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# Sustainable strategies for green hotel design

Jennifer Benson

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Sustainable Strategies for Green Hotel Design

by

Jennifer Benson

Thesis

Submitted to the College of Technology

Eastern Michigan University

in partial fulfillment of the requirements

for the degree of

MASTER OF SCIENCE

in

Interior Design

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November 15, 2013

Ypsilanti, Michigan

## **Dedication**

I would like to dedicate this paper to my family. To my parents and siblings for all of their love and support and words of encouragement throughout this journey. To my husband for the emotional support and all the loving words that kept me going.

## **Acknowledgements**

I would like to thank my thesis committee for their time and dedication throughout this process. I would especially like to thank Dr. Shyu for his constant encouragement and positivity throughout this process as well as throughout my entire academic career here at Eastern Michigan University.

## **Abstract**

Many of today's commercial industries are realizing the negative impact they have on the environment and taking steps to become more sustainable in hopes of lessening that impact. The hotel industry is one of those industries. Hotel owners and guests are expressing their concern for the environment, and both are playing a role in making the hotel industry more sustainable. With the help of government organizations, better technology, and green education, the idea of environmentally friendly hotels is not just an idea; it is becoming the norm.

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## Chapter 1: Introduction

One of the leading contributors to the depleting of our natural resources is the hospitality industry; sustainability, reducing the carbon footprint, and lowering operating costs have all become important focuses of the industry. Energy concern is not a new concept for the industry; the energy crisis of 1973-74 caused concern about utility costs and energy supply, which prompted hoteliers to focus on energy conservation strategies. Other time points related to the idea of sustainability include the 1990s, which brought about the first hospitality specific environmental certification programs; the LEED green building program came into the forefront during the 2000s; and the financial crisis of 2008-2009 prompted hoteliers to reevaluate their cost control measures and reduce utility costs.

The challenge with the hotel industry is that it operates 24 hours a day, 7 days a week, 365 days a year, with guests expecting certain luxuries, such as restaurants, fitness centers, and spas. This poses the problem; how can the industry be sustainable but still maintain the level of luxury that guests expect when staying at a hotel?

Sustainable development was first defined in 1987 in a report written during the Brundtland Commission of the United Nations as “development that meets the needs of the present without compromising the ability of future generations to meet their own need” (Winchip, 2007). In other words, a sustainable development should do its best to create less of an impact on the environment as well as sustain natural resources. From sustainable development comes the idea of sustainable design. In her book *Sustainable Design for Interior Environments*, Susan M. Winchip defines sustainable design as “design that reflects a respectful interaction between people and the earth by conserving resources for current and future generations,” and the principles that define it serve as the foundation for sustainable

design.

The purpose of this report is to provide a strong argument that the hotel industry is a good candidate for becoming more sustainable and strategies it can take to reach that goal. This report will look at three of the largest strains the hotel industry places on the environment: the consumption of energy and water and the production of wastes. More importantly, it will look at what sustainable strategies can be used to reduce the environmental strain through energy efficiency, water conservation, recycling, and “green” design. A number of case studies and benefits will be discussed to help strengthen the argument that the hotel industry is capable of becoming sustainable.

## Chapter 2: Literature Review

In the United States, the hotel industry represents more than five billion square feet of space and pays close to \$4 billion in annual energy use (*LEED*). According to an article on Eco Traveler's website, the hotel industry uses 84.7 billion kilowatts of energy, 219 billion gallons of water and creates 1.9 billion pounds of trash per year. (Figure 1)

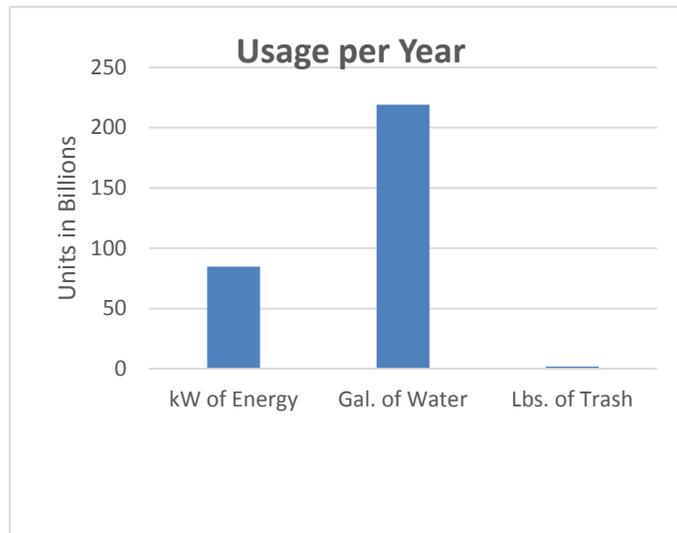


Figure 1. Yearly energy, water, and waste consumption

An average energy cost of \$2,196 is spent per guestroom (*Energy star*, 2008). These staggering numbers are a good representation of why the hotel industry is a perfect candidate for sustainability. The Environmental Protection Agency (EPA) reports that the hotel industry could save \$745 million annually just by reducing energy use by 10% (Hetter, 2013). The large consumption of energy and natural resources is part of the reason why a number of organizations were created to address sustainability specifically for the hotel industry. These organizations have created guidelines for the industry to follow in order to become a more eco-friendly, energy-efficient development and award certification to hotels

that meet those guidelines. An online article by EcoGreen Hotel states that according to the World Tourism Organization, ecotourism, a form of environmental tourism, is the “fastest growing market in the tourism industry, growing at a rate of 5% worldwide and representing over 11% of all consumer spending” (Parisi & Burger, 2012). Throughout the last few decades a number of certifications have become available, many of them with different guidelines making it very confusing for hoteliers and guests to determine which certification works for them. The following section addresses these organizations and their guidelines.

## **LEED**

The United States Green Building Council (USGBC) developed LEED, Leadership in Energy and Environmental Design, in 2000; it provides a rating system for the design, construction, and operation of a green building. The system was created to define what it means to be a “green” building, recognize environmental leadership in the building industry, promote green competition, and raise consumer awareness of the benefits of a green building. To become LEED-certified means that a third party has verified that a building was “designed and built using strategies aimed at achieving high performance in key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality” (*LEED*). Professionals in the building industry developed a rating system organized into five credit categories: sustainable sites, water efficiency, energy and atmosphere, materials and resources, and indoor environmental quality. In order to become LEED-certified, a building must acquire a certain number of points under each category. Once these credits are obtained, there are four different LEED certification levels: certified, the lowest number of points; silver; gold; and platinum, the highest number of points.

Some of the advantages of becoming a LEED-certified hotel include lower operating costs, increased property value, and a healthier and safer environment for its occupants. Lower operating costs result in lower utility bills and maintenance costs, LEED buildings have been shown to have a higher market value for new and existing construction, and improved indoor air quality provides a healthier work environment for its employees. As of 2011; 17 hotels were LEED certified, 27 were LEED silver, 33 were LEED gold, and 2 were LEED platinum (Figure 2). In 2011, the number of LEED certified hotels more than doubled in one year.

To become LEED certified is an important accomplishment in the industry; not only to other competitors, but to guests and the media as well. LEED is becoming a commonplace reference for those that are environmentally conscious; being awarded LEED certification can attract the “green” traveler, defined as a person who is environmentally conscious and seeks sustainable accommodations when traveling.

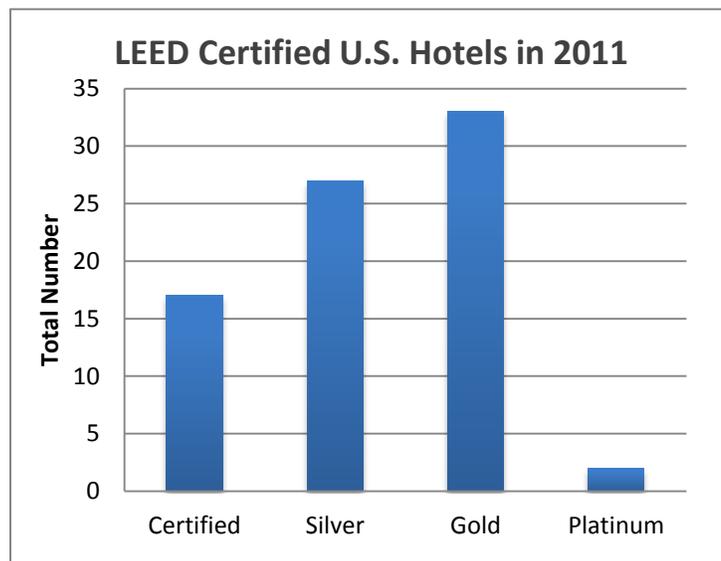


Figure 2. Total number of LEED certified hotels in the U.S.

## **USGBC**

As mentioned above the USGBC is responsible for developing the LEED system. The USGBC was founded to promote environmentally responsible buildings, as stated on their website the organization hopes to enable “an environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life.” The organization provides guides that give examples of green strategies for different types of LEED-certified buildings; from residential to hospitality. The guide for hotels is broken down into the six credit categories of LEED and gives examples of how LEED certified hotels have fulfilled the requirements.

## **ASHRAE**

Another organization that sets standards for energy efficient design is the American Society of Heating, Refrigerating, & Air-conditioning Engineers (ASHRAE), founded in 1894, today the organization focuses on energy efficiency, building systems, indoor air quality, and sustainability. A strategic plan was created to make the building industry more sustainable that includes four directions the organization will take to make this happen. The first direction is that “ASHRAE will be a leader in advancing sustainable design, construction, and operations for new and existing built environments” (ASHRAE, 2011). Strategies to achieve that include promoting the use of life-cycle analysis, influence research, and education for “systems and equipment to be used in high-performing buildings.” Another strategy is to lead the development of integrated design that includes energy efficiency, water conservation, and indoor environmental quality. The second direction is for ASHRAE to become “a world class provider of education and certification programs,” by providing on-demand education, partnering with other organizations around the world and encouraging the use of ASHRAE

documents on sustainable building at universities and technical schools. The third direction is to “position itself as an essential resource for optimizing the performance of building and energy systems throughout their life cycle.” They hope to accomplish this through aggressive marketing, conducting market research and establishing and maintaining relationships with key government agencies. The final direction ASHRAE hopes to take is to become a “global leader in the building and energy system community.” By providing staff support outside of North America and conducting global meetings and conferences, more countries will be educated in energy systems for an entire sustainable building.

ASHRAE publishes design guides for all of the building industry on how to create energy efficient designs. For hotels, it looks at how to achieve 30% energy savings, the guide covers hotels that have up to 80 rooms, but the same strategies could be applied to a much larger luxury hotel. ASHRAE 189.1 deals specifically with the design of high performance green buildings, providing requirements for “the siting, design, construction, and plan for operation of high performance green buildings to: balance environmental responsibility, resource efficiency, occupant comfort and wellbeing, and community sensitivity” (*Standard*, 2009). Much like LEED, ASHRAE 189.1 focuses on water use efficiency, indoor air quality, energy efficiency and the building’s impact on the environment.

The guide recommends the following steps in achieving set energy goals. The first step is to develop an Owner’s Project Requirements (OPR); this is meant to highlight the project’s energy and sustainable development goals, especially those goals that produce the greatest amount of savings. The guide suggests focusing on higher building envelope insulation and glazing, efficient lighting design, and higher-efficiency heating, ventilation, and air-conditioning systems (HVAC). The building envelope consists of the outer shell of the

building or the physical separator between the indoor and exterior of the building.

Recommendations for the building envelope insulation include designing the building so that it has a continuous air barrier system; this controls leakage in and out of the interior space. A lot of energy and money can be wasted if interior heat or air is leaking outside or vice versa. The air barrier system should have the following characteristics: joints could be airtight, it should be durable, and it should be capable of withstanding positive and negative combined wind. The building envelope should address moisture control and be designed to prevent high moisture content and liquid water intrusion.

The second step focuses on construction and what needs to be done to accomplish an efficient building; this involves consistently reviewing the building envelope and mechanical and lighting systems and randomly verifying checklists once the contractors complete them. The third step is acceptance; this simply means making sure all of the systems are functioning properly. The fourth step is occupancy; this takes place during the first year of a hotel's operation, the owner needs to review the overall operation and performance to make sure they are performing as expected. The final step is operation; this involves comparing energy use against previous data to make sure the building is performing at its peak.

Another important part of the building envelope is the fenestration, or windows and glazing. The guide mentions that "uncontrolled solar heat gain is a major cause of energy consumption," this is especially true in warmer climates or in the warmer months of cooler climates. Significant energy savings can be attained when the solar heat is blocked before entering the windows; one way to accomplish this is through horizontal overhangs. The overhang stops the sun from going directly into the space, lowering solar heat gain. Windows can be operable or fixed, having operable windows give guests the advantage of maintaining

their own comfortable environment and getting fresh air has numerous benefits. However, it does lead to the risk of having impacts on energy use through the HVAC system. One suggestion is to install mechanical systems that use interlocks on all operable windows; the HVAC system is disabled when the windows are open. For a new build it is important to consider the building and window orientation, north and south-facing windows can be easily shielded through the use of sunshade devices against the sun causing less solar heat gain and east and west facing windows produce less glare.

The section on lighting mentions many of the same strategies already mentioned earlier in this report. The goal is to maximize efficiency but still maintain good aesthetics, through the use of CFLs, occupancy sensors, vacancy sensors, especially in guest bathrooms, having a time delay that the guests can set, and installing a control device at the guestroom doors that controls all lighting and switches in the room.

### **Green Hotel Association**

Hotel sustainability has come to the forefront of the hospitality industry with the help of numerous organizations developed to promote sustainability. Perhaps the most notable organization is the “Green” Hotel Association or GHA. Founded in 1993 by Patricia Griffin; their mission statement is to “promote and support the “greening” efforts of the lodging industry by researching and sharing information primarily on water and energy conservation and waste reduction” (Wilfong, 2009). Once hoteliers become a member, they are given a 150-plus-page document called *Membership Conservation Guidelines & Ideas* that has tips for becoming a more “green” hotel and lists of “green” products hotels can use. As of 2009, the association had more than 500 members and it is the “longest-standing, most experienced green hotel association in the world” (Bohi, 2009). The GHA magazine IMPACT was

launched to expand the message of the benefits of going green. Issues of the magazine contain valuable information on new “green” products available for hoteliers, examples of sustainable hotels in the industry, energy efficient strategies, and ways to teach staff about the importance of sustainability.

### **Other Organizations**

Organizations such as LEED and USGBC are better suited for new builds or hotels that are undergoing renovations, but there are several other programs suited for already existing hotels. One of these certification programs is Green Key Global, a Canadian certification program that in recent years has made its way to the United States. The basis of this certification is a 140-question online audit; hotels are awarded based on the results of these audits and given a rating of one to five Green Keys. The audit looks at nine areas of sustainable hotel operations: energy and water conservation, solid and hazardous waste management, indoor air quality, community outreach, building infrastructure, environmental management, and land use.

Green Globe International is the standard for green hotels worldwide, certified hotels have to be re-certified on an annual basis and the program often updates certification requirements. Because many hotels cannot afford to completely rebuild, the intention behind the organization is to identify practices and habits that hotels can adopt to create less of an impact on the environment.

The EPA created the Energy Star program about ten years ago to reduce energy consumption and greenhouse gas emissions. The benchmarking system, Portfolio Manager, allows managers to enter their energy usage to measure the energy performance of the building; this gives them a concrete idea of how well they are saving energy. Energy Star has

proven to be a successful program and buildings that have earned the Energy Star label use almost 40% less energy and emit 35% less carbon.

Green Seal is a science based environmental certification; to obtain a certification a hotel must go through an initial evaluation, an on-site audit, and annual monitoring to ensure compliance. To qualify for Green Seal certification, a hotel must demonstrate recycling and waste minimization, energy efficiency, management of wastewater, fresh water resources, and hazardous substances, and environmentally sensitive purchasing. An important aspect of this program is making sure the hotels that are certified are doing what they say they are doing and why annual audits are implemented.

In 1998, the Audubon Green Leaf Eco-Rating Program was introduced “to meet the lodging industry’s desire to provide quality guest services while minimizing its impact on the environment” (Parisi & Burger, 2012). Hotels are awarded one to five Green Leaves based on four practices: saving energy, reducing waste, conserving water and resources, and preventing pollution. The program is unique in that it provides a “checklist for evaluating environmental performance,” by providing environmental education and hands-on staff assistance, this idea will be addressed later on in this paper, a program can only be successful when managers and employees are educated about the environmental practices.

EcoRooms & EcoSuites has not only developed an online directory for guests to find the most environmentally responsible hotels but has begun to push for a more sustainable hospitality industry. The organization has formed a set of EcoCriteria for hotels to follow with two tiers of green designations: the first is the “approved” status and is based on the satisfactory completion of an application, to become “certified,” the second tier, the hotel must undergo an on-site audit. EcoRooms & EcoSuites is the only program that makes it

mandatory for a hotel to complete all of their eight criteria at 100%, making them the most stringent certification program in the industry; as of 2012 there were about 12 hotels that had received certification. Some of their criteria include energy-efficient lighting in every applicable area; a linen and towel reuse program, high efficiency plumbing, and recycling in guest rooms.

To date, there are many sustainable hotel developments that have followed the guidelines of the above-mentioned organizations and as a result are now much more energy efficient and have created less of an impact on the environment. The following section addresses the ways in which hotels can follow these guidelines and what sort of techniques and products are available to them today.

### **Chapter 3: Methodology**

A qualitative research approach was taken for this report. Due to the nature of the topic, conducting field studies was not conducive to the subject matter, and past research was studied and analyzed to provide the information for this study. Research relevant to the topic was analyzed and categorized depending on their importance to the topic of sustainable strategies for the hotel industry and whether or not it made the argument stronger.

## **Sustainable Building Materials**

The benefit of a new build is that sustainable materials can be used from the ground up; the first step in creating a sustainable hotel is choosing the right building materials. Jong-Jin Kim, an assistant professor of Architecture at the University of Michigan discusses a three life-cycle phase that “relate to the flow of materials through the life of the building” (Kim, 1998). The first phase is known as the “pre-building phase,” it is described as the production and delivery of the material up to the installation, which includes extracting, manufacturing, packaging, and transportation of the raw material. This phase is where most of the environmental damage is done and why it is important to choose raw materials that are highly renewable. When choosing materials it is important to consider pollution prevention and waste reduction in their manufacturing. Choosing manufacturers that practice more efficient production by reducing the amount of scrap material that accumulates and one that reduces the amount of pollutants that are released during manufacturing is an important step.

The second phase is the “building phase,” and relates to “a building material’s useful life.” It begins when the material is used in the structure and extends to the life of that material; because building sites can produce large quantities of waste, it is important to choose materials that create the least amount of construction waste or waste that can be recycled. Using energy efficient materials can reduce the amount of energy generated needed to run the building; these can be measured in r-value, and shading coefficient. R-value is the insulating value of a material or the measure of thermal resistance, the higher the r-value the more insulating that material is. R-values can be measured in insulation, siding, walls, and floors, to name a few. The shading coefficient relates to different types of glass or glazing used in the building, it is the “ratio of the solar heat gain of a building’s fenestration to that of

a standard sheet of double-strength glass of the same area.” Shading devices can block solar heat gain while certain types of glass can allow only certain amounts of light while reducing or preventing the amount of heat gain.

The final phase is known as the “post-building phase” and refers to the end life of the building materials or the disposal of building materials. The demolition of a building and disposal of the waste can create a great impact on the environment; some of the materials can create toxins or consume landscape space this is why it is important to either reuse or recycle the materials.

The idea behind Kim’s three life cycle phases can be used for both the exterior and interior materials of a sustainable hotel. Practicing sustainability means being aware of where a product or material comes from, how it is manufactured, and its impact on the environment.

The consumption of energy is one of the most important reasons why it is important for the hospitality industry to embrace sustainability, especially in the areas of heating and cooling and lighting. Figure 3 illustrates the areas of electric and natural gas consumption in a hotel.

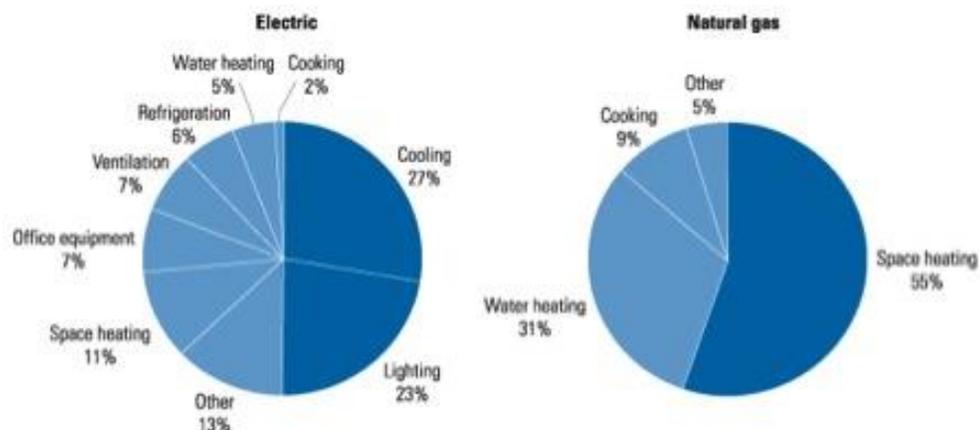


Figure 3. Annual energy consumption. Retrieved on June 16, 2013, from <http://www.fccomfort.com>

The following sections suggest strategies that hotels can use to save money and natural resources.

## **HVAC**

The use of a more sustainable and efficient HVAC system is perhaps the most beneficial sustainable strategy. A simple approach to saving energy is using digital thermostats in all guestrooms. Digital thermostats can be programmed with temperature range limits to avoid extreme temperature change and are more accurate than conventional thermostats. The American Hotel & Lodging Association (AH&LA) calculated that installing digital thermostats in a 300-room hotel could save 298,961 kWh and \$35,478 annually on electrical and natural gas costs.

Occupancy sensors can be installed to detect when a room is occupied and the thermostat will automatically adjust the temperature of the room when it is unoccupied. The thermostat responds by turning down the heat or turning up the air conditioner when the room is unoccupied. Similar to occupancy sensors, guestroom key cards can send a room into occupied and unoccupied mode. When guests insert their key to gain access into their room, this signals to the system to go into occupied mode which signals the HVAC system to go from an economy setting to a comfort setting, the room is now under the control of the guest. When the guest is not in the room the setting reverts back to a more economical one. All of these features can be maintained through a building management system (BMS). A BMS is a computer-based system that can control the lighting, HVAC, and electrical systems in all areas of the hotel. The system is responsible for controlling, monitoring, optimizing, and reporting all these areas. For the HVAC system, BMS improves efficiency by monitoring room occupancy and adjusting the temperature levels accordingly (*Managing*, 2004).

New hotel builds are using geothermal systems as a renewable heating and cooling source. Geothermal systems rely on the heat coming directly from the Earth through the use of heat pumps; the warm air that comes naturally from the Earth comes up through an underground piping system and is pumped into conventional ductwork into the building, the warm air can also be used in hot water heating. The system does the reverse when cooling; heat is extracted from the air and moved back into the pipes or back to the hot water heating system (Figure 4).

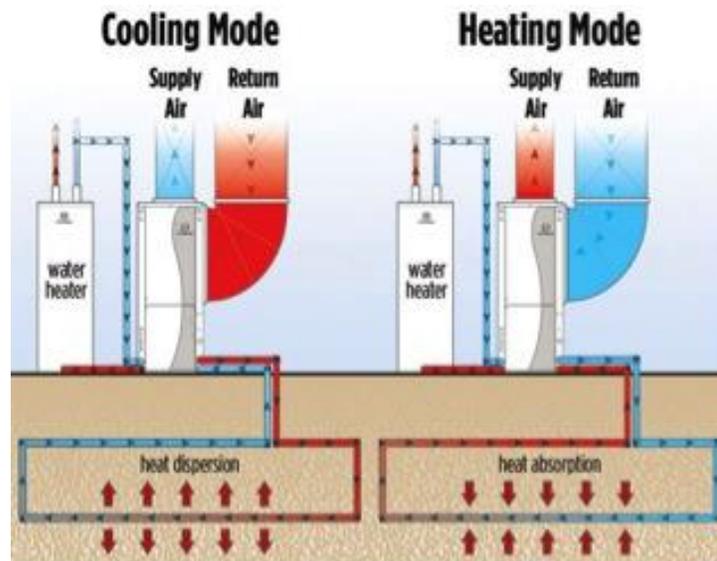


Figure 4. Geothermal systems. Retrieved on June 16, 2013, from <http://www.fccomfort.com>

Besides the cost benefit on heating and cooling bills, another benefit of geothermal systems is low maintenance, there are very little moving parts in the system and the geothermal heat pump has an ASHRAE life expectancy of about 30 years.

### **Water Conservation**

According to the EPA, “15 percent of the total water use in commercial and institutional facilities in the U.S. takes place in hotels.” Guest rooms account for the majority

of the water being used (*Water*); installing water saving devices in guest rooms is an important step towards water conservation.

Installing low flow showerheads can reduce water consumption and energy cost of heating the water up to 50% (*Water*). According to the AH&LA, installing these low flow shower heads could save 1,182,600 gallons of water with savings of \$11,826 and an energy hot water savings of \$23,652 per year. Having an aerator installed in all sinks can reduce the amount of water used by 50%; they help to restrict the flow of water without reducing water pressure.

Other water-saving technologies includes dual flush and 1.6 gallon toilets. According to Water Use and Management, toilets can account for 15% to 40% of the total water usage. Installing 1.6 gallon toilets as compared to the common 3.5-gallon can add up to annual savings of \$13,482 in water and sewage costs for a 300-room hotel. The Holiday Inn San Antonio International Airport was part of a water saving program and after installing high efficiency toilets, faucets and showerheads in all 397 guestrooms at a cost of about \$100,000 they have saved 7 million gallons of water a year. That amounts to a savings of 333,000 kWh of energy and \$68,000 savings in water, sewer, and energy costs a year.

Another area for water conservation is laundry services. According to an article by the Alliance for Water Efficiency, a set of bed sheets requires six to eight gallons of water to launder and a towel set requires another six to eight gallons. One way to save on water is to suggest guests who are staying for more than one night to reuse their sheets and towels. Today many hotels are already implementing this strategy; by leaving a card in the room that informs guest about the depleting resource and how they can have a hand in conserving water, guests have the option to reuse their sheets and towels. The downfall to this program is

that it requires guest's cooperation, and many guests come to a hotel expecting luxury and may not be concerned with water conservation. Training the staff about water conservation and how to talk to guests about it can help make this program successful. Hotel management can also help by providing more towel rack space to hang towels, if towels are not able to dry in between uses, guests may prefer to have a fresh set, which defeats the purpose of the program. Using the 300-room hotel example, by practicing this water saving program, water usage could be reduced by 51,840 gallons and detergent usage by 346 gallons, this would result in an annual energy, water, and labor savings of \$15,957.

Some hotels have installed a greywater system to conserve water. Greywater commonly refers to any untreated water that has not come into contact with sewage; sources include showers, sinks, and washers. The water gathered from these sources is recycled by going through a filtration system and stored for later use (Figure 5).

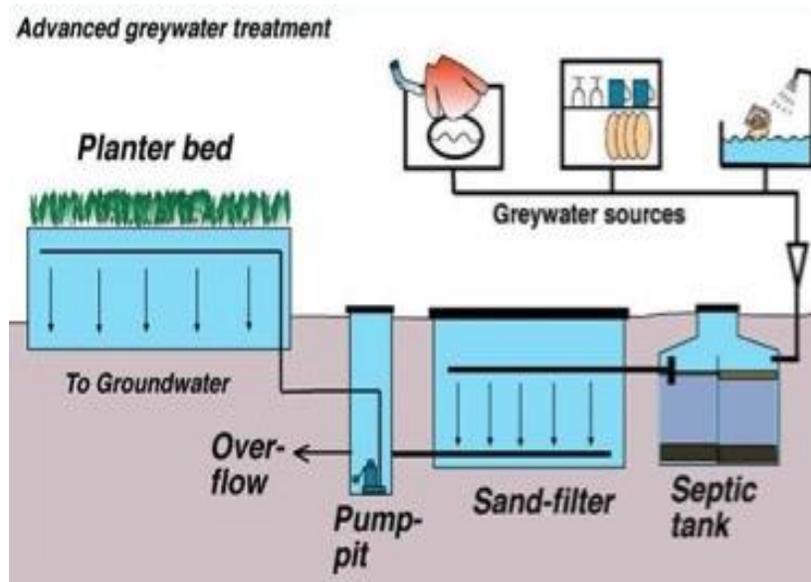


Figure 5. Greywater system. Retrieved on May 5, 2013, from <http://www.fccomfort.com>

Many sustainable hotels are using the greywater in the irrigation of landscape, reducing the amount of treated water that is used and reducing the water bill.

### **Waste Management**

The hotel industry produces an exorbitant amount of waste; the Eco Traveler Guide reported that hotels create about 1.9 billion pounds for waste each year. A simple strategy for waste management is to practice the three r's: reduce, reuse, and recycle. There are steps a hotel can take to implement the three r's: the first would be to conduct an assessment, conducting a waste audit will help to determine what type and how much waste the hotel produces, then determine how much the hotel pays for waste disposal and find ways that the waste can be reduced, which is the second step, reducing waste. Hotels should consider purchasing products with less packaging or that is biodegradable and can be composted. The third step is to find products that can be reused such as rechargeable batteries, cloth laundry bags, and soap and shampoo dispensers as opposed to individually wrapped soaps and shampoo. A recycling program can be utilized in all areas of the hotel such as guest rooms, offices, kitchens, and restaurants, to name a few. One study found that about "50-60 percent of the waste materials in an accommodation facility can be recycled or reused," (Bohdanowicz, 2005). By introducing a recycling program, the Westin San Francisco Airport Hotel recycled 22 tons of materials and saved \$6000 annually (Alexander, 2002).

In order for a recycling program to work in the hotel environment, it is important to enlist someone to coordinate the program, they can be in charge of implementing the program, encouraging other staff members to recycle and keeping track of what finances are needed to recycle and how the hotel is profiting from recycling. In order for it to be a successful program, placing recycling bins in convenient places and creating guidelines for

what can be recycled will be helpful to guests and employees can help educate them about the importance of recycling.

One way to encourage guests to recycle is by introducing in-room recycling. Guests are more willing to participate if bins are located right in the rooms instead of having to find bins in the hall (Wilfong, 2009). Most hotels report up to an 85% guest participation. The same practice can be used for staff, by placing recycling bins in offices, at the front desk or any location that is convenient for staff; they will be more apt to participate.

There are opportunities for some items to be reused. Excess linens and toiletries and unwanted furniture can be donated to local non-profits. Three hotels in North Charleston, South Carolina donated almost 300 pieces of furniture to a community assistance center and in Glenwood Springs, Colorado, the local Habitat for Humanity made over \$500,000 because of sales of donated furniture from five hotels undergoing remodel (Condon, 2012).

All of these strategies can be successful through the right kind of education and motivation of guests and staff.

### **Solar energy**

There have many advances in technologies using the sun as a source of energy. Solar photovoltaic roof panels can create electricity for an entire hotel and not rely on the electrical grid, saving money for the hotel. Photovoltaic technology converts sunlight into electricity; the panels are connected to an inverter that converts the systems direct current (DC) to alternating current (AC), which is compatible to the utility grid that powers appliances and lights (Figure 6.). The electricity produced can be used to power the hotel or be fed back to the grid. Hawaii's Mauna Lani Bay Hotel boasts 3 acres of photovoltaic panels producing 1,150,250 kWh of green power annually.

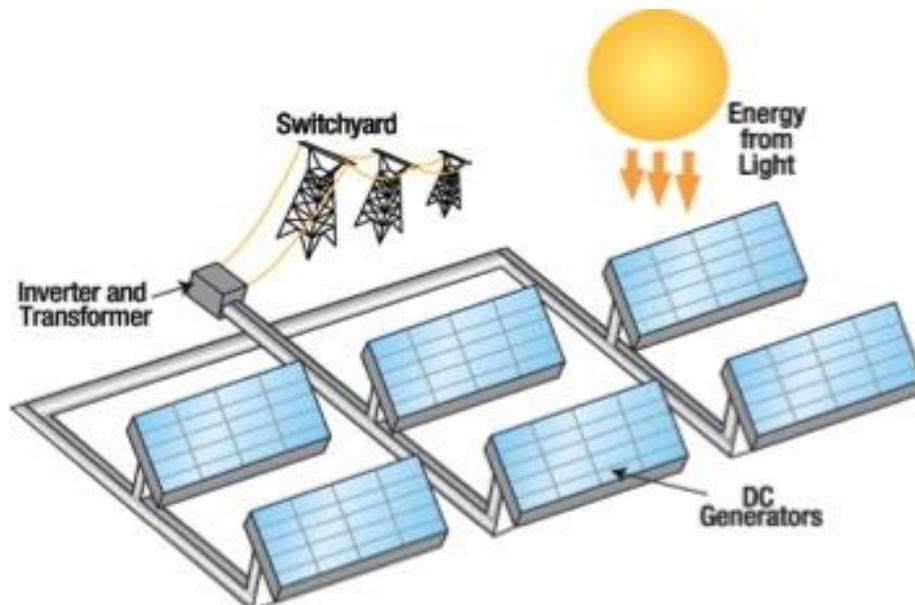


Figure 6. Photovoltaic cells. Retrieved on May 5, 2013, from <http://www.holbert.faculty.asu.edu>

Another way to use solar energy is through solar water heaters; solar collectors or panels on the roof turn the sun's radiation into heat, the heated water then goes into a collection tank where it is ready to be used. Solar water heaters use the power of the sun rather than gas or electricity to heat the water, which generates a large cost savings considering the staggering amount of heated water that hotels go through in laundering services and guest showers (Figure 7). The one hundred solar panels installed on the roof of the Proximity Hotel in Greensboro, North Carolina provide around 60% of the hot water used by the hotel and they have saved \$18,000 annually in natural gas costs. They are also able to sell renewable energy credits at \$20,000 a year (*Practical*, 2009).

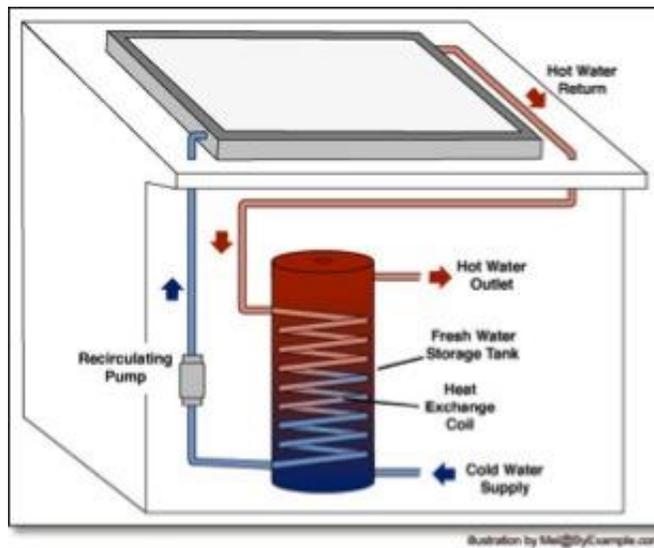


Figure 7. Solar water heater. Retrieved on April 13, 2013, from <http://www.byexample.com>

## Lighting

According to the Florida Power & Light Company, interior lighting accounts for 19% of electricity used in hotels (*Energy*). A simple sustainable lighting strategy is to replace all incandescent lights with compact fluorescent light bulbs or CFLs. According to Energystar.gov, CFLs use up to 75% less energy than an incandescent light and lasts up to 10 times longer. Using CFLs can help reduce energy consumption, generate less heat, and reduce the amount of labor it would take to replace lamps. According to the American Hotel & Lodging Association Guidelines, if a 300-room hotel were to install CFLs in each guestroom containing 5 lamps, there could be a potential savings of 141,912 kWh, which leads to an annual savings of \$17,029.

Using CFLs is only part of the solution to reduce the amount of energy used in lighting; having guests turn off lights while the room is unoccupied is an important part of this strategy. One way to approach this problem is to have reminder cards in each guestroom

reminding guests to turn off the lights when they leave. Another approach is to install occupancy sensors in guest rooms and conference areas that eliminate the need for guests to be responsible for turning off the lights. The sensors can detect if the room is occupied or unoccupied and any lights left on while unoccupied will be turned off.

Lighting researchers in a Berkley lab found that one of the “largest energy-saving opportunities in guestroom lighting are eliminating the unnecessary extended operation of the bathroom fixtures. More than 75% of the energy used by these fixtures occurs when they are left on for more than two hours at a time” (*Energy*). Installing energy efficient light-emitting diode or LED night-lights in guest bathrooms eliminates the practice of guests leaving bathroom lights on for an extended amount of time. More open areas of the hotel such as lobbies and hallways can benefit from the use of daylighting. Daylighting is the practice of using natural light to light a space. This can be achieved through the use of skylights, clerestory windows that are placed higher in a space, or light shelves.

Light shelves have a highly reflective surface and when mounted on the outside of a window can bounce visible light toward the ceiling, which deflects down, into the interior space eliminating the need for artificial lighting (Figure 8).

Effective daylighting can eliminate the use of artificial lighting by letting in natural light; research has shown that it has a direct effect on people’s wellbeing, benefiting both guests and employees. Properly designed daylighting reduces the amount of electricity needed for lighting, “good daylighting design could save from 15 to 75 percent of the energy used for electric lighting in a hotel building” (*Day-lighting*, 2010).

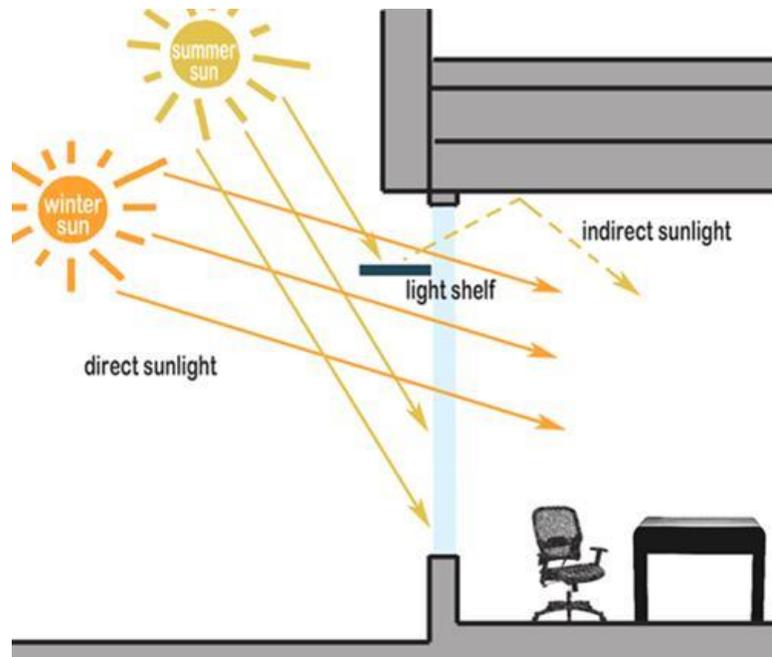


Figure 8. Light shelf. Retrieved on April 13, 2013, from <http://www.superhomes.org.uk>

## Green Roof

A green roof or living roof is a rooftop area that is covered by vegetation planted over a waterproof membrane. Most green roof construction consists of the waterproof membrane to protect the roof structure from moisture; it is typically laid in three layers and helps to prevent any leaks into the structure. The next layer is an insulation layer; it is laid down to stop the water absorbed by the vegetation from pulling heat from the building in the winter months or cool air in the summer. The third layer is a drainage layer that ensures the removal of excess water. Depending on the type of green roof construction, the next layers may include a filtration layer; usually a fabric that keeps the soil in place making sure water doesn't carry small particles into the drainage system, or a root repellent layer. The last few layers consist of a growth medium or soil, a water storage and irrigation layer that keeps the plants from drying out and the final layer; the vegetation, Figure 9 illustrates these layers.

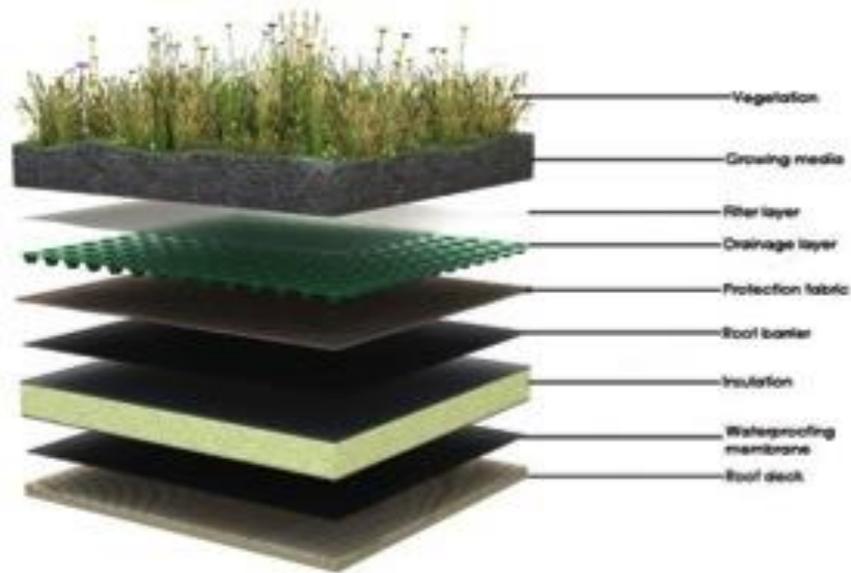


Figure 9. Layers of a green roof. Retrieved on June 22, 2013, from <http://www.dcgreenworks.org>

Compared to a traditional roof, there are a number of benefits to installing a green roof. The vegetation on the green roof can protect the roof membrane from harsh weather and UV radiation as well as maintain a fairly stable surface temperature comparable to the air temperature; unlike traditional roofs that can rise up to 90 degrees higher than the air temperature. Due to the green roof decreasing the temperature of the air radiating from the building; it reduces the risk of urban heat island effect, this occurs when the surrounding areas, namely in a city, are hotter than in the surrounding rural areas, causing a rising demand for air conditioning that creates an energy consumption contributing to global warming. Having the growing medium and vegetation also helps to insulate the building from extreme temperatures and minimizes heat gain. Other benefits include controlling water runoff; the vegetation and soil act as a sponge, instead of water going into gutters with polluted water going into streets and sewers, it is absorbed and filtered. The vegetation also acts as an air filter; pollution particles can be trapped and absorbed by the plant life, washed into the soil

and then broken down into beneficial nutrients for the plants.

The EPA states that green roofs generally start at \$8 per square foot in comparison to the \$1.25 per square foot that traditional roofs cost. Despite the more expensive costs of a green roof, they have been shown to last twice as long as a traditional roof and much more aesthetically pleasing.

### **Sustainable Interior Design**

The interior design of the hotel also plays a large role in sustainability. Consumers have become more environmentally conscious causing hoteliers to become more interested in low-impact interiors to “create healthy and productive places to stay and work (Introduction). The push towards “green” interiors also helps hoteliers get closer to their “green” building certification.

Sustainable interiors should consist of products whose manufacturing have little to no impact on the environment and can be environmentally friendly to dispose of. Another term for this is cradle-to-grave or life cycle assessment, it is a tool “used to help determine the environmental impact of products, services, or processes,” (Winchip, 2007). Figure 10 gives a graphic representation of how the cradle to grave concept works in manufacturing. The “cradle” represents the start of the product or extraction of raw material and the “grave” represents the end of the product and whether it ends up in a landfill or recycled back into a new product. It is important to use products that are sustainable and are produced by companies that are environmentally conscious.



*Figure 10.* Cradle to grave diagram. Retrieved on May 2, 2013, from <http://www.sustainabiliymain.com>

Green Hotelier’s article “Sustainable Interior Design” lists six guiding principles to sustainable interior design. The first is to “establish a responsible purchasing strategy.” It is important to find suppliers who operate their business in a sustainable way such as conserving energy and using minimal natural resources. The second is to buy products locally, not only does this limit the amount of transportation needed, creating a smaller carbon footprint, it also supports the local government. “Consider a product’s true cost,” relates to the cradle-to-grave concept, consider how the product is made and how it is disposed of. The fourth principle is “reclaim, recycle, and reuse,” look for products that are made of recycled or renewable material and consider using reclaimed products like salvaged wood floors or vintage furniture. The fifth principle focuses on energy-efficiency; use the most efficient materials and products in the design. The last principle is probably the most

important to guests and that is aesthetic. It is easy to use sustainable materials in design, but that design must be attractive enough to lure guests in.

These principles are now much easier to follow thanks to the growing number of commercial "green" products available for the hotel industry.

**Flooring.** Sustainable flooring includes products made from renewable or recyclable material. Bamboo has become a popular sustainable flooring option because of its comparable durability and strength to hardwood floor and it is a highly renewable material. Bamboo is considered sustainable because it grows much faster than wood and can reharvest itself through its root system. There are eco-friendly options for hardwood such as wood that is Forest Stewardship Council or FSC certified. The FSC is a global forest certification program founded in 1993 under the principle of reducing the environmental impact of logging and maintaining the integrity of the forest. Forests awarded with this certification meet the ten principles set by the FSC. These include using logging techniques that have a low environmental impact, respect for the indigenous people in that area, and continuous monitoring of the activities and condition of the forest, to name a few. Another natural option is reclaimed wood flooring; wood taken from deconstructed barns or older buildings that is turned into usable flooring. Cork flooring is another renewable resource that comes in many colors and styles. The cork is harvested from the bark of the cork oak tree, the tree is able to continue to grow and regenerate new bark after the bark is harvested. Concrete is also a natural material and it can also be 100% recycled, today's concrete floors come in many colors, polishes, and designs. Natural slate and stone is another sustainable option and many times it can be obtained locally.

Other flooring made from sustainable sources includes: recycled carpet; rubber

flooring, made from rubber trees is 100% renewable; and natural linoleum, a 100% biodegradable product that does not contain any harsh chemicals.

Recycled carpet tiles have become a popular choice for sustainable hotels. The Carpet America Recovery Effort or CARE was formed between both industry and government to “increase the amount of recycling and reuse of postconsumer carpet and reduce the amount of waste carpet going to landfills,” more than 5 billion pounds annually according to the EPA (Bonda & Sosnowchik, 2007). The Shaw carpet company developed Eco Solution Q, it is a brand of their carpet line that is cradle to cradle certified, the company will reclaim its old carpet for free and it will be used to make new carpet.

Recycled glass tile can be used for both flooring and bathroom walls; it can be made from postconsumer recycled glass bottles to old windows.

**Fabric.** The textile industry consumes large amounts of water in manufacturing and generates a large amount of wastewater, about 3 gallons of water is needed to obtain only 2 pounds of cotton textile. According to an article put out by Green Hotelier, toxic chemicals are used for dyeing, bleaching and finishing fibers that release volatile organic compounds or VOCs into the atmosphere, these are dangerous to breathe in and can affect people’s health. This is all the more reason to consider using natural fibers for hotel textiles. Natural fibers can be derived from animals or plants, such as wool, organic cotton, linen, or silk; all are biodegradable and durable. Eco-friendly textiles that are currently available include organic cotton, grown without chemicals and recycled, or reclaimed cotton fabrics made from cast-offs that would have ended up in a landfill. Organic linen can offer protection from UV rays and has “natural anti-fungal and antibacterial properties” (*Introduction*). Recycled PET is fiber made from recycled plastic bottles and is used in carpets, the same is true for recycled

polyester and nylon, both require minimal amounts of energy to produce and both are made from previously used products that would have ended up in landfills. Another eco-friendly and popular fiber is bamboo, due to its high absorbency it is often used in towels and bath mats.

Certification programs have been developed to help consumers determine what types of textiles are considered sustainable. The Institute for Market Transformation to Sustainability or MTS “believes it is possible to transform manufacturing and retail practices worldwide so that by 2015 sustainable products are available in 90% of the global marketplace” (Bonda & Sosnowchik, 2007). The Unified Sustainable Textile Standard 2.0 for carpet, fabric, and apparel was developed as a certification program for textile manufacturers and has been approved by MTS. In order for a textile to be recognized it must fall under one of the five categories: safe for public health and environment, renewable energy and energy efficiency, bio based or recycled material, facility or company based, and sustainable reuse and end of life management.

**Furniture.** Aspects to consider when choosing sustainable furniture are manufacturing practices and materials used. In 2011, a group of hotel leaders representing suppliers, brands, architecture and design firms, and owners launched the Hospitality Sustainable Purchasing Consortium. It was created to “provide an industry-wide purchasing performance measurement solution so that hotels are built, furnished and operated in ways that benefit guest health, comfort and wellbeing, and enhance the environmental and social impacts of the industry” (*Hospitality*). The goal of the consortium is to support product selection based on “quality, design, value, service and sustainability.”

Like wood flooring, wood furniture can also be made of FSC certified lumber and use

environmentally friendly stains and adhesives. Bühler Hospitality is a hotel furniture manufacturer that uses environmentally friendly practices. These include recycling all of their wood cutoffs and sawdust into particleboard, using formaldehyde free stains, recycling all cardboard waste, and all the electricity consumed is generated by renewable Hydro Electric power. This is an example of a manufacturer practicing the cradle-to-grave concept.

**Paint and finishes.** The sustainable choice for paints and finishes are products with low VOC's. VOCs can be found in paints, furniture polishes, adhesives; such as those used to lay flooring, as well as in fabrics and carpet. Many VOCs can be toxic and may affect the eyes, respiratory system or even the central nervous system. Today there are low VOC to zero VOC paint products available and many manufacturers of furniture and flooring produce products that do not use VOCs in their finishes. Using low to no VOC products helps to promote better indoor air quality or IAQ and a healthy environment for hotel guests. Healthy air quality can impact guest's comfort and health. The U.S. Environmental Protection Agency ranked indoor air quality as one of the top five public health risks (Montgomery, 2005).

**Windows and glazing.** A lot of heat gain and heat loss occur when inefficient windows are used in buildings. The benefit of using energy efficient windows and glazing is improving indoor air quality for guests and staff and providing proper insulation. According to the Northwest Energy Efficiency Alliance (NEEA), "heating and cooling losses through windows in commercial buildings result in approximately 2% of the nation's energy use" (Winchip, 2007).

Factors that affect efficiency are the U-factor, solar heat gain coefficient (SHGC), air leakage rating, and visible transmittance (VT). The U-factor measures the rate of heat loss,

the lower the rating the better insulation it has. The more efficient windows are ones with a U-value that avoids heat gain and prevents heat escaping. This can result in large energy savings, more energy efficient windows means less reliance on the HVAC system leading to financial savings. The SHGC rates how well a window or skylight blocks heat from the sunlight, tints, low E-films and reflective coatings applied to glazing's can help to control the amount of sunlight that comes into a space, these can be especially helpful in lobby area windows while VT represents how much light penetrates the glazing, choosing a higher VT allows in more light allowing for the use of daylighting.

## Chapter 5: Case Studies

There are many misconceptions about becoming a sustainable hotel, mainly that it is not financially feasible, that there isn't a high demand for them or that green hotels are not equated with comfort or luxury. As hotel industry expert Sheehan stated, sustainability is not about sacrificing luxury but about "fulfilling our guests' current dreams and desires without sacrificing future generations' dreams and desires" (Pearce, 2013). This section will highlight some of the sustainable and LEED certified hotels in the United States and support the idea that sustainable hotels are becoming more popular and how some or all of the strategies listed above can help a building become more energy efficient and have less of an impact on the environment.

As noted above, LEED's rating system consists of five categories; each of the five categories can be broken down into more specific categories with the amount of credits that can be earned by each. The Crosby Street Hotel, a LEED gold certified hotel, is a great example of how these credits are obtained. For example, sustainable site credits can be earned through providing alternative transportation, bike storage and changing rooms. The Crosby Street Hotel provides bike racks and shower/changing rooms for their guests, visitors and employee; eliminating the need for automobiles thus reducing the carbon footprint. Site selection encourages green strategies to be used; a new build cannot be on a site that is considered prime farmland, close to water or wetlands, or land that is considered a habitat for threatened or endangered species. The hotel achieved habitat restoration by restoring 25% of the native plantings and the use of a green roof reduces the heat island effect, both are underlined in the category of site selection. For the category of water efficiency, credits are earned for a 20% or 30% reduction of water use. By installing dual flush toilets, low flow

urinals, and low flow bathroom faucets, the hotel reduced water usage by 20%. Under the category of energy and atmosphere, credits can be earned for optimizing energy performance. Some of the energy efficient measures implemented in the hotel include, installing thermally broken windows designed to stop the transfer of cold and heat, installing a condensing boiler which are about 90% more efficient than typical water heaters, occupancy sensors installed in common areas of the hotel saves on lighting costs, and premium efficiency motors are used in mechanical equipment. There are a number of ways to earn credits through materials and resources, by diverting 75% of construction wastes from landfills, the Crosby Street Hotel managed to divert 95% of construction debris to a recycling facility. To gain credits for the sum of the recycled content being at least 10% of the total value of materials steel products, concrete, insulation products, and gypsum board were all recycled. Using local products such as gypsum board, bricks, concrete and steel products helped the hotel to gain credits for using regional materials. The fifth category, indoor environmental air quality, was met by using low VOC emitting carpeting, paints, and adhesive and sealants, providing rooms with 100% outdoor air that is filtered with efficient filters before being brought into the space, and implementing green cleaning practices to avoid the use of harsh chemicals. Outside, the construction of the hotel reduced pollution by controlling soil erosion, water sedimentation, and the generating of airborne dust by filtering storm sewer inlets with hay bales, installing dust fences at the construction site, using washout boxes to prevent debris from construction and keeping dirt off public streets.<sup>1</sup> Figure 11 include images of the Crosby Street Hotel, representing the high quality the hotel maintains while meeting the LEED requirements.

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<sup>1</sup> Information about The Crosby Street Hotel was acquired through e-mail contact with Craig Markham-Director of Marketing and PR



Figure 11. Crosby Street Hotel. Retrieved on Nov. 1, 2013, from <http://www.firmdalehotels.com/new-york/crosby-street-hotel>

To acquire credits for the category of sustainable sites, a hotel in Washington installed a green roof and planted over 24,000 native sedum plants; the roof has reduced the amount of energy required to cool and heat the main ballroom that is directly underneath and provides a downtown habitat for birds. Rooms with a view of the rooftop garden have become a popular request for many of its guests. A California hotel provided a line of biodiesel-fueled motor coaches and offers free shuttle service for guests and staff to the hotel. The shuttle drives throughout San Diego and Orange County, eliminating the need for guests and staff to drive, which eliminates the unnecessary production of CO<sub>2</sub>.

The goal of water efficiency is to “encourage smarter use of water, inside and out” (*Practical*, 2009). A North Carolina hotel built with high-efficiency Kohler plumbing fixtures has saved two million gallons of water in its first year and expects to continue to see an annual savings of \$14,000 in water bills. By installing low-flow toilets, showerheads, and flow

restrictors, the Orchard Hotel in California reduced water use by 20%, some of the purchase prices of the showerheads and flow restrictors were covered by rebates from the California Public Utilities Commission.

The goal of the energy and atmosphere category is to encourage energy efficient strategies; installing 100 rooftop solar photovoltaic panels has offset the reliance on the electrical grid for the Bardessono hotel in California. Installing a geothermal system combined with the solar photovoltaic panels has saved the hotel around \$90,000 a year and 500,000 pounds of carbon dioxide emissions.

The idea behind the materials and resources category is to encourage the use of sustainable materials and the reduction of wastes. The construction team of a Massachusetts hotel “diverted 83% of construction, demolition, and land-clearing debris from landfills or incinerators.” Cityflats in Holland, Michigan relied on its parent company, Charter House Innovations, to design and manufacture all of its interior seating and décor at a facility just a few blocks away reducing the amount of fuel use and pollution.

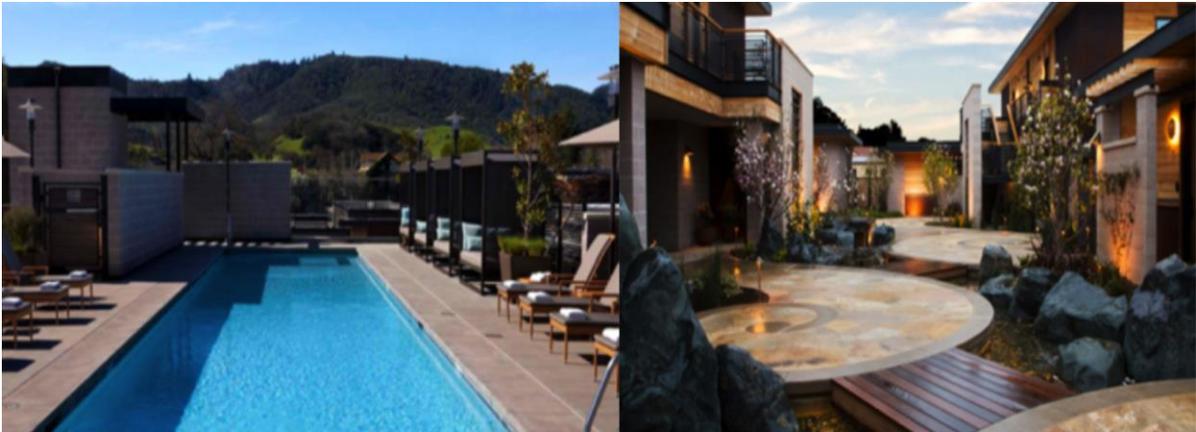
We spend much of our time indoors and that is why the category of indoor environmental quality (IEQ) is so important. Winchip defines IEQ as “considerations associated with the built environment that must be employed for the health and well-being of people.” These considerations include availability of daylight, adequate ventilation, noise levels, indoor air pollution, and outdoor views, to name a few. Creating a healthy environment is important for the hotels guests and employees. Using the example of the Bardessono, over 95% of its space has access to natural daylight with views of the outdoors. This helps to reduce the need for artificial lighting and they have gotten positive feedback from guests about the use of daylighting. By using low-VOC paints and coating, the Cityflats Hotel helped lower the

amount of harmful off gases and reduced the number of contaminants released into landfills and groundwater.



*Figure 12.* Proximity Hotel. Retrieved on Nov. 1, 2013, from <http://www.proximityhotel.com>

Two LEED Platinum certified hotels are now recognized as being among the greenest luxury hotels in the world helping them obtain an average occupancy rate that is among the highest for luxury hotels, the Proximity Hotel in Greensboro, North Carolina (Figure 12) and the Bardessono Hotel in Yountville, California (Figure 13).



*Figure 13.* Bardessono Hotel. Retrieved on Nov. 1, 2013, from <http://www.bardessono.com>

The Proximity Hotel houses 147 rooms, 5000 square feet of conference and event space and a full-service restaurant and boasts a Four Diamond Rating while the Bardessono includes 62 luxury rooms, a spa, a 75-foot infinity rooftop pool and a fine-dining restaurant. Both hotels had project teams with a clear mission; to achieve sustainability and focus on cost and guest experience.

To address energy savings, the Proximity installed a geothermal refrigeration system, occupancy sensor systems, maximized daylighting, and used an insulated precast concrete building envelope. The Bardessono Hotel incorporated low-e glass windows which reduces the amount of solar ultraviolet wavelengths from entering a space, geothermal heat pumps, LED and fluorescent lamps, and high efficiency HVAC systems, to name a few. Every guest room is equipped with occupancy sensors that automatically control the thermostats to adjust the temperature accordingly, overhangs installed on the outside of windows reduce the amount of heat gain in the summer but still allow for the winter sun to enter and heat the rooms. The windows are also equipped with automatic exterior blinds that lower to reduce heat gain and rise. The photovoltaic panels laid flat on the roof generate about 260,540 kWh/year thus reducing the dependency of the electrical grid.

The use of recycled material was prevalent in both designs; the Proximity's restaurant bar is made of salvaged walnut trees that died of natural causes, room service trays are made of bamboo plywood, and recycled building materials included 90% recycled reinforcing steel, 100% recycled gypsum board and 50% recycled staircase steel. The Bardessono obtained most of its material locally including Monterey Cypress on the exterior of some of the buildings, recycled redwood from wine casks were used for some of the public ceilings and doors, while walnut wood was used for flooring and entry doors.

To address indoor air quality, 95% of occupied space for both hotels has access to natural daylighting along with views of the outdoors. The Bardessono have exterior Venetian blinds that are automatically controlled to admit sunlight and heat. The Proximity addressed IAQ by circulating large amounts of outside air into guest rooms using an energy recovery technology (Fig. 14) “the outside air is tempered by the air being exhausted” (Pearce et al., 2013).

Cost premiums to incorporate sustainable strategies were \$2 million for the Proximity Hotel and \$3 million for the Bardessono Hotel; both are expected to pay for themselves in a few years because of tax incentives and savings in energy and water. Part of the reason both of these hotels are successful is because of the education and dedication of the staff; both hotels have educated staff members in sustainable strategies and both have regular environmental and sustainable events to help educate and advocate sustainable strategies in hopes to change the attitudes of communities and individuals and show the importance of sustainable design.

Three of the larger hotel chains that are the leaders in sustainability include Marriott International, Wyndham Worldwide, and Hilton Worldwide. Together with sustainability consultants BSR, Hilton Worldwide has launched a three-year program to help buyers make more informed purchasing decisions and have access to more information on the sustainability features of products. The Center for Sustainable Procurement or CSP will be responsible for publishing research on sustainable products and helping buyers decide the best sustainable products to purchase. The idea came about from Hilton Worldwide’s involvement with LightStay, a sustainability measurement system that calculates and analyzes environmental impact. The system measures energy and water use and the output of waste and carbon for Hilton properties and analyzes performance of about 200 operational practices such as air quality, paper product usage, and housekeeping. In order for the hotel to have a quantitative

idea of their impact on the environment, LightStay provides the hotel with a “meeting impact calculator.” As of December 2011, all of Hilton Worldwide’s 3600 global brands used LightStay making it the first major hospitality company to require property-level measurement of sustainability. As a result; by 2009 the 1300 properties that used LightStay reduced energy usage by 5%, carbon output by 6%, waste output by 10%, and water usage by 2.4%, this saved the company more than \$29 million in utility costs. According to the Hilton Worldwide website, that’s enough energy to power 5700 homes and the reduction in their carbon footprint is equivalent to taking 34,865 cars off of the road. By 2011, Hilton Worldwide had saved \$147 million and was on track to reduce their CO2 emissions by 20%, and water consumption by 10%. As a result, the company maintained its ISO 14001 certification for Environmental Management Systems. ISO stands for the International Organization for Standardization, part of those standards deal with sustainability; they help businesses “make progress in the three pillars of sustainable development-the environment, economy, and society” (*ISO*). The U.S. Environmental Protection Agency or EPA has also recognized Hilton Worldwide for their accomplishments such as purchasing more than 450 million kWh of green power, enough to meet 94% of the company’s annual electricity use in the U.S and implementing Good 360 which allows all 3900 hotels to donate goods to over 2000 organizations in need. This is a great example of how a large hospitality corporation can successfully market sustainable hotels and do their part to help save the environment.

In 2005, Marriott became the first major hotel chain to construct a LEED certified hotel; by the end of 2011 there were 96. They have worked with the USGBC “to pilot the world’s first LEED Volume Program (LVP), a pre-certified green hotel prototype for the hospitality industry,” all of the LVP projects use 25% less energy and water. Through this program,

owners can save about \$100,000 in upfront costs and should recover initial costs in two to six years.

A 2011-2012-sustainability report put out by Marriott International highlighted their dedication to “greening” the industry. They first started to implement sustainable strategies in 2007 with goals to further reduce energy and water consumption by 20%, “educate and inspire associates, business partners and guests to conserve and preserve,” and empower other hotel developers to build green hotels (Marriott, 2012). Some of the sustainable strategies that the Marriott has implemented include an LED lighting retrofit program and launching a program with Nalco, a water treatment and process improvement company that has helped the Marriott save 450 million gallons of water over a three year period. Through their recycling program, they were able to decrease the amount of waste per occupied room by 10% and through waste audits were able to divert over 12,000 tons of waste from landfills through recycling and food composting.

Other sustainable strategies include establishing a supply chain sustainability committee to research companies that use sustainable practices and materials and conserve energy and reduce water use. Some of the products they use are recycled content key cards, low VOC paints, low-energy light bulbs, and Eco-Smart pillows.

The Marriott International hotels have been so successful in their sustainable initiatives in part due to the education and involvement of their employees and guests. By providing standards and training on green practices, at the end of 2011, about 1000 employees were certified in their green meetings program standard.

## **Chapter 6: Conclusion and Discussion**

### **Benefits**

All the above information in this report leads to a question many in the hotel industry

are asking themselves, besides helping the environment what other benefits are there to becoming sustainable? Besides the obvious; sustaining natural resources, creating a smaller carbon footprint, and creating a healthier environment for guests and staff; there are other benefits to going “green.” An article in the Green Hotels & Responsible Tourism Initiative gives a summary of some of those benefits. One of the most significant reasons why hotels look to becoming more sustainable is cost savings; implementing sustainable strategies can lower operating costs (Brebbia & Pineda, 2004). As in all businesses, the bottom line is keeping costs down and saving money; as listed above less expensive strategies can be practiced to reduce energy bills such as changing all light bulbs to CFLs, using digital thermostats, or installing low flow showerheads. Higher costs strategies such as installing solar panels or geothermal systems may take a longer time to reap the financial benefits, but in the end will save much more money than the initial investment. Even though there can be expensive setup costs and a long return in investment, the “economic benefits usually outweigh the cost of implementation,” (Graci & Kuehnel, 2010). According to Greentech Media, despite the average LEED new construction costing \$3 more per square foot to build, that building will gain an energy savings of \$73 per square foot (Johnston & Breech, 2010). A number of cost saving examples were listed above in the areas of lighting, water, and heating and cooling.

There is a competitive advantage. Due to the rising costs of energy and the growing concern for the environment, there may one day be a requirement for the hospitality industry to be more sustainable. If this is the case, those hotels that took the “green” initiative early on will have an advantage over those hotels that have not. A sustainable hotel can benefit from incentives, federal tax deductions are available for establishments that install certain energy

efficient technologies or other sources of renewable energy such as wind or solar and from grants available at the state and local level to encourage “green” building. Sustainable hotels can also benefit from low interest loans, grants, and public investments. Sustainability is a growing trend right now in the industry and if local and federal governments offer incentives there will be a push towards becoming more sustainable.

Another benefit is customer loyalty; becoming “green” has developed into a lifestyle over the years. Typically location and amenities are what people look for when choosing a hotel, but customer loyalty may develop when they see all of the environmentally conscious changes the hotel implements. There is now a market for the “green” traveler; marketing a hotel as sustainable attracts this type of traveler which leads to higher profits and it has been shown that environmentally conscious travelers are willing to pay about 20% more to stay in a sustainable hotel (Wolff, 2009). April of 2009 saw the launch of the Green Hotels Directory, the first online reservation system for the green traveler. The site allows travelers to find hotels that are sustainable or are using green practices in their hotel.

## **Opinions**

The idea of a sustainable hotel leads to a number of questions for both the hoteliers and the guests. Is there enough of a market for hotels to spend the money and effort to become certified? What do guests think? Are there risks? The following section of this report will address those questions.

According to GHA, 43 million U. S. travelers are concerned about the environment, (Vora, 2007), this is a good indication that travelers will look for eco-friendly hotels in their next travel plans. CMI Green, a green dedicated research provider, conducted their second annual Green Traveler Study in 2010 and analyzed the responses of over 950

“eco-conscious” travelers on questions such as “Will they pay a premium for sustainable choices,” “How deep is their commitment to green travel,” and “What drives their interest in green travel.” An important finding was that eco-travelers are becoming greener. There was a 7.5% increase in the number of respondents that said they “researched and booked greener accommodations,” and 75% said they took part in the towel and sheet reuse program (Roth, 2011). The report also found that there is a green skepticism among eco-travelers.

Respondents preferred to stay at hotels that had third party verification such as LEED; this gave them a verification that the hotel was indeed sustainable and not “greenwashing.”

Greenwashing is a commonly used term in the industry when more money is spent on advertising that a place is “green” instead of on the actual green strategies themselves.

Another survey looked at business travelers and their attitudes towards sustainable hotels. It found that 95% of respondents think hotels should be taking green initiatives, more than 70% of those respondents expected recycling and energy efficient lighting in the hotels, while close to 50% expected cards in the room requesting sheets and towels not be changed, water-saving devices in the rooms, and the use of environmentally safe cleaning products (Weissenberg, Redington, & Kutyla, 2008).

## **Marketing**

How does the industry target those “green” travelers? According to research from the University of New Hampshire Whittemore School of Business and Economics, sustainable hotels should use “both functional and emotional green images to attract green guests” (King, 2012). Functional ways to attract the green traveler is by demonstrating the hotel’s commitment to green practices, or hotels becoming LEED certified. Emotional ways to attract guests is through evidence that the hotel has a commitment to the environment and

sustainability; the report gives the example of giving hotel guests the opportunity to dine on food supplied by local farmers. The study, done by professor Nelson Barber, addresses the issue that identifying the green guest can be a challenge, although research has shown that a large percentage of guests would prefer to stay in a sustainable hotel, a study by a major hotel chain showed that 75% of their guests said they wouldn't give up certain amenities to reduce their environmental impact. This is a good representation of the challenge this paper has already addressed, how does a hotel remain sustainable while still providing its guests with the amenities they expect such as freshly laundered linens, high pressure showers, and ample supply of towels? The good news is that the green traveler tends to be more concerned for others and "have a higher desire to work for the good of society than nongreen consumers," and are "less likely to purchase self-serving products" such as those associated with excess.

A new green marketing phenomenon targets what the industry calls Lohas or "Lifestyles of Health and Sustainability," they represent the consumers that base their decisions on socially responsible and sustainable living. According to the website Green Hotels, this demographic represents about 41 million consumers representing a \$209 billion marketplace for goods and services. The idea behind this new demographic is proof that the market for sustainability is out there; the hotel industry just has to find a way to get the attention of these consumers. This new demographic shows that there are consumers out there that look for sustainable hotels and using the right marketing technique and getting the right certifications will bring that consumer into the hotels.

### **Barriers**

One of the barriers for hotels not becoming sustainable is the hotel owner themselves. The main reason hotel owners do not practice sustainability comes down to education, or the

lack of. Hotel owners are not educated on the financial and environmental advantages of becoming a sustainable hotel. A lack of awareness about sustainable practices by the hotel staff and guests is another reason hotel owners do not embrace sustainability; this again has to do with a lack of education. A common thought for hotel owners and many guests as well is that their sustainable actions won't have an effect on the environment. This is a common misconception for sustainability in general, the thought of "I'm just one person; what little effect do I have on the environment."

Many hotel owners do not know what steps to take to become sustainable, an article put out by Green Hotels & Responsible Tourism Initiative, lists eight steps to establish a sustainable program in the hotel. The first is to establish someone as a green coordinator as well as an environmental coordinator. The responsibilities of an environmental coordinator should be to organize a "green team" and coordinate environmental audits for water, waste, energy, and purchasing. The second step is to implement departmental audits; the departments include engineering, laundry, housekeeping, purchasing, grounds and recreation, kitchen, and management. The audit would look at how much energy and water each department consumes, it is important to set a goal and to check on the progress of that goal for each department. The third step is to engage the staff in the program and to get their support; the program will not work without the support and cooperation of the entire hotel staff. This is useful because the employees will have a better understanding of which areas savings could occur and what improvements could be made to save energy. Setting an action plan is important in order to achieve results. By setting goals such as making sure all housekeeping staff turns off all the lights when leaving the room, savings in energy can be monitored. It is important to elect a "green team" to run the new environmental program,

people who are passionate about sustainability will motivate the rest of the staff to participate in the action plans. The sixth step is to write an environmental policy statement that will express the environmental goals, sharing these goals with employees in employee manuals and guests in guest information packs or on a website will show the hotel's commitment to sustainability as well as motivate staff and guests to help with the cause. The next step in establishing a sustainable program is to incorporate the program into employee training, as stated above, none of the goals set will be met without the help of the hotels employees, it is important for the employees to see the benefits of becoming a sustainable hotel and how important they are in reaching that goal. The environmental program will run better when everyone understands his or her responsibilities. The final step is to create regular progress reports; people will be more motivated when they can see physical evidence that goals are being met.

Many hotel owners believe that there is much higher costs to becoming sustainable then compared to a conventional hotel. The term "green premium," as coined by Persic-Zivadinov (2009) is used to refer to the cost difference between building a sustainable building versus a conventional one. Hotel owner and developers believe that this green premium is about 10% when the fact is; it is only an additional 1-2%. Most returns on the initial investment are seen within two to five years due to energy savings. In an article by Bauld and McGuinness (2007), they estimated that owners would see a \$6 savings due to energy efficiency for every square foot of building space.

Another reason hotel owners don't adopt sustainable practices is because they think customers will equate a sustainable hotel with a hotel that doesn't have high standards and all the amenities that they expect. This paper has proven that this is far from the truth; it is very

easy to become sustainable and still be considered a luxury hotel.

The misconceptions that the public and hotel owners have about becoming sustainable are one of the reasons organizations like the Green Hotel Association was developed; to not only teach the importance of sustainability but also how to become sustainable. In order for sustainability to become commonplace in the hotel industry there needs to be education available for both guests and hotel owners. Perhaps the most important benefit to highlight for hotel owners is the financial savings that can accrue with a sustainable hotel. Despite the upfront costs, this paper has shown that the benefits in the end outweigh the initial costs. It is also important to assure the general public that a sustainable hotel can offer the same amount of amenities that other hotels can offer but in some cases can contribute to a healthier atmosphere to the guests.

## **Conclusion**

There are a number of options the hotel industry can take to become more sustainable; from simple measures like implementing a towel and linen reuse program to using sustainable materials and strategies from the ground up in a new build. There has been enough research done to show that the money a hotel can save is worth the initial investment. A hotel cannot just implement sustainable features with a guarantee that it will be successful, education is an important part of the process, and without it the program will not work. This is perhaps the biggest hurdle that the hospitality industry faces. There are a number of misconceptions and educating managers, staff, and guests on the importance of a greener development can make for a more successful program.

As with any new “trend” there will always be those programs or certifications that are created not having the best interest of the company in mind and are just trying to make a

profit, this is where hoteliers have to be educated on the organizations available today and which certifications best suit their needs and the needs of their guests. Guests who are concerned about the environment also have to be educated on which hotels are truly taking a step to becoming more sustainable and which one are just greenwashing. The industry can be more successful when it targets not only the ecotraveler but also the average hotel guest, it can do this by providing all the luxuries that they expect but also be environmentally conscious in doing so.

In recent years there has been a lot of research done on the toll the commercial industry takes on our environment, the hospitality industry being one of the major contributors; it has become not a matter of if the industry will do something to become more environmentally conscious, but when. There has to be a change in how the industry treats the environment before it is too late.

### **Index to Abbreviations**

AH&LA- American Hotel & Lodging Association

ASHRAE- American Society of Heating, Refrigerating, and Air-Conditioning

BMS-building management system

CFL-compact fluorescent lamp

EPA-Environmental Protection Agency

GHA-Green Hotel Association

HVAC-heating, ventilation, and air conditioning

IAQ-indoor air quality

IEQ-indoor environmental quality

LEED-Leadership in Energy and Environmental Design

USGBC-US Green Buildings Council

VOC-volatile organic compounds

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