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Sustainable Strategies for Green Hotel Design: A Case Study of Proximity Hotel and the Bardessono Hotel

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Abstract

The hospitality industry is beginning to incorporate green design and construction methods, conserving energy, water, and resources and so contributing to environmental preservation. Green construction approaches may help create healthy and comfortable internal environments for hotel inhabitants such as visitors and workers. However, there is the possibility of a conflict between green construction methods and hotel guests' contentment and comfort, because resource conservation may detract from the quality of a tourist's visiting experience. The case study method was used in this study to discover and assess green design and construction approaches that provide a green and elegant environment without negatively impacting the hotels' financial status. An extensive literature research was carried out in order to identify green design and construction approaches, premium hotel design elements, and key design conflicts between the twin aims of green building and a luxurious hotel atmosphere. Two LEED platinum hotels (the Proximity Hotel and the Bardessono Hotel in the United States) were chosen, and data on their green design and construction practices, luxurious design features, and operation and maintenance practices were collected from a variety of sources, including the owner, designer, contractor, engineer, and LEED consultant. This data was studied from the standpoint of the building's whole lifetime to uncover green design and construction approaches that not only create a green, elegant atmosphere but also improve the hotels' financial soundness.

Keywords*: green buildings, green design, environmental preservation, case study, conservation, hospitality industry.*

1. Introduction

The built environment of which a structure is a part has both good and negative consequences on the planet, its resources, the people who live on it, and their communities throughout the design, construction, operation, and end-of-life-cycle activities that comprise a building's existence. Over the last two decades, the notion of "sustainability" has acquired universal recognition as part of the endeavor to decrease these negative environmental consequences and increase benefits, including ecological, economic, and social components of the built environment (Ahn & Pearce 2007). Green design and construction practices in the building sector include: increasing efficiencies, thereby saving energy, water, and other resources; providing satisfying, productive, healthy, and high-quality indoor spaces; using environmentally preferable materials; and educating building occupants about efficiency and conservation (Ahn & Pearce 2007; Kibert 2008). Hotel operators that want to be environmentally responsible for economic and financial efficiency as well as personal ethics are using green building principles (Tzschentke et al. 2004; Bader 2005). This trend toward green hotels is projected to increase visitor pleasure and comfort while simultaneously addressing environmental issues by saving energy, water, and resources (Becker 2009; Millar & Baloglu 2008). Guest contentment, desire to return, and likely to suggest a hotel are critical success elements in the hospitality sector. As a result, while designing a new hotel, the design team often concentrates on areas known to be highly related to these elements,

such as the lobby, guest rooms, bathrooms, food and drinks, spas, the outdoor environment, and the artwork shown around the hotel (Heide & Gronhaung 2009). However, there is frequently a sense of a contradiction between client happiness and comfort and green construction standards in hotels that strive for green design and sustainability. According to Kirk (1995), this might occur as a result of resource saving, such as water and energy conservation, which could detract from a guest's enjoyment and comfort. Luxury hotels, for example, are often larger and have plush or exotic materials, sophisticated lighting that feels warm and inviting, and bathrooms with huge bathtubs and many showerheads. These hotel luxury attributes are rarely compatible with green building practices, which favor smaller spaces, and non-exotic, recycled, natural, or rapidly renewable materials and products, as well as increased use of fluorescent lighting to reduce energy consumption and an emphasis on the environment and water conservation (McLennan 2004; Becker 2009). Furthermore, a green hotel is frequently believed to be unsightly and uncomfortably large (McLennan2004). To offset these inclinations and assumptions, it is vital to identify green construction strategies that may be used across the facility's full life cycle to decrease environmental impact, enhance social and economic potential, and increase visitor happiness and comfort. The researchers therefore conducted a case study of the Proximity Hotel in Greensboro, NC, and the Bardessono Hotel in Yountville, CA—the only hotels in the United States at the time of this study to have achieved the highest LEED rating of Platinum while also providing their guests with a comfortable and luxurious environment.

2. Literature Review

Current hotel design characteristics that give luxury settings to guests and increase their pleasure are noted, as are the several sorts of green construction techniques that may be adopted in hotels to meet sustainability goals. Finally, the contradictions between the two aims of promoting sustainability while also offering a nice hotel atmosphere are investigated. In the United States, the hotel business occupies more than five billion square feet of space and consumes almost $4 billion in energy each year (LEED). According to an article on the Eco Traveler website, the hotel business consumes 84.7 billion kilowatt-hours of energy, 219 billion gallons of water, and generates 1.9 billion pounds of rubbish each year. (See Figure 1)

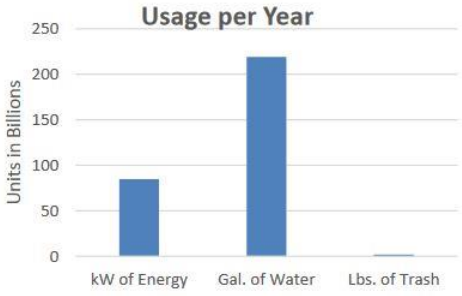

Figure 1: Yearly energy, water, and waste consumption (Source: Sustainable Strategies for Green Hotel Design by Jennifer Benson)

The name "hotel" was derived from the French phrase hôtel in the 1760s, which originally referred to a nobleman's mansion, huge governmental edifice, or town hall (Becker,2009). Despite the fact that hotels were developed in the United States in response to travelers' demand for accommodation, they represented high quality guesthouses that were above the level of the taverns and small inns that were widespread at the time (Becker 2009). As a result, hotels tended to serve as architectural examples of American excellence and represented a distinctly American vision of mobility, civil society, and democracy (Sandoval-Strausz 2007), though this perception of hotels has faded somewhat over time due to a wide variety of industry market segmentation, including a large increase in supply of low-cost, low-quality chain hotels (Becker 2009). However, in recent years, numerous chain hotels have created boutique brands, such as the W hotel, that give outstanding service to visitors searching for hotel experiences with style, service, comfort, and luxury that are personal, unique, and artistically engaging. These hotels frequently experiment with high fashion architecture, hotel design, and distinctive interiors that impact hotel guest happiness, intent to return, and likely to suggest a hotel (Heide & Gronhaung 2009). Based on a survey of several studies that examined acceptable design aspects for luxury hotels, this study identified important design features that can elevate a hotel to premium level. A premium hotel, for example, will have greater space, plush or exotic materials, sophisticated lighting that feels warm and inviting, and bathrooms with enormous bathtubs and many showerheads (Becker 2009). These design elements make visitors' trips more pleasant, but they may appear to contradict with sustainability, because main green building solutions focus on lowering humans' environmental imprint by limiting resource use to the essentials. Such luxurious qualities may be regarded as incompatible with green construction approaches, which frequently focus on lowering resource consumption throughout the building life cycle to minimize environmental footprint.

2.1 Green Building and Sustainability Practices

Green buildings are the building industry's answer to the need to reduce negative environmental, social, and economic repercussions in the building industry. Green construction approaches allow us to strive toward the goal of "filling the needs and ambitions of today without jeopardizing future generations' capacity to satisfy their own needs" (Brudtlland). To produce a green building, green design and construction practices should be implemented from the planning stage to the demolition phase of the project. A green building is based on a completely integrated "whole building" strategy that includes the whole building cycle, including design, construction, operation, and destruction (Boecker, et al. 2009). Several studies have shown that green buildings that use green building methods have benefits. For example, they can assist alleviate building challenges and problems, such as environmental concerns connected with existing structures, while also providing building users with better interior environments. Green construction approaches continue to improve in order to attain these benefits, with significant breakthroughs in the sector throughout the first decade of the twenty-first century (McLennan 2004). The growing acceptance of green building rating systems, particularly the LEED

(Leadership in Energy and Environmental Design) green building rating system developed by the U.S. Green Building Council (USGBC), in many business sectors, including the tourism and hotel industry, is one of the main indicators of the movement's success.

2.2 Balancing the Dual Objectives of Sustainability and a Luxurious Hotel Environment

TABLE 1: Major Green building practices and their potential benefits

Categories	Major Practices	Specific Benefits
Sustainable Site	• Sustainable site planning and landscaping • Solar orientation of building • Public transportation • Stormwater management	• Reduce environmental impacts • Efficiency of site use • Heat island effect • Reduction of civil infrastructures
Energy Efficiency	• Solar orientation • High efficiency envelopes (efficient windows and high R-value insulation) • High efficiency HVAC system • Building automation systems • Daylighting and high efficiency lighting • Onsite renewable energy sources (photovoltaics)	• Energy saving • Reduction in greenhouse gases • Lower operating costs
Water Efficiency	• Water saving fixtures and technologies • Rainwater harvesting system	• Water saving • Lower operating costs
Materials & Resources	• Green supplies and materials • Construction waste management • Recycled content materials • Regional materials, locally sourced • Rapidly renewable materials	• Resource saving • Reduce environmental impacts
Indoor Environment Quality	• Daylighting & high efficiency lighting • Adequate air filtration • Low VOC materials • Mold prevention • Enhanced acoustical performance	• Productive and healthy indoor spaces • Provide optimal indoor • environment to building users • Improved occupant health and wellbeing
Building Operation & Maintenance	• Green cleaning supplies • Indoor pest prevention and control • Waste reduction and recycling • Energy and water conservation • Green grounds keeping • Electronic versus paper communication • Guest education/communication program	• Reduced environmental impacts • Reduced operational and maintenance costs
Demolition	• Exposed ceiling • Nylon 6 recycled carpet	• Reduce construction waste

Given the possibility of conflicts between luxury and green building practices, it is critical to understand how green building practices may be successfully applied at each step of hotel design, construction, operation, and deconstruction. Green hotels are ones that "follow policies that are safe, healthy, and ecologically friendly, apply green management practices, support green consumerism, safeguard the ecosystem, and correctly use resources." Furthermore,

Brundtland's (1989) most widely accepted definition of sustainability is "meeting the needs and aspirations of the present without jeopardizing future generations' ability to meet their own needs," though Sheehan notes that this definition is insufficient to describe green hospitality because hospitality should not be about sacrifice but rather comfort, suspense, setting desirable expectations, and satisfying current needs.

Sheehan goes on to define sustainability in the hotel sector as follows: "Sustainability is about meeting our customers' present goals and wishes without jeopardizing future generations' dreams and desires." The goal is to achieve sustainability without sacrificing anything." Researchers and practitioners have identified a variety of green construction methods that might be adopted in hotels to achieve both sustainability and visitor satisfaction. One approach is to use the USGBC's LEED green building rating system, which provides third-party verification that a building was designed and built using green building strategies aimed at improving building performance such as energy savings, water efficiency, lower CO2 emissions, improved indoor environmental quality, resource stewardship, and sensitivity to environmental impacts. As a result, it is vital to have a deeper understanding of how to achieve sustainability goals in a hotel while keeping luxurious surroundings for guest enjoyment, as well as the initial cost premium imposed by applying green construction methods. This study used a case study research technique to address these research questions because it provides a valuable tool to investigate the complex challenges involved in reaching the goal of a green hotel and sheds fresh insight on the cause-effect connection of applying green construction practices.

TABLE 2: Additional Green strategies in hotels.

Areas	Strategies
Interior	• Lighting, air conditioning and heating: Intelligent control systems that monitor the presence of guests in the room, together with their preferences and patterns (Heung, et al. 2006; Sheehan 2007) • Fewer furniture pieces (Sheehan 2007) • Carpet tiles (so only a few tiles need be replaced instead of the entire carpet in the event of damage); Green Label Plus carpets (Sheehan 2007) • Materials selected for durability (Sheehan, 2007)
Operation	• Fresh air and clean drinking water (Heung, et al. 2006) • Green products and services (Manaktola & Jauhari 2007) • Operational coordination with guests, i.e., reusing towels and bedding for a multi-night stay (Sheehan 2007) • Clear standards for operations and housekeeping (Kasim 2004) • Recycling programs (Millar & Baloglu 2008)

3. Methodology

The objective of this research is to uncover, examine, and generalize green construction approaches that may reconcile the twin goals of sustainability and luxury environment while also

improving a hotel's financial soundness. The case study research technique was chosen to fulfill the study's goal because it provides a thorough and in-depth contextual investigation of a restricted number of event variables and their interactions (Soy 1997). In order to establish a viable case study based on methodological principles (Yin 2003), the following steps were done in this study:

- Identify and identify research questions
- Choose the instances and decide on data collection and analysis methods.
- Gather data
- Evaluate and evaluate data

This section illustrates how the hotels in the case study were chosen and how the data was obtained for the objectives of this study. This study was created using a qualitative research technique. Due to the nature of the issue, doing field surveys was not feasible, thus previous research was researched and processed to offer the material for this study. Relevant research was examined and classified based on its relevance to the issue of sustainable solutions for the hotel sector and whether or not it strengthened the case.

4. A Case Study of Proximity and the Bardessono Hotel

Two LEED Platinum certified hotels, the *Proximity Hotel* in Greensboro, North Carolina, and the *Bardessono Hotel* in Yountville, California, are now acknowledged as being among the greenest luxury hotels in the world, allowing them to achieve among the highest average occupancy rates for luxury hotels.

4.1 The Proximity Hotel

Fig 2: Proximity Hotel (Image source: Proximityhotel.com)

In early November 2007, the Proximity Hotel, a 147-room hotel with a restaurant and 5,000 square feet of conference, meeting, and event space, opened (Figure 2). The hotel was built by Quittance-Weaver Restaurant & Hotels (QWRH) and obtained the USGBC's first LEED Platinum (highest rating) accreditation in 2008. The Proximity Hotel, which has a AAA Four

Diamond rating with accommodation prices ranging from $190 to $350, proves that green construction and luxury do not have to be mutually incompatible. The project team employed approximately seventy green building methods to accomplish their aims of green building, luxury, and long-term economic viability, which are presented in Table 3. The Proximity implemented a geothermal refrigeration system, occupancy sensor systems, increased daylighting, and employed an insulated precast concrete building exterior to save energy. To mention a few, the Bardessono Hotel used low-e glass windows, which minimize the amount of sunlight ultraviolet wavelengths that enter a space, geothermal heat pumps, LED and fluorescent bulbs, and high efficiency HVAC systems. Every guest room has occupancy sensors that automatically manage the thermostats to alter the temperature. Overhangs added on the exterior of windows decrease heat gain in the summer while still allowing the winter sun to penetrate and heat the rooms.

Additionally, the windows include automated external blinds that descend to prevent heat intake and rise. The solar panels installed flat on the roof create around 260,540 kWh per year, decreasing reliance on the electrical grid. The Proximity's restaurant bar is built of rescued walnut trees that died naturally, 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.

4.2 The Bardessono Hotel

Fig 3: Bardessono Hotel (Image source: Trip advisor & Bardessono Hotel's website)

The second case in this study is the Bardessono Hotel, a boutique luxury hotel (price range: $399–$699) in Yountville, California, in the heart of the Napa Valley (Fig. 2). There are 62 luxury rooms, a spa with four treatment rooms, a 75-foot-long rooftop infinity pool, a fine-dining restaurant, and a conference area inside the hotel. MTM Luxury Lodging (MTM) in Kirkland, Washington, developed and launched Bardessono in February 2009. Recognizing the importance of sustainability and environmental challenges, as well as delivering a magnificent guest experience, the MTM development team was led by the mission statement: The majority of the materials used at the Bardessono were sourced locally, including Monterey Cypress for the

exteriors of several of the buildings, repurposed redwood from wine casks for some of the public ceilings and doors, and walnut wood for flooring and entry doors. The outside Venetian blinds of the Bardessono are automatically regulated to allow in sunshine and heat. To address interior air quality, 95 percent of both hotels' occupied area provides access to natural daylighting as well as views of the outdoors.

TABLE 3: Common Sustainability Practices across Case Studies.

Sustainability Strategies	Proximity Hotel	Bardessono Hotel	Target Outcomes
Pre-Design Strategies			
Site selection using sustainability criteria; dense development and community connectivity	X	X	Avoid the development of inappropriate sites; Protect greenfields and preserve habitat and natural resources
Multidisciplinary design team with prior experience	X	X	Find implementable, optimal design solutions at reduced cost
Integrated Design Process and sustainability objectives	X	X	Find implementable, optimal design solutions at reduced cost
Sustainability charrette process	X	X	Find implementable, optimal design solutions at reduced cost
Design Strategies			
Alternative transportation – design for:	X	X	Reduce pollution and land development impacts from automobile use
• Proximity to public transportation (Bus routes)	X	X	
• Bicycle storage and changing rooms	X	X	
• Low-emitting and fuel-efficient vehicles	X	X	
• Limited parking capacity	X	X	
Maximize open space retained on site	X	X	Promote biodiversity; allow for contact with natural systems
Preserve or restore a minimum of 50% of the site to pre-development conditions	X		Conserve existing natural areas and restore damaged areas
Reduce impervious cover, increase on-site infiltration, and implement a stormwater management plan	X	X	Reduce stormwater runoff and eliminate contaminants
Install vegetated roof	X		Reduce the urban heat island effect and manage stormwater runoff
Use reflective roof materials	X	X	Reduce the urban heat island effect; reduce cooling energy needs
Minimize the amount of exterior uplighting	X	X	Limit light pollution and associated negative biological impacts
Use a water efficient landscaping and irrigation system (Drip irrigation system)	X	X	Reduce potable water consumption for landscaping by 64% (526,876 gallons)
Undertake measurement & verification of system performance	X	X	Provide ongoing measurement and verification of system performance to identify and resolve problems that could result in poor energy performance
Monitor energy consumption through continuous commissioning	X	X	Reduce energy consumption and carbon emissions and collect data that is useful in managing the hotel
Employ a green cleaning policy	X	X	Minimize exposure of guests and employees to potentially hazardous chemicals
Sustainable purchasing policy - cleaning materials/products	X	X	Minimize exposure of guests and employees to potentially hazardous chemicals
Support local farmers, food makers, and vendors	X	X	Support the prosperity of local community by purchasing locally
Use organic linens and terry cloth		X	Support organic cotton farms and improve guests' satisfaction and comfort
Use electric and bio-diesel vehicles		X	Reduce fossil fuel use and carbon emissions
Sustainable management system – Educate staff on ways to improve performance in dealing with and understanding sustainability	X	X	Change employees' behavior and attitude toward sustainability
Sustainable education for community	X	X	Educate guests and staff about sustainability and encourage them to change their behavior and attitude toward sustainability
Compost food waste (Earth Tub)		X	Minimize waste stream of kitchen and garden vegetables and plant waste
Use local artwork	X		Help local artists and economy
End-of-Life Cycle Strategies			
Maintain exposed ceilings	X		Minimize construction waste at the demolition phase of the facility
Maintain exposed concrete	X		Minimize interior finish materials and construction waste at demolition phase

Use low flow fixtures: • Low flow toilets • Low flow faucets and showerheads	X	X	Reduce potable water consumption • Proximity Hotel: 33.5%, total potable water savings of 403,387 gallons/ year) • Bardessono Hotel: 34%, total potable water savings of 205,218 gallons/ year)
On-Site renewable energy • Photovoltaic (PV) system • Solar hot water system	 X	X	Increase levels of on-site renewable energy self-supply to reduce environmental and economic impacts associated with fossil fuel energy use • Proximity Hotel: 100 solar hot water panels, 1,413 MBtu, 60% of the hotel hot water, 8.49% of the building's energy costs • Bardessono Hotel: 940 PV panels, 889MBtu, 26.37% of the energy cost
Optimize energy performance by using: • Daylighting and low-e glass • Reflective materials on the roofs • Sensor technologies • Geothermal heat pumps • Geothermal refrigeration system • LED and fluorescent lamps • Insulated precast concrete building envelope • Variable speed hoods • Regenerative elevator	 X X X X X X X X	 X X X X X	Reduce energy consumption to minimize negative environmental and economic impacts associated with excessive energy use; Provide optimal indoor environment for guests' comfort and satisfaction • Proximity Hotel: Total energy savings of 42.5% (Energy cost saving of 39.2%), 7,938 MBtu/year • Bardessono Hotel: Total energy savings of 31.5% (Energy cost saving of 45.9%), 2,980 MBtu/year
Materials reuse		X	Bardessono Hotel: The hotel has used salvaged, refurbished, or reused materials equal to 10.02% of the total material value (Monterey Cypress, Tufa (limestone), Walnut trees, California Bay trees, etc.)
Use of recycled content materials	X	X	Reduce the use of virgin materials and production energy: • Proximity hotel: 22.4% recycled content by value • Bardessono Hotel: 11.54% recycled content by value
Use of regional materials	X	X	Reduce negative transportation impacts and enhance local economies: • Proximity Hotel: 45.9% of the total building materials value • Bardessono Hotel: 30% of the total building materials value
Use of low-emitting materials	X	X	Promote occupant and installer health and reduce exposure to harmful chemicals

4. Analysis and discussion

The case study analysis of the two hotels began with a broad strategy for analyzing the data gathered for each case study. Data were classified according to the project life cycle phase, namely the pre-design, design, building, and operation phases of the hotel. Data from the two examples were compared for each step to demonstrate the similarities and contrasts in the tactics used by these two very different hotels to attain sustainability and luxurious harmony. The study also assessed performance outcomes for incorporating green building techniques during design and construction, as well as guaranteeing customer satisfaction during facility operations. The pre-design phase was undoubtedly one of the most essential elements in the development process based on the procedures used in building these two greenest premium hotels. By implementing green building ideas and technology, it was possible to achieve sustainability and luxury while lowering the initial cost surcharges. The following techniques, in particular, led to the effective completion of the pre-design process for both of the hotels in the case study:

One of the most essential parts of the building life cycle is design, in which the project is changed from a concept to a collection of buildable papers, including drawings and specifications. In order to achieve harmony between sustainability and luxury, the project teams in both cases used an integrated design process and a system approach when selecting not only optimal green building design practices, but also design considerations and factors that impact guest satisfaction. There are numerous options for modifying a building's design elements to make its life cycle more environmentally friendly, so during the design phase of the project, both

design teams worked closely with the management teams of their respective hotels, government officials, contractors, cost consultants, civil engineers, and others.

- *Site strategies*
  Both the Proximity and Bardessono hotels used green construction site practices to decrease transportation-related carbon emissions, conserve adjacent ecosystems, control storm water runoff, reduce the heat island effect, and remove light pollution. Furthermore, both project teams evaluated how the hotel grounds should be manicured, since this would be a significant aspect in boosting visitor relaxation and enjoyment once the hotels were open. Both hotels also have a bicycle rack with bicycles that guests can use to ride on nearby bike trails. One important site technique employed on the Proximity Hotel project was the restoration of 700 linear feet of the stream adjacent to the hotel by limiting erosion, planting native, adaptive plant species, and reconstructing the buffers and banks. A vegetated rooftop has also been planted on the nearby restaurant and conference hall to mitigate urban heat island effects and give visitors with green roof space. In the Bardessono Hotel project, construction was pushed back from the stream by at least 35 feet, and the spaces in between were planted in native riparian plants with the goal of creating a healthy vegetative habitat for animals and fish, as well as limiting silting of the creek through runoff.

- *Water related strategies*
  Both hotels incorporated high-efficiency fixtures and fittings, such as water closets, dual flush toilets, waterless urinals, and low-flow showers, to improve water efficiency and minimize waste consumption in the hotel. Because such fittings are recognized to be directly tied to guest happiness and an important feature of elegant bathroom settings, the design teams in the two hotels evaluated not just the need to minimize water use but also the quality and design of the fixtures. When these water-saving methods were implemented, a reduction of around 34% of potable water was realized when compared to ordinary hotels. Furthermore, important landscaping tactics employed for the hotels' environs included the planting of native and adapted plants, the installation of drip irrigation systems, and the avoidance of the use of turfgrass on either site. Proximity employed a non-potable water source for plant irrigation and placed freezers in the hotel restaurant that used geothermal energy rather than water cooled systems, saving substantial water. Proximity is able to save 3 million gallons of drinkable water per year as a consequence of these water-saving efforts, whereas Bardessono is able to save 1.1 million gallons per year. The key water-efficiency measures at both hotels were to find water-saving fixtures on the market, to plant native and adaptive trees and plants, and to construct a drip irrigation system or water-saving irrigation system if permanent irrigation of the landscape was necessary.

- *Energy related strategies*

  When attempting to achieve the dual goals of sustainability and luxury, energy is a critical issue because it affects not only the hotel's initial and operating costs, but also has a significant impact on the indoor environment and greenhouse gas emissions, with a subsequent strong impact on guests' comfort and satisfaction. To achieve the goals of energy savings, a high-quality interior environment, aesthetics, and cost effectiveness, both hotels used an integrated design process and a systems approach. The use of a geothermal refrigeration system, variable speed hoods, sensor technology, regenerative elevators, an insulated precast shell, and optimal use of sunshine were all significant energy-saving measures at the Proximity Hotel. Furthermore, the Proximity placed 100 solar hot water heating panels covering 4,000 square feet of rooftop to produce 60% of the hotel's hot water. Furthermore, all rooms have overhangs to limit heat intake from the summer sun while allowing the winter light to penetrate and warm the rooms. When cooling is required, the automated motor system may lower the outer venetian blinds to prevent heat gain from the sun, and then lift the shades when visitors demand.

- *Materials-Related Strategies*

  The project teams for both hotels investigated and selected a variety of green materials and resource solutions, such as material reuse, use of recycled content, regional materials, and green furniture or goods. Each of these measures may significantly minimize waste in construction by utilizing green building materials with low environmental, social, and health implications throughout extraction, processing, transportation, use, and disposal. The design team selected to employ the following goods sourced locally or on-site in the Bardessono:

  - Monterey Cypress on the outside of various structures
  - Walnut wood was used for the hotel's floors, entry doors, and other public areas.
  - Redwood reclaimed from wine casks for several of the public rooms' ceilings and numerous public room doors The Napa Valley
  - The slabs for the desks in the guest suites were made from California Bay trees.
  - The design team also picked repurposed Tufa limestone for the outside walls and internal public areas of the Bardessono. Rammed dirt was used to create landscape elements and permanent signpost buildings to honor Napa Valley's soils.

- Innovative Social Sustainability Strategies

Finally, both project teams used unique ways to meet the twin aims of sustainability and a magnificent hotel atmosphere in terms of society and culture. The Proximity Hotel, for example, collaborated with local artists to produce original art for each guest room and lobby, and both hotels were created to reflect the local environment and culture. Locals were also participating in collaborative efforts to promote the town and the hot springs.

4.1 Findings across case studies

The two hotels in this case study utilized a variety of green construction strategies throughout their facility's life cycle in order to achieve sustainability in the hotel business while creating a luxury atmosphere for guests. Table 3 compares the solutions implemented in each project to increase project sustainability while preserving performance in other critical areas for a premium hotel. This table serves as the foundation for the conclusions of the case study analysis, which will be described further below.

Strategies Used During the Construction Phase

During the construction phase of both case study projects, project teams worked to minimize site disturbance and pollution, as well as to implement erosion and sedimentation control plans, construction waste management plans, and indoor air quality management measures to eliminate potential contaminants in HVAC equipment and ensure worker health and safety. Furthermore, in both situations, it was critical to locate and support producers of local and regional materials and furnishings that might be used in place of more traditional exotic or luxury materials such as marble and luxury furniture.

Based on the case study facilities' experiences, green luxury hotels may consider adopting the following sorts of initiatives to enhance operational sustainability:

- High-performance green cleaning program to reduce costs and avoid toxic fumes and skin irritants
- Comprehensive recycling and solid waste management program through extensive staff and guest education
- Sustainable purchasing policy, such as a local organic food purchasing policy
- Comprehensive staff training and guest education on green building practices
- Sustainable operating policies, including integrated pest and landscape management
- Green housekeeping program

5. Conclusion

All of the material in this research raises a question that many in the hotel business are asking: aside from saving the environment, what other advantages are there to becoming sustainable? Aside from the obvious benefits of preserving natural resources, reducing carbon footprints, and providing a healthier atmosphere for guests and employees, there are other advantages to being "green." Some of these advantages are summarized in an article published by the Green Hotels & Responsible Tourism Initiative. The bottom line in any organization is to keep expenses low and save money; as mentioned above, less expensive techniques to cut energy bills may be used, such as converting all light bulbs to CFLs, employing digital thermostats, or installing low flow showerheads. Higher-cost options, such as installing solar panels or geothermal systems, may

take longer to gain financial rewards, but will save far more money in the end than the initial expenditure. Despite the fact that there may be high setup costs and a delayed return on investment, the "economic advantages generally surpass the cost of implementation," according to the study (Graci & Kuehnel, 2010). Given the growing interest in green construction in the world, it is expected that developers will explore green building approaches in the future to enhance the environmental, social, and life cycle economic performance of their hotels. This study discovered green construction techniques that were shared by two case study hotels and may be used as a starting point for future hotel projects. Although not meant to be a comprehensive list, this collection of practices has a track record of success with the two hotels thus far and should be considered by project teams intending to construct future green luxury hotel projects.

References

Ahn, Y. H. (2010). The Development of Models to Identify Relationships Between First Costs of Green BuildingStrategies and Technologies, and Life Cycle Costs for Public Green Facilities, Ph.D. dissertation, Virginia Tech, Blacksburg, VA.

Ahn, Y. H., and Pearce, A. R. (2007). “Green Construction: Contractor Experiences, Expectations, and Perceptions.” Journal of Green Building, 2(3), 106-122.

Ahn, Y. H., Pearce, A. R. & Ku, K. (2011). “Paradigm Shift of Green Buildings in the Construction Industry.” International Journal of Sustainable Building Technology and Urban Development, 2 (1), 52-62.

Bader, E. E. (2005). “Sustainable Hotel Business Practices.” Journal of Retail & Leisure Property, 5 (1), 70-77.Cornell Hotel and Restaurant Administration Quarterly, 40, 47-53.

Becker, E. J. (2009). The Proximity Hotel: A Case Study on Guest Satisfaction of Sustainable Luxury Environments, Master’s Thesis, The University of North Carolina at Greensboro, Greensboro,

Boecker, J., Horst, S., Keiter, T., Lau, A., Sheffer, M., B., T., and Reed, B. (2009). The Integrative Design Guide to Green Building, John Wiley & Sons, Inc, Hoboken, NJ.

Bohdanowicz, P. (2006). “Environmental Awareness and Initiatives in the Swedish and Plish Hotel Industries Survey Results.” Hospitality Management, 25, 662-682.

Brundtland, G.H. (1989). "Protecting the Global Commons," Earth Ethics, fall, 12.

Cohen, M. & Bodeker, G. (2008). Understanding the Global Spa Industry: Spa Management, Elsevier Ltd, Oxford, UK.

Coleman, M. (2009). "On Green Building in Today's Economy." Boutique Design, March/April, 14-15.

Curtis, E. (2001). Hotel: Interior Structures, Wiley-Academy, West Sussex, Great Britain.

Ding, G. K. (2004). The Development of a Multi-criteria Approach for the Measurement of Sustainable Performance for Built Projects and Facilities, Ph.D. Dissertation, University of Technology, Sydney, Sydney, Australia.

Fisk, W. J. (2000). "Health and productivity gains from better indoor environments and their relationship with building energy efficiency." Annual Review of Energy and Environment and Resources, 25, 537-566.

Forbes. (2011). "The Nation's Greenest Luxury Resort and Spa is Profitable." http://www.forbes.com/sites/kymmcnicholas/2011/02/17/the-nations-greenest-resort-and-spa-is-profitable/ (Access March 15, 2011).

Hasek, G. (2007). "Hospitality Gets Greener: LEED Applications Pile up as the Program Becomes an Accepted Standard." NEWH: The Hospitality Network, 12.

NC. Bernstein, L. (1999). "Luxury and the hotel brand: Art, science, or fiction?" Cornell Hotel & Restaurant Administration Quarterly, 40(1), 47-53.