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Water and Energy Challenges In the Caribbean

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ABSTRACT

This article identifies the water and energy issues that the Caribbean tourism industry will face in the new millennium and proposes an analytical framework for developing a sustainable energy management system. Hotel operators must realize the need to incorporate environmental reporting into their existing control systems.

Section 1 provides a brief description of the state of the Caribbean tourism sector and its prospects for the future.

Section 2 provides a background to the present approach to environmental management in the Caribbean and identifies some of the environmental challenges facing the industry in the coming decades, particularly in the area of water and energy.

Section 3 explores some ways in which environmental sustainability can be incorporated into any company's energy and environmental management system implementation.

The focus is on countries where tourism comprises a significant proportion of Gross Domestic Product (GDP), namely: Antigua and

Barbuda, The Bahamas, Jamaica, St. Lucia and the Turks and Caicos islands.

There are a number of environmental issues that are likely to affect the development of the Caribbean's tourism industry in the coming century. The United Nations Environment Programme (UNEP) in its *Global Environment Outlook 2000* categorizes these issues into three primary groups. These are "unforeseen events and scientific discoveries; sudden, unexpected transformation of old issues; and already well-known issues to which present response is inadequate[1]."

The focus of this article is on the final category—those well-known environmental issues facing the Caribbean tourism industry and the adequacy of the response of the region to them.

The environmental issues plaguing the Caribbean tourism industry include freshwater scarcity, energy conservation, waste management, and coastal degradation among others.

Hotel operators in the region have given priority to these issues as reflected in the implementation of energy management systems, primarily in the area of water and energy efficiency, by a number of operators. The sustainability of the industry is however threatened by the inadequacy of these existing energy management systems to support the projected growth of industry into the 21st century.

SECTION 1: OVERVIEW OF THE CARIBBEAN TOURISM INDUSTRY

Over the last decade or so, the tourism sector has emerged as one of the most important industries in the Caribbean, accounting for approximately one third of the region's gross national product and some 25% of all employed persons. For countries such as Antigua and Barbuda, Turks and Caicos, Bahamas, St. Lucia and Jamaica, tourism has become the mainstay of the economy. In the case of Antigua for example tourism in 1980 accounted for 12% of the country's GDP and today

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*GEO-2000, p. 13. A survey of some 200 scientists in some 50 countries identified freshwater scarcity (291%), freshwater pollution (28%) and energy consumption (15%) as some of the major environmental problems of the next century.

accounts for more than half of the GDP. In the Bahamas, tourism accounts for more than 60% of the GDP and 40% of the labor force. The table on page 22 depicts selected tourism data for these countries in terms of number of hotel rooms, occupancy, tourism expenditure and the number of stayover visitors.

The Tourism Association also instituted an environmental project, Environmental Audits for Sustainable Tourism (EAST) to encourage the adoption of environmental management systems. At the regional level, the Association of Caribbean States (ACS) has adopted a resolution to make the Caribbean the world's first sustainable tourism zone by the year 2010. A number of hotels have also made significant strides in implementing an energy management system. A brief account of the implementation of such a system is outlined below.

Hotel Case Study

Jamaica's Sandals Negril Beach Resort and Spa began operations in 1988 as part of a Sandals Resorts International chain of hotels owned by Gordon "Butch" Stewart. The hotel was not a newly constructed hotel and as such some of the buildings and fixtures are much older. The property however, has undergone several renovations over the years and today has expanded to provide spa facilities. The total number of rooms currently available stands at 223. Sandals Negril Beach Resort & Spa's approach to energy and environmental matters has shifted focus from the purely peripheral to one that is increasingly integrated into the company's strategic business decision-making activities.

The Energy and Environmental Management Program (EENP) at Sandals Negril focuses on four main areas: water management and conservation, energy management and conservation, natural environmental issues, and waste management. Supporting these pillars of the EENP are the choice of equipment and other purchasing decisions, maintenance, best practices, communication, and training and education.

Some of the major projects undertaken primarily in the water and energy areas by Sandals Negril and the energy saving and non-energy benefits of these initiatives are:

Water Management and Conservation

Efficiency in water use is of critical importance to Sandals Negril since this vital commodity accounts for over 20% of the utility bill of the

hotel. At a cost of J$0.15 per 1000 gallons, water was identified as an important area where cost savings can be realized if a more effective approach was adopted to improving the efficiency of its use.

Among the measures undertaken over the past five to six years to improve water efficiency include:

- The use of low-flush toilets and urinals which use only one gallon per flush. The approach taken by Sandals has been to replace the old toilets with the low flush toilets when renovation and refurbishment activities are undertaken. Today the majority of the toilets of the hotel are so classified.

- The use of aerators and in some instances sensors on faucets to regulate the flow of water in areas that are significant potential sources of water wastage such as in the kitchen, guest rooms and public areas.

- Use of water efficient washers with a built-in water reclamation system in the laundry.

- The hot water system also has a return system whereby unused water is stored and recycled rather than simply drained off.

- An ongoing program of replacing traditional showerheads with water-saving showerheads.

In addition to the energy conservation methods listed above, Sandals Negril also implements a number of water-saving practices including:

- restricting watering of the grounds to the afternoons
- use of gray water for irrigation
- replacement of towels and linens only on the request of the guest

A stringent system of preventive maintenance has also been enacted with the goal of ensuring virtually leak free plumbing. Turning off taps in guest rooms and reporting signs of leak are also part of the checklist for housekeepers. There are also highly visible signs directed at both guests and workers on the importance of conserving water.

The practices described above resulted in a reduction in total water consumption by about 23% over the past four years. In 1996 water consumption per room night was 450 gallons and today this figure stands at 380 gallons.

Table 1: Selected Tourism Data, 1999

Country	*Hotel Rms. #*	*Occ %*	*Tourism Exp. US$*	*S/O Visitors #*
Antigua & Barbuda	3500 est	—	228.6 mm	480,050
Bahamas	13,421	66.4	1.42 bn	3.36 mn
Jamaica	23,000 ('98)	55.2	1. 14 bn ('97)	1.90 mn
St. Lucia	3200 est	71.4	283.3 mn	601,608
Turks & Caicos	1700	—	117.5 mn	93,011

Source: Caribbean/Latin American Profile, 1999

Future Trends in Tourism

The tourism and travel industry, along with telecommunications and information technology, has been identified as one of the main industries that will drive the service led economies of the 21st century. In the Caribbean where tourism is the number one international industry and the number one exchange earner in the region, the outlook for tourism is equally favorable.

In the immediate future, 2000-1, the outlook for the expansion of tourism in the region is favorable based on the continued growth of the US economy. The United States accounts for the majority of visitors to the region. By the year 2007, tourist arrivals are expected to increase by 36% with the potential of creating 2.2 million jobs.

SECTION 2: ENERGY ENVIRONMENTAL ISSUES AFFECTING TOURISM IN THE CARIBBEAN

The travel and tourism sector has yielded a number of economic benefits in the Caribbean region over the years. These benefits include employment, foreign exchange generation and growth in GDP. Tourism, however, has had a number of negative environmental impacts. These countries are particularly susceptible to such problems because "with their small size, fragile ecology and very limited natural resources, environmental problems hit islands first and hardest." The environment is one of the main assets of tourism and as such the quality of that environment has become of critical importance to the sector.

Environment Initiatives Undertaken

Governments, industry associations and individual properties have taken a number of initiatives to address the impact of tourism on the environment. The Caribbean Hotel Association in 1997 for example established a separate entity, the Caribbean Association for Sustainable Tourism (CAST) which assists hotels in developing environment programs.

Non-energy related benefits attributed to the measures adopted include: the improvement in guest satisfaction caused by a proper water supply; improved visibility of the hotel as an environmentally sensitive establishment; reduced maintenance cost; and an extended equipment life.

Energy Efficiency

Perhaps the single most important utility cost affecting Sandals Negril as with any hotel is electricity. Over the 1997/1998 fiscal year electricity accounted for over 50% of energy consumption and over 70% of total energy costs. In Jamaica, the cost of electricity is US$0.11 per kWh. The measures undertaken to reduce electricity consumption include:

- The use of alternative fuel which saw the replacement of electric and diesel heaters and boilers with LPG fuel.

- Replacement of incandescent bulbs with energy efficient bulbs.

- Use of timers for extractor fans, walkway and tennis court lights and other security lights and jacuzzis.

- Program of replacement of old motors with energy efficient models.

- In the turn down service in the evening, only one bedside lamp is left on instead of two.

- In public areas including restaurants, fans and lights are turned to the minimum needed for comfortable lighting and cooling.

The use of solar energy is also an important aspect of our energy efficiency program and has been in use since the resort began operation. It is used primarily to preheat water for the hot water system reducing both electricity and LPG use. As with the measures taken in respect of water efficiency, preventive maintenance and communication with staff and guest are an essential feature of the measures taken to improve energy efficiency.

The measures undertaken to reduce energy use and prevent wastage have been successful. Electricity use per room night, which averaged 54 kWh in 1996, has been reduced by some 25% to average 41 kWh per room night in 1999.

Sandals Negril has earned international recognition for its efforts to improve the efficiency of energy. The property was one of 13 properties recognized by the International Hotels Environmental Initiative for its environmental program. Sandals Negril also participated in the Green Globe program and was among the first in the world to achieve certification process, through the development of an environmental management system that was formulated with the assistance of Hagler Bailly Inc.

Environmental Challenges for the Caribbean Tourism Industry

The 21st century presents additional environmental challenges to the Caribbean hotelier to become even more proactive in the incorporation of environmental issues in their operations. Some of the environmental threats to the long run viability of the sector include:

- The increasing demand for energy and water,

- The rising cost of energy and water,
- Growing scarcity of freshwater resources, and
- Limited expansion of local production capacity to meet the water and electricity requirements.

Hoteliers, however, can meet these challenges if a more concerted effort is made to integrate environmental issues into the general business and operational decisions that are undertaken on a daily basis. Technology, in particular the Internet, also needs to play a greater role in developing and implementing energy management systems.

Water Challenges

The tourism industry is a major economic activity on many small islands. This translates into a high demand for water that meets the highest standards in terms of physical, chemical and bacteriological quality. The nature of some islands is such that the demand for water by tourist establishments can place excessive strains upon the existing water resources to meet demand and quality.

In the future the cost of water is expected to increase as government move towards a pricing method that reflects the true cost of water production. In addition the growth in tourism is likely to put further strains on existing distribution systems resulting in increased cost to the consumer and well as increased competition among the various sectors of the economy for the resource.

The countries of the Caribbean face a number of problems in terms of the availability of freshwater. Among the factors identified are size, geology, topography and climatic conditions. In some instances, the rainfall is inadequate, leading to frequent droughts.

Other contributing factors include lack of adequate storage 2 facilities and delivery systems*. The projected increase in tourism, an industry that is extremely water intensive, is more than likely to further worsen the acute water problem impacting on these countries. The following table shows the percentage of households in selected Caribbean countries that have access to piped water and flush toilets.

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*UNEP Commission on Sustainable Development, Sustainable tourism development in small island states, Feb. 1996.

Table 2: Water and Electricity Indicators for Selected Caribbean Countries, 1998

	Households with:			*Elec. Cons.*
	Piped water	*Access to flush toilets*	*Elec. (%)*	*(GWh)*
Antigua and Barbuda ('90)	61.8	52.9	89.1	88.7
Bahamas	77.5	74.5 ('90)	95	947.6
Jamaica	65	40.2 ('92)	80	—
St. Lucia ('90)	62	35.7	72.9	125.4

For Antigua and the Turks and Caicos in particular the overriding environmental issues that will influence the development of the tourism sector is water management because of the limited natural fresh water resources. The islands that comprise the Turks and Caicos for example are primarily low-lying limestone and coral terrain. Groundwater is very limited and surface storage is virtually nonexistent.

Recommended Responses

Hotels need increasingly to obtain non-traditional water sources—for example the harvesting of rain water as well as the increasing use of gray water which can be used for watering the grounds and other non-potable uses.

In St. Lucia, for example, beginning in January 2000, the price of water doubled because of the privatization of the country's water company, the Water and Sewage Authority. The rate was increased to reflect the true cost of producing, treating and distributing the water. This trend is likely to be repeated in other countries of the region. Hoteliers therefore need to give serious consideration to the use of their waste water treatment plants to produce gray water for non-potable uses. This reclaimed water can be used for irrigation. It has been shown that water consumption can be reduced by some 20%.

Hotels also need to give serious consideration to the use of reverse osmosis (R/O) systems. This allows the hotels to install their own potable water plants that will produce water to meet their needs. The data indicate that a small plant will be economical to run and will be more

reliable. In Antigua, for example, the cost to purchase water is EC$0.05/gallon ($EC. 2.70 = $US 1). Using an R/O plant, cost is an estimated $EC0.02/gallon. In the case of Turks and Caicos, the cost to purchase water is US$35 per 1000 gallons, while using the R/O the cost is US$5.00 per 1000 gallons.

Additional measures that can be adopted include the use of low-flow shower heads (2 gpm), faucet aerators (1.5 gpm), low-flush toilets (1.5 ppf) and linen and towel reuse program. Laundry water reuse and reclamation systems is another measure which can be adopted. Such systems can easily be designed to meet the specific needs of each hotel.

A great deal of water is wasted in traditional washing machines since fresh water is used for both the initial rinse cycle and the washing cycle. Water reuse systems capture the water for the next load's first rinse cycle. These systems are estimated to save some 25% of the water used in the laundry.

Water reclamation systems go a step further, capturing all rinse and wash water, filtering and treating it, then reusing it in future wash and rinse cycles. This type of system can reduce laundry water use by some 75% to 80%. Both systems can also conserve energy by preserving the heat in the water to be reused.

Energy Challenges

The expansion of the tourism sector will generate increased demands for energy. The sector must also compete with other sectors that are significant users of the resource and will not only be facing increasing energy costs but also the possibility of supply limitations. Energy conservation and efficiency measures are even more imperative as is the identification of more substantial ways to reduce energy cost.

For the majority of the countries of the Caribbean indigenous fossil fuels that can be commercially exploited are scarce or in limited supply. These countries are therefore heavily dependent on imported energy resources, primarily petroleum, which accounts for approximately 90% of commercial energy used.

In the coming decades, the focus needs to be on continuing the efforts at improving energy efficiency use in the hotel sector, particularly in light of the cost of the fuel and competition. The challenge, however, is not only improving energy efficiency but also exploring ways in which more indigenous and renewable energy sources can be explored and also on mitigating the negative environmental impacts that may arise.

Recommended Response

The UNEP reports that while the use of indigenous sources of energy is increasing in small island developing countries "their share of total energy supply remains at a level significantly below their potential*."

Hotels need to explore the possibilities of alternative sources of energy that are not only indigenous but also renewable. Since many initiatives to develop indigenous sources have not met with resounding success, the recommendation of the UNEP that focus be on proven successes such as solar energy, wind and hydropower need to be considered. The adoption of these alternative energy sources will depend on the nature of the islands themselves. However, success with this initiative would require support from the industry association, government institutions and utilities.

Electricity

In most Caribbean countries, the generation of electricity is done using diesel-based systems. Table 3 shows some energy indicators over the 1982 to 1992 period for selected Caribbean countries.

For most of these countries, the production of electricity is very close to consumption levels. The implication is that with the growth in tourism fueling increased demand for electricity, increased stress is likely to be placed on existing production. One likely impact is to increase the price of electricity as utilities attempt to rationalize demand.

In St. Lucia for example, the total installed capacity of electricity generating plants is 51 MW with a maximum demand of about 41 MW. The hotel sector is a significant source of this demand. Given this high level of energy consumption, the hotel industry in St. Lucia has embarked on a energy conservation program and is also working towards Green Globe certification.

Since most of the properties use old technology for heating and cooling, projects have been ongoing to rehabilitate this area. These include the replacement of electric water heaters with LPG heaters and the use of more efficient central chiller systems such as the Centravac Trane chillers. Each of these uses 0.65 kW per ton.

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*UNEP Commission on Sustainable Development—Energy resources in small island developing states, Feb. 1996

Table 3: Energy Indicators, selected countries

State	*Elec. Prod. by Thermal Plants (in million kWh)*	*Per Capita Consumption of Electricity (kWh)*			*Net Installed Capacity of Generating Plants*		
		'82	'92	Avg. Annual Change (%)	'82	'92	Avg. Annual Change (%)
Antiqua and Barbuda	95	857	1439	4.7	26	26	0.0
Bahamas	975	3788	3693	–0.2	312	401	2.3
Jamaica	2805	1011	1108	0.8	740	732	–0.1
St. Lucia	107	496	781	4.1	16	22	2.9

Source: United Nations, Sustainable Development of Energy resources in Small Island Developing States, Feb. 1996

Sandals Royal Caribbean

The benefits of this program include the cost savings (LPG costs some 60% less than electricity) and the elimination of the environmental hazard that diesel burning presents. LPG is a much cleaner burning fuel than diesel. In addition, with diesel there is also the potential that leakage may occur which would be detrimental to the environment particular since Sandals Negril is located next to sensitive environmental areas—marshland and the beach.

Other non-energy benefits include: the reduction in emissions which improves the environment for visitors and staff, reduction in cleaning associated with sooting that may occur in using diesel; increased capacity for equipment for example motors; reduction in maintenance; and reduced equipment down time.

A more aggressive program of identifying and implementing energy efficient opportunities is also necessary. An example of this is the use of energy saving bulbs. These have the potential to reduce the energy use index by more than 15%. However, many properties still use incandescent bulbs.

The utility companies in St. Lucia and Jamaica have also initiated rebate incentives for industries that reduce their electricity usage. In order to take advantage of these incentives some properties may need significant capital injections. A capital lending program directed at these properties can be instituted to facilitate the upgrading of their systems. Utilities can also help through a formal program of assistance to hotels through site visits, to enable these hotels to institute changes to their operational procedure.

The single largest energy consuming system in the hotels is air-conditioning, accounting for some 39% of electricity use, There must be a concentrated effort to use only the most efficient and most economical mode of cooling. Split A/C systems are typically more efficient than window units.

The most efficient option, however, remains the central chiller sys-

Sandals Ocho Rios Resort and Golf Club

tem. The use of wind is largely ignored in the design of most properties, and needs to be given greater consideration as buildings with adequate avenues for natural cooling such as open air restaurants reduces the need for air-conditioning. The cost savings that this option affords is significant.

Some of the basic systems that hotels need to adopt to reduce energy consumption are:

- Energy efficient fluorescent lighting
- Lighting controls, e.g. timers, photocells, occupancy sensors
- Programmable thermostat, sliding glass door shut-off controls

Sizing, and acquisition of appropriate technologies, is therefore perhaps the most important aspect of the operations.

SECTION 3: SUSTAINABLE DEVELOPMENT

Most hoteliers in the Caribbean are already sensitized to the importance of conservation to preserve their future investment. Sandals Negril for example has undertaken this effort with the help of external consultants to derive an environmental management system and has made the first step in implementation by the drawing up an environmental policy.

However, in most cases the environmental emphasis is not sustainable and there are still significant obstacles to be overcome in order for hotels to reach the stage where environmental issues are fully integrated into management decision-making. Some recommendations for facilitating such integration are presented below.

Sandals Negri Beach Resort and Spa

Rebate Control Systems to Environmental Issues

The control systems in most hotels tend not to be related to environmental issues. Most managers and key decision makers still operate in what has been described as "old world mental models" that do not give sufficient value to the environment.

Strategies therefore need to be developed where the environment is viewed to be as important as traditional indicators of performance success such as profitability and growth. Environmental issues cannot therefore continue to be treated as an add-on to other corporate policies. There is a need to adapt the control system to accommodate the new strategy.

One recommendation is to make the environmental report a critical

aspect of the performance of a hotel. Thus in addition to the traditional forms of reporting in the hotel sector—budget, profitability and customer satisfaction—the environment report could become a basis for performance appraisal. Such reports should therefore form an integral part of the reporting requirement for managers.

Make Business Sense of Energy and Water Efficiency

In presenting the need to protect our natural environment to stakeholders in the tourism sector, the focus has been largely on the direct cost savings that would result such as:

- energy savings from reducing energy and water consumption
- savings from recycling paper and other recyclable items, and
- the benefits to the environment.

The time has come for a stronger business case to be made to hoteliers, quantifying the energy and non-energy benefits of integrating energy efficiency and environmental management in their operations. The rationale for this change of focus is simple: by reducing energy use, profits are enhanced over and above the direct cost reductions associated with energy savings.

Examples of these non-energy benefits include reduction in cleaning and maintenance activities, extension of the life of equipment and supplies, reputation, improved product quality and increased productivity. The ultimate objective is to reinforce the idea that pursuing energy and environmental issues translate to benefits that in many cases far outweigh the simple benefits derived from energy savings.

Evaluate the Sustainability of the System

An environment management system that is sustainable requires the "optimization of the system to minimize energy cost, available material, government regulation, financial resources, protection of the environment, and the safety, reliability, availability and maintainability of the system."

Sustainability of the system can be assessed by the use of sustainability indicators. Some suggested indicators are resource, environment, social and economic. Hotel operators can therefore identify a

particular resource such as water, identify some of the measures that can be used to improve its management such as water saving showerheads, list some of the social consequences of different choices as well as identify some of the economic factors that need to be considered.

The advantage of this approach is that it allows a profile of all the factors which influence the sustainability of any environmental management system so that these issues are considered **simultaneously**. It also allows linkages between the traditional economic factors with issues of the environment. A sample chart is presented below.

Resource	Environ.	Social	Economic	Rating
Water	Waste water generated	Jobs lost	Cost of water	Excellent
Consumption per room night			Cost of implementing changes	

CONCLUSION

Since the 1990s, considerable effort and resources have been spent by individual companies and the industry association directed towards improvement in the environmental position of the Caribbean. However, these efforts are not likely to be environmentally sustainable in the long run since environmental indicators are not fully integrated into managerial decision-making.

The most fundamental environmental issue facing the Caribbean tourism industry is not the need to respond to environmental challenges such as freshwater scarcity per se. Rather the issue is one of making energy and environmental issues the cornerstone of all business decisions and operations. Indeed, it is apparent that more than just corporate environmental management systems are needed. Sustainability of the Caribbean tourism plant requires that the economic, social, environmental and technical factors be simultaneously balanced.

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His work experience has covered all areas of energy management and demand-side management. For the past seven years, he has been with Sandals Resorts International, where at present he is the Group Engineer.

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