IMPROVING WATER USE EFFICIENCY IN JAMAICAN HOTELS AND RESORTS THROUGH THE IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT SYSTEMS

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INTRODUCTION

A "quiet revolution" is taking place in Jamaica and elsewhere in the Caribbean – one less visible than the construction of new hotels and the building of new cruise ship terminals. The voluntary introduction of environmental management systems (EMS) is changing the nature and shape of the tourism and hospitality industry in every hotel guestroom, housekeeping, laundry or maintenance facility, and in every tourism destination.

Over the past 2 years, this trend has been translated into results in Jamaica in the form of the Environmental Audits for Sustainable Tourism (EAST) project, an activity sponsored by the Jamaica Hotel and Tourist Association and funded by the United States Agency for International Development (USAID). Through the EAST project, Hagler Bailly Services has been demonstrating the benefits hotels can achieve by adopting an EMS, a comprehensive organizational approach designed to help properties achieve environmental care in all aspects of their operations. Partnering environmental protection with cost-saving environmental improvements and best practices, the EAST project is a model for hotels and tourism destinations in the Caribbean region and beyond.

This article presents current water use patterns and discusses the measures that can be taken to improve water conservation in Jamaican hotels. The findings and recommendations are based on over 20 audits performed by Hagler Bailly in small hotels under the USAID/Jamaica EAST project, and in large resorts under private client contracts.[1] Hagler Bailly uses a standard process of audits, documentation, and training to help hotels optimize their use of resources - water, energy, chemicals, and materials - and prepare for Green Globe certification.[2] The first four Jamaican hotels achieved Green Globe certification in 1998 and another 12 hotels are presently in various stages of preparation towards certification.

BENEFITS OF WATER CONSERVATION

The benefits of water conservation fall into three categories: financial, environmental, and social benefits. The financial benefits are the most compelling to hotel owners and managers. Water supplied by local water utilities generally costs from $4 to $11 per thousand gallons (including taxes and sewerage fees), and that supplied by tanker trucks ranges from $25 to $75 per thousand gallons. Water produced by a Reverse Osmosis (RO) plant costs from $5 to $20 per thousand gallons depending on the cost of electricity, which is generally the largest cost component in the production of RO water.

However, the financial benefits of water conservation are not only linked to the direct purchasing or production cost of water. In properties with overloaded tile fields, reducing water use decreases the maintenance requirements of septic tanks and the costs associated with these operations. For example, a 70-room property pumped 400 loads of wastewater in a single year from its septic tanks at a cost of $37,000. Water conservation also reduces: the cost of treating raw water; the size and cost of water storage tanks; the capacity and cost of pumps and pressure tanks; and the size and cost of septic tanks, tile fields and wastewater treatment systems.

The environmental benefits of water conservation accrue from a reduction in the amount of chemicals, energy, and other resources used in the production and supply of potable water. Water conservation also plays

an important role in improving the performance of the on-site wastewater disposal or treatment systems used by many hotels. For example, by increasing the detention time of wastewater in a septic tank, water conservation can help decrease the suspended solids concentration in the septic tank effluent, improve the tile field's capacity to purify the settled wastewater, and reduce the mass of pollutants that reaches the groundwater table.

The principal social benefits of improving water conservation in the Caribbean hotel industry include fewer water shortages for businesses and communities located "at the end of the water main," and a reduction in government spending to increase the capacity of water mains, sewers, and water and wastewater treatment plants.

CHARACTERIZING CURRENT WATER USE PATTERNS

In order to account for occupancy levels and the relative size of a specific property, and thus allow for a better comparison between properties, the water consumption of a hotel should be indexed to its guest-night or room-night occupancy (i.e., calculated in terms of gallons per guest-night or gallons per room-night). These water use indices can be calculated using any time interval, but monthly and yearly intervals are most commonly used. Exhibit 1 lists the water efficiency benchmarks for three hotel categories - these benchmark figures apply to hotels equipped with a full laundry service, but do not account for banquet facilities that are used by outside visitors. (Note that figures are shown in U.S. gallons per guest night. To convert from U.S. gallons to Imperial Gallons, divide by 1.2.)

Exhibit 1
Water efficiency benchmarks
(International Hotels Environmental Initiative)

Property size	Water use rating (figures are in US gallons/guest night)			
	Good	Fair	Poor	Very poor
< 50 rooms	< 116	116 - 134	134 - 154	> 154
50 - 150 rooms	< 154	154 - 178	178 - 213	> 213
> 150 rooms	< 176	176 - 226	226 - 259	> 259

A hotel's water use index varies throughout the year. The principal factors that affect the magnitude of the water use index include: occupancy, the baseload demand, or the steady water consumption in "back-of-house" operations regardless of occupancy, climate, and irrigation needs, preventative maintenance practices, and guest type. Exhibits 2 and 3 show the variations over time of the total water consumption and the monthly water use index of a 215-room hotel.

The impact of the baseload demand on the overall water efficiency of a hotel is evidenced in Exhibit 3 by the marked inverse relationship between the water use index and the occupancy curves. The monthly water use index of this property jumped from a low of 160 gallons per guest night in August to a high of 263 gallons per guest night in September. This 64 percent increase in the water use index was triggered by a 57 percent drop in occupancy, thus suggesting that the water used by the individual guests in this hotel was small compared to the volume of water consumed by the staff in the property's background activities.

Exhibit 2
Changes in total water consumption with occupancy
(215 room hotel, Jamaica)

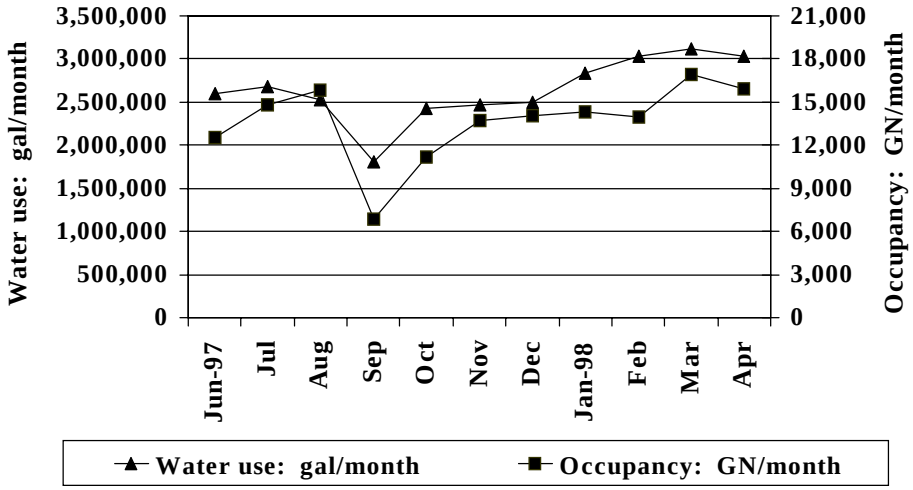
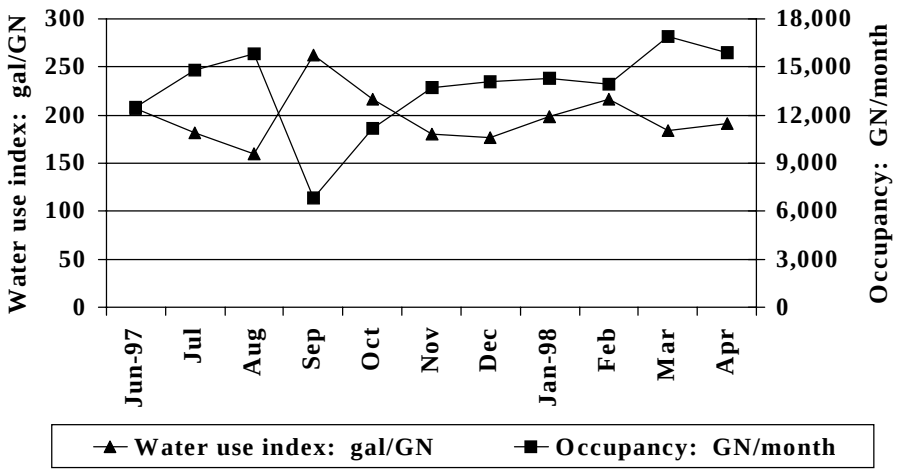


Exhibit 3
Changes in the water use index with occupancy
(215 room hotel, Jamaica)



The water conservation component of Hagler Bailly's EMS audit focuses mainly on the following aspects: water monitoring programs, water storage and handling practices, leaks, toilets, faucets and sinks, showers and tubs, laundry operations, pools, gardens, and rainwater harvesting. Other water conservation issues, such as graywater and laundry water reuse, are also included in

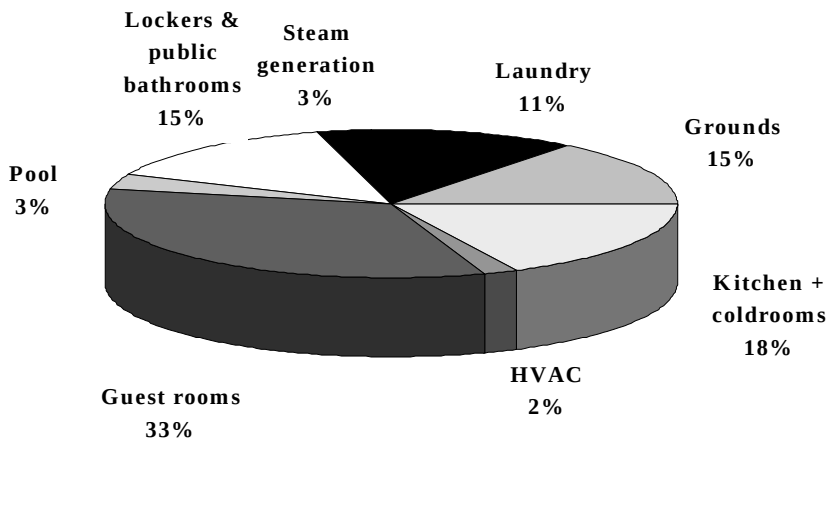
the audit but are generally best considered at the time of facility design.

GENERAL AUDIT FINDINGS AND RECOMMENDATIONS

A reliable water monitoring program is one of the most important and cost-effective features of a hotel's water conservation program. Unfortunately, most small and medium-sized hotels do not monitor their water consumption and often pay dearly for this oversight. An effective water monitoring program consists of three simple tasks: 1) read all water meters every day, 2) use the daily meter readings to calculate the property's daily water consumption (i.e., gallons per day), 3) use the end-of-month meter readings to calculate the property's monthly water use index (i.e., gallons per guest night for the particular month). Daily water consumption figures are used by the maintenance department to detect leaks and major operations problems, while monthly water use index figures help the property define its normal consumption patterns, ensure that employees comply with water conservation guidelines, and quantify the impact of its water conservation efforts.

Water conservation efforts in hotels are generally concentrated in guestrooms, and include such standard measures as the use of low-flow showerheads, faucet aerators and water saving toilets, and the adoption of linen and towel reuse programs. However, the areas where water conservation measures have the greatest impact are generally neglected (e.g., in kitchens, bars, and employees' changing rooms). Exhibit 4 shows the breakdown of water use in a "typical" hotel.

Exhibit 4
Distribution of Water Use in a Hotel



Toilets: Poorly maintained toilets - such as toilets with leaking flapper valves, overflowing tanks or defective flush mechanisms - can waste a significant amount of water. For example, 40 percent of the total water consumed by a 35-room hotel audited by EAST was traced to 3 leaking toilets. While the cost of these leaks amounted to $1,300 per month, they could have been easily repaired in 30 minutes with $10 worth of materials.

Toilet dams, water displacement devices, short-flush valves and flow diverters are standard water conservation devices that can reduce water use in conventional toilets by up to 30 percent. New water-saving toilets need as little as 1.6 gallons per flush compared with 5 to 7 gallons per flush in a conventional toilet.

Faucets and sinks: The output of a faucet can vary from 0.5 to 10 gallons per minute (gpm) depending on water pressure, faucet model, and the type and condition of the aerator installed on the faucet. Faucet aerators are generally available in 0.5, 1.5, 2.0, 2.2, and 2.5 gpm models.

Standard recommendations for faucets and sinks include: fixing leaks; installing flow aerators on all possible faucets; periodically cleaning and descaling

existing aerators; installing flow restrictor devices on faucets which cannot be equipped with aerators; partially closing the stop valves to reduce the output of faucets which have excessively high flows; and ensuring that sink stoppers in guestrooms and back-of-house areas seal properly. Pedal valves and metering faucets can also be installed in areas where water is typically left running needlessly, such as in kitchens, bars, and public and employee bathrooms. However, given the relatively high cost of these fixtures, they are cost effective only if installed in particularly problematic areas.

Showers and tubs: The amount of water consumed in a shower can range from 1 to 10 gpm depending on water pressure, and on the type and condition of the shower head used. Few hotels are fully retrofitted with low-flow shower heads: it is not uncommon to find hotels where guestrooms are equipped with low-flow shower heads which use less than 2.0 gpm, while staff locker rooms have "open pipe" showers which consume up to 10 gpm.

Standard recommendations for showers and tubs include: fixing leaks; installing low-flow shower heads in all hotel areas, using tamper-proof models where necessary; periodically cleaning and descaling all shower heads since guests will take baths rather than unsatisfying showers; and ensuring that all tub stoppers seal properly.

Laundry: The amount of water used in laundry operations can account for up to 20 percent of the total volume of water consumed by a hotel, and is mainly influenced by the type of equipment available and the level of training of the laundry staff.

Equipment-based recommendations include: using front-loading washers which consume 40 percent less water than top-loading machines; using washers with adjustable load-size settings; and investing in a laundry water recycling system if the laundry supports more than 250 to 350 rooms. The laundry water recycling systems available on the market are generally expensive but can reduce water and energy consumed in washers by up to 50 percent. Typical operations-based recommendations include: pre-sorting heavily stained items to minimize reprocessing; counting or weighing items to ensure that washers are loaded to capacity; tracking load sizes in a log to monitor the average loading of the laundry's washers; and consolidating loads and processing them in the largest possible washer.

Pools: Given high flows used to backwash a sand filter (50 to 100 gpm), this operation can waste a larger amount of water if carried out improperly by the pool operator. Filters should be backwashed based on filter pressure rather than on a fixed schedule, and the operator should respect the recommended length of the various steps of the backwashing process -- generally 2-5 minutes for the backwash step, and 1-2 minutes for the rinse step. Other water conservation recommendations for pools include: providing foot-baths to reduce the amount of sand and soil carried into the pool; and sweeping pool decks before hosing them down -- a water hose is a costly substitute for a push broom.

Gardens: The audits revealed that most Jamaican properties used from 10-20 percent of their total water supply to irrigate their lawns and gardens; therefore, proper garden operations are crucial to ensuring the overall water efficiency of a hotel.

Standard water conservation measures in gardens include: planting native species which are well suited to the climate; using compost and mulch to improve the water retention characteristics of the soil and reduce evaporation in garden beds; irrigating lawns and gardens in the early morning hours to minimize evaporation; and controlling sprinkler operations with the use of timers and rain gauges. Although more complex, the use of graywater from sinks, showers, and laundry for irrigation can reduce a property's water consumption by up to 20 percent.

Rainwater collection: Harvested rainwater should ideally be used for laundry operations, but it is also often used for general non-potable uses (toilets, showers, and sinks) and irrigation. Although rainwater harvesting is no longer generally practiced in Jamaican hotels, a few hotels still supply approximately 90 percent of their water needs with rainwater, thereby reducing their total utility costs by up to 35 percent.

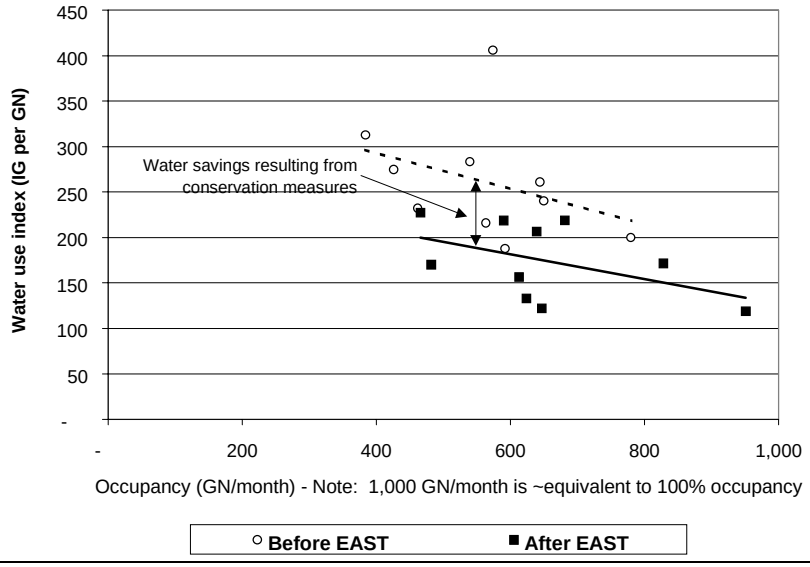
Rainwater harvesting offers many advantages: rainfall is plentiful in many parts of Jamaica (e.g., 35 gallons/ft^2/year in Negril); collected rainwater is relatively clean and naturally soft, and contains very low levels of total dissolved solids (TDS); rainwater collection also reduces waterlogging and ponding after storms and reduces stormwater runoff problems (e.g., the discharge of sediments and pollutants to the sea or streams). The use of rainwater in laundries minimizes or eliminate the use of water softening columns or chemicals, lowers the amount of chemicals consumed in laundry operations, and improves the quality of the laundry effluent and facilitates its reuse for irrigation.

MONITORING RESULTS

As mentioned earlier, the water use index of a hotel varies widely with changes in occupancy because of the high water baseload consumed by the staff in support operations -- as a general rule, the water use index rises during low occupancy months and drops during high occupancy months. Given the significant influence of occupancy, the water monitoring data collected from the EAST properties which implemented an EMS had to be analyzed in greater detail to ensure that efficiency gains result from improved efficiency rather than better occupancy rates.

EXHIBIT 5 presents the water monitoring data in one of the EAST properties, and shows how the hotel's monthly water use index varied with respect to occupancy before and after an audit and the property's implementation of an EMS. Since the water use indices are consistently lower "after" the implementation of the EMS, regardless of the actual occupancy levels, this graph clearly demonstrates that the property's water savings are indeed due to improved water conservation practices and efficiency. The actual water savings achieved by this property is represented by the vertical distance separating the "before EAST" and "after EAST" trend lines.

Exhibit 5
Water use index of a Jamaican property before and after EAST



After implementing an effective EMS, this property improved its average water use efficiency by 30 percent, and saved approximately $800 per room per year in reduced water bills alone. The economic benefits will automatically double as a 100 percent sewerage surcharge is introduced in 1999. It should be stressed that these gains were achieved through low-cost conservation measures such as the creation of a water monitoring program, basic maintenance of the property's plumbing fixtures, staff training and motivation programs, and the start of a towel and linen reuse program. Indeed, this property has transformed its management culture and its efforts have shown bottom line results.

IMPLEMENTING AN EMS

The EMS, which encompasses water conservation and all other environmental aspects, provides a framework for planning action and evaluating results, and assists an organization to achieve environmental care in all aspects of their operations. Although the ISO 14000 series is the most widely applied EMS standard worldwide, the World Travel and Tourism Council's GREEN GLOBE organization has created its own EMS standard and certification process which is specifically tailored to the particular needs and conditions of the travel and tourism industry.

A GREEN GLOBE EMS can help a hotel assure guests of its commitment to environmental management, and invite them to collaborate in its environmental efforts by participating, for example, in its recycling efforts and towel and linen reuse program. It forces a property to set specific and realistic performance objectives and targets, monitor results to ensure that the objectives and targets are met, and take corrective action when necessary. An EMS can enhance a hotel's image in the marketplace, and help reach millions of environmentally aware tourists who are interested in visiting environmentally friendly destinations and staying in accommodations with environmental policies and programs in place. Most importantly, an EMS can improve efficiency and reduce operating costs. In fact, the financial savings alone should be sufficient for any hotel to commit to implementing an EMS.

CONCLUSIONS

Water conservation opportunities are both easy to achieve and cost-effective to implement. Hagler Bailly's findings indicate that the majority of recommended actions in its audit report cost less than $10 per guest room to implement and payback in less than 2 months. The audit recommendations include both changes in equipment and practices. Most important, however, is building a consciousness within management to monitor water use (against a baseline index), and strive for continuous improvement. The EMS that Hagler Bailly has designed for hotels ensures that the actions are prioritized based on costs and savings, and that the improvements in water use efficiency are maintained through a systematic process of planning, target-setting, reporting, and evaluation.

Bill Meade is a principal with Hagler Bailly Services, a leading international environmental and energy management consulting headquartered outside Washington, D.C. Bill has been with the company for 10 years, and has led assignments in over a dozen countries on the subjects of alternative energy, energy efficiency, environmental management, and environmental impact assessment. He has worked for all of the major development institutions as well as a number of private companies in advancing the concept of integrated energy and environmental planning and management. Currently, Bill leads Hagler Bailly's "sustainable tourism" practice focusing on best practices and policies to encourage improved environmental management. Bill completed training as a Green Globe certification auditor, and helped the first four hotels in the world become Green Globe certified. He also sits on the U.S. Technical Advisory Group for ISO 14000 and the Governing Council and Technical Advisory Committee for CHA's Caribbean Alliance for Sustainable Tourism (CAST). Bill holds a B.A. in energy and environmental studies from Brown University, and has completed graduate and professional training courses in environmental law, environmental auditing, pollution prevention, and rural environmental management.

Patricio Gonzalez Morel has more than 8 years of experience in the field of industrial and environmental engineering. For the past two years, he has worked as the technical manager for the Environmental Audits for Sustainable Tourism (EAST) project, which provides technical support to the Jamaican hotel industry and manufacturing sector on matters related to waste minimization, water conservation, energy efficiency, process efficiency, and waste management and treatment. Prior to his involvement with EAST, Mr. Gonzalez provided technical support to the Latin American country programs of the Environmental Pollution Prevention Project (EP3). As part of his responsibilities at EP3, Mr. Gonzalez has led or participated in numerous waste minimization, water conservation and energy efficiency audits, and training assignments in more than 25 industrial sectors in Bolivia, Ecuador and Mexico. Mr. Gonzalez holds a B.S. in mechanical engineering from the George Washington University and a M.S. in environmental engineering from the University of Maryland.

ENDNOTES

[1] The Environmental Audits for Sustainable Tourism (EAST) project was designed as a pilot program to demonstrate the benefits of adopting EMS in small hotels (less than 100 rooms).

[2] Green Globe certification combines that EMS attributes of ISO 14001 with the Agenda 21 principles for sustainable tourism. The program requires independent verification and annual recertification. It was launched in 1998.