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A Review of Water Conservation Practices
and Potential for Tourist Facilities in
Barbados and St. Lucia

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by

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Barbados:

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- Barbados Tourism Authority
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- Barbados Water Authority
- Almond Beach Resorts (Almond Beach Village and Club)
- Woodville Beach Hotel
- Treasure Beach Hotel
- Barbados Hotel & Tourism Association
- Casuarina Beach Club

St. Lucia:

- Ministry of Agriculture, Lands, Forestry, Fisheries and Environment
- Ministry of Finance and Planning
- St. Lucia Tourist Board
- St. Lucia Hotel & Tourism Association
- Water and Sewerage Authority
- Le Sport
- Orange Grove Hotel
- Rex St. Lucian
- Auberge Seraphine
- Glencastle Resort
- Bay Gardens Hotel
- Jalousie Hilton

ACRONYMS

BWA	Barbados Water Authority
CAST	Caribbean Alliance for Sustainable Tourism
CTO	Caribbean Tourism Organization
EHP	Environmental Health Project
GDP	gross domestic product
lpcd	liters per capita per day
mgd	million gallons per day
mgyr	million gallons per year
UFW	unaccounted-for water
USAID	U.S. Agency for International Development
WASA	Water and Sewerage Authority, St. Lucia

EXECUTIVE SUMMARY

This report analyzes the impact of current water consumption practices and potential improvements at tourist facilities on the islands of Barbados and St. Lucia. Using the results of water consumption audits conducted at 10 facilities, the report estimates total current consumption within the hotel sector, projects consumption rates through 2018, and estimates the potential reductions in water consumption and attendant cost savings to the hotel industry if improved practices are implemented.

The report concludes that the tourism industries in Barbados and St. Lucia could achieve a substantial reduction in water consumption by adopting modern conservation methods at hotels and other tourism facilities. The amount of water that could be conserved by such measures is more than enough to accommodate the anticipated rates of growth in tourism through 2018, without resulting in a net increase in consumption over this period. Furthermore, even with the rapid rate of growth anticipated, the tourism industry will still account for a relatively modest proportion of total water consumption in both countries in 2018 if the industry adopts conservation methods.

Given these conclusions, the principal driving force for water conservation will be the financial self-interest of hotel owners, rather than governments' interest in limiting the industry's usage to preserve water for other sectors. Adopting water conservation devices and practices would result in significant reductions in tariffs paid for water. The tourism sector could avoid costs of US\$580,000 per annum in St. Lucia and US\$1,051,000 in Barbados, averaged over the 20-year period to 2018. Based on an average length of stay of nine days, the cost savings for individual hotels would be approximately US\$1.80 per guest in St. Lucia and US\$1.90 per guest in Barbados, over the entire stay.

Hotel owners and tourism officials should recognize that they have an interest in supporting governmental efforts to conserve water in tourism and other sectors (e.g., agriculture and domestic uses) through tariffs, enforcement, and physical improvements to reduce water losses ("unaccounted-for water"). These measures will help the industry preserve its current share of total water consumption. For example, in Barbados, if the water authority's ambitious program to reduce water losses is successful, it will conserve enough water to accommodate anticipated rates of growth in all sectors through 2018. If it is not successful, total consumption will approach and possibly exceed the total water resources available in an average year, resulting in more frequent water shortages and increased political pressure on the tourism industry to conserve water or slow its growth.

Survey results indicate that hotel owners and managers are interested in reducing water consumption on their properties, although they lack information on how to accomplish the desired reductions and—particularly at the smaller facilities—the time to develop and maintain efficient systems. The authors recommend that a simple template be developed that hotels could use to gather data and keep track of water consumption. The database could be prepared for the Caribbean Alliance for Sustainable Tourism (CAST) and made available to its members.

Barbados is further along in water conservation efforts than is St. Lucia. Its policy-makers are aware of the issues and are attempting to deal with them. In St. Lucia, the Water and Sewerage Authority lacks data on usage, and the issue of water consumption and conservation is not currently part of tourism-related discussions.

By adopting modern conservation methods, hotels in Barbados and St. Lucia could reduce water consumption by an amount sufficient to accommodate anticipated rates of growth in the industry over the next 20 years, without a net increase in water consumption.

The report concludes by recommending that when government departments are reviewing applications for new tourist facilities, they consider water resource requirements and encourage or require owners of new properties and properties being enlarged to install water-saving devices. It recommends that hotels keep records of water consumption and that medium and large hotels install meters to measure water use by individual departments, such as laundry and food service. Owners and managers should set realistic consumption targets, implement prevention measures, fix water leaks promptly, and install conservation devices and practices, such as low-flow toilets, flow restrictors/aerators, foot pedals, towel reuse, drip irrigation, wastewater reuse, and staff training.

This study was undertaken as part of a joint effort by the Caribbean Tourism Organization (CTO) and (CAST) to develop and implement a regional policy on sustainable tourism. The work was funded by the U.S. Agency for International Development, Bureau for Latin America and the Caribbean, under its Hemispheric Free Trade Expansion initiative. The study was planned and conducted in collaboration with USAID's Caribbean Regional Program, which provides technical and financial support to CTO and CAST. The study was prepared by staff at the Caribbean Environmental Health Institute in St. Lucia, with management and technical oversight from USAID's Environmental Health Project.

1 INTRODUCTION

Tourism is the largest sector of the economies of the Caribbean countries. According to the World Travel and Tourism Council, it is expected to account for 29% of the gross domestic product of the region, 25% of its jobs (2.9 million), and 75% of its capital investment (US\$ 15 billion) in 1998. The sector is expected to grow rapidly over the next 10 years.

The tourism industry is under pressure to adopt more environmentally sustainable practices. The natural resource base upon which the industry depends is under stress from inefficient resource use and poor environmental management practices. High rates of water consumption at hotels and other tourist facilities are depleting resources in some areas. Inadequate management of waste is contributing to the contamination of land and surface, ground, and coastal waters.

Competitive pressures are also encouraging hotels to “go green” as tourists become more sensitive to environmental issues.

The Caribbean Alliance for Sustainable Tourism (CAST) and the Caribbean Tourism Organization (CTO) are working together to develop, adopt, and implement a regional policy on sustainable tourism. This effort is being supported by USAID’s Caribbean Regional Program. The regional policy will establish a framework for developing standards, policies, and incentives for improving environmental practices at tourist facilities.

There are few well-documented analyses of the potential long-term impacts of environmental practices in the tourism industry on land, water, and other resources in the Caribbean. Such an analysis is needed to promote productive dialogue regarding environmentally sustainable tourism. It is also needed to provide information for developing the regional policy on sustainable tourism and motivate the public and private sector participants to adopt an effective policy framework.

This report analyzes the impact of current practices and proposed improvements on water consumption by tourist facilities in Barbados and St. Lucia. It includes information on current water consumption rates at selected hotels in each country and projected consumption rates through the year 2018. These consumption figures and their associated costs are then compared to levels that can be realized if improved practices are implemented in order to estimate the potential reductions in water consumption and cost savings to the hotel industry.

2 METHODOLOGY FOR CASE STUDIES

Five hotels in Barbados (two small, two medium, one large) and seven in St. Lucia (two small, two medium, three large) were visited and surveyed over a three-week period. A copy of the survey form used is attached as Appendix A. Apart from descriptive and anecdotal information, the following data were collected.

For the period January 1997 to December 1998, properties provided the following data:

- C Water consumption records
- C Bed nights or room nights sold monthly
- C Average length of guests' stays
- C Average number of guests per room.

(Note: Not all the hotels provided information in all four categories.)

This information, coupled with the country background information, was analyzed to produce the following summary information:

- C Daily per capita water usage for each hotel
- C Average daily per capita usage for each island
- C Current annual total usage for each island and associated cost
- C Projected total usage and cost to 2018
- C Projected water and cost savings to 2018, assuming adoption of water conservation methods.

3 CASE STUDY: BARBADOS

Background Information

Water resources and supply

The Barbados Water Authority (BWA) recently completed a thorough analysis of its available water resources and current levels of consumption, plus projected increases in demand for the period 1996 to 2016. The information presented in this case study is based on results from the BWA report, “Water Resources Management and Water Loss Studies, 1996.”

Potable water in Barbados is supplied from the groundwater sources on the island. BWA’s total water production is currently 31 million gallons per day (mgd), 70% of the current available resource (44.57 mgd) (see Table 1). An estimated 8 mgd is also being drawn by owners of private wells. The public supply is delivered through a system consisting of 23 wells (pumping 0.3 to 10 mgd) and 27 reservoirs. It is estimated that the distribution system supplies 98% of the island’s population with water. Major water outages tend to occur only in the dry season, usually in the central highlands. These outages are heightened during drought conditions, when the average rainfall is less than 40 inches.

Table 1
Available Water Resources in Barbados

Source	Average Rainfall Conditions (56" per year)	
	m ³ /day	mgd
Groundwater	202,591	44.57
Surfacewater	15,909	3.50
Springwater	5,455	1.20
Wastewater	30,018	6.60
Runoff	1,455	0.32
<i>Total</i>	<i>225,410</i>	<i>49.59</i>

Eight of the supply wells (including the largest of 10 mgd) supply the west and south coasts of the island where all the hotels participating in the study are located. Current water tariffs are as follows:

Domestic Users \$1.50 each for the first 33 m³; \$2.12 per m³ thereafter
Commercial Users \$2.12 per m³

The BWA study estimated that unaccounted-for water (UFW)¹ was of the order of 60%. This figure has since been reduced to 40% through leakage detection and repair and replacement of mains. A universal metering program is now being introduced to install 40,000 new meters across the island. This program will bring the percentage of metered customers to 70% as compared to 30% before installation. The effects of leakage detection and repair and universal metering have been a marked reduction in daily production, from 36 to 31 mgd.

Despite these improvements, BWA will begin exploiting alternative water sources to ensure that both current consumption and projected demand by the various sectors can be met. A 6 mgd desalination plant is currently under construction utilizing a design-build-own contract with a private firm. It is expected to be in operation by the end of 1999. Table 2 outlines consumption figures for 1996, projected demand in 2016, and the projected change in demand over this 20-year period.

Components of the tourism industry (hotels, ships, and golf courses) are currently estimated to consume 3.45% of the total water produced. Demand from hotels and ships is expected to double over the next 20 years, while golf course irrigation is expected to increase by almost five times, for a total increase of 3.82 mgd or 327% for the tourism sector. Over this same period, BWA anticipates reducing UFW by about 70%, which will yield a net increase in water availability of 14.45 mgd, more than enough to address anticipated growth in the tourism sector and other sectors as well.

Although tourism is clearly the sector experiencing the fastest growth in water consumption, projected demand for this sector in 2016 is still substantially less than that for domestic uses and agriculture. It is even less than the anticipated residual level of UFW. If BWA's ambitious goal of increased water availability is realized, total demand across all sectors will actually be lower in 2016 than it was in 1996. If BWA is able to achieve only a 30% reduction in UFW (6.33 mgd) however, then total demand in 2016 will equal the estimate of currently available water resources (49.59 mgd).

Table 2
Current and Projected Demand for Water in Barbados, 1996 to 2016

Type of Use	Consumption 1996			Projected Demand 2016			Change	
	m ³ /day	mgd	%	m ³ /day	mgd	%	mgd	%
Domestic	48,681	10.71	22.00	51,337	11.29	27.36	0.58	5.4
Industrial and	16,955	3.73	7.66	17,460	3.84	9.30	0.11	2.9
Hotels and ships	5,200	1.14	2.34	10,821	2.38	5.77	1.24	108.8
Agriculture	52,091	11.46	23.54	63,545	13.98	33.87	2.52	22.0
Golf course irrigation	2,458	0.54	1.11	14,182	3.12	7.56	2.58	477.8
Unaccounted-for water	95,973	21.11	43.35	30,				
<i>Total Consumption</i>	<i>221,35</i>	<i>48.69</i>	<i>100</i>	<i>187</i>				

BWA's water conservation initiatives

Apart from the traditionally accepted methods of metering and leakage detection and repair, BWA is also implementing an ongoing water conservation program through its Marketing and Communications Unit. This program includes a public awareness program targeting all sectors. The Authority also conducted a pilot water conservation project that entailed the distribution of water conservation devices free of charge to domestic customers

Water consumption at tourism facilities in Barbados is approximately 700 liters per person per day, compared to 213 liters per day for domestic consumers.

¹ Unaccounted-for water includes leakage, standpipes, illegal connections, and wastage

in good standing. Other programs to be implemented include revision of the pricing and tariff structure, development of educational programs, and information dissemination. With regard to the tourism sector, BWA, in collaboration with the Ministry of Health and Environment, the Ministry of Tourism, and the Barbados Hotel and Tourism Association, began implementing a water conservation and management in the hotel and tourism sector project in 1998. The project is being implemented with financial support from the Pan American Health Organization.

BWA's estimates indicated that the per capita demand for water by the tourism sector was approximately 700 liters per day and rising as compared to the domestic average of 213 liters per day. The project was developed to assist BWA and other stakeholders identify actual water needs. This information will be used to control water usage and facilitate coordinated action by the Ministry of Health and other stakeholders in addressing water management and maintenance issues.

The objectives of the project are to:

- C Obtain data and information for a water conservation strategy
- C Demonstrate the use of water conservation fixtures in properties within the tourism sector
- C Demonstrate to stakeholders the benefits of using optimum water conservation techniques
- C Sensitize sector decision-makers and technicians to the need to employ water conservation techniques
- C Develop and implement a coordinated plan of action for water conservation and management within the tourism sector.

Activities include conducting a nationwide survey of tourism facilities to collect data, reviewing existing policies and legislation, developing two demonstration projects, and conducting workshops and seminars to promote and increase awareness and knowledge of conservation.

The project was scheduled to run from January 1997 to December 1998. To date, however, only the first activity (conduct a survey) has been completed. Questionnaires were sent to tourism facilities across the island, but the response rate has been poor. (A sample questionnaire is provided in Appendix A.) The information collected in this phase will be used to select sites for the demonstration projects. The project is scheduled to resume by the end of 1999.

Tourism

Tourism is the leading economic sector in Barbados, contributing some 14% of gross domestic product (GDP) and employing 12,500 persons (10.6 % of workforce) directly and indirectly. There are currently 137 facilities (hotels, guest houses, and apartment hotels) in operation on the island. Of these facilities, 96% are located on the west and south coasts. This percentage includes 70 hotels, 81% of which are members of the Barbados Hotel and Tourism Association.

There were 472,290 visitors in 1997, increasing to 512,397 in 1998 (an increase of 8%). Growth during the period 1987 to 1997 fluctuated, with an average of 4%² (see Table 3). With intensified marketing efforts, along with the corresponding increase in room availability, this increase is likely to continue over the next decade.

Table 3
Growth in Tourist Visits to Barbados, 1986-1997

² Source: Caribbean Tourism Organization

Year	Stayover	% Change
1986	369,770	
1987	421,859	14.10
1988	451,485	7.00
1989	461,259	2.20
1990	432,092	-6.83
1991	394,222	-8.80
1992	385,427	-2.20
1993	395,979	2.70
1994	425,632	7.50
1995	442,107	3.90
1996	447,083	1.10
1997	472,290	5.60

Recognizing the need to provide clear direction for the industry and to identify policies, strategies, and a development focus, the Government of Barbados, through the Ministry of Tourism, has developed a National Tourism Policy. The policy has been approved by the Barbados Cabinet, and it is currently a Green Paper open for public comment. A key component of the policy is the development of links between tourism and positive environmental practices. The broad policy objective is to pursue sustainable tourism development through optimal use of human resources and services and the conservation and managed use of the island's cultural and natural heritage.

The policy covers 14 subject areas of relevance to the sector. Of these, Specific Objective 11 addresses the natural environment and is intended to promote sustainable tourism development through the protection, conservation, and development of the natural environment within its carrying capacity and creation of awareness and respect for the island's unique natural heritage. With this in mind, the Ministry of Tourism will implement a project called Greening of Hotels, focusing on five small properties and three attractions. Energy, freshwater, and greywater audits will be conducted at the facilities and recommendations for improvements will be made. The second phase of the project will implement the recommendations (financed by the facilities) and be monitored by the Ministry.

The Barbados Hotel and Tourism Association has an Environmental Committee whose main function is to provide information to the members on Environmental Programs and Technologies. The committee has been functioning off and on for the last four years. Neither the association nor the committee has an articulated policy dealing with water consumption or conservation.

Analysis and Projections

Water consumption patterns

Results from water consumption surveys conducted at selected hotels are reported in Appendix B. The estimated daily per capita water consumption figures are summarized in below.

Table 4
Estimated Daily per Capita Water Consumption
at Selected Hotels in Barbados

Hotel	Per Capita Consumption (Liters)
Woodville Beach Apartments	373

Casuarina	320
Treasure Beach Hotel	734
Almond Beach Club	920
Almond Beach Village	1431
Average	756

Projected growth in the number of residential tourist visits (“stayovers”) to Barbados were provided by the CTO. Projected growth in water demand was estimated by first assuming continued consumption at the current rate (756 l/day) and an average length of stay of nine nights. Potential reductions in consumption are estimated based on the well-established general guideline that aggressive water conservation and management at hotels can yield at least a one-third reduction in consumption. The results are shown in Table 5.

Table 5
Projected Demand in Water Consumption, Barbados, 1998-2018

Year	Stayover	Demand (mgvr)*	% Demand **	Cost to Sector	Demand w/1/3 Savings (mgvr)***	Cost to Sector	Cost Savings
1998	512,397.00	596.0	5.3	\$2,910,608.85	397.3	\$1,940,405.90	\$970,202.95
2003	532,892.88	619.8	5.5	\$3,027,033.21	413.2	\$2,018,022.14	\$1,009,011.07
2008	554,208.60	644.6	5.7	\$3,148,114.54	429.7	\$2,098,743.02	\$1,049,371.51
2013	576,376.94	670.4	5.9	\$3,274,039.12	446.9	\$2,182,692.75	\$1,091,346.37
2018	599,432.02	697.2	6.2	\$3,405,000.68	464.8	\$2,270,000.46	\$1,135,000.23

* Based on average length of stay of 9 nights.

** Assuming current production remains constant.

*** Assuming savings of one-third upon adoption of water conservation practices.

All costs in US\$.

Water conservation measures at hotels

Table 6 summarizes the water conservation devices and practices currently in use at the hotels surveyed. It shows that Barbados has already made some progress in water conservation at hotels. This study, however, was not a complete survey, and it did not determine the extent to which water conservation measures have already been adopted across the industry. If such measures have already been widely adopted, the potential reductions in consumption and resulting cost savings for the tourism industry as a whole may be somewhat less than the estimates shown in Table 5.

Table 6
Use of Water Conservation Devices or Practices at Hotels on Barbados

Hotel	Device or Practice						
	Low-Flow Toilets	Flow Restrictors/ Aerators	Foot Pedals	Towel Reuse	Drip Irrigation	Wastewater Reuse	Staff Training
Almond Beach Village	*	*	*	*		*	
Almond Beach Club		*	*	*		*	
Casuarina Beach Club	*	*	*	*	*		*

Treasure Beach Hotel	*	*		*
Woodville Beach Hotel	*	*	*	*

4 CASE STUDY: ST. LUCIA

Background Information

Water resources and supply in St. Lucia

The Water and Sewerage Authority (WASA) is a parastatal organization mandated by law to develop and manage the water supply and sewerage services on St. Lucia. Twenty-nine surface water sources (rivers) supply the island. Current average daily production by WASA is approximately 12 million gallons. It is estimated that the total available water resource (after runoff) is of the order of 7 billion gallons per year (or about 20 mgd). Although it would appear that the available source is adequate to meet the demands of the population, the capacity and design of the island's water supply infrastructure are inadequate to satisfy increasing demands. Currently only a small proportion of the consuming public receives a 24-hour supply of potable water. Water outages occur on a regular basis, and most consumers have installed water storage tanks. Water consumption by sector is shown in Table 7.

Table 7
Estimated Usage of Water Supplied by WASA, 1997

Category	Percentage
Domestic	90.00
Commercial	3.60
Government	5.64
Hotels	0.19
Boats/Ships	0.17
Agriculture	—
Total	100.00

Source: WASA

Because of the common occurrence of water outages, hotels sometimes have to truck in water to meet their needs. The water usage estimate for hotels in Table 7 therefore, does not reflect total consumption. Attempts to quantify the amount of supplemental water used by hotels were unsuccessful.

There is no recorded figure for the agriculture sector for a number of reasons. WASA currently allows farmers to withdraw water from the raw water mains (i.e., water being transported for treatment) for irrigation. They are charged a flat rate for this service. The Authority is currently considering ending this practice because the low cost leads to extreme wastage. In addition, farmers also irrigate using water drawn directly from rivers, and some small property holders use the domestic water supply.

Current water tariffs are shown below in EC dollars.

Sector	Rate (EC\$)	Service Charge
Domestic	\$4.10/ 1,000 gals for 1 st 3000; \$7.78 after	\$5 and \$10
Commercial/Industry	\$10.28 per 1,000 gallons	\$15-\$100
Hotels	\$11.00 per 1,000 gallons	\$10
Government	\$6.40 per 1,000 gallons	\$100
Ships	\$40.00 per 1,000 gallons	

WASA is planning to upgrade the water distribution system by laying a major trunk main to supply the portion of the island north of Castries, i.e., the main tourism areas.

Water conservation initiatives by WASA

The Authority has no planned programs apart from water rationing during the dry season. During that time, public service announcements are made advising residents to use water carefully and refrain from excessive irrigation of lawns or washing of cars.

Tourism

Tourism is a major foreign exchange earner in St. Lucia, second only to agriculture (bananas). There are a total of 132 accommodations providing approximately 6,259 beds in 4,125 rooms. Of these properties, 31 are apartments or villas, 68 are guest houses, and 33 are hotels. The growth rate for the industry for 1997-1998 was 11.7%.

Projected rates of growth in tourism to 2008, prepared by the St. Lucia Tourism Board, are cited in Table 8. These calculations are based on expected room capacity, airlift and air load, the average cost of a vacation, and the seasonality of major markets. The projections are subject to change if major unforeseen developments occur.

Table 8
Tourism Forecast for St. Lucia

Year	No. of Tourists			Growth Rate (%)	No. of Rooms
	Cruise	Stayover	Total		
1998	372,068	252,237	624,305	11.7	4,125
1999	409,275	259,804	669,079	6.7	4,349
2000	442,017	272,794	714,811	6.4	4,646
2001	450,857	278,250	729,107	2.0	4,739
2002	495,943	289,380	785,323	7.2	5,105
2003	510,821	298,062	808,883	2.9	5,258
2004	521,038	307,003	828,041	2.3	5,382
2005	531,458	316,214	847,672	2.3	5,510
2006	542,087	325,700	867,787	2.3	5,641
2007	552,929	335,471	888,400	2.3	5,775
2008	563,988	345,535	909,523	2.3	5,912

In 1997 a Tourism Master Plan to the year 2003 was completed by consultants and submitted to the government. The authors were not able to obtain a copy of the document and could not, therefore, determine whether the master plan includes any recommendations regarding water consumption.

Analysis and Projections

Water consumption patterns

Survey results are reported in Appendix B. Estimated daily per capita water consumption figures are summarized in Table 9.

Table 9
Estimated Daily per Capita Water Consumption
at Selected Hotels in St. Lucia

Hotel	Per Capita Consumption (Liters)
Bay Gardens	767
Auberge Seraphine	516
Le Sport	793
Glencastle	571
<i>Average</i>	<i>662</i>

Growth in the number of tourists for the years 2009 to 2018 was estimated by the St. Lucia Tourist Board at 4.4% per year, the average of rates projected for the years up to 2008. Projected growth in water demand was estimated by first assuming continued consumption at the current per capita consumption rate (662 l/day) and an average length of stay of nine nights. Potential reductions in consumption are estimated based on the same guideline used in the earlier analysis for Barbados, i.e., that aggressive water conservation and management at hotels can yield at least a one-third reduction in consumption. The results are shown in Table 10.

Table 10
Projected Demand in Water Consumption, St. Lucia, 1998-2018

Year	Stayover	Demand (mgyr)*	% Demand **	Cost to Sector	Demand w/1/3 Savings ***	Cost to Sector	Cost Savings
1998	252,237	330.3	7.5	\$1,337,313.80	220.20	\$891,542.53	\$445,771.27
1999	259,804	340.2	7.8	\$1,377,432.63	226.81	\$918,288.42	\$459,144.21
2000	272,794	357.2	8.2	\$1,446,303.20	238.15	\$964,202.14	\$482,101.07
2001	278,250	364.4	8.3	\$1,475,229.90	242.91	\$983,486.60	\$491,743.30
2002	289,380	378.9	8.7	\$1,534,239.10	252.63	\$1,022,826.07	\$511,413.03
2003	298,062	390.3	8.9	\$1,580,269.45	260.21	\$1,053,512.97	\$526,756.48
2004	307,003	402.0	9.2	\$1,627,672.98	268.01	\$1,085,115.32	\$542,557.66
2005	316,214	414.1	9.5	\$1,676,507.99	276.05	\$1,117,671.99	\$558,836.00
2006	325,700	426.5	9.7	\$1,726,801.00	284.34	\$1,151,200.67	\$575,600.33
2007	335,471	439.3	10.0	\$1,778,605.03	292.87	\$1,185,736.69	\$592,868.34
2008	345,535	452.5	10.3	\$1,831,962.50	301.65	\$1,221,308.33	\$610,654.17
2018	359,356	470.6	10.7	\$1,905,241.00	313.72	\$1,270,160.66	\$635,080.33

* Based on average length of stay of 9 nights.

** Assuming current production remains constant.

*** Assuming savings of one-third upon adoption of water conservation practices.

Water conservation measures at hotels

Table 11 shows the distribution of water conservation devices and practices currently in use at the hotels surveyed. It shows that St. Lucia has not made as much progress as Barbados on water conservation at hotels. This is probably because agriculture has been the main economic sector for a long period and tourism development is a relatively recent phenomenon.

Table 11
Use of Water Conservation Devices or Practices at Hotels in St. Lucia

Hotel	Device or Practice						
	Low-Flow Toilets	Flow Restrictors/ Aerators	Foot Pedals	Towel Reuse	Drip Irrigation	Wastewater Reuse	Staff Training
Auberge Seraphine	*					*	
Bay Gardens							
Glencastle Resort							
Jalousie Hilton		*				*	
Le Sport	*	*		*		*	
Orange Grove Hotel							
Rex. St. Lucia	*	*		*			

5 CONCLUSIONS

Hotels in Barbados and St. Lucia could achieve a substantial reduction in water consumption by adopting modern water conservation methods throughout the tourism industry. The amount of water that could be conserved by such measures is more than enough to accommodate the anticipated rates of growth in tourism in both countries through the year 2018. By adopting water conservation measures and saving one-third of current consumption rates, the total demand for water by the tourism sector in 2018 would be less than the current demand in both countries, notwithstanding a rapid rate of growth in the sector (see Tables 5 and 10).

Adopting water conservation measures will also result in significant reductions in costs for water tariffs. By adopting such measures, the tourism sector can avoid costs of US\$580,000 per annum in St. Lucia and US\$1,051,000 in Barbados, averaged over the period 1998 to 2018. The cost savings for individual hotels would be approximately US\$1.80 per guest in St. Lucia and US\$1.90 per guest in Barbados for an average length of stay of nine nights.

Projected water demand for the tourism industry is a relatively modest proportion of total consumption, despite the rapid growth anticipated in the sector. This is even more true if the industry adopts water conservation measures. For this reason, the principal driving force for water conservation at hotels will be the financial self-interest of the hotels themselves, rather than the governments' interests in limiting usage to preserve water for other sectors. It also indicates that the tourism industry has a strong interest in urging and supporting governments' efforts to achieve water conservation in other sectors (agriculture and municipal uses) and to reduce UFW, so that the industry can preserve its current share of total water production.

6 RECOMMENDATIONS

The previous tables illustrate the possible savings both in water and costs that can be effected by the introduction of water conservation methods. These savings are based on the generally accepted reduction by one-third in water usage that can be achieved by installing water-saving devices and changing water-use practices.

During the survey, the authors found that most hotel owners and managers are interested in reducing water consumption at their properties. In fact, of the 12 properties surveyed, only one saw the efforts behind recording water consumption data as not useful. All five hotels surveyed in Barbados and two of the seven surveyed in St. Lucia were members of CAST and, as such, have an appreciation of the importance of collecting this information. What appears to be the main constraint to recording useful information and analyzing it at most of the properties is a lack of knowledge of how this should best be done. This is especially true of the smaller facilities where the owner/manager is usually also directly responsible for most, if not all, of the various aspects involved in running a hotel. Most owners and managers do not have the time needed to develop and maintain these systems.

With this in mind, the authors recommend that a simple database template be developed for tracking and managing water consumption at hotels. This template can be adapted as necessary, depending upon the type and size of hotel. The template can be included as part of the CAST member package and also be sold to nonmembers. This will be useful in ensuring that data are readily available to demonstrate, for example, the savings to be achieved in installing water conservation devices. For hotels such as Casuarina Beach Club, which have installed many of these devices, it is difficult to determine the actual savings since the program was done over an extended period of time and no rigorous analysis of any available data has been done.

The situation in Barbados is promising as evidenced by the National Tourism Policy and the Water Consumption Project described above. Efforts should be made to restart the latter as soon as possible and ensure that it is completed as planned. It may be useful, however, to rethink the data collection approach depending on the detail desired in the information being collected. This may require the injection of additional funds by CAST and CTO. These organizations may also wish to consider replicating the project in other territories. The recent conduct of the Barbados Water Resources Management and Water Loss Studies also indicates that the policymakers are aware of the issues, and they are attempting to deal with them. Coordination and follow through are the main ingredients now needed to ensure a successful program.

The situation in St. Lucia is very different. The St. Lucia Water and Sewerage Authority is currently faced with the task of becoming self-sustaining and providing an adequate supply to all sectors. There is only an approximation of total available resources from 1991 and no information on current demand patterns. It will be useful to bring to the attention of stakeholders the findings of this short study as an indication that a more in-depth program should be undertaken. Perhaps duplication of the Barbados project can begin in St. Lucia. Efforts should also be made to have the issue of water consumption and conservation on the agenda of tourism-related discussion on the island so that it can receive the attention it demands.

Some Policy Options

The following are suggestions of policy options that can be applied in both countries.

- C When applications for new tourism facilities are made, the review process must consider the water demand for the facility as well as available water resources. This means that the department reviewing the application must be aware of all relevant information relating to water resources. While this function could be forwarded to the relevant authority for recommendations, the planning department must understand the basis on which these recommendations are made.
- C New properties should be encouraged or required to install only water-saving fixtures. This should also apply to extensions of existing properties. Developers should submit a water conservation plan for the property.

What Hotels Can Do

The authors recommend that hotel owners and managers implement the following activities.

- C Keep records of water consumption and review as appropriate to determine daily per capita consumption. The frequency of collection should vary as follows, according to hotel size:
 - # Small hotels: read meter every two weeks
 - # Medium hotels: read meter every week
 - # Large hotels: read meter every day

Submetering (i.e., installing meters to measure water consumed by individual departments, such as the laundry) should be installed at medium and large hotels. All hotels should review their water use monitoring data on a regular basis to detect leaks and ensure that water and money are not being wasted.

- C Set a realistic target for consumption and develop a program to achieve it as part of a larger environmental management system.
- C Implement preventive maintenance systems for plumbing fixtures.
- C Train all staff in the importance of checking for and reporting water leaks and ways of conserving water in the routine conduct of their jobs.
- C Install water conservation devices as appropriate and monitor consumption for any changes.

APPENDIX A: Survey Form

General Information

Name of Property

Location

Type of hotel

Name of General Manager

Name of Maintenance Manager/Chief Engineer

Maximum number of guests that can be accommodated

Average occupancy rate

High-season

Low season

Has the hotel implemented any environmental management programs?

If yes please name it and state when implemented.

If documented, can you provide a copy?

General Information on Water

What is your source of potable water?

Do you have a system for:

(a) Monitoring water consumption?

(b) Targeting water usage reductions?

Please describe

Is water usage in different areas of the hotel noted?

If yes, which areas?

Do you know which departments consume most water?

If yes, which ones?

Pools

Number of pools

Volume of pools

Are pools ever emptied and refilled?

If so how often?

Laundry

Is there an on-site laundry?

Number of washing machines

Capacity of machines
Average number of loads daily
Are all loads full loads?
Any other method of washing used?
Estimate quantity of water used in the laundry

Green Areas

Size of golf courses (if applicable)
Size of landscaped areas
Irrigation method and source of water
How often irrigated?
How much water is used for irrigation?

Wastewater Management

What volume of wastewater is generated?
Is wastewater treated on site?
If so, which streams are treated? (sewage, greywater etc.)
What volume of wastewater is treated?
Is the treated effluent reused on property?
If yes, what for?
Is effluent reused throughout the year?

Rooms

Number of rooms
Total water consumption (if available)
Are rooms fitted with any water conservation devices?
If so which?
Flow restrictors
Flow aerators
Low flush toilets
Other
When were these devices fitted?
Were any changes in water consumption levels noted?
What were the changes?

If a water conservation policy is in place are the guests involved?
If yes, how?

Kitchens

If available what is the average water consumption in the kitchens?
How many kitchens are in operation?
Are water conservation devices fitted?
How many dishwashers are used?
What is the capacity of the dishwashers?

How many loads are done daily?
Are all loads full loads?

Maintenance

Is staff asked to report all water leaks promptly?
How quickly are leaks fixed?
Is there a preventative maintenance system in place?

Miscellaneous

If not already doing so, what is the interest in implementing a water conservation program?

At what rate would you estimate the implementation of such a program?

Would you be willing to implement all or most recommended measures for lowering water consumption (i.e., low-cost as well as more expensive)

If not, to what level would you implement such measures?

APPENDIX B: Survey Results

Barbados

Almond Beach Resorts

Almond Beach Resorts is owned by the publicly held Barbadian company, Barbados Shipping and Trading, and operates two all-inclusive resorts located on the West Coast (St. James and St. Peter). The company is a member of CAST and as such has been implementing environmental management programs in various areas. An environmental and conservation manager was appointed full time in February 1999, and a site-specific environmental and conservation program was developed. The program addresses the areas of water conservation, solid and liquid waste management, and energy conservation. Implementation is planned for the duration of 1999.

Almond Beach Village

General Description

The Almond Beach Village can accommodate a maximum of 850 guests in 354 rooms. The annual average occupancy rate is 80%. The hotel has a total of 10 pools. Until November 1998, an on-site laundry was in operation, but currently laundry is done by an external service. This service charges a flat rate monthly basis. The hotel operates four kitchens and uses a total of five automatic dishwashers. There is also a nine-hole golf course on the property.

Water Consumption and Conservation Practices

Potable water is provided by BWA. Currently the property has a bulk service meter, which is read daily, as well as submeters. These, however, have not been used for some time and may not be functional. There are plans to repair them if necessary and re-introduce this aspect of water consumption monitoring. Taps and showerheads in the rooms are fitted with aerators. Some rooms have been fitted with low-flow toilets and toilet dams are being installed in other existing tanks. A towel reuse program will also be put in place, although it is recognized that this will not have a direct cost impact on the hotel.

An on-site wastewater treatment facility is in operation, and the treated effluent is stored and reused for irrigation of the golf course and other green areas. Aerated faucets are in use in the kitchens. The water conservation plan recommends that foot pedals be installed in the kitchens and on the showers and taps in public areas.

A preventative maintenance program is not currently in place, but it is also planned. All staff are asked to report leaks promptly, and these are generally repaired within 24-48 hours.

Table 12 shows the total monthly consumption figures for the hotel for the period January 1997 to December 1998. Included is an estimation of the consumption per guest per night in litres (1,431).

Table 12
Water Consumption at the Almond Beach Village

	1997				1998			
	Room Nights	Population Equivalent*	Volume (m ³)	Daily Per Capita Consumption (liters)	Room Nights	Population Equivalent*	Volume (m ³)	Daily Per Capita Consumption (liters)
January	5,931	13,048.2	17,502	1,341.33	7,325	16,115.0	23,088	1,432.70
February	6,367	14,007.4	18,250	1,302.88	7,042	15,492.4	23,299	1,503.90
March	6,986	15,369.2	13,989	910.20	8,092	17,802.4	25,147	1,412.56
April	7,613	16,748.6	19,594	1,169.89	7,958	17,507.6	34,059	1,945.38
May	7,155	15,741.0	20,992	1,333.59	7,490	16,478.0	16,214	983.98
June	6,372	14,018.4	22,805	1,626.79	6,568	14,449.6	27,938	1,933.48
July	7,864	17,300.8	20,953	1,211.10	6,880	15,136.0	25,360	1,675.48
August	8,072	17,758.4	18,809	1,059.16	7,649	16,827.8	27,661	1,643.77
September	5,848	12,865.6	22,354	1,737.50	6,028	13,261.6	25,670	1,935.66
October	7,547	16,603.4	22,651	1,364.24	7,711	16,964.2	22,595	1,331.92
November	7,653	16,836.6	17,764	1,055.08	7,160	15,752.0	20,505	1,301.74
December	6,821	15,006.2	24,761	1,650.05	6,677	14,689.4	21,884	1,489.78
	Average:			1,313.48	Average:			1,549.20

Two-Year Average: 1,431.34 lpcd

* Based on an average of 2.2 persons per room.

Almond Beach Club

General Description

The Almond Beach Club is a smaller property with 161 rooms and a maximum number of guests of 350. The average occupancy is 80% annually. There is one pool on the property. Laundry is sent to an external service. One kitchen is in operation, and the landscaped areas are small.

Water Consumption and Water Conservation Practices

Potable water is provided by the BWA. Currently the property has only the bulk service meter, which is read daily. Water usage in different areas of the hotel is not noted currently, but there are plans to introduce submetering. Taps and showerheads in the rooms will be fitted with aerators, and toilet dams will be installed during 1999. Sinks in the kitchen are fitted with foot pedals.

All wastewater is treated on site, and the effluent is partly discharged through a tile field and also used for irrigation.

A preventative maintenance program is not in place currently, but it is planned. All staff are asked to report leaks promptly, and these are generally repaired within 24 to 48 hours.

Table 13 shows the total monthly consumption figures for the hotel for the period January 1997 to December 1998. Included is an estimation of the consumption per guest/per night in litres (920).

Table 13
Water Consumption at the Almond Beach Club

1997	1998
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	Room Nights	Population Equivalent*	Volume (m ³)	Daily Per Capita Consumption (liters)	Room Nights	Population Equivalent*	Volume (m ³)	Daily Per Capita Consumption (liters)
January	3,491	6,982	2,877	412.06	4,267	8,534	6,679	782.63
February	3,894	7,788	7,075	908.45	4,008	8,016	6,464	806.39
March	3,702	7,404	5,037	680.31	4,610	9,220	7,205	781.45
April	4,247	8,494	6,702	789.03	4,114	8,228	5,559	675.62
May	3,408	6,816	8,864	1,300.47	3,988	7,976	6,386	800.65
June	2,837	5,674	5,741	1,011.81	1,337	2,674	5,305	1,983.92
July	2,910	5,820	5,664	973.20	2,071	4,142	5,429	1,310.72
August	3,447	6,894	5,669	822.31	2,446	4,892	5,658	1,156.58
September	3,519	7,038	5,708	811.03	3,711	7,422	3,564	480.19
October	4,006	8,012	6,285	784.45	4,325	8,650	5,868	678.38
November	3,942	7,884	5,676	719.94	4,164	8,328	7,108	853.51
December	3,185	6,370	4,023	631.55	2,968	5,936	11,463	1,931.10
	Average:			820.38	Average:			1,020.10

Two-Year Average: 920.24 lpcd

* Based on an average of 2.2 persons per room.

Woodville Beach Hotel

General Description

Woodville Beach Hotel is a privately owned property and consists of 49 self-contained double rooms with kitchenettes. Of these, 9 rooms were opened in September of 1997, and 12 in November of 1998. Average occupancy is 80% annually. The hotel is a member of CAST, and it has implemented several environmental management programs including separation of solid waste. There is one pool on the property. The hotel operates a small on-site laundry with two washing machines. Some laundry is sent to an external service. The size of the property is small with approximately 2,000 sq. ft of landscaped areas. All wastewater is treated, using septic tanks and discharged via soakaways. It is expected that the property will be connected to the South Coast Sewerage System, once the system is completed. In addition to the kitchenettes, there is also a small central kitchen, which is operated mainly as a grill for snacks and fast food.

Water Consumption and Water Conservation Practices

Potable water is provided by the BWA. Currently the property has only the bulk service meter. Records are kept of monthly water consumption. The property employs only a maintenance supervisor for routine repairs, so the maintenance function is managed by the owner/manager. Water usage in different areas of the hotel is not noted currently, but there are plans to introduce submetering.

Flow restrictors and flow aerators are installed in all the rooms including the kitchenettes and the central kitchen. Low flush toilets are installed in the 21 new rooms. A towel reuse program is also in place and notification flyers are placed in the rooms to encourage guests to participate. Irrigation of the gardens is done by the drip method. The lawns are not usually watered.

Table 14 shows the total monthly consumption figures for the hotel for the period January 1997 to December 1998. Included is an estimation of the consumption per guest per night in litres (373).

**Table 14
Water Consumption at the Woodville Beach Hotel**

	1997				1998			
	Occupancy %	Population Equivalent*	Volume (m ³)	Daily Per Capita Consumption (liters)	Occupancy %	Population Equivalent*	Volume (m ³)	Daily Per Capita Consumption (liters)
January	89	1,545.04	449	290.61	82	1,881.08	469	249.32
February	93	1,458.24	545	373.74	92	1,906.24	789	413.90
March	85	1,475.60	651	441.18	86	1,972.84	789	399.93
April	69	1,159.20	450	388.20	53	1,176.60	552	469.15
May	71	1,232.56	510	413.77	72	1,651.68	1,278	773.76
June	61	1,024.80	442	431.30	80	1,776.00	773	435.25
July	74	1,284.64	476	370.53	83	1,904.02	697	366.07
August	80	1,388.80	587	422.67	84	1,926.96	650	337.32
September	72	1,598.40	359	224.60	82	1,820.40	474	260.38
October	68	1,559.92	474	303.86	86	1,972.84	606	307.17
November	81	1,798.20	522	290.29	79	2,322.60	607	261.35
December	77	1,766.38	724	409.88	64	1,944.32	611	314.25
	Average:				Average:			
				363.39				382.32

Two-Year Average: 372.85 lpcd

* Assuming double occupancy

Casuarina Beach Club

General Description

The Casuarina Beach Club is a privately owned property and consists of 166 self-contained rooms with kitchenettes (studios, one- and two-bedroom), and one two-bedroom cottage. Six of these rooms as well as the cottage have been in operation since early 1999. Average occupancy is 95% annually. The hotel is a member of CAST, Green Globe, and the Green Hotel Association, and it has won several awards for its environmental programs. A full-time environmental manager was appointed in 1996, and he has implemented several environmental management programs, including water conservation and separation of solid waste. Weekly seminars for staff on environmental issues are held, and the environmental manager works closely with the maintenance staff, especially when new programs are planned.

There are two pools on the property. The hotel operates a small on-site laundry with two household-size and one commercial-size washing machines. Some laundry is sent to an external service, which charges per item laundered. The size of the property is eight acres with approximately one-third of it being lawns and gardens. All wastewater is treated using septic tanks and discharged via soakaways. It is expected that the property will be connected to the South Coast Sewerage System, once the system is completed. In addition to the kitchenettes, there is a central kitchen, which operates daily for breakfast, lunch, and dinner.

Water Consumption and Water Conservation Practices

Potable water is provided by BWA. Currently the property has only the bulk service meter. Records were kept of the monthly water consumption until April of 1998 when the meter became damaged. This was repaired in March 1999. For that period the property was charged a flat rate based on an

estimate of average use. Water usage in different areas of the hotel is not noted currently, but there are plans to introduce submetering. Water for irrigation is obtained from brackish water wells on the property. Daily irrigation is done primarily by the drip method, but some sprinkling and use of garden hoses are employed.

Flow restrictors, low-flush toilets, and water dams were installed in all the rooms between 1995 and 1997. Water dams were also installed in the kitchenettes and the central kitchen. Foot pedals are used on the taps in the main kitchen, which uses one automatic dishwasher. Casuarina is currently considering installing an additional device known as the AquaSaver to effect more water savings during toilet flushes. A towel reuse program is in place, and the appropriate notification for guests is placed in the rooms.

A preventative maintenance program is in operation. All staff are asked to report leaks promptly, and these are generally repaired within 24 hours.

Table 15 shows the total monthly consumption figures for the hotel for the period January 1997 to December 1998. Included is an estimation of the consumption per guest/per night in litres (320).

**Table 15
Water Consumption at the Casuarina Beach Club**

	1997				1998			
	Occupancy %	Population Equivalent*	Volume (m ³)	Daily Per Capita Consumption (liters)	Occupancy %	Population Equivalent*	Volume (m ³)	Daily Per Capita Consumption (liters)
January	95	14,136.0	5,088	359.93	90	13,392.0	2,524	188.47
February	98	13,171.2	4,330	328.75	97	13,036.8	3,338	256.04
March	96	14,284.8	3,997	279.81	91	13,540.8	4,601	339.79
April	97	13,968.0	4,527	324.10	96	13,824.0	3,990	288.63
May	97	14,433.6	5,362	371.49	96	14,284.8	4,895	342.67
June	91	13,104.0	4,606	351.50	97	13,968.0	4,634	331.76
July	95	14,136.0	4,548	321.73	97	14,433.6	4,557	315.72
August	97	14,433.6	5,491	380.43	96	14,284.8	5,215	365.07
September	98	14,112.0	4,922	348.78	98	14,112.0	4,462	316.18
October	98	14,582.4	4,802	329.30	98	14,582.4	5,045	345.96
November	96	13,824.0	4,588	331.89	97	13,968.0	4,439	317.80
December	95	14,136.0	3,728	263.72	98	14,582.4	4,100	281.16
			<i>Average:</i>	332.62			<i>Average:</i>	382.32

Two-Year Average: 320.03 lpcd

* Assuming an average of 3 persons per room

Treasure Beach Hotel

General Description

Treasure Beach Hotel is a privately owned property and consists of 29 double occupancy suites. Average occupancy is 74% annually. The hotel is a member of CAST, and the general manager is responsible for its environmental programs. These efforts have been primarily in the areas of water and energy conservation. The general manager also supervises a maintenance team of four persons. There is one pool on the property. All laundry is sent to an external service. The size of the property is just about one acre with half of that being landscaped. All wastewater is treated using septic tanks and discharged via soakaways. It is expected that the property will be connected to the planned West Coast Sewerage System. In the interim, the general manager is considering installing an on-site system

since the municipal one may not be completed for another 10 years. There is one main kitchen on the property.

Water Consumption and Water Conservation Practices

Potable water is provided by BWA. Currently the property has only a bulk service meter and is purchasing two additional meters to monitor water consumption in the kitchen and for irrigation. Records are kept of the monthly water usage, and they are used to calculate the quantity of water consumed per room/per night. Flower beds are irrigated daily during the dry season by the drip method, and lawns are irrigated with sprinklers.

Flow aerators have been installed in showerheads and tap faucets in all rooms and low-flush toilets in nine rooms as a pilot study. Results from this have been poor because the toilets have to be flushed repeatedly. Toilet tanks have also been installed with the AquaSaver. This device limits the amount of water flowing to the bowl during refill and also reduces the time taken to refill the tank. No devices are currently fitted in the kitchen, but they are planned for 1999.

A preventative maintenance program is in place only for the air-conditioning system. All staff are asked to report leaks promptly, and these are generally repaired within 24 hours.

Table 16 shows the total monthly consumption figures for the hotel for the period January 1997 to December 1998. Included is an estimation of the consumption per guest/per night in litres (734).

Table 16
Water Consumption at the Treasure Beach Hotel

	1997				1998			
	Room Nights	Population Equivalent*	Volume (m ³)	Daily Per Capita Consumption (liters)	Room Nights	Population Equivalent*	Volume (m ³)	Daily Per Capita Consumption (liters)
January	753	1,506	985	654.05	715	1,430	869	607.69
February	668	1,336	891	666.92	715	1,430	1,113	778.32
March	713	1,426	980	687.24	757	1,514	1,129	745.71
April	685	1,370	961	701.46	668	1,336	938	702.10
May	398	796	607	762.56	722	1,444	1,041	720.91
June	557	1,114	780	700.18	555	1,110	909	818.92
July	349	698	614	879.66	498	996	800	803.21
August	388	776	669	862.11	663	1,326	996	751.13
September	400	800	643	803.75	374	748	917	1,225.94
October	404	808	596	737.62	808	1,616	903	558.79
November	649	1,298	845	651.00	777	1,554	945	608.11
December	758	1,516	994	655.67	819	1,638	862	526.25
	Average: 730.19				Average: 737.26			

Two-Year Average: 733.72 lpcd

* Assuming double occupancy

St. Lucia

Rex St. Lucian

General Description

Situated in the northern part of the West Coast, the Rex St. Lucian has been implementing environmental management programs in various areas. A conservation committee has been established to address water conservation, food safety, and energy conservation issues. The Rex St. Lucian Hotel can accommodate a maximum of 260 guests in 120 rooms. The annual average occupancy rate is 75 to 80%. High season occupancy stands at 95%, and low season occupancy is 50%. The hotel has one large pool. There is an on-site laundry which is operated by the Royal St. Lucian and does laundry for the Rex, Royal, and Papillon (all adjacent sister properties). The laundry currently operates four washing machines—one large capacity and three small capacity. Laundry staff are encouraged to run full loads in an effort to conserve water and energy. There are two kitchens (main and grill) with one automatic dishwasher. There are no water conservation devices fitted in the kitchens.

Water Consumption and Conservation Practices

Potable water is provided by WASA. Currently the property has a bulk service meter and smaller meters for laundry and irrigation. Additional meters will be installed to monitor other areas during 1999. Once per month the meters are read. Water usage in the laundry is noted as this amount is charged to the Royal St. Lucian. The departments that consume the most water are guests rooms, laundry (which is shared with Royal and Papillon), and Food and Beverage. Showerheads in the rooms are fitted with flow restrictors, which can be adjusted by guests. In 1996, some rooms were fitted with low-flow toilets and toilet dams. Changes in water consumption level were not noted because at that time the property was split to form the Rex St. Lucian and the Papillon Hotel.

There is a water conservation policy in place, which also involves the guests at the hotel. Stickers advocating the conservation of water and energy are put in guests rooms. Towel reuse is encouraged.

Wastewater is collected and treated by WASA's municipal facility. A preventative maintenance program is in place and all staff are asked to report leaks promptly, verbally or documented. This is standard procedure, and these leaks are generally repaired within 24 to 48 hours.

There are no golf courses on the hotel grounds, but the landscaped areas are estimated at two to three acres. Plants are watered by hose as necessary, once per week/per acre. The hotel is planning to install an irrigation system.

Information on water consumption provided by the hotel yielded an unusual per capita consumption figure (see Table 17). These figures are being verified.

Table 17
Water Consumption at the Rex St. Lucian

Year	Volume (gallons)	Population Equivalent*	Daily Per Capita Consumption
1997	36,405,120	75,920	479.52
1998	48,600,120	75,920	640.15
Two-Year Average (gallons)			559.83
Two-Year Average (liters)			2,547.25

* Based on double occupancy

Jalousie Hilton

General Description

A conventional hotel, located on the outskirts of the town of Soufriere, the Jalousie Hilton has been implementing environmental management programs in various areas. The hotel was recently reopened and has been receiving guests since August 1998. The parent company, Hilton Hotels, has been a member of Green Hotels for 18 years.

The maximum number of guests that can be accommodated is 250 in 114 rooms. The annual average occupancy rate at high season is 80%, and at low season it is 50%. The hotel has one main pool with a 200,000 gallons capacity. There are 97 plunge pools (36 with 1,500 gallons and 61 with 1,000 gallons). The pools are not normally emptied and refilled, but mostly backwashed and partially refilled (except for major maintenance purposes).

There is an on-site laundry and the hotel currently operates three washing machines with a 85 pound capacity per load. Laundry staff are encouraged to operate full loads in an effort to conserve water and energy. There are four kitchens with a total of four dishwashers. All loads are normally full.

Water Consumption and Conservation Practices

Potable water is provided by WASA. Total monthly water consumption is monitored, but water usage in different areas of the hotel is not. The hotel is in the process of installing submetering through various areas. Full loads are encouraged in laundry and dishwashers; filtering is maximized and pools and plunge pools are backwashed instead of refilled. The areas that consume the most water are rooms (plunge pools), kitchen, and laundry. The guest rooms are fitted with water conservation devices, using flow restrictors and flow aerators at 2.5 gallons per hour. This was done in 1998.

There is an on-site wastewater treatment facility. Approximately 50,000 gallons of wastewater is generated and treated daily. Treated effluent is reused for irrigation yearly. All irrigation greywater is chlorinated. A preventative maintenance program is in place. All staff are asked to promptly report leaks, which are fixed almost immediately.

There is a seven-hole golf course. The landscaped areas are estimated at 375 acres. Irrigation is done by using greywater from sewage. This is normally done daily, due to lack of water. About 40,000 to 50,000 gallons of water per day are used for irrigation.

Table 18 shows monthly water consumption figures for the period August 1998 to February 1999. An average per capita consumption was calculated to be 1,876.5 liters. The figures provided for consumption are being verified.

Table 18
Water Consumption at the Jalousie Hilton

	Occupancy %	Population Equivalent*	Volume (gallons)	Daily Per Capita Consumption (gallons)
1998				
August	44	3,410	1,715,400	503.05
September	42	3,150	1,710,200	542.92
October	66	5,115	1,736,800	339.55
November	54	4,050	1,896,700	468.32
December	66	5,115	1,788,500	349.66
1999				
January	69	5,348	1,889,000	353.25
February	72	5,040	1,658,500	329.07
Average (gallons)				412.26
Average (liters)				1,876.55**

* Assuming a maximum of 250 guests per night

** Note: Very high, need to verify

Bay Gardens

General Description

Bay Gardens Hotel, a member of CAST, was opened in November 1996 and accommodates a maximum of 106 guests in 53 rooms. The hotel expanded to 71 rooms in April 1999. The average high season occupancy rate is 80 to 85%. Low season occupancy is 75%. Both pools are emptied twice yearly for maintenance. There is no on-site laundry. There is one kitchen with manual dishwashing facilities. The hotel possesses four ice machines.

Water Consumption and Conservation Practices

Potable water is provided by WASA. The hotel has a 27,000 gallon storage tank. Monitoring water consumption is based on the monthly bills from WASA. The meter is read on a monthly basis to compare readings. If there is a significant increase in charges, a leakage control check is done. The departments that consume the most water are guestrooms and the kitchen, which does a lot of catering. Low flush toilets and water conservation devices are being considered for the new block of rooms, and the existing rooms will be retrofitted. The hotel plans to implement a towel reuse program. Practices in the kitchen are commendable; meat thawing, for example, is generally done without the use of running water.

Wastewater is treated at the WASA municipal facility. To some extent, a preventative maintenance program is in place. Staff are asked to report leaks promptly. Small leaks are fixed immediately; larger leaks take longer.

There are no golf courses on the hotel, but the landscaped area is estimated at three-quarters of an acre. The landscape is irrigated with a hose and tapwater.

Table 19 shows the monthly water consumption for the period January 1997 to December 1998. Estimated daily per capita consumption is 767 liters.

**Table 19
Water Consumption at the Bay Gardens Hotel**

	1997				1998			
	Occupancy %	Population Equivalent*	Volume (gallons)	Daily Per Capita Consumption (gallons)	Occupancy %	Population Equivalent*	Volume (gallons)	Daily Per Capita Consumption (gallons)
January	84.54	1,035.20	91,796.88	88.68	89.84	1,100.04	166,171.88	151.06
February	89.22	986.75	213,593.75	216.46	85.51	945.76	176,562.50	186.69
March	83.26	1,019.55	74,218.75	72.80	83.87	1,027.00	158,476.56	154.31
April	80.40	952.76	166,000.00	174.23	80.43	953.12	154,062.50	161.64
May	77.54	949.49	113,281.25	119.31	76.99	942.78	145,156.25	153.97
June	64.97	769.88	93,750.00	121.77	74.09	877.94	125,585.94	143.05
July	79.49	973.34	179,600.00	184.52	70.91	868.25	143,281.25	165.02
August	69.20	847.39	173,300.00	204.51	66.77	817.58	201,992.19	247.06
September	67.30	797.45	126,500.00	158.63	71.55	847.82	179,257.81	211.43
October	73.22	896.58	138,900.00	154.92	71.55	876.08	162,773.44	185.80
November	85.53	1,013.58	119,500.00	117.90	71.55	847.82	200,000.00	235.90
December	71.45	874.96	164,296.88	187.78	76.32	934.58	233,400.00	249.74
	<i>Average:</i>				<i>Average:</i>			
			150.13				187.14	

Two-Year Average (gallons): 320.03
Two-Year Average (liters): 767.27

* Based on an average of half single and half double rooms

Glencastle Resort

General Description

Glencastle Resort is a privately owned hotel with 19 double and 18 single rooms. The average occupancy rate is 55%. High season occupancy stands at 72% and low season occupancy is 40%. The hotel has two pools, 8,000 and 10,000 gallons each. The pools are topped up weekly with 200 gallons of water. There is no on-site laundry. The hotel has one kitchen. Owners are currently considering becoming a member of CAST.

Water Consumption and Conservation Practices

Potable water is provided by WASA. The hotel also has several storage tanks due to the irregularity of the water supply. Currently the property has only the bulk service meter. There is no system in place for monitoring water consumption, but the hotel does a crosscheck of WASA meter readings. The general manager estimates that the departments which consume the most water are the guests rooms and kitchen. The hotel is planning to implement a water conservation program. It is hoped

that the program will be implemented during 1999 with assistance from one of the larger CAST members. The hotel intends to equip the rooms with flow restrictors, aerators, and low flush toilets.

The average water consumption in the kitchen is 20% of the total. Water conservation devices will also be installed there. Dishwashing is done manually.

There is no on-site wastewater treatment facility in operation. Wastewater is treated by the WASA municipal treatment plant. A preventative maintenance program is in place for the solar water heaters and the standby generator. All staff are asked to report leaks promptly and, due to constant water shortages, do so conscientiously. All leaks are fixed immediately.

There are no golf courses on the hotel grounds and the landscape area is minimal, about 5% of the total area. The area is irrigated with a sprinkler system. This is done twice a day during the dry season.

To date, only water consumption records for the period August to November 1998 are available. An estimate of daily per capita water consumption is 571 liters (see Table 20).

Table 20
Water Consumption at the Glencastle Resort

	Population Equivalent*	Volume (gallons)	Daily Per Capita Consumption (gallons)
1998			
August	1,388.8	176,500	127.09
September	1344.0	115,000	85.57
October	1388.8	207,200	149.19
November	1344.0	188,300	140.10
Average (gallons)			125.49
Average (liters)			570.97

* Based on 40% summer occupancy

Auberge Seraphine

General Description

The hotel can accommodate a maximum of 44 guests in 22 rooms. The annual average occupancy rate is 95 to 100%. The hotel caters mostly to the business sector; consequently, the rooms are generally single occupancy. The hotel has one pool that is maintained on a yearly basis. There is an on-site laundry. The hotel currently operates two large capacity and one domestic washing machine. Average loads depend on demographics of clientele. There is one kitchen and one automatic dishwasher. The hotel does not have a comprehensive environmental management program in place; initiatives have been done on a piecemeal basis.

Water Consumption and Conservation Practices

Potable water is provided by WASA. There are eight storage tanks at the hotel. No system for monitoring water consumption is in place, but the meters are read monthly. The general manager estimates that the department that consumes the most water is the laundry. The guests rooms were fitted with low flush toilets when the hotel was opened four years ago.

Wastewater (sewage only) is treated in on-site septic tanks. Greywater is discharged to drains but some is used for plant watering. All staff are asked to report leaks promptly.

Table 21 shows monthly water consumption for the period January 1997 to December 1998, but some months are missing. Estimated daily per capita consumption is 516 liters.

**Table 21
Water Consumption at the Auberge Seraphine**

	1997			1998		
	Population Equivalent*	Volume (gallons)	Daily Per Capita Consumption (gallons)	Population Equivalent*	Volume (gallons)	Daily Per Capita Consumption (gallons)
January	682	34,910	51.19	682	74,550	109.31
February						
March				682	109,500	160.56
April	660	85,780	129.97	660	116,380	176.33
May	682	10,201	14.96			
June	660	69,740	105.67	660	81,070	122.83
July	682	74,690	109.52	682	75,740	111.06
August	682	75,510	110.72	682	84,650	124.12
September	660	80,660	122.21	660	71,370	108.14
October	682	80,820	118.50	682	95,350	139.81
November	660	62,140	94.15	660	75,050	113.71
December	682	75,460	110.65	682	90,910	133.30
	Average:			Average:		
			96.75			129.92

**Two-Year Average (gallons): 113.33
Two-Year Average (liters): 515.65**

* Based on 100% single occupancy

Orange Grove Hotel

General Description

Orange Grove is a subsidiary of Clubs International and is located in Bois D'Orange on the west coast. The hotel can accommodate a maximum of 145 guests in 62 double rooms. The high season occupancy stands at 100% and low season occupancy is 88%. The hotel has one pool that is constantly filtered. There is a guest laundry. The hotel currently operates two washing machines. There is no environmental management program.

Water Consumption and Conservation Practices

Potable water is provided by WASA. There is a bulk meter which is used to monitor water consumption. Water usage is controlled in various ways; e.g., use of bowls instead of running water for washing and thawing meats. The bulk of laundry is sent. Only guest laundry is done at the hotel. Average number of daily loads depends on house count. All the loads are full. There are other methods of washing delicate fabrics.

The hotel operates one kitchen, with one automatic dishwasher that is used only for rinsing. The flowerbeds on the four acres of landscaped area are irrigated with hoses once a week during the dry season.

The wastewater system is hooked to the sewerage line. Staff are asked to report all leaks promptly. Leaks are fixed as reported. There is a daily pipeline and room check to spot leaks. Property owners are considering implementing a water conservation program. Already they are using low-energy light bulbs and photocells.

No water consumption records from this property have been available to date.

Le Sport

General Description

Le Sport is a locally owned, all-inclusive hotel and spa. The hotel can accommodate a maximum of 204 guests in 102 rooms. The annual average occupancy rate is 90%. There are three main pools on site and two plunge pools. These are maintained every three years. There is an on-site laundry, but it is used intermittently due to irregularity of water supply. The hotel currently operates one heavy duty and one domestic washing machine. Load size varies. Sometimes handwashing is done. There is one kitchen in operation and another about to be started. Only one dishwasher is used. The hotel is a member of CAST, and two staff members have been trained in environmental management.

Water Consumption and Conservation Practices

Potable water is provided by WASA and water is also trucked in. There is a system in place for monitoring water consumption and targeting water usage reduction. Meters are read daily and recorded. A computer system monitors the daily usage. A target is set and when daily readings are inputted, an alert is given if the value is over the target. Water usage in different areas of the hotels is noted for the laundry, kitchen, and spa.

The hotel has a water conservation policy in place that involves towel reuse. It has been found that the European guests are more likely to comply with the program. The guests rooms are fitted with water conservation devices. The showerheads have flow aerators, and there are low flush toilets in the rooms. These devices were fitted two and one-half years ago. There were dramatic reductions in the water consumption when the devices were installed. Changes totaled about 10,000 gallons in one month.

Wastewater is treated on site. All sewage and greywater are treated. The treated effluent is reused on the hotel's property (at the spa) for irrigation. This effluent is used through the year. Currently sprinklers are used, but a drip irrigation system is being installed. Potable water is used in other areas, but the intention is to extend the reuse system to the entire property.

Staff are asked to report all water leaks promptly in writing. The leaks are fixed within 24 hours. The hotel has a preventative maintenance system in place.

Figures for the total water consumption by the hotel for the period January 1997 to December 1998 are outlined in Table 22. Estimated daily per capita consumption is 793 liters.

Table 22
Water Consumption at Le Sport

Volume 1997-1998 (gallons)	Population Equivalent*	Daily Per Capita Consumption (gallons)	Daily Per Capita Consumption (liters)
20,758,000	119,182	174.17	792.48

* Based on total bed nights for the period