

## **SUSTAINABILITY IN THE FIELD: LAKE TAHOE HOSPITALITY AND ENVIRONMENTAL PROTECTION**

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**ABSTRACT:** The Embassy Suites Lake Tahoe, a Hilton Corporation hotel located in South Lake Tahoe, California, is working to become an environmentally responsible lodging business. This case study describes what the site has done to improve their environmentally relevant practices. The installation of technology, implementation of behavior-based programs to encourage guests and employees to engage in conservation practices, and their work to influence local individuals and businesses to adopt similar initiatives is described. The results indicate that these investments have had a positive impact on business operations evidenced by reduced costs (e.g. a 1.1 million dollar cost savings over 3 years). Additional benefits in reducing environmental externalities are noted. This paper articulates some challenges and opportunities for behavior analysts as more businesses adopt similar programs.

**KEYWORDS:** sustainability, cultural change, leadership, environment

In recent years the world has witnessed devastating earthquakes, floods, tornados, tsunamis, extreme weather, and the human toll these disasters exacted. These events indicate the suffering people will encounter as environments are degraded, changing established life patterns. Current data indicate that the impact of natural disasters influenced by climate and environmental change will increase in frequency and intensity (McDonough, 2002; Nickerson, 2003; Thompson, 2010). Acid rain, ozone depletion, wetland loss, glacier melt, rising sea levels, deforestation and other negative changes in global habitat will continue to challenge the earth's populations.

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### **The Role of Behavior Science in Climate Change**

Human practices are increasingly seen as a source of influence in climate change, and it is these human practices that are seen as the force by which positive change must occur. Thompson (2010) summarized the evidence for global warming and called for changes in human behavior to prevent or lessen the impending effects of environmental change on humanity. Thompson suggested, however, that the window in which to act is closing fast and the potential for human suffering is accelerating. The call for human action is no longer a question among scientists. Good stewardship of limited resources is needed and might be achieved with new technologies, supported by human behavior to design, implement and evaluate them (Grant, 2010).

Scientists studying the problem call for behavior change with increasing urgency. While climate, geological, and other sciences produce measures to track environmental degradation, the role of changing behavior falls on the shoulders of behavior scientists who possess the skills needed to address these issues (Grant, 2007; Lehman & Geller, 2004). These challenges include educating the public and supporting the business and community leaders who are developing contingencies to promote environmentally relevant behavior (ERB) (Luke & Alavosius, 2012). The challenges are compounded by the often-distant negative consequences of current unsustainable environmental design (Grant, 2007; Lehman & Geller, 2004) that are too delayed to sustain behavior change. Coupled with a changing natural environment, the present economic recession forces many corporations to consider new business practices. This increases the potential for behavior change at a considerable scale as much consumer behavior is influenced by corporate decisions.

### **Organizations and Climate Change**

To survive, organizations seek to cut costs and provide new methods of appealing to a rapidly changing market (Pearce & Michael, 1997; Young, 2009). Many businesses now look towards environmentally conscious options as a means of survival. Kareiva (2012) argues that corporations are perhaps the most viable platforms available to support large-scale behavior change needed for conservation of earth's dwindling resources. Corporations' "green" business practices provide opportunities for governmental rebates, public appeal, and long term cost savings. Leading business operations in the hospitality and resort industry are creating sustainable systems (Smerecnik & Anderson, 2010) in order to distinguish themselves from their competitors.

The following case study depicts business decisions and management practices which support the implementation of sustainability programs at the Embassy Suites Lake Tahoe (ESLT). The four-season resort and its suppliers work together to establish new cultural practices related to environmental protection and restoration. Together, they demonstrate sustainable reductions in environmental impact to a fragile ecology while operating under the constraints of an economic downturn. These new practices operate to reduce waste via recycling and composting and decrease consumption of electricity and fuel via the adoption, utilization and monitoring of new technologies. The hospitality industry is especially intriguing as guests are exposed to innovative technologies during their stay. Given the appealing and pleasurable aspects of their visit they may become more motivated to adopt similar practices in their everyday lives. This case is of interest to behavioral scientists as it illustrates organizational change within an operating business effective in producing systematic change and modeling potentially replicable results.

### **Environment Surrounding the ESLT**

Lake Tahoe is the largest alpine lake in North America at an elevation of 6,225 feet on the California/Nevada border. It is surrounded by the Sierra Nevada Mountains and is widely regarded as a premier vacation destination offering year-round activities to 3 million visitors annually. The Lake Tahoe basin includes numerous ski resorts, hotels, golf courses, summer recreation businesses, restaurants, shops, and casinos.

Given its location and popularity, Lake Tahoe provides a highly visible laboratory to study climate change and human behavior. The University of California, Davis has monitored the lake since 1978 to create a record of change in air temperatures, reductions in snowfall, invasion of foreign species, increases in surface temperature, reductions in water clarity, and other markers of ecological change (Tahoe Environmental Research Center, 2010). The Tahoe Environmental Research Center (TERC) annually reports these measures to educate the public about the science behind preservation and restoration of Lake Tahoe. Members of the TERC research team hypothesize that the changes in the lake are highly influenced by the changing global climate compounded with increased usage and industrial development around the lake. Yearly data continue to support this hypothesis. It is vital that environmentally conscious engineering, education, and contingency management are applied as the lake community continues to develop; otherwise the pristine features that attract so many visitors may be lost.

The ESLT is a Hilton Corporation hotel located in South Lake Tahoe, California. The management team of the Tahoe hotel site recognized the fragility of the lake and the need to mitigate the resort's role in harming the environment. They work to become a more environmentally friendly lodging facility by installing several technological upgrades, developing and running ERB based programs that encourage their guests and employees to participate in ecologically responsible practices, and influencing local citizens and businesses to adopt similar initiatives. In addition, they host an annual West Coast Green Lodging conference to educate both managers of national and international corporations about the environmental and economic benefits of ERB for the hospitality industry. Through these efforts they work to educate the public with regard to eco-tourism and use their resort to provide recreational activities within a set of technologies and business practices identified as "green" innovations.

This case analysis describes how the innovative sustainability efforts within the ESLT developed at the corporate level and implemented within operations so that the resort is regarded as a practical example of environmental stewardship for businesses working to achieve similar outcomes. The corporate decisions leading to the implementation of these interventions are noted. The impacts of these efforts are described from both an environmental and business perspective.

### **Method**

#### **Personnel and Setting**

The ESLT employs 250 individuals and is the largest private employer in Eldorado County, California. Work tasks range from maintenance of the building and grounds, housekeeping, food and beverage services, entertainment, concierge services, and more. All employees work to ensure the comfort of their guests as well as the vitality of the recreation and entertainment within the resort and surrounding community (<http://www.embassytahoe.com/sustainability>, 2012).

**Embassy Suites Lake Tahoe Resort.** The ESLT resort is a 400-room resort located in South Lake Tahoe, the largest city along the lake's 72-mile shoreline. South Lake is located on the California - Nevada border and caters to a large number of tourists. ESLT hosts an average of 100,000 visitors each year who access numerous summer (e.g., boating, golf, hiking) and winter (e.g., skiing, mountaineering) activities as well as gaming-based entertainment provided in Nevada.

ESLT maintains an average occupancy rate of 68%, and provides each visitor with numerous complementary services and amenities to attract return visits. These services and amenities consequently increase the cost of operations and the amount of waste generated. Numerous programs were implemented to mitigate some of these costs and sustain the business within a fragile economy and alpine environment. As a result, all departments within the site now participate, either directly (e.g., housekeeping) or indirectly (e.g., marketing) with the sustainability programs.

**Community.** The ESLT, as one of the largest employers in the region, serves as a hub by which local businesses connect and work together to provide services around Lake Tahoe that attract visitors. The local communities around the Tahoe Basin contain businesses which support the sustainability efforts and preservation/restoration of the lake is highly valued and often discussed in local media. These businesses involve renewable energy, composting, recycling, waste management, ranching, farming, and more. Collectively they provide many services to the ESLT and functionally intersect business practices for everyone's economic benefit.

### **Organizational Changes and Sustainability Programmatic Elements**

Dynamic change within an operating organization requires environmental, structural, and administrative components throughout the system to work in coordination and not disrupt ongoing processes within the business (Malott, 2003). Although each component may be necessary for change, alone they may not be sufficient for systematic restructuring (James & Card, 2012; Markus & Robey, 1988). The economic context in which the ESLT operates as well as the community's and consumers' values towards environmental issues were evaluated as plans to initiate the changes described below were launched.

Economic pressures and growing concern for environmental protection created a context for corporate decision makers to favor new and innovative ideas related to ERB at the ESLT. The chief engineer functioned as an "idea generator" (Galbraith, 1982) to plan, develop, advocate, test and oversee the rollout of the technological and behavioral sustainability program elements at the ESLT. The resort staff needed to acquire the knowledge, and skills to implement the many changes across the organization while maintaining the hospitality guests expected. The sustainability efforts required personnel to engage in coordinated behaviors that interlock with guests' behaviors to produce a coherent hospitality system that reduces negative impacts on the environment and reduces costs. The many changes to the resort's systems and operations require behavior changes by executives (e.g., new policy directives), managers (e.g., scheduling and training staff members), front-line personnel (e.g., implementation procedures) and guests (e.g., recycling) to improve the sustainability of the resort. No systematic evaluations were done to test which were required for lasting revitalization, so assessment is speculative. Interestingly, the chief engineer proposed to achieve all of the outcomes described below in 2002. No action was taken at that time in part from lack of economic pressure and little public demand for

environmentally sustainable products/services to then justify large upfront costs for new technologies and programs.

In 2009 the business context changed such that executives and managers came together, across the organizational network, to initiate changes related to sustainability of the resort. While the following is discussed in a linear progression it is important to note that the changes witnessed occurred in a complementary fashion. Technological upgrades and behavioral changes occurred across multiple levels overseen by the chief engineer, who coordinated the layers of innovation within a continuously operating resort.

**Context.** Within the last five years the tourism/hospitality industry experienced drastic changes affected by many things including economic stressors, (e.g., the recession) and growing cultural awareness of climate change which affect consumer choices (Dangelico & Pujari, 2010; Holt & Barkemeyer, 2010). These factors created a supportive context for organizational change within ESLT but a counter argument could be made that changes might disrupt hospitality services and deter visits to the resort.

Malott (2003) describes a macrosystem as the social and natural environment in which any organization functions and provides a framework to assess potential impacts of any intervention. At its most-basic conceptualization, a macrosystem is composed of inputs, processing operations (individual business units), and a receiving system (Malott, 2003; Brethower, 1988).

The processing operations of an organization in the hospitality industry include transportation, parking, check-in, housekeeping, dining, laundry, concierge, and other guest services. These focus on providing goods and services to consumers seeking an entertaining and enjoyable stay. The majority are tourists and some are repeat guests. A resort's various operations provide a hospitable setting in which leisure and entertainment activities are provided to consumers and in so doing can educate the public about sustainable building design, lifestyle behaviors, and community engagement. In order to survive, the processing functions that maintain an enjoyable setting must be interconnected with inputs from the macrosystem, the outputs to the macrosystem and operate to provide an experience valued by the consumer (Brethower, 1988).

The recession beginning in 2007 drastically affected the monetary inputs for the tourist industry (Eadington, 2011) as economic stressors led to fewer tourist dollars fueling the business. The recession occasioned changes to business practices at the ESLT so that operation costs would be minimized while maintaining visitors to the resort. Corporate decision makers requested innovative ideas from the chief engineer that might save hundreds of thousands of dollars and allow the Tahoe hotel site to survive.

A second contributing contextual factor involved the receiving system for the ESLT, namely the tourists' increasing desire for accommodations within a more sustainable resort. Cohen (1963) articulates how news media can influence society's awareness about current events and global issues. The density of media generated around a given topic can then be used as an indicator of public opinion and focus (Cohen, 1963). The media's focus on climate change can serve as a metric through which society's values can be predicted (Holt & Barkemeyer, 2010).

Between January 2005 and December 2008 Holt and Barkemeyer (2010) sampled 112 media outlets and reported drastic increases in the coverage dedicated to climate change. In 2005, 10-20 articles per month were considered average, by 2008, 60 articles per month were the norm. Current data indicate that the prevalence of media dedicated to this topic is still high (Holt & Barkemeyer, 2010). Growing public awareness of environmental issues produces a new demand for environmentally friendly services across big industries (Dangelico & Pujari, 2010). This

demand set the occasion for corporate decision makers within the ESLT to move business practices towards environmental sustainability and re-fashion the resort to attract consumers seeking more “green” accommodations. By 2009 this market was identified as a growing segment of the population interested in visiting the ESLT.

**Corporate direction.** In 2009 corporate directors of the ESLT solicited innovative ideas, related to cutting operation costs, from the onsite chief engineer. This individual submitted several return on investment (ROI) analyses for the recommended innovations that were based on his experience in the industry and research of available innovations. He has the unique history of working within innovative resorts and formerly worked in Robert Redford’s Sundance Resort. His experience and ideas convinced owners of the ESLT to upgrade the resort using “green technologies.” Company directors recognized the value of upgrades in terms of long term cost savings despite the upfront costs. Budgets were set to upgrade technology and implement new behavior based programs with the goal of decreasing operating costs, improving the durability of the organization through the recession, and potentially attracting a new tourism group (i.e., eco-tourists seeking opportunities to engage in ERB at their chosen resort).

**Intermediary advocacy.** Market share and profit consequences for business directors often drive the adoption, utilization or abandonment of business practices (Biglan, 2011). Often businesses seek practices that produce immediate positive gains. This results in relatively little attention to the production and mitigation of negative externalities produced by corporations (Biglan, 2009). Biglan defines a negative externality as “harm that the business transaction of a corporation does to a third party.” Such events have been a focal point of discussion among environmentalists (Biglan, 2011) and the ESLT provides a clear example of that trend. Negative externalities affecting the environment produce challenges for behavior sciences in that the harmful consequences are often invisible and distant. This lack of immediacy easily overpowers the consequences that might select good environmental stewardship. The relatively immediate and certain reinforcing consequences of luxury and expedience (Lehman & Geller, 2004; Newsome & Alavosius, 2011) often select harmful and wasteful practices by consumers and those that feed their appetites. Under such conditions, Biglan (2009, 2011) argues that advocacy is one of the most important approaches for effective change of organizational practices.

The chief engineer (second author of this paper) advocated for upgrades to critical systems. His previous work on the development and operations of the Robert Redford Sundance Resort educated him on the benefits of environmentally sustainable business practices enabled him to select viable technologies for the ESLT. This unique history also affords him credibility to advocate for change by corporate leaders seeking to distinguish the ESLT resort from its competitors. In 2009 he was given the budget to make the ESLT more sustainable in its operations.

The chief engineer established communication networks and training programs to foster a work culture that embraced ERB and new technologies. Behavior change was essential for ESLT’s personnel to adopt practices that replaced older, more wasteful methods and increase staff members’ routine contact with socially reinforcing consequences to maintain the program.

**Training.** The chief engineer organized training teams for the resort’s staff. A roll out system created a collaborative work culture with explicit goals to promote staff members’ engagement in ERBs. Weekly team meetings, initial and quarterly trainings and information boards provide staff members with updates, feedback, and recognition. These are permanent features of the work place to inform staff members of their behavior and update them on their progress.

Staff members are educated on the new materials and technologies implemented at the resort allowing them to identify their use, function, and purpose within the resort. They implement the programmatic changes and communicate the sustainability goals of the resort with hotel guests. The ESLT operates as an environment rich in naturally occurring reinforcement to interlock environmentally responsible behavior by staff members and guest (Houmanfar & Rodrigues & Smith, 2009).

### **Behavior Changes**

Lehman and Geller (2004) articulate three types of response classes and/or contingency manipulations that promote the longevity and outcomes of ERBs. Specifically, these are (1) efficiency behaviors, (2) response maintained behaviors, and (3) permanent interventions. While Lehman and Geller make reference to “response maintained” interventions, a more descriptive classification of these interventions would label them as “perpetual conservation” responses. Boundaries among these three response classes are somewhat ambiguous as distinctions involve either topographical or temporal features of the behavior; all function to reduce environmental impact. All three classifications are applied within the ESLT and sustained over the last three years. The upfront cost of implementation of these changes was extensive, (nearly \$200,000) yet once installed the cost of continued use is minimal.

**Efficiency behaviors.** Efficiency behaviors are *one-time* behaviors that modify current environmental impact typically through the adoption of technologies that produce benefits through their continued use (Gardner & Stern, 1996). For example, installing more efficient appliances minimizes the negative externalities produced by older, more wasteful devices (Lehman & Geller, 2004). At the ESLT, energy management systems, occupancy sensing thermostats and motion detectors, occupancy sensing lighting, Light Emitting Diode (LED) lighting, and ozone laundry systems were installed. The management team monitors all these interventions to assess the ROI and guide optimal use of the technologies. Some require ongoing calibration of systems and require follow-up actions after installation in order to achieve optimal impact. Calling them “one-time behavior” is a misnomer as further human behavior is required to achieve desired savings but they have been classified as efficiency behaviors since their installation is the critical behavior. See Table 1 for a description of the interventions and interlocked behaviors required to maintain and implement the following technologies across the ESLT. This table also notes the year these changes were implemented.

**Energy management system.** This computer system automates the heating, ventilation and lighting of the building based upon the occupancy demands rather than set at a standard rate independent of use or non-use. The heating, cooling, and lighting of the building are now controlled by a database of the scheduled events occurring in the building so that energy-intensive operations are automatically controlled and no longer wastefully left running in vacant spaces.

**Occupancy sensing thermostats and motion detectors.** All ESLT suites are equipped with occupancy sensing devices and a passive infrared sensor that activates the room’s thermostat when guests enter and turn off when occupants leave. The occupancy sensing devices are coupled with the passive infrared sensor to insure that all occupants have left the room before turning off heating or cooling in the suite. Upon activating the occupancy sensor by opening or

Table 1. *Utilization and Implementation Process for Efficiency Behaviors*

Identified Inefficiency	Engineering Solutions & Date of Installation	Description	Level of Organizational involvement for implementation			Outcome
			Organization al leadership	Chief engineer	Front line	
Climate control, and lighting left negligently running when not in use	Efficiency Management System (2009)	Automated system operating energy dependent technologies based on occupancy demand	<b>Approval, policy, sponsor, budget, evaluations, oversight,</b>	<b>Select, justify, install operate, monitor</b>	<b>Schedule, report, utilize</b>	Decreased energy costs
AC or Heat left running when rooms left vacant	Occupancy sensing thermostats and motion detectors (2009)	Electronic sensors that indicate when hotel guests enter and leave hotel rooms	<b>Approval, policy, sponsor, budget, evaluation, oversight.</b>	<b>Select, justify, install, monitor</b>		Decreased energy costs
Lights left on, and inefficient lighting used	Lighting (2010)	Motion detecting sensors indicate movement with in rooms, and LED lights installed	<b>Approval, policy, sponsor, budget, evaluate</b>	<b>Select, justify, install, monitor</b>		Decreased energy costs
Excessive energy use, to heat water, drying cycles. Toxic chemicals handled to sanitize.	Ozone laundry system (2009)	Ozone systems disinfect laundry, replace soap and the need for hot water	<b>Approval, policy, Sponsor, budget, evaluate, oversight</b>	<b>Select, justify, install, operate, monitor</b>	<b>Interface, report, operate</b>	Decrease energy costs, supply costs, drying time, and reduces employ contact with harsh disinfectants that traditionally were added to laundry.

*Note. Bolded columns indicate behavior engaged in at different levels of organization functioning.*

closing the door the motion detectors are also activated. This two-step process insures that if one individual leaves or enters the room while others are still inside, the thermostat does not respond as if the room is vacant.

**Lighting.** Lighting occupancy sensors were installed in all maid closets, offices and back of house operating areas. LED lights produce less heat and require less energy to operate and were installed in 165 exit lights throughout the building grounds. Eighty garage lighting fixtures were replaced with LED lighting. Over 300 lighting structures were identified as unnecessary and



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redundant (i.e., some lighting fixtures housed two light bulbs when only one was needed) and were removed.

**Ozone laundry systems.** The ESLT personnel wash approximately 120,000 pounds of laundry per month with huge costs to the organization. An ozone system reduces soap and eliminates the need for hot water. Ozone also opens the weave of the fabric producing noticeably softer linens. This reduces the time needed for washing and drying, lowers the energy needed for laundering and cuts the time employees spend doing laundry. Other benefits include an increase in the life cycle of the linens and removing the need for employees to handle caustic and toxic chemicals (e.g., bleach). Naturally occurring ozone in the air is used (ozone is a natural antibacterial), reducing the costs associated with detergent and water treatment required by the old system.

**Perpetual Conservation.** Technology can mitigate inefficiencies and waste but not all negative externalities can be addressed with automated technological adaptations (Lehman & Geller, 2004). Some require continued human behavior to mitigate. Management at ESLT identified that more savings could be made by involving guests and employees directly in the ERB sustainability initiatives. Table 2 articulates the perpetual conservation programs at the ESLT and the behaviors required to maintain implementation across the resort. The timeline for implementation is also noted.

**Recycling.** The ESLT uses a multi-faceted recycling program that prompts hotel guests to recycle and trains employees to sort recyclable materials. Each resort suite is equipped with a

*Table 2. Utilization and Implementation Process for Perpetual Conservation*

Identified Inefficiency	Organizational Change & Date of Implementation	Description	Level of organizational involvement for implementation			Outcomes
			Organizational Leadership	Chief Engineer	Front Line	
Extensive cost in hauling recyclable waste materials	Recycling Program (2009)	Employees and guests are prompted to discriminate between recyclable material and waste materials via separate bins when they throw items away.	<b>Policy and oversight</b>	<b>Select, install, operate, monitor</b>	<b>Transfer, sort, restock</b>	Reduced waste removal costs. Increase cash inflow from exchanging recyclables.
Extensive cost in hauling food waste materials	Composting Program (2010)	Employees are trained to utilize bins and materials for composting food waste	<b>Policy and oversight</b>	<b>Select, install, operate, monitor</b>	<b>Transfer, restock</b>	Reduces waste removal costs

*Note. Bolded columns indicate behavior engaged in at different levels of organization functioning.*

recycling bag for aluminum cans, plastic bottles and glassware. Recycling drop boxes are located on every floor of the hotel for reduced response effort required for recycling behaviors. All employees are trained and oriented quarterly to the recycling program to maintain the integrity of the implementation. During these trainings employees are instructed how to answer guest questions about the recycling program, how to collect and sort the recyclables as well as how to incorporate these responses into their everyday tasks. Thus, the staff members actively model desired practices and invite and support guest participation.

As a result of this program, the ESLT recycles approximately 2 cubic yards of office paper, 20 cubic yards of cardboard, and truckloads of aluminum, plastic, glass, and toner cartridges each week. These recyclables are exchanged for cash at the Sierra Refuse Company in South Lake Tahoe, a participant in the California recycling exchange program. The proceeds are used to offset the cost of purchasing items necessary for the success of the composting program (i.e., compostable containers, trash bags, and eatery). The recycling program now successfully supports the compost program so additional funds are not needed from other budget items to fund the costs involved in composting.

**Composting.** ESLT produces about 4 cubic yards of food waste each week. This waste contributes substantially to the amount of methane and CO<sup>2</sup> gasses produced by the resort and its disposal is expensive. The chief engineer hired Full Circle Compost, located in the Carson Valley, a 30 minute drive from South Lake Tahoe, to take all food waste, including meat based products, for de-composition. In order to correctly sort compostables from non-compostables, food service employees receive quarterly training to sort these items during their regular work tasks. To reduce work effort, compostable trash bags and corn based cutlery and dishware are used in the resort, as these can be composted along with food waste.

The chief engineer personally hauled the waste to Full Circle Compost during the first year of implementation to pilot test this process. Transport was accomplished by the local waste removal company once the process was established. In 12 weeks the waste is composted and converted to nutrient rich soil that the ESLT uses to maintain its grounds. The composting system organizes resort waste operations to mimic natural restoration processes and provides an aesthetically pleasing alternative to landfill operations. Local businesses within the community are supported by purchasing landscaping materials from “Full Circle Compost” that is fuelled in part by the food waste generated by ESLT.

**Permanent Interventions.** Permanent interventions are implemented without ongoing behavior monitoring for institutionalization. Lehman and Geller (2004) delineate two types of permanent interventions. The first changes environmental features that result in changed behavior (e.g. such as the modification of building structures, and the adoption of technology that replaces inefficiencies). The second category is systematic changes that utilize natural consequences to support continued utilization (e.g., the recycling exchange program for cash utilized by the state of California). They argue that if such interventions are cost effective there is little reason for them to be removed and are thus adventitious to keep in place.

Permanent interventions at the ESLT were made to the physical structure of the resort. The structure of the building in 2009 reflected poor efficiency and cost the business owners excessive funds to maintain. Thus the decision to install the following systems served dual functions: support environmental stability, and reduce costs. Table 3 articulates the timeline for these interventions and the role of leadership in their installation.

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Table 3. *Utilization and Implementation Process for Permanent Interventions*

Identified Inefficiency	Structural Solution & Date of Installation	Description	Level of organizational Involvement for implementation			Outcome
			Organizational leadership	Chief Engineer	Front Line	
All or non response for an AC motor controlling cooling pumps	Variable Frequency Drives (2009)	Drives that improve the function of pumps needed building utilities	<b>Sponsor, budget</b>	<b>Detect problem, propose solution, install</b>		Reduced fuel, and energy costs
Lack of precision in identifying building needs based on occupancy to operate valves in cooling systems	DDC three way valve (2009)	Serve as an efficient and effective replacement for high voltage valves on cooling systems	<b>Sponsor, budget</b>	<b>Detect problem, propose solution, install</b>		Reduced energy costs
Building inefficiency resulted in cooling pumps running constantly	Correcting construction defect (2010)	This defect was corrected to minimize running a hot water pump continually	<b>Sponsor, budget</b>	<b>Detect problem, propose solution install</b>		Reduced fuel and heat costs

*Note. Bolded columns indicate behavior engaged in at different levels of organization functioning*

**Variable Frequency Drives.** The Variable Frequency Drives installed at the ESLT control the rotational speed of an alternating current (AC) electric motor to efficiently control fundamental pumps at the ESLT based upon occupancy demands. This variable function reduces unnecessary use of these core-building pumps and reduces consumption of fuel and energy. The variable frequency drives allows for percentage of pump functioning rather than the all or none, on or off, mechanical responding of the earlier system.

**DDC three way valve.** The older pneumatically operated valves for the cooling systems were inefficient as they did not provide the pinpoint accuracy needed to maximize cost efficiency. All pneumatically operated valves on the ESLT cooling system were replaced with DDC (Digital Direct Current) low voltage control valves.

**Correcting construction defect.** An error in original building construction led to a heating pump inefficiently running twenty-four hours a day seven days a week. This flaw grossly minimized the efficiency of the building operations. Relocating the piping of the hot water to the correct condenser loop and away from the chilled water was corrected in March 2009.

### Dissemination

The personnel at the ESLT disseminate findings to the community and educate the public on topics related to environmentalism and sustainability initiatives. See Table 4 for a description of

Table 4. *Utilization and Implementation Process for Dissemination*

Goals	Organizational Solution & Date of Roll-out	Description	Level of organizational involvement for implementation			Outcomes
			Organization- al Leadership	Chief Engineer	Front Line	
Provide staff with information on programmatic success	Public posting (2010)	Serves as an educational, feedback, and social reinforcement media source for employees	<b>Policy and goals</b>	<b>Specify, coordinate, update</b>	<b>Evaluate, utilize, implement updates</b>	Employee programmatic buy in.
Interact and educate local community	Community Education (2009)	ESLT hosts several community events supporting environmentally friendly activities	<b>Policy and goals</b>	<b>Specify, coordinate, supervise</b>	<b>Implement</b>	Local networking with other business organizations (i.e., consulting with other hotel business)
Interact and network with others in the hotel industry.	West Coast Green Lodging Conference (2011,2012,2013)	Educational conference education national and international hotels on the benefits of green lodging	<b>Policy and goals</b>	<b>Program coordinator, presenter</b>	<b>Serve, direct, report</b>	Consultation work with in the hotel chain

*Note. Bolded columns indicate behavior engaged in at different levels of organization functioning.*

the goals, timeline and behavior to disseminate information and technology to the community at large.

**Public posting.** The ESLT uses a “sustainability information board” to disseminate the latest information on sustainability and what employees can do to help promote current environmentally supportive efforts within the resort and surrounding community. This board informs employees about ERB in the work place as well as encourages their use at home. The board is a public forum for posting the achievements of employees participating in the sustainably programs and celebrating results. For example, the ESLT sustainability efforts has been reported in the local press on numerous occasions and these articles are posted on the board so that the employees can celebrate their achievements and share the news with family and friends.

**Community education.** The ESLT hosts several community outreach and educational events to promote responsible stewardship of the lake’s valuable and fragile environment. These events include outreach supporting non-motorized watercraft on the lake, the production and dissemination of recycling containers, and zero waste events.

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Each year Lake Tahoe hosts a non-motorized watercraft celebration. The stated mission of the annual Paddle Fest is to insure the “preservation of indigenous watercraft, art and culture” (Dayberry, 2010). In 2009 the ESLT managed and oversaw the zero waste component of the event. No trash was generated and all waste was recycled or composted. ESLT defines zero waste events as, “any function, meeting, banquet event or gathering that leaves a minimal amount of waste.” Waste products are things such as leftover food, containers, trash bags, stationary and other debris. At these events, guests, employees and community members are educated on the efforts made by ESLT to recycle and compost all things that previously would be sent to a landfill.

As one of the largest resorts within the Lake Tahoe area, the ESLT accumulates vast quantities of recyclable plastic. These are recycled and made into recycling containers then placed within the community to encouraging community recycling as a cultural practice. ESLT personnel successfully modeled these practices to the paddle fest organizers who in 2010 independently replicated the practices displayed by ESLT. This zero-waste festival occurs annually and demonstrates practices needed for low impact recreation. Such events are a popular and attractive means to educate the community as well as celebrate and recognize the work of ESLT employees.

**West Coast Green Lodging conference.** The ESLT started and hosts an annual green lodging conference (West Coast Green Lodging) to educate those in the lodging and tourism industry on new and innovative ways to operate sustainable resorts and cut operation costs. This event is held within the resort so attendees can view the operations, participate in educational seminars within the ESLT’s energy efficient conference rooms and see firsthand examples not available if the conference was held elsewhere. This event educates personnel within the Hilton hotel chain and other competing chains, while simultaneously bringing additional guests to the hotel and increasing occupancy.

### **Primary Dependent Measures**

The primary measures to evaluate the value of these ERB initiatives are monetary benefits to the business. Comparing the expense of older operations with new methods provides an estimate of the long-term monetary gains of upgrades and savings in energy-intensive systems. Any cost savings above the additional costs of implementing environmental programs are positive consequences that serve as powerful predictors of future business practices (Foxall, Oliveria-Castro, James, Yani-de Soriano & Sigurdsson, 2006).

The benefits of the many organizational changes produced by the ESLT upgrades are primarily evaluated in terms of their cost efficiency. Their effects on occupancy rates are critical as well since any changes that discourage tourist visits will harm the business. Protection of the natural beauty of the Tahoe Basin is also vital but harder to measure. These impacts are indirectly estimated (i.e., recycling, composting and other reductions in waste) to measure the externalities of sustainable commerce. The aesthetics of the technologies within the resort and the vacation experience by guests are evaluated from both a marketing and consumer satisfaction vantage point. Customer satisfaction with the extent to which technologies minimize environmental externalities is a measured benefit that increases in importance as concern for the environment mounts.

## **Sustainability Program and Verification Procedures**

Site personnel lead by the chief engineer documented the many interventions geared towards reducing environmental impact implemented at the ESLT and described the resort's systematic adoption of new technologies and work practices. This documentation defines the operational changes necessitated by the upgrades and includes measures of their cost and benefits to the organization.

Independent observers from the University of Nevada, Reno (UNR) made several visits to the ESLT to interview personnel, observe work practices, and assess organization of the sustainability efforts. They toured the facility and interviewed staff members to confirm the changes documented by the management team and probe their integrity across the organization. During onsite observations, the UNR teams observed back of house operations to verify the technological upgrades, viewed employees using the ozone laundry systems, managing the recycling program, and composting food waste from the hotel restaurants, breakfast buffet, and the two onsite industrial kitchens.

The ESLT employees observed included front line employees (cooking, and engineering staff members) and upper level management (Director of Sales, and facility management). During the site review, staff members were asked at random to meet with the UNR team to discuss their role(s) in the sustainability program. During the interviews employees described the goals of the sustainability program, their role in the program, and how they contribute to evaluating the results of program. Employees provided their perspectives of the sustainability initiatives and what they saw as the most important elements of the program. Interviews concluded with questions regarding what next installments would advance the sustainability operations.

## **Results and Discussion**

### **Financial Metrics**

Using 2008 cost expenditures as a baseline of annual costs before intervention, the ESLT has saved \$698,636 in electricity and \$299,569 in fuel in 3 years of their ERB based efforts. The upfront cost for implementation of these programs was \$199,000. Factoring in waste reduction savings of \$78,000, the direct savings are conservatively estimated to be \$1,076,205. The local energy company, NV Energy, and the federal rebate program for the utilization of energy saving technology gave the ESLT substantial rebates for the changes made. Some of the more substantial rebates were awarded for the variable frequency drive (\$6,750 rebate), lighting modifications (\$3,680 rebate) and the ozone laundry system (\$4,770). The total rebates received by the ESLT have reached \$27,727.2 resulting in a total ROI of \$1,103,932.20.

### **Occupancy Rates**

During the 3-year period of this sustainability program, occupancy remained at the yearly average of 68 percent. The numerous change initiatives did not adversely affect rates of occupancy or disrupt day-to-day operations of the resort.

### **Site Review**

All of the employees interviewed accurately identified the goals of the sustainability program, communicated how recommendations from staff are made to upper levels of management, identified the ESLT values regarding the environment, and expressed their own personal perspectives on why ERBs are important which were consistent with the corporate mission. All employees interviewed were knowledgeable of their roles in the system and offered suggestions as to how further improvements could be made. Front line employees discussed how their work provided opportunities to educate patrons on the importance of sustainability. Evidence from the site visits, interviews, and analysis of financial data combine to indicate the sustainability program at the ESLT is operational, institutionalized, and results in substantial benefit to the resort and community. Thus the sustainability program operates to produce behavior change and results consistent with the corporation's goals for sustainability.

The ROI estimates that launched these upgrades underestimated the actual cost savings. The energy management system was expected to recover its initial cost over a 2-year period of time; it successfully recovered its cost in 6 months. The ozone laundry system produced benefits extending far beyond initial expectation. The ESLT demonstrates a comprehensive sustainability program that improves the running of the organization across multiple areas and produces measurable and substantial reductions in environmental impact.

### **Key Aspects of the ESLT Program**

These system-based changes altered individual behavior at multiple levels within the organization. The engineering staff implemented and maintains new technology without disrupting guest service functions. Housekeeping staff manage the recycling program and operate a new laundry system. Customer service associates educate consumers and suppliers on the resort's sustainability efforts. Multiple departments work together to adjust to these new and sweeping changes. The personnel at the ESLT resort organize work processes such that individual work departments are integrated to support the quality of the environment and sustain a pleasant resort experience for guests who are the receiving system of these goods and services (Malott, 2003).

Communication networks across departments and between levels of the hierarchy are established within the resort to sustain efforts. A sustainability team composed of representatives from the front line hotel staff, management, and chief engineer work to sustain the environmental sustainability program across the last three years. They have created a forum in which ideas for change and improvement are freely exchanged. The team of frontline employees working with management demonstrates how a working organization can adopt progressive technologies and effect change with wide scale implementation without disrupting business functions (Galbraith, 1982). The longevity of the changes implemented at the ESLT demonstrates successful maintenance of the overall program.

### **Innovations that Differentiate ESLT from Other Environmental Programs**

One of the features of the environmental program at the ESLT is its comprehensive nature. Individual departments and unit managers did not implement change in isolation to other departments. All departments work together to promote the new business model. Specifically,

this was done by involving front line employees, management, corporate leadership and local business suppliers in all the efforts with clear communication of roles and responsibilities. The employees of ESLT are involved in maintaining the integrity of the programs and help convey the unique features of the resort to guests. This active engagement likely supports maintenance of the sustainability program (Sigurdsson & Austin, 2006).

The ESLT demonstrates how the hospitality industry can utilize behavioral systems theory to develop a sustainability program. Given that this program is successfully run within a fragile alpine environment that attracts many visitors speaks well to the possibilities for replication elsewhere. Developments involve strategic linking of the consumer (receiving system) to the resort personnel/setting (processing systems) and interlocking these behaviors to promote sustainability. From a behavioral perspective, many contingencies are operating within and beyond the resort organization to maintain these efforts and maximize business survival. Metrics are available (e.g., utility bills, customer satisfaction measures) to enable data-based management of the system.

### **Implications for Behavioral Sciences**

Biglan (2009) recommended that advocacy organizations support corporate decisions makers to reduce negative externalities produced by their organizations. Noting that advocates were fundamental in the success of the tobacco control moment, Biglan argues that advocacy is an effective tool for large-scale change. The Cambridge Center for Behavioral Studies (CCBS) is a nonprofit organization that aims to serve the community at large by harnessing experts in behavior science and promoting human wellbeing through “scientific study of behavior and its humane application to the solution of practical problems, including the prevention and relief of human suffering” (<http://www.behavior.org/>). The CCBS developed a Behavior Based Safety (BBS) accreditation program to conduct third party review of corporate safety systems, validate their effectiveness and provide expert feedback to refine and enhance the accredited organizations’ BBS programs. This accreditation program can be replicated to assure quality ERB-based efforts like those underway at the ESLT. As ERBs become more important in business operations, advocacy organizations like the CCBS are poised to audit sustainability services, recognize advancements and assure the quality of behavioral interventions in service of corporations’ stated goals towards sustainability. The ESLT presents as an adopter of emerging environmentally-supportive technologies and behaviors in the hospitality industry. Comprehensive behavioral management systems, as illustrated in this case report on the ESLT, provide a coherent example of organized behavior to manage multiple challenges. We note that some of the CCBS safety-accredited programs have integrated “sustainability”/“green” programs with their safety programs. This makes sense as occupational safety and environmental protection involve similar values, goals, and management practices so that their consolidation is a logical development path (Cunningham & Galloway-Williams & Geller, 2010). This field report of sustainability efforts within the ESLT pilot-tests a “green” accreditation evaluation for auditing programs like these in similar venues and this paper serves as a prototype of a site visit report.

### **Recommendations for Future Work**

Over the last 3 years the ESLT implemented sweeping changes resulting in substantial cost savings to maintain an environmentally supportive business. Further analysis of individual



behavior change as a result of the adoption of these new technologies would be helpful in pinpointing the conditions which may influence wide scale industry adoption of “green” technologies. Some argue that as new technologies are created to reduce human error the need for behavioral engineering and interventions will be also be reduced (Petroski, 1992). The full potential of new technologies requires that behavioral inefficiencies are identified and managed as it is human beings who use new technology, and it is human beings who design and install it.

### **Limitations**

No experimental designs were planned to evaluate the elements at the ESLT to rule-out competing explanations for effects. This case study relies on financial records that reveal the monetary impact of innovations and cost of implementation, direct observation of practices on site and employee interviews. Future research might use experimental or quasi-experimental designs to evaluate factors contributing to observed benefits.

Examining how surrounding business within the ESLT network replicate the interventions utilized by ESLT may reveal more about community adoption of sustainability programs and how innovation is disseminated. The content and format of employee and guest prompting and information campaigns can be investigated to optimize the effectiveness of dissemination. How advocacy organizations like the CCBS might promote ERB through organizational accreditation that identifies management systems that use behavioral kernels to affect lasting behavior change (Luke & Alavosius, 2012) can also be examined.

Lastly, data sets depicting industry measures of environmental inefficiencies and consumption in relation to production are needed to benchmark organizations and identify exemplary performers. At present, there is no set standard to measure environmental impact. These data are available to gauge safety performance (e.g. incidence rates of accidents and injuries) and provide a model for what might be developed regarding environmental safety. Clearly, much progress has been made at the ESLT yet further data-based comparison of these changes with industry benchmarks would provide both internal and external validity supporting applications of similar initiatives elsewhere (Hayes, Barlow, & Gray, 1999).

Sulzer-Azaroff (2001) notes the utility of a systems perspective when striving for a large-scale, successful behavioral application and uses a vivid analogy of the vantage points of eagles and worms as contributing to the design of sustained operations. The worm lives in the ground and constructs an environment of narrow tunnels addressing only what is directly ahead and solves each individual problem before progressing. So it is with the many small tasks involved in managing the resort’s environment for sustainable operations. Employees toil in the laundry, kitchens, facilities and grounds to maintain an attractive resort. The eagle, however, soars high above the ground surveying the broad environment seeking opportunities to act. Figure 1 depicts the reach and opportunities the eagle must perceive to be effective. The efforts underway in the ESLT resort are enabled by both perspectives. The chief engineer most clearly serves to interconnect these two perspectives. The ESLT directors, managers, and personnel have organized their environment to minimize energy consumption, lower waste, reduce environmental impact and share their efforts with guests and the local community. They demonstrate a comprehensive system working within an aesthetically pleasing setting that implements “green” technology and practices from their business model. Hineline (2005) describes the need for behavior analysts to consider the aesthetic elements of behavioral technologies as an important feature of wide-scale adoption.

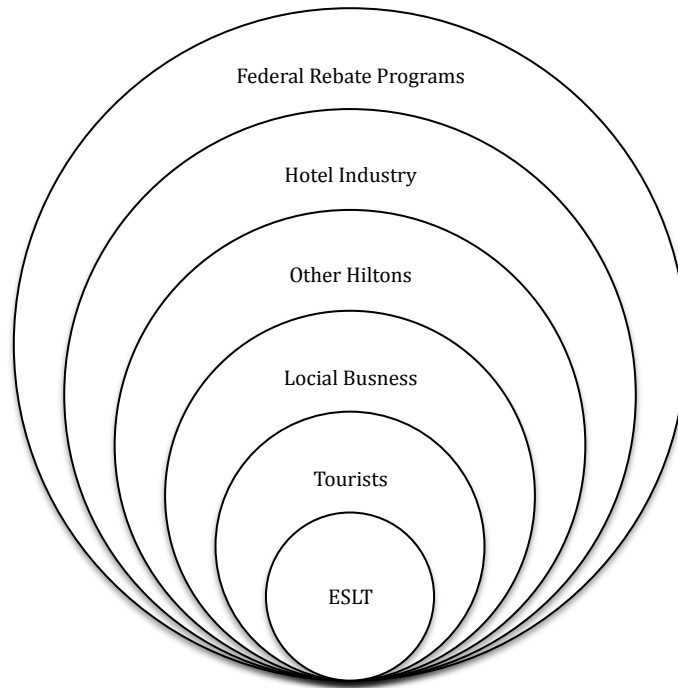


Figure 1. The macrosystem dynamics influencing the ESLT.

The hospitality industry provides a particularly interesting venue for changing cultural practices as the aesthetics of their environments are crucial to their success. Investigations of how this industry can promote innovative and creative behavior are recommended. Research in applied settings is possible when personnel within business and academic settings collaborate and bring their areas of expertise to address important social problems. This report from the field illustrates one starting point in this needed line of investigation.

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