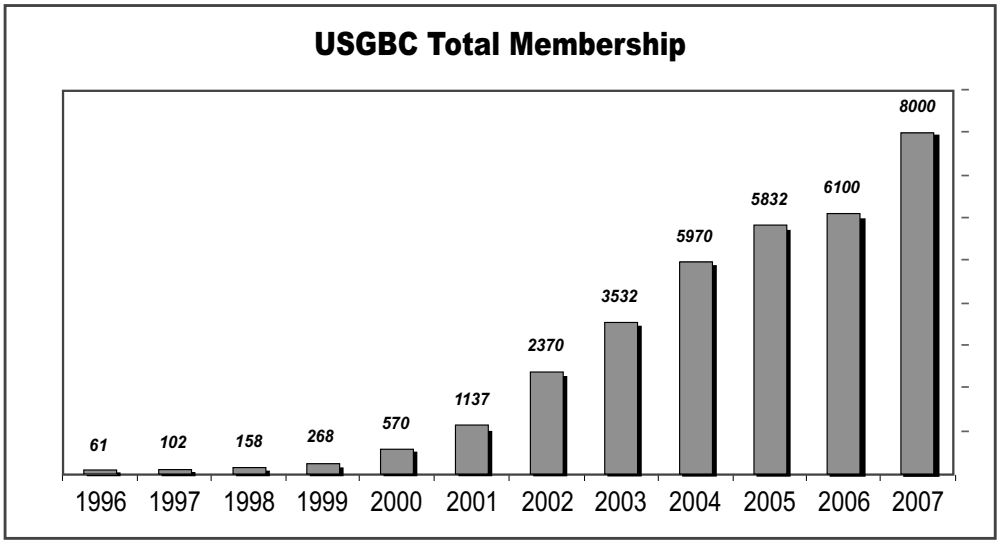
**By taking a broader, triple bottom line approach to managing existing buildings, building owners acknowledge the interconnections between building performance, environmental impacts, and tenant health and well-being. While many benefits of utilizing green practices in existing buildings are easily identifiable in terms of economic gains, ignoring less tangible benefits such as indoor air quality and thermal comfort creates a barrier in realizing a building's maximum potential.**

**The U.S. Green Building Council's LEED (Leadership in Energy and Environmental Design) Rating System for Existing Buildings provides a comprehensive approach to building evaluation which incorporates the economic, environmental, and social bottom lines. This paper details how green practices affect the triple bottom line through case studies and an analysis of current literature.**


## Understanding the LEED Rating System

The LEED Rating System is becoming increasingly universal as the rating system to measure and verify the sustainable practices employed in the design, construction, and operation of commercial real estate in the United States. Corporations and professionals

across the U.S. are beginning to realize and understand the potential economic benefits of utilizing green technologies and practices. U.S. Green Building Council (USGBC) membership has grown to 8,000 companies during the last 11 years—with the most dramatic growth in the last 5 years—and the number of projects registered with the USGBC with the intent to become LEED certified has grown to more than 5,500 (U.S. Green Building Council 2007). Many municipalities and government agencies now require LEED certification for public building construction, and through a joint effort, the sustainable practices of LEED are being incorporated into the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 189p, which would extend ASHRAE Standard 90.1 - the current basis for all U.S. energy codes. While other rating systems have been developed in the U.S., the USGBC's LEED system is viewed by industry professionals as the most stringent and is rapidly moving toward standardization.




Source: U.S. Green Building Council

Despite the increasing adoption of the LEED Rating Systems, the knowledge of how to "green" *existing* buildings through the implementation of sustainable practices remains largely unfamiliar to the real estate industry. While the LEED Rating System for New Construction was launched in 2000, the Rating System for Existing Buildings was only introduced to the market in late 2004. As of February 2007, there were a total of 715 LEED certifications, 550 of which represented new construction, while only 45 represented existing buildings. Of the existing buildings rated, almost all were single-tenant buildings.

## figure 1

USGBC Total Membership

## author

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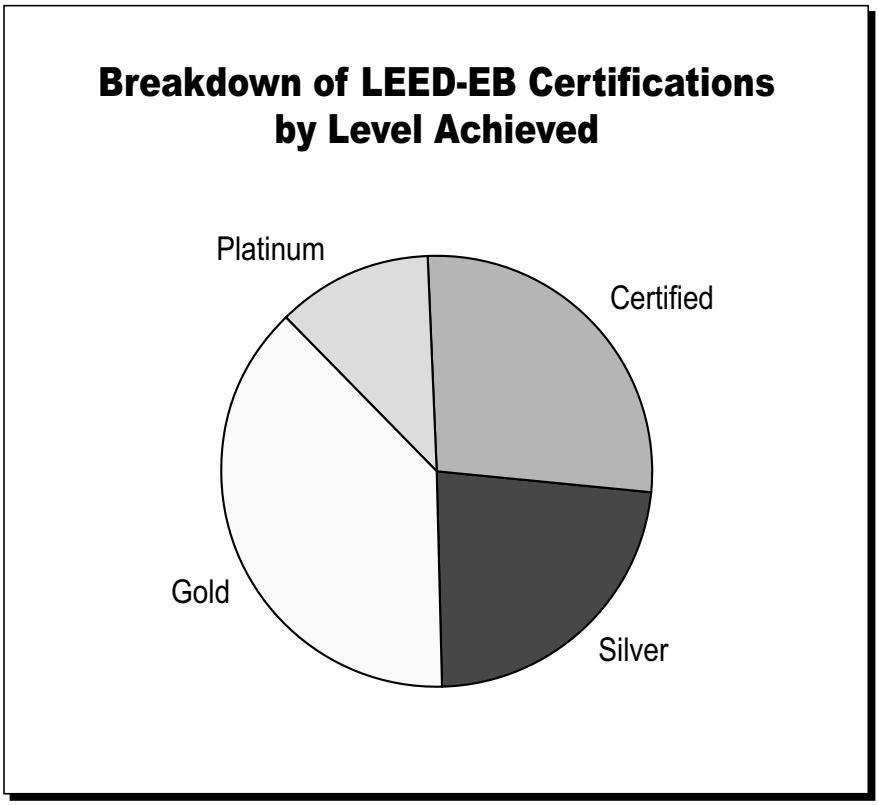


figure 2

Breakdown of LEED-EB Certifications by Level Achieved

Source: U.S. Green Building Council

Education, training, and experience remain barriers to implementing green practices in existing buildings. The USGBC now offers training and exams for LEED Accredited Professionals working with existing buildings. To date, there are over 35,000 LEED Accredited Professionals—increasing at an average rate of 25 per day—of which only a handful are certified through the existing building exam.

In addition to the education barrier, the cost of certification and paperwork requirements reduce building owner adoption of LEED certification. Currently, projects are registered to become LEED certifiable on an individual basis. However, in a commitment to streamline the process and capture economies of scale, the USGBC is piloting a Portfolio Program. The Portfolio Program will apply to all LEED certifications —New Construction (NC), Commercial Interiors (CI), Existing Buildings (EB), Core & Shell (CS), and systems still under development, such as Schools and Retail.

The USGBC's Portfolio Program provides greater flexibility for organizations that routinely work with multiple buildings or sites. The idea behind the Portfolio Program is to implement LEED-certified green practices across entire portfolios of existing buildings, new construction, commercial interiors, etc., to gain economies of scale in the USGBC certification process. Since the launch of the pilot Portfolio Program in November 2006, the number of registrations for existing buildings has increased more than 50% to exceed 400 as of February 2007. The Portfolio Program will be pivotal in the greening of the existing building stock in the United Sates.

## LEED Certifying an Existing Building

Even if a building is of newer construction or was constructed with sustainability and efficiency in mind, a review process may unveil a surprising number of deficiencies, particularly in areas where systems aren't operating at peak performance (Winters 2006). Even a building LEED certified as New Construction will not necessarily qualify for Existing Building certification if it is not operated and maintained at its full potential. This is because LEED-NC focuses specifically on building materials and anticipated design performance, while LEED-EB incorporates operations and maintenance procedures as well as ongoing actual performance.

The driving force behind implementing green practices in existing buildings is knowledgeable and diligent property management companies. Unlike fulfilling green building requirements for new construction, converting existing buildings into green buildings requires an ongoing commitment to monitor building systems, train staff, and keep up to date with certification requirements. While this may seem like added work with added costs, the financial benefits of pursuing green practices are pronounced and long lasting (Kats 2006).

As is the case in many instances, the only way to learn how to green an existing building is by actually working through the process. LEED certification begins with registration of a building and proceeds with bringing the building up to LEED-EB standards. This process usually takes 9 to 24 months, depending on the current state of the building. After successfully meeting the LEED rating system requirements, an organization then submits all relevant information to the USGBC for certification through the LEED website.

Many building operators begin the LEED certification process by determining a building's energy efficiency through ENERGY STAR or an equivalent energy measurement. The ENERGY STAR rating system, developed by the EPA, represents the industry cornerstone and is based on aggregate data from actual buildings throughout the U.S. (United States EPA 2007). The ENERGY STAR Portfolio Manager software compares information about the subject building to this aggregate data using statistical modeling to determine where the building stands in relation to its peers. Ratings range from 1 to 100, with 50 being average and 75 being above average. Once the comparative energy usage for a particular building is known, improving the building's performance through the use of ENERGY STAR's Guidelines for Energy Management becomes easier.

While satisfying minimum requirements of ENERGY STAR (or an equivalent) is a prerequisite to LEED certification for existing buildings, LEED certification goes beyond energy efficiency to include areas such as green cleaning, materials purchasing, recycling, indoor air quality, and water efficiency. While it is true that all the triple bottom line benefits of LEED-EB certification are attainable without participating in the formal certification process, the exclusive benefit to independent certification is the label that lets tenants, employees, and clients know a company is actively engaged in responsible management and operations (Fedrizzi 2006). LEED-EB therefore provides a useful framework for achieving building optimization, projecting forward-thinking management strategies, and administering ongoing performance monitoring. As stated in the LEED-EB Green Building Rating System, "the goal of LEED-EB is to help building owners operate their buildings in a sustainable and efficient way over the long term" (U.S. Green Building Council 2005).

## Prerequisites for LEED-EB Certification

With effort, a company can achieve the requirements for LEED-EB certification and simultaneously improve their triple bottom line. There are four certification levels possible: the lowest level is Certified, then Silver, then Gold, with Platinum as the highest level. LEED-EB "Certified" buildings require just 32 out of 85 possible points, many of which relate to practices already in place in most buildings. However, to reach higher levels of LEED-EB certification, existing buildings must be modified in order to increase energy efficiency and sustainability.

figure 3

LEED-EB Certification Levels

| Certification | Points |
|---|---|
| Platinum | 64 - 85 |
| Gold | 48 - 63 |
| Silver | 40 - 47 |
| Certified | 32 - 39 |

The prerequisites for achieving any level of certification are as follows:

- maintain an erosion and sediment control policy
- document that the building is at least two years old unless it is LEED-NC Certified
- reduce water usage to at or below what would be used if all fixtures met the Energy Policy Act of 1992 requirements
- demonstrate compliance with the EPA Clean Water Act or provide documentation of exemption
- verify and ensure all fundamental building systems are installed, calibrated, and operating as intended and perform a comprehensive building commissioning
- for buildings addressed by the EPA ENERGY STAR program, demonstrate an ENERGY STAR rating of at least 60; for buildings not addressed, demonstrate equivalency
- replace all CFC-based refrigerants in building systems unless not economically feasible to do so (as assessed by a third-party audit); if CFC-based refrigerants remain, leakage must be below 5% annually
- conduct a waste stream audit and implement a waste reduction program
- provide an easily accessible recycling location for a minimum of paper, glass, plastics, cardboard, and metals
- maintain an average mercury content below 100 picograms per lumen hour for all light bulbs in the building
- establish minimum indoor air quality performance through modification or maintenance of the current system

- minimize or prevent exposure of occupants, indoor surfaces, and systems to tobacco smoke by prohibiting smoking within the building, establishing negative pressure in smoking rooms, or reducing leakage between smoking and non-smoking rooms (for residential buildings only)
- have in place an asbestos management program that identifies applicable regulatory requirements and intends to reduce the exposure of building occupants to asbestos
- have in place a PCB management program that identifies applicable regulatory requirements and intends to reduce the exposure of building occupants to PCB and PCB combustion byproducts in the event of a fire.

It is important to note that all of these prerequisites represent good business practices for those owning, managing, or operating buildings. Once these are achieved a company can turn its focus toward additional optimization and LEED-EB certification.

## Achieving LEED-EB Certification

The minimum 32 points required for LEED-EB certification are geared toward tweaking existing systems rather than overhauling major building components. Points are allocated to different credit "categories," and applicants are free to select the combination of credits that makes the most sense for a particular building. Given that many existing buildings exhibit similarities, what follows is a starting place for navigating the certification process and the points awarded for each achievement.

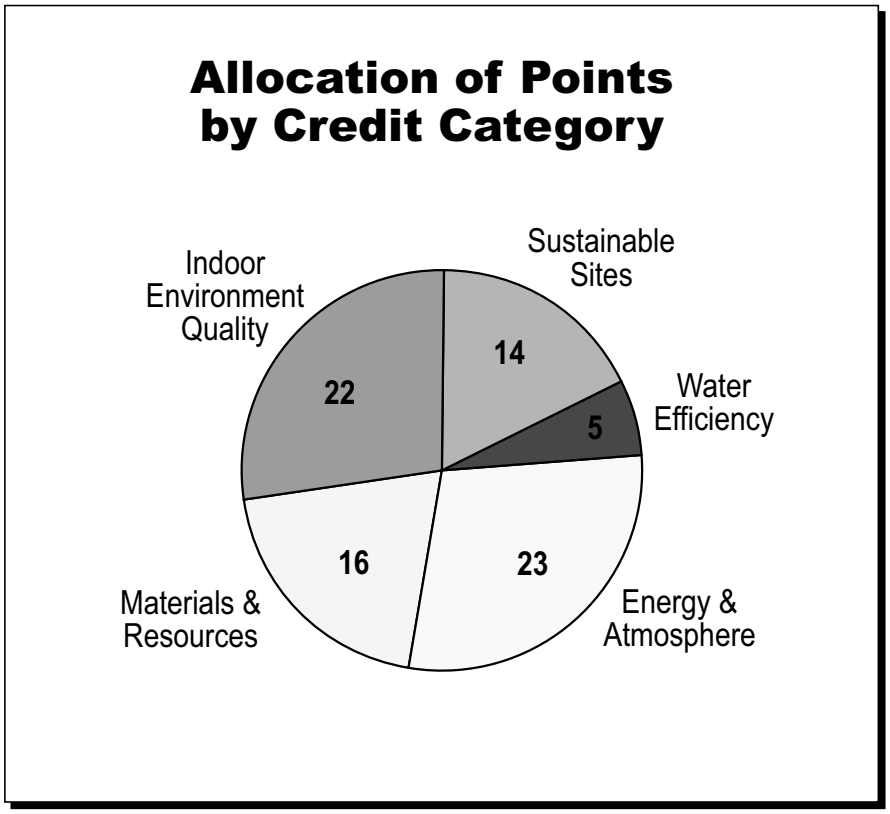


figure 4

Allocation of Points by Credit Category

By optimizing energy performance and achieving more than the minimum EPA ENERGY STAR rating requirement of 60, it is possible to earn substantial points for LEED-EB certification. Achieving a rating of 63 earns one point and each rating increment of four, up to the maximum rating of 99, earns an additional one point toward LEED-EB certification. For example, a building with an ENERGY STAR rating of 83 will earn six points toward EB certification.

Several points are awarded for building location and availability of alternate transportation.1 If the building is located in an urban area it will likely already qualify for one point; converting 3% of parking spaces to preferred parking for building occupants who drive alternative fuel or hybrid vehicles nets an additional point.

Redesigning the building's landscaping to include native or adapted vegetation and other ecological features indigenous to the location is a good way of both minimizing site disturbance and reducing water needed for landscaping. By covering 75% or more of the building site (excluding the footprint) with a native landscape the reduction in water demand will be substantial and earns two points. By combining regionally appropriate landscaping with efficient irrigation technology, such as drip irrigation instead of sprinklers, a 95% reduction in water usage is achievable. Two points are earned for a 95% reduction, while only one point is earned for a 50% reduction in outdoor water usage when compared to traditional irrigation.

A particularly low-cost investment is recycling. Diverting 40% of the waste stream, by weight or volume, earns two points, while diverting 50% earns three points towards LEED certification. Recycling can also be profitable. By diverting refuse from the waste stream, Thomas Properties Group's building-wide recycling program saves the California EPA headquarters building in Sacramento more than $102,000 per year through a 202.7 ton reduction in waste and associated trash bag purchases. This translates into almost 11 cents per square foot of savings (U.S. Green Building Council 2006).2

Another quick tweak is purchasing and using sustainable cleaning products and utilizing green cleaning strategies. In order to be considered "sustainable," cleaning products and materials must meet the Green Seal GS-37 (or the California Code of Regulations allowable VOC levels) and janitorial trash bags and paper products must meet the requirements of U.S. EPA's Comprehensive Procurement Guidelines. Points earned for LEED certification are determined by the percentage of total products purchased on a cost basis. Many GS-37 cleaning products are cost neutral, and the JohnsonDiversey corporate headquarters saves $5,500 per year by utilizing green cleaning products (U.S. Green Building Council 2004). One point is earned for each 30% of green cleaning products purchased, up to a total of three points.

While sustainable cleaning products focus on the type of products purchased, green cleaning strategies focus on implementation. A maximum of six credits is allotted for green cleaning strategies. The easiest point to earn is for installing and maintaining grills, grates, or mats at all heavily trafficked entrances. The California EPA saves $9,500 annually on entryway cleaning through this small change (U.S. Green Building Council 2006). Another point can be earned for a low-impact environmental cleaning policy that addresses the use of sustainable cleaning products and sustainable cleaning systems, training of maintenance personnel, using appropriate dilutions of chemicals, the use of

[1] Building location significantly affects environmental impacts in many ways as illustrated by factors such as commute length and choice of urban infill versus suburban construction.

[2] Based on $50 per ton landfill depositing costs.

antimicrobial-free hand soaps, and utilizing cleaning equipment that reduces impacts on indoor air quality. Pest management also falls under green cleaning strategies. Two points are possible for an integrated indoor pest management policy that has low environmental impact.

In addition to these green cleaning strategies, two additional points are available for somewhat more substantial investments. The first of these involves efficiency and impact on indoor environment quality of cleaning equipment, while the second point is for isolating the janitorial closet from the building interior by providing separate exhausts, structural deck-to-deck partitions, maintaining negative pressure within the closet, and providing hot and cold water to the janitorial area.

Management and documentation practices also earn points toward certification. Providing 24 hours of high-quality building maintenance and operations training that involves the goal of achieving sustainable building performance for each appropriate staff member earns one point toward certification. A preventative maintenance program for post-warranty maintenance also earns one point. Implementing a building monitoring system to track and optimize systems that regulate indoor comfort and conditions and provides alarms for malfunctions earns an additional point.

Another management practice that earns one point is a construction indoor air quality management plan. This plan applies to any construction or renovation projects and is designed to reduce indoor air quality problems that may result from that construction.

An indoor air quality management program that addresses ongoing performance also earns one point. The plan must be based on the EPA document, "Building Air Quality: A Guide for Building Owners and Facility Managers."

Using outdoor air intake filters with at least particulate removal effectiveness MERV 13 and maintaining them properly nets one point. Maintaining a comfortable temperature within the building, one that complies with ASHRAE Standard 55-2004, also earns one point.

The total points achieved for the above recommendations is 29. Two additional points are achievable by involving a LEED Accredited Professional on the project team and participating in innovative approaches to environmental benefits that go above and beyond the requirements specified by an existing LEED-EB credit, or addressing an area that is not covered by LEED-EB.

Finally, a point is earned for documenting the cost reductions achieved through LEED-EB certification. Cost reductions are compared to the length of building occupancy, up to five years. This nets the required 32 points to achieve the minimum LEED-EB rating of "Certified."

## The Economic Bottom Line

Companies that have achieved LEED-EB certification tout significant savings and additional benefits that are difficult to pass up. The USGBC collects data on all LEED certified buildings, and this data indicates that on average a 30% reduction in energy use, a 30% to 50% reduction in water use costs, and a 50% to 90% reduction in waste costs is achieved in LEED certified buildings when compared to traditional buildings (U.S. Green Building Council 2007).

General Dynamics C4 Systems Roosevelt Road facility realized a number of benefits from LEED-EB certification (Olson 2006). At 1.5 million square feet of floor space, this

industrial complex features a mix of office, laboratory, manufacturing, warehouse, and data center uses. By implementing water and energy saving measures such as monitoring the irrigation system and performing lighting audits, the facility now uses 14 million fewer gallons of potable water per year, and overall utility costs were reduced by 16% annually. Additional efforts include reducing the number of interior wall demolition and re-erections, and monitoring indoor air quality. Annual net savings were $322,000 and the payback period for General Dynamics C4 Systems was only six months.

The Chicago Transit Authority Headquarters, constructed in 2004, was recently submitted for LEED-EB certification by Transwestern, a national real estate company. The property team implemented a comprehensive continuous improvement plan that included fine-tuning the energy mechanical systems, adjusting plumbing fixtures, and implementing a full recycling program. Overall operating expenses declined 1.4% in the second year of implementation (2006) primarily due to a 12% reduction in utility expenses that resulted from system performance improvement. Commissioning also revealed a number of improvements that could be made in future years to further improve building energy efficiency. The team utilized existing building components and earned points with a 29,000 square foot green roof, bicycle storage, and related shower facilities. Through using low-impact cleaning, introducing pest control practices, and providing superior ventilation and generous natural light, the building has earned enough points for Transwestern to apply for Gold certification. To achieve the second highest level of performance, the owner spent less than $38,500 (including consulting and certification fees) and will spend $2,500 per year on MERV 13 filters and implementation of a low-impact pest management policy. The building's Computerized Maintenance Management System (CMMS) will be used to track and account for performance, documentation, costs (including staff hours) and benefits. These investments create a healthier, more productive work environment, and payback was achieved within the first year.

## The Social and Environmental Bottom Lines

While it is true that many benefits of implementing green practices in existing buildings involve financial gain, economic returns are coupled with social and environmental benefits. The pendulum however can swing the other way: many building improvements that affect the health and well-being of its occupants or address environmental stewardship result in financial gain for the building owner or operator.

Many factors that play significant roles in employee health and productivity are addressed in LEED-EB certification. The LEED-EB section on indoor environment quality addresses building ventilation, thermal comfort, chemical and pollutant control, green cleaning, and daylighting, among others. The direct effects of improving any of these building features may not surface in energy consumption data, as the economic impact of a healthier indoor environment is more difficult to measure.

Indoor air quality is a significant factor in employee health and productivity. The U.S. EPA estimates that $20-$50 billion is lost each year due to decreased worker productivity and, in 2000, the estimated loss of work due to the four most common respiratory illnesses (common cold, pneumonia, influenza, and bronchitis) was 176 million work days and 121 million days of substantially reduced activity.

Studies illustrate the result of improved indoor environments is increased productivity and confirm the impact of building characteristics on the prevalence of

respiratory illness (Fisk 2000). The improvement in indoor air quality in buildings can reduce the symptoms of flu, asthma, sick building syndrome, allergies, respiratory infections, headaches, and colds by 41.5% on average (Carnegie Mellon 2005). Rates of outdoor air supply measured against absenteeism illustrate that buildings with high ventilation rates experience absentee rates that are 35% lower than buildings with moderate ventilation rates (Milton 2000). Other factors affecting worker health and productivity include lighting, temperature, and moisture. High-performance lighting enhances productivity by 6.7%, while improved temperature control enhances productivity by 3.6% (Carnegie Mellon 2005).

The cost of a poor indoor work environment is also perceptible in employee turnover rates. Case studies of LEED-NC buildings illustrate the potential effects of indoor environment quality on employee retention. PNC Bank experienced a 30% reduction in staff turnover after moving to its LEED Silver certified building (Winters 2006). At the other end of the spectrum, a major Dallas law firm experienced significant professional staff loss primarily due to poor-quality office space. The firm lost 30 professional staff in a 12 month period, which represented $6 million in billings. Creating a pleasant indoor environment is clearly about more than aesthetics.

The materials utilized in finish-outs and daily cleaning also affect building occupants. From carpeting to paint, many products present in indoor environments negatively impact the health and well-being of building occupants. Traditional carpets and plywood contain formaldehyde, and traditional paints and sealers contain volatile organic compounds (VOC). Choosing products that are certified green, such as by ENERGY STAR, GreenSeal, or Greenguard, or that have low VOC content, results in fewer toxins introduced into the work environment, and environmentally friendly cleaning products ensure that a healthy environment is sustained.

Choosing certified green products is also environmentally responsible. The use of green cleaning products reduces environmental contamination from cleaning agents, and using recycled and green materials, such as carpets and furniture, removes material from the waste stream.

Improving energy efficiency in buildings is an opportunity for building owners and tenants to reduce their environmental footprint as well. According to the PEW Center on Global Climate Change (Brown, et al 2005), energy used in buildings in the industrial and commercial sectors contributes 22% of the annual carbon dioxide emissions. With the inclusion of residential buildings, the annual carbon dioxide emissions total 43%, and together these buildings consumed approximately 40.3 quadrillion BTU of energy in 2002. According to the Office of Energy Efficiency and Renewable Energy (2003), each quadrillion BTU of energy consumed in the building sector results in approximately 40 million metric tons of carbon dioxide emissions.

Energy efficiency measures lead to a reduction in energy usage and therefore a reduction in greenhouse gases emitted. Data for all LEED certified buildings indicates an average energy reduction of 30% and an average carbon dioxide emissions reduction of 35% when compared to traditional buildings (U.S. Green Building Council 2007). Considering the total yearly energy consumed and emissions produced for buildings, this would be equivalent to removing approximately 53.8 million cars from the nation's roadways.

As scrutiny of greenhouse gas emissions increases, ignoring the major environmental impacts of energy efficiency becomes increasingly difficult. The Carbon Disclosure Project

(2007), launched in 2000, provides a forum for understanding the business implications of global climate change and requests information about greenhouse gas emissions throughout a company's supply chain. This collaboration represents a significant dynamic that is gaining momentum in the greenhouse gas debate. On February 1, 2007, the letter accompanying the questionnaire for the fifth cycle of the project (CDP 5) was signed by 280 institutional investors with assets totaling $41 trillion. This number is up from 35 endorsers for the first information request in 2000.

In April 2006, the Senate Energy and Natural Resources Committee received affirmative stances regarding mandatory caps on carbon emissions (Winters 2006). Six out of eight executives from large energy companies were either welcoming or accepting of the proposition. Many other efforts exist with regard to curtailing greenhouse gas emissions, many of which are gaining support and popularity within mainstream corporate culture.

## Conclusion

Significant opportunities to improve the triple bottom line lie within the existing building stock. The LEED certification program for existing buildings provides a useful framework to achieve sustainability goals that are economic, social, and environmental in scope. The LEED Portfolio Program will facilitate the process by providing economies of scale in the certification process and supporting the implementation of green practices across entire portfolios of buildings, which will result in the re-training of real estate professionals. As new construction buildings such as Four Times Square and The Solaire grab the limelight, it is easy to become transfixed by their sleek, ultramodern appearances and high-tech features and forget about the potential present in the current building stock. Tackling the challenges and roadblocks present in existing buildings is the realistic alternative to the unrealistic option of replacing every traditional building with a cutting-edge, high performance structure.

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