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An Environmental Audit of Aracari Resort

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Abstract

Tourism impacts the economy, the natural and built environment, the immediate population, and even tourists – the very resource needed by the industry to remain viable. Regular assessment of the environmental performance of the industry is necessary to ascertain compliance with national standards and regulations. This is achieved with an environmental audit. To this end, an environmental audit was conducted at the Aracari Resort, almost a decade after it began operations. The Resort's operations should have minimal impact on public health and the environment, as evidenced by good sanitation, safety measure implementation, and adherence to the Public Health Legislation and Occupation Health & Safety Act. The methodology used included monitoring of water quality and use, noise, and energy; and direct observation of waste and safety management. The results showed that water quality parameters such as pH, temperature, phosphorus and ammonium were in compliance with the national effluent discharge guidelines; however, chlorides, chemical oxygen demand, and total suspended solids were not. Water metre readings revealed an average daily water consumption of 22.5m^3 and an average weekly water consumption of 135m^3. Noise produced from the Resort was in compliance with the daytime limits of 75 dB based on the national standard, but exceeded residential nighttime limits (from Friday to Sunday) of 60 dB. The average (55.6 kW), maximum (83.85 kW), and minimum (51.9 kW) power demands across a 7-day period were obtained from Fluke Monitoring System readings. Solid waste management was observed to be inadequate on days of planned events, with overflowing bins evident on the premises. Safety measures were implemented for food, chemical handling and storage, swimming pool safety, and fire safety, which were observed to be consistent with the standards. The facility's overall performance was satisfactory based on the evaluation criteria, and some environmental practices of Aracari Resort conformed to the Environmental Protection Agency requirements and other established guidelines. Areas identified for improved compliance and enhanced environmental management included the implementation of an environmental policy, regular monitoring of environmental parameters, and staff training on the terms and conditions of the Environmental Permit.

Keywords: Environmental Audit; Environmental Monitoring, Aracari Resort

1. Introduction

Background

A clean and healthy environment is critical for a successful tourism industry. All over the world from coastlines in Asia, the Caribbean to nations in Africa and Europe, environmental degradation caused by tourism continues to bring business losses. According to Goodall (2003), the state of the environment determines the success of the tourism product. Tourism being one of world's largest industries has come under scrutiny over the past decades for destruction caused to environment in its development. According to United Nations Environment Programme [UNEP] (2011), the three main impacts of tourism include depletion of natural resources, pollution, and physical impacts of tourism development. Goodall (2003) stated that environmental auditing allows a tourism business to evaluate the environmental consequences of its current range and level of activities to determine the extent to which current operations measure up to outlined standards. Thus, environmental auditing, whether voluntary or regulatory, can contribute to sustainable forms of tourism. It will also allow for enhanced reputation among regulatory authorities. Further, Holden (2000) emphasised that operators who implement environmental audits can benefit from more efficient use of resources such as energy and water.

Environmental auditing is a management tool comprising a systematic, documented, periodic, and objective evaluation of how well environmental organisation, management, and equipment are performing; with the aim of helping to safeguard the environment by:

i. Facilitating management control of environmental practices; and
ii. Assessing compliance with company policies, which would include meeting regulatory requirement. (International Chamber of Commerce, 1989, p. 1)

Environmental audits are invaluable for environmental management; they form the basis for accreditation, benchmarking, and best practices for tourism management (Weaver, 2006). Environmental auditing as a tool is one of the main methods of achieving sustainability (Mowfort & Munt, 2003). In Guyana, management of resorts and tourism facilities can be enhanced with the use of environmental auditing. Based on the findings of the environmental audit, modifications can be made to facilitate improved management and reduce negative impacts. The status and level of compliance can be easily traced and identified: and environmental problems can be corrected sooner. Therefore, an environmental audit is an effective means of managing the impacts of resorts on their immediate environment and ensuring compliance with established standards.

This research identified the environmental implications of the Aracari Resort through environmental auditing. The research sought to assess the quality of effluent produced by Aracari Resort; the facility's environmental management practices with reference to energy and water use, waste, noise, and health and safety; and to examine the resort's institutional arrangements for environmental management of its operations.

Aracari Resort is one of the registered tourism accommodations in Guyana. It was granted an environmental permit in 2005 from the Environmental Protection Agency (EPA), and a Guyana Tourism Authority (GTA) license in 2008. The facility officially began operation in June, 2008. However, no assessment of the facility's environmental impacts was done at the time of this study. Unchecked tourism can have negative impacts on the environment. The establishment has also added new areas of operations, such as a hair salon and spa, additional hotel rooms and a kitchen garden. Given that this facility was in operation for almost five years, it is appropriate that an environmental audit be conducted. The implications of these new areas of operations on the environment are unknown.

Protection of the environment is important for long term sustainability. There is a need to assess the current effects of the operation on its environment and make pragmatic recommendations for environmental management as necessary. Therefore, the tool of environmental audit could be used to achieve such an assessment. Moreover, an environmental audit assists organisations and regulatory bodies in measuring the effectiveness of systems in place to mitigate impacts of the operation on the environment.

Management of Tourism Activities through Environmental Auditing

This section examines methodologies used by other researchers on environmental audits, waste audits and energy audits of tourism accommodations internationally, regionally and locally. It also includes findings, method of data analysis, and the sampling approach of the studies.

Nagawiecki (2009) reported the findings of the University of Idaho's (UI) Waste Characterisation study. The waste study consisted of three major components: an in-depth waste sort of selected dumpsters on campus, in-building waste stream analyses of UI dining facilities, and a survey of large capacity dumpsters to determine cost effectiveness of current hauling procedures. At least one dumpster from each of the following categories was sorted to ensure the sample accurately represented the total waste generated at UI: student services, classrooms/offices, residence halls, and other facilities. The dumpsters in each category were selected based on the high volume of waste they generated, and the knowledge that they did not contain any materials that would pose a serious health and safety danger to volunteers. The day of the week the dumpsters were emptied was also used in the selection process to ensure dumpsters would contain a fair amount of waste. The waste was sorted into one of 16 categories. These categories were selected based on research of previous waste characterisations conducted at other universities and specifics of the UI waste management system. Once sorted into the respected categories, the waste was weighed using a non-digital bathroom scale. The dumpster survey found that about 80 cubic yards of waste were generated by these dumpsters weekly.

Warnken et al. (2002) conducted an energy audit for Australia's tourist accommodation sector. Data for this study was collected as a series of independent energy audits for 11 hotels, 13 self-contained apartment complexes (SCACs), five eco-Resorts, and six caravan parks. The spatial scope encompassed the Gold Coast, Sunshine Coast and Cairns regions. This scope was chosen for two reasons: (1) these regions were highly popular holiday destinations, and (2) they were undergoing rapid growth of local resident populations. Efforts were made to collect figures for energy consumption from all accommodation providers. Qualitative information was collected from websites, brochures, and interviews with managerial, engineering or maintenance staff. Figures for electricity consumption were collected from electricity bills or electronic record-keeping systems. Convenience sampling was used as it was a matter of securing the cooperation of any business willing and able to assist, rather than choosing particular businesses. Data was analysed using descriptive statistics, linear regression and ANOVA. Comparisons of electricity figures between the different types of accommodation revealed that on average, per capita consumption of electricity was greatest for hotels and lowest for caravan parks. In hotel buildings, hot water systems and air conditioners generally accounted for a larger proportion of electricity use – and correspondingly, total energy use.

ECO Engineering and Energy Solutions [ECOSOL] (2012) conducted an energy and water audit report for a 5-Star hotel in Aqaba-Jordan. This study, similar to the one conducted by Warnken et al. (2002), analysed the hotel's total electrical bill for the past year. ECOSOL took continuous and instantaneous electrical measurements of the electrical loads and electrical energy consuming systems to establish each system's electrical consumption and cost breakdown. The hotel's annual water bills were analysed over the past year to determine the monthly water consumption and associated costs. Data was analysed using descriptive statistics. The energy audit revealed that water chillers and air conditioners were the main components of energy consumption, representing about 65% of the total electrical energy consumption. Other energy consuming systems (lighting system, pumping system, etc.) represented less than 33% of the total electrical energy consumption. The energy audit proposed recommendations to achieve monetary savings, such as replacing high wattage lamps with low wattage CFLs, installing a solar water heater, and adjusting flow rates of water faucets.

Another energy audit conducted among hotels in Barbados by Caribbean Hotel Energy Efficiency Action Programme [CHENACT] (2010) employed the use of the walk through assessments and review of utility bills. Electricity consumption per guest night was calculated as the total electricity consumption divided by the number of guest-nights during the period. The study represented 31.25% of hotels in Barbados. Convenience sampling was used based on access to and willingness of hoteliers to participate in the study. Data was analysed using descriptive statistics. Based on the results of the CHENACT (2010) energy audits, the smaller properties (up to 50 guestrooms) appeared to utilise more electricity per guest night than the larger properties. This was because energy uses in common areas such as lobbies, grounds and hallways were spread across a larger guest population. The smallest properties also had the largest variation of electricity efficiency, ranging from 12 to118 kWh/guest night. It was also found that air conditioning accounted for roughly half of the total electricity use, followed by lighting.

Edwards (2010) conducted an environmental audit of Splashmin's Resort, Guyana. Water quality parameters were investigated and compared with baseline data from an EIA report prepared in 2001 to evaluate the impact of Splashmin's Resort on the biophysical environment. Edwards (2010) also used in-depth interviews with tourist operators and regulatory agencies to assess implemented mitigation measures and examine challenges to environmental management. Direct observations were also used to identify the flora, fauna and operating features. Data was analysed using descriptive statistics and in a narrative form.

Water quality parameters analysed included pH, faecal coliform, nitrates, dissolved oxygen, total metals, total dissolved solids and conductivity. Nine water samples were taken from the project site: eight water samples were taken at points along the creek and one sample was taken from the well for analysis. Water quality analysis revealed nitrate levels were far below acceptable limits of <10 mg/L based on GNBS Guidelines. Faecal coliform was found to be greater than 16 per 100ml. High levels of dissolved oxygen were identified between the first washroom and pavilion. A comparison with baseline data taken in 2001 showed an increase in total dissolved solids upstream and decreased total dissolved solids downstream. There was a significant reduction in faecal coliform levels in the well water compared to 2001 baseline data. Monitoring of water quality was inadequate, but most of the parameters tested were within allowable limits (Edwards, 2010).

Some of the animals identified at the specific project area in 2001 were not observed during visits in 2010. According to Edwards (2010), the addition of retirement and private homes by the tourism operator might have affected the natural habitat of animals and native species of flora. It was further observed that the majority of waste produced included: styrofoam boxes, plastic and glass bottles. Solid waste practices were inadequate during planned events at the resort. Observations of sewage facilities indicated that the required grease traps for kitchen were installed at the resort. Furthermore, interviews revealed that fuel was only purchased when necessary and during planned events that involved the use of motorboats and jet skis. Electricity was supplied by GPL and solar panels, accounting for a reduction in noise produced by generators and lower impacts on air quality. However, important mitigation measures that were not implemented into the operation may affect water quality, fauna and soils within the Resort. The study provided recommendations to ensure compliance and enhance environmental management at the Resort (Edwards, 2010).

Similarly, Environmental Management Consultants [EMC] (2005) conducted an environmental audit of Marudi Creek Resort, Guyana. A site visit was carried out to observe the facilities and operations of the Resort and to administer the environmental audit questionnaire/interview with the tourism operator. Information on the Resort such as site description, site history, operating procedures, recreational activities, inventory of raw materials, and environmental management in terms of noise emissions, water management, waste management, emergency response, and health and safety issues were among the critical areas inspected to verify whether the resort was operating in compliance with the EPA environmental permit. Data from interviews were analysed in a narrative form.

The environmental audit revealed air and noise emissions at the Marudi Resort were minimal. The resort enforced a noise policy and if anyone failed to comply they were asked to leave the resort. The main sources of noise were from the generator and water pump and measures were in place to ensure that the generator operated at a minimum number of 28 hours per week, along with regular maintenance and service. The water pump worked all day to ensure there was enough water and was checked, maintained and serviced daily. There was no system in place for the collection and analysis of water. It was further observed that seven soak-a-ways and two septic tanks were alternatives methods used to process waste water and toilet waste at the Resort. A 20 ft. by 20 ft. dug out pit situated at the back of the Resort was used to separate, recycle, bury and store all solid waste at the Resort.

Multitasking by staff with knowledge of all areas of the Resort operation and customers' service were part of the staff job description at the Resort. These staff members however, lacked formal training on environmental impacts. The staff at Marudi were aware of health and safety regulations to some extent. Precautionary measures and safeguards were in place when purchasing items for the Resort operations in terms of checking expiry dates on food stuff and maintenance and regular checks in and around the Resort grounds. The facilities and grounds of the Resort were in a clean and healthy state with regular cleaning being evident. Based on the findings, EMC made recommendations to the management of Marudi Resort to ensure compliance with operational permit and established guidelines.

The Guyana Energy Agency [GEA] (2014) conducted an energy audit of Cara Lodge hotel. The study mainly focused on identifying the energy conservation opportunities in the building and evaluating the existing systems in the facility that consumed the most energy, and therefore, had the greatest contribution to the energy bills. The energy assessment involved analysing the various measurements recorded by a Fluke 1735 monitoring system and covered all major energy consuming areas to assess energy losses and potential for energy savings.

Data acquisition involved the collection of the following details:

- Power consumption in kW via Fluke 1735 monitoring system
- Voltage (V) and current (I) measurements at supply circuit via Fluke 1735 monitoring system
- Energy measurements in kWh at main supply circuit via Fluke 1735 monitoring system
- Inventory of lighting and appliances via observations
- Electrical data collected included GPL bills for previous months to obtain the recorded units consumed and tariff details.

Data was analysed using the Power Log software 4.0.2 to show trends and patterns of energy consumption. Based on results from the Fluke 1735 for a 7-day period, the energy consumed was 5023.60 kWh. This translates to approximately 21,527 kWh of energy consumed per month (assuming a 30-day month) if the occupancy level remains the same over that period. Recognising that a hotel would have different events, this value would vary. The highest consumption based on utility bills was recorded at 16,632 kWh in June, 2013. There was a noticeable increase in monthly consumption for June and July of 2013. GEA (2014) stated this could have been due to increase in occupancy and other activities such as new equipment or floor space during those periods. The energy consumed for 1 year was 131,634 kWh.

Water heating and air-conditioners made up the largest power consumption, accounting for 64% and thus had the greatest potential for energy conservation opportunities. Lighting made up 11% of the power consumed and was one of the easiest areas to address. It was observed during the assessment that outdoor lamps, mostly made up of incandescent lamps, were switched on earlier than required. GEA (2014) recommended cleaning or replacing air conditioner filters periodically, avoid keeping equipment such as televisions, hair dryers and lamps close to A/C thermostats, change of electric water heaters to solar water heaters, all incandescent lamps be replaced with CFLs or LED, timers or photo-sensors be installed to control outdoor lamps, exterior decorative lights be tuned off at about midnight when most guests are asleep, enable power saving feature on office equipment and painting of roof in white to improve cooling of the building.

In Kellman (2013), waste was characterised using 15 categories: (1) mixed paper, (2) cardboard, (3) food waste, (4) yard waste, (5) wood, (6) textiles, (7) glossy cardboard, (8) polystyrene (cups & boxes), (9) plastic; bags, cutlery & containers, (10) plastic bottles, (11) foil and foil, wrappers, (12) glass bottles and glasses, (13) steel and ferrous metals, (14) aluminum cans and (15) miscellaneous waste. This was followed by the establishing of bin zones, based on the faculty proximity to the clusters of bins. A six-foot plastic quadrat work area was built to facilitate a work environment that kept the garbage off the ground and kept the waste in a controlled area for easier handling. It also aided in the efficient clean up after the exercise was completed.

Kellman (2013) conducted four (4) waste characterisation exercises of the six (6) predetermined zones, over a four (4) week period. The dates chosen were scheduled garbage collection days. Kellman (2013) employed a similar methodology to Nagawiecki's 2009 waste study. The waste characterisation exercises began with the random sampling selection of a single 170 litre bin from each zone on a given characterisation day. The contents of each bin were emptied onto a plastic quadrat, then manually sorted into the various waste classification categories and weighed using a Salter Bracknell Electro Samson (45 kg x 0.05 kg) Hanging Scale. Each day of exercise saw this process repeated for each of the six bins from the six zones, and 24 bins were examined over the four weeks of assessment. The waste characterisation data was transferred from a data collection sheet into Microsoft Excel for descriptive analysis.

The methodologies used by Warnken et al. (2002), Kellman (2013), Nagawiecki (2009), CHENACT (2010), GEA (2014), Edwards (2010), EMC (2005) and ECOSOL (2012) were noted and incorporated in the fulfillment of this study.

2. Methodology

Research Design and methods

A cross sectional research design was applied using both qualitative and quantitative data collection methods. The instruments for data collection used for this research were observations/site inspections, interviews, questionnaires and scientific experiments (primary data). Secondary data was obtained from books, websites, journals and newspaper articles. These methods were selected based on the review of the literature and because they were effective for carrying out the purpose of the research.

Effluent Discharge

To ensure accuracy, samples were collected in duplicate at three (3) different discharge points: the Hotel Front, CEO house, and Poolside and Garden. Additionally, water samples were taken from upstream north and west of the Resort to develop a background. A total of ten (10) water samples were taken from the project site for water quality analyses. Collection of water samples was done in the morning within a one-hour period (07:00hrs – 08:00hrs) to coincide with the opening of the koker on that particular day; thus, facilitating flowing water. A Garmin GPS was used to identify coordinates of the points from which samples were taken. Water quality analyses were conducted by the researcher and the Guyana Sugar Corporation (GUYSUCO) Laboratory. The average of the duplicate samples for each parameter was then calculated. Table 1 indicates the parameters that were investigated.

Table 1
Water Quality Parameters Investigated

Parameters	Units	Method/Equipment
Temperature	°C	Hach HQ40d multi meter
Phosphorus	mg/l	Spectrophotometer
COD	mg/l	Reflux method
Total Suspended Solids	mg/l	Gravimetric method
pH		Hach HQ40d multi meter
Ammonium	mg/l	Ammonia test strips
Chlorides	*mg/l*	Chlorine meter

Waste

Waste Characterisation was used to classify, analyse and determine the types of materials that were discarded or disposed of in the waste stream and in what proportions. Waste categories were established using the Solid Waste Sampling Training Guide prepared by Gershman et al. (1995). The categories were also chosen based on observation of the types of waste regularly generated. The categories were: (1) mixed paper, (2) cardboard, (3) food waste, (4) yard waste, (5) wood, (6) polystyrene (cups and boxes), (7) plastic; bags, cutlery and containers, (8) plastic bottles, (9) glass bottles and glasses, (10) aluminum cans and (11) miscellaneous waste. A three foot plastic quadrat work area was built to facilitate a work environment that kept the garbage off the ground and in a controlled area for easier handling.

A total of four waste characterisation exercises were done over a two week period. The dates chosen were March 20 and 23 and April 24 and 27, 2014; these were days scheduled before the day of garbage collection. Waste characterisation exercises were carried out in the afternoon period at around 17:00hrs because garbage was collected the following morning at 03:00hrs. These dates were also selected based on a low week (low occupancy and normal activities) and high week (high occupancy and eventful activities) so that the average amount of waste generated could be calculated. The contents of the bin were emptied out onto the plastic quadrat, then manually sorted into the various waste classification categories and weighed using a portable electronic hanging scale "OCS-20A" (50kg/20g). Sata was recorded on the data collection sheet.

Energy & Water Use

In order to quantify energy and water consumption and to ascertain practices of energy and water conservation, the following data collection methods were taken: (1) technical measurements, (2) an inventory, (3) utility bills, (4) questionnaires, and (5) observation checklists. Technical measurements were taken using a Fluke 1735 monitoring system under the guidance of GEA Energy Engineers. Data was then analysed using the Power Log 4.0.2 software. An inventory of lighting and appliances was conducted to note the watts (W) and hours (hrs) of use to calculate the daily energy consumed. This was done to determine the energy load of each device/ appliance and hence, the total energy consumed by the building when summed by using the formula:

Energy consumed (kWh) = Power (w) x Time (hrs)
Where power = voltage (v) x current (amps)

Other electrical data collected included GPL bills for the year 2013 to obtain the average monthly energy consumption, yearly energy consumption, and tariff details. GWI bills were also collected for the year 2013 to calculate yearly and average quarterly water consumption. Weekly water consumption was also calculated by reading of the water meter on the April 27 – May 4 and May 4 – 11, 2014. Metres measured the amount of water used by the facility in cubic metre (m^3). The reading was subtracted from the last reading taken on the water meter to determine the weekly consumption. These two readings were then added and divided by 2 to give an average weekly consumption.

A questionnaire was designed and administered to hotel guests to estimate their energy and water consumption and to ascertain their attitude towards the application of energy and water conservation. This tool was selected because it was inexpensive, guaranteed anonymity, reached a large number of persons, and allowed for easy collation of data. The questionnaire was semi-structured and divided into three sections: (a) Energy and water consumption, (b) Attitude towards the application of energy and water conservation, and (c) Other. Convenience sampling was used to distribute the questionnaire based on availability, access to and willingness of respondents. It was fully administered over a two week period during April and May of 2014. The population/number of guests were 43 based on the occupancy level over the two week period. A total of 30 questionnaire responses were received; this represented approximately 69.77% of the hotel guests based on the occupancy level over the two week period. Twenty-two interfaces were conducted while the remaining eight accounted for respondents who completed the questionnaire as they checked out of the hotel.

An observation checklist for energy and water use was also developed to record observations of energy efficient practices in lighting, building design, air conditioners, appliances and water use. These best practices were developed based on the Guyana Energy Agency Guidelines for an energy efficient home (2012).

Health & Safety

An observation checklist specifically for health and safety was developed to record observations regarding fire safety, food safety, swimming pool safety and chemical handling and storage practices of Aracari Resort.

Noise

Noise measurements were taken using a Shimana Sound Level meter. Noise levels were taken during the daytime and nighttime on weekdays; and weekends at predetermined points of Aracari Resort. Noise levels were measured at the eastern, western, northern and southern boundaries of Aracari Resort. Measurements were also taken 50ft away from Aracari Resort and the nearest house from Aracari Resort. Noise measurements were taken daily over a one-week period. The date, time, location, noise level, sources of noise and noise mechanisms were noted on an observation sheet. Further, interviews were conducted with community members to inquire how they were affected by the operation of Aracari Resort. Four interviews were conducted with residents from the adjacent community of Roraima Housing Scheme. Interviews were structured and conducted based on availability and willingness of residents.

Institutional arrangements for environmental management

An interview schedule was prepared to examine Aracari Resort's institutional arrangements for environmental management. The interview schedule was designed to target the staff of Aracari Resort. Interviews were conducted over the period of March 24 – 28, 2014. A total of 15 out of 25 staff were interviewed. Structured interviews were conducted to gather precise data. Interviews were conducted based on the availability and willingness of staff.

A second interview schedule was designed to target key personnel from the regulatory bodies: Environmental Protection Agency (EPA), Guyana National Bureau of Standards (GNBS) and Guyana Tourism Authority (GTA). Interviews inquired about the institutional framework for environmental management; their policies, their challenges to environmental management, implemented standards for tourism accommodation and lessons learned in relation to management of these facilities. Three unstructured interviews were conducted on March 31, and April 3 and 7, 2014 based on the availability of officers.

Environmental Management (EM) Index

An EM index was developed to further analyse data. Indicators were identified for each component and assessed based on the criteria for evaluation. The environmental components assessed included: quality of effluent, energy and water use practices, noise levels, waste management practices, health and safety practices, and institutional arrangements of Aracari Resort. The criteria for evaluation for each component were the guidelines/standards/regulations. Scores of 0-3 were awarded based on the comparison of the indicator and the criteria of evaluation. The total scores were then added for each component and categorised as good, satisfactory, or poor based on the range calculated. The formula used to derive the range for assessment for each component follows:

$Z=X-Y$
Then, $R= Z/n$
Given that $n=3$
$A=Y- (Y+R)$ $B= (Y+R) - (Y+2R)$ $C=(Y+2R) - (Y+3R)$

Where:
X-Highest possible score
Y-Lowest possible score
Z- Difference of X and Y
R= range
n= number of categories (such as good, satisfactory and poor)
A= Poor B=satisfactory C=Good

Limitations

Three (3) main limitations to the study were experienced:

- Financial restraints: the high costs of laboratory analyses did not allow testing for other water quality parameters and prevented further testing over varying periods.
- Language barriers: Hotel guests were sometimes not fluent in English. As such the researcher was unable to administer questionnaires to persons in this category.
- Limited willingness: There was some lack of willingness by hotel guests to participate in the study.

3. Results and Discussion of Findings

Assessment of the quality of effluent at Aracari Resort

Table 2
Effluent Quality at Aracari Resort

Indicators	Score
pH	3
Temperature	3
Cl^-	0
COD	1
TSS	0
NH_4^+	3
P	3
Total	13

The results showed that water quality parameters such as pH, temperature, P and NH_4 were in compliance with *GNBS (2002) effluent discharge guidelines* however, other parameters such as chlorides, COD, TSS were not in compliance with the guidelines (Table 2). Chlorides were above the acceptable limits for all three of the discharge points, possibly because of the backwash of chlorinated waters that may have reacted with ammonium from the fertiliser used in the kitchen garden and algaecide used in the swimming pool to produce nitrogen trichloride. It may also be attributed to laundry and cleaning detergents containing chloride compounds. The levels of COD were above acceptable limits for discharge points at the Hotel Front and the CEO's house. These points were noted to discharge laundry, dishwashing and cleaning detergents, and overflow of septic water and chemicals from the hair salon may have contributed to high level of organic pollutants. TSS levels were also above the acceptable limits for all discharge points. This could be explained by factors such as the overflow of septic discharge, irregular cleaning of drains and garbage dumped along this discharge point. It can also be attributed to the discharge of wastewater used for cleaning, which may contain contaminants. Nevertheless, based on the EM Index, this component scored 13 out of 21, which can be classified as satisfactory.

Assessment of Energy and Water Use

Based on the criteria used for evaluation of energy and water use (Table 3), the facility scored 66 out of 84, which can be classified as satisfactory. The range for assessment was good = >70 – 84, satisfactory = 56 – 70, and poor = 42 – <56. The facility utilised some energy efficient practices however, there were also areas identified with inefficient practices that allowed for the wastage of energy. Air- conditioners (56%) and lighting (14.5%) accounted for most of the energy consumption. Electrical bills revealed that the annual energy consumption was equivalent to approximately 255,596 kWh with an average 21,299.67kWh per month. The average energy consumed by hotel guests was found to be 32.75kWh per day. Readings from the Fluke monitoring system showed that the energy consumption per week was equivalent to 4,338.10kWh. According to the readings, the average power demand for the 7-day period was 55.6kW, the maximum demand was 83.85kW and the minimum demand was 51.9kW. The facility also attempted to reduce water consumption however, while there were decreases in water consumption at Aracari Resort, there were also areas marked for improvements. Water bills revealed that the annual water consumption was equivalent to approximately 3148m^3. Additionally, water meter readings revealed an average daily water consumption of 22.5m^3 and an average weekly water consumption of 135m^3.

The Resort used a combination of incandescent bulbs, energy saving CFLs, fluorescent lamps and mercury vapour lamps. Incandescent bulbs were used as dimmers in the restaurants to avoid energy wastage. Incandescent lights were also used in the conference room and hotel rooms. The US Department of Energy (2011) stated that CFLs used between one fifth and one quarter of the power of an equivalent incandescent bulb and last longer. Therefore, incandescent light bulbs are highly inefficient forms of lighting. Energy saving CFLs or fluorescent lights were used in some hotel rooms, the hotel hallway, outdoor lighting, the salon and spa, the gym, the bar, the kitchen, the conference room and the office. It was further observed that mercury vapour lamps were used as outdoor lighting. The GEA (2012) recommended the use of CFLs over mercury vapour lamps because they are a more energy efficient form of lighting. The facility also used sodium vapour timers, which automatically turned on lights in the nights. The researcher noted that even though the facility used energy saving bulbs, they were of high wattages.

Table 3
Energy and Water Use Practices at at Aracari Resort

Indicators	Score
Use of CFLs	2
Use of Dimmers	2
Use of Timers	2
Use of Occupancy Sensors	1
Use of motion sensors	1
Use of Incandescent bulbs	1
Use of Mercury Vapour lamps	1
Switched electrical sockets	1
Use of Fluorescent lamps	2
Turned off lights when not in use	1
Buildings decorated with light colours	2
Light colour roof	1
Maximize natural lighting	2
Maximize airflow	2
Vegetation provide cooling and shading	1
Properly insulated hotel rooms	2
Properly insulated offices	1
Use of inverter type air conditioner	2
Cleaned units	1
Air conditioners set at standard temp.	2
Use of an additional fan to circulate air	2
Use of appliances with energy star	2
Appliances w/compressors plugged in	2
Unplugged appliances not in use	1
Refrigerator doors were locked tightly	2
Use of diesel fuel in generator	2

Covered liquids and foods in fridge	2
Refrigerators were defrosted	2
Cold and hot appliances separated	2
Computers set to sleep mode	2
Air-dried Clothes	2
Full loads of laundry	2
Use of renewable energy sources	1
Rain water harvesting	2
Use of a spray nozzle w/cut-off handle	2
Leaky faucets	1
Use of low flow toilets	1
Use of aerator or electronic faucet	1
Use of aerators showerheads	2
Use of solar water heaters	1
Use of a pool cover	1
Display of awareness materials	1
Total	66/84

Although lights were focused where needed the most, it was observed that lights in areas such as the conference room and outdoors were closely spaced resulting in energy wastage. Lights were switched on in the hotel hallway during the day even though the facility made use of natural lighting through vents. It was further noted that standard rooms were equipped with one switch that controlled lights in the bedroom and washroom, which allowed for wastage of energy especially when the washroom was not in use.

The facility interiors were decorated with light colours such as white and orange to keep the buildings cooler. The facility exterior was decorated with light and pastel colours such as cream and orange with a light blue roof for natural cooling, however, GEA (2012) recommended a white roof to improve cooling of the building. Trees and vines were not present, which according to GEA (2012) can provide cooling and shading. It was noted that the facility used louver windows and air vents in the office, laundry room, and Kiskadee restaurant to maximise natural lighting and airflow during the day. Rooms with air conditioners were properly insulated except for one office room with a damaged door. Observations revealed the facility used door sweeps on hotel room doors and this helped to reduce energy consumption by not allowing air from the AC to escape. However damaged doors may allow air to escape, potentially causing the AC equipment to overwork and increase energy consumption as noted by GEA (2012). Each hotel room was equipped with 7-10 electrical sockets that do not carry switches. With reference to the GEA (2012), light sockets that carry switches allow appliances that are plugged into the outlets to be turned off with the flip of a switch and avoid wastage or flow of energy.

Observations revealed the facility used inverter-type air conditioners and window air conditioners. These were used according to room size therefore, smaller rooms used window ACs (515W) while larger rooms used inverter type ACs (3550W). However, it was observed these air conditioners comprised of dust and other particles. According to GEA (2012) this will decrease the performance and life span of the air conditioners and will increase energy consumption. Inverter air conditioners were noted to be set at a standard room temperature controlled by a switch. This was found to be very good practice as noted by the GEA Guidelines (2012) since lower temperatures would require the compressor to work more frequently and hence, increase energy consumption. Additionally, the researcher noted fans were used in the air conditioned hotel rooms; according to GEA (2012) this helps to circulate air. Additionally, observations indicated that the Resort used energy star or energy guide labels appliances such as Whirlpool washing machines and dryers and LG televisions. Interviews revealed 10 out of the 15 employees unplugged devices when not in use. It was also observed that computers were set automatically to sleep mode which according to GEA (2012) kept the equipment cooler and prolonged their life. However, it was observed that televisions and AC were kept plugged in hotel rooms. This should be plugged out when not in use because according to GEA (2012), appliances have an idle power that contributes to increased energy consumption. The only way to ensure zero power consumption is to completely unplug the device (GEA, 2012).

It was observed that towels and sheets were air dried. Interviews with housekeeping staff revealed that washing machine and dryers were only used during full loads of laundry. It was observed that the refrigerator doors were locked tightly and kept plugged in. This was recognized as a good practice by GEA (2012) because compressors work harder each time the appliance is plugged in. The GEA (2012) further stated that improperly sealed doors would result in the accumulation of frost and the loss of energy. The loss of cool air and inflow of warm air would result in the compressor working excessively and result in the consumption of more energy (GEA, 2012). Refrigerators were also positioned in the coolest possible environment and away from the stove. It was also noted that liquids were covered and foods were wrapped in the refrigerators. This was another excellent practice recognised by GEA (2012), as uncovered foods release moisture and would make the compressors work harder. Interviews with kitchen staff revealed refrigerators were also defrosted twice monthly. The GEA (2012) recommends defrosting refrigerators to avoid frost buildup which decreases energy efficiency of the unit. Diesel fuels were used in the generator instead of gasoline, which according to Geoffrey (1981) is more efficient because it contains more usable energy than gasoline.

Interviews with maintenance staff revealed that approximately 10,000 gallons of water was harvested in a metal tank. This water was used for the swimming pool and maintenance of the kitchen garden. Additionally, the facility relied on the water supply from GWI for cooking, washing, cleaning and for use by hotel guests. Observations revealed that the facility does not use aerator or electronic faucets that were recommended by GEA (2012) to minimise use of water. Further observations indicated that the facility also does not use low flow toilets that use less water. However, aerator showerheads were used for a smooth and continuous flow of water. According to GWI (2013), the aerator adds air and spreads the water stream into many little droplets that volumises water, avoids wastage and decreases consumption. Furthermore, observations revealed a shut-off nozzle hose was used to water the kitchen garden and avoid water wastage and continuous flow. Washing machines were operated only with full loads. According to GWI (2013), a full load is the most efficient way to wash clothes and reduce water consumption. Observation and interviews revealed that the Resort used gas water heaters, which required changing every 2-3 months depending on occupancy instead of solar water heaters. GEA

(2012) recommends solar water heaters because they consume a renewable source of energy, so are more efficient than gas water heaters.

Assessment of Noise Levels

The facility scored 34 out of 36 which can be classified as good, based on the criteria for evaluation for noise levels (good = >24 – 36, satisfactory = 12 – 24, and poor = 0 – <12). Noise levels produced by the Resort were in compliance with daytime limits of 75 dB based on GNBS (2010). However, noise levels exceeded their residential nighttime limits of 60dB from Friday to Sunday due to an increase in patrons at the Resort, more social activities and additional speakers in use on weekends. Nearby residents confirmed that they were affected Friday, Saturday, and Sunday evenings by the music produced from Aracari Resort. The interview with the poolside manager revealed that the disparity in noise levels on weekends was due to the use of four speakers in comparison to one speaker from Monday to Thursday. Additionally the music set was located in a semi-enclosed auditorium. It was also noted that on weekends the music set was turned off at approximately 00:00hrs and turned on at approximately 11:00am. The other sources of noise were from the poolside pump, generator, and water pump. The maintenance staff indicated that the generator operated only during power failure. The poolside pump operated for approximately 8hrs daily while the water pump operated for 1-2hrs daily. However, these equipment were enclosed so they did not affect noise levels.

Assessment of Solid Waste Management

Based on the criteria used for evaluation for waste management, the facility scored 11 out of 16 which can be classified as satisfactory (Table 4). The range for assessment *was* good = >13 – 16, satisfactory = 11 – 13, and poor = 8 – <11. Solid waste management was found to be inadequate on days of planned events at the resort. It was observed that there was a presence of litter that affected the facility's aesthetics. There was notable accumulation of garbage in the first (Hotel Front) and third (Poolside & Garden) discharge points mainly consisting of plastics and styrofoam boxes. Sand was also found lodged in the drain adjacent to the gym and at the first discharge point. However, other points of the drainage system were found to be garbage-free because those drains were grilled. Further observations revealed that the hotel was cleaned daily, thus there was no rubbish or redundant equipment lying inside the facility. Nevertheless, outside of the facility rubbish and redundant equipment such as broken chairs, a sand mixer, and styrofoam boxes could be seen near the kitchen garden. There was no evidence of garbage burning on site.

Table 4
Waste Management Practices at Aracari Resort

Indicators	Score
Litter	1
Grease trap	2
Overflowed bins	1
Reuse of waste materials	1
Separation of Waste	1
Visible Garbage Receptacles	1
Bins in hotel rooms	2
Septic tank installed with a filter bed	2
Total	11/16

Additionally, interviews with hotel staff revealed that garbage was disposed twice weekly by Puran's Brothers Disposal Inc. who also provided garbage receptacles both within and outside the facility. Despite the provision of these bins, the main garbage bin, which had a capacity of approximately 1100L, overflowed during events such as wedding ceremonies and parties. Garbage receptacles were not covered and were not located at visible and convenient locations in accordance with the environmental permit. Bins in the poolside auditorium were located in the kitchen and behind the bar. Garbage such as plastics and styrofoam boxes were seen at the garbage receptacle. The five highest categories of waste found in Aracari Resort's waste stream were glass bottles and glasses (54%), food waste (12%), yard waste (8%), plastic bottles (7%) and mixed paper (6%). Therefore, these categories provided opportunities for waste reduction initiatives.

There was also the presence of five well maintained septic systems which were installed with a filter bed for further treatment in accordance with the environmental permit. According to the CEO, septic tanks were cleaned three times since the resort began operations. Additionally, a grease trap was located behind the Kiskadee Restaurant and this collected grease from the main drainage outlets of both restaurants.

Assessment of Health & Safety Practices

Based on the criteria used for evaluation for health and safety practices, the facility scored 50 out of 54 which can be classified as good (Table 5). The range for assessment was good = >45 – 54, satisfactory = 36 – 45, and poor = 27 – <36. In summary, the facility implemented fire safety, swimming pool safety, food safety, and chemical handling and storage measures. However, the facility was lacking in some areas and recommendations are made to address these issues.

Table 5
Health and Safety Practices at Aracari Resort

Indicator	Score
Fire extinguishers placed 30m apart	2
Smoke detectors	2
Hose reels	2
Alarm systems	2
Fire-buckets	2
Servicing of Fire extinguishers every year	1
Evacuation exits	2
Directional Arrows	2
Food Handlers Certificate	2
Hairnets	2
Aprons	2
Warning signs on pool safety	2
First Aid Kit	2
Steps and bars for easy access	2
Lifeguards	1
Separate pools/ section for children	2
Demarcation of pools	2
Disinfection of swimming pool	2
Water quality of swimming pool	2

Showers and washrooms poolside	2
Non-slip surfaces of poolside	2
Emergency Signage well displayed	2
Use of gloves by salon staff	2
Use of gloves when handling diesel	1
Use of gloves when handling pesticides	1
Use of glove when handling chemicals	2
Safe storage of flammables/combustibles	2
Total	50/54

It was observed that while fire extinguishers were present on site, they were absent in the salon and spa, office and lobby; however, there were other types of firefighting equipment present in these areas such as smoke detectors. Fire extinguishers were in working order, however, they had not been serviced since 2011. This was not in accordance with GFS guidelines, which specified that fire extinguishers should be serviced every year. The GFS guidelines indicated that fire extinguishers should be placed about 30m apart. Measurements proved that these fire extinguishers were adequately spaced at 26m apart and therefore in accordance with GFS guidelines. Other firefighting equipment such as hose reel, alarm system and smoke detectors appeared in working order. It was observed that smoke detectors were also present in larger rooms such as the deluxe and executive rooms. There were two evacuation exits on each floor of the hotel and there were directional arrows leading to these exits in accordance with the GFS guidelines. Additionally, there were notices displayed on each floor indicating the fire emergency response plan to hotel guests. This was found to be in accordance with GTA Regulation (2008), which specified signs should be displayed at convenient locations indicating how to obtain emergency assistance and procedures to be followed in the event of a natural or man-made disaster.

It was observed that kitchen staff wore hairnets and aprons at all times which was in accordance with the OHS Act (1997). Additionally, interviews revealed that all cooks held a valid Food Handler's licence. Kitchens were maintained in a clean and sanitary condition and meals were prepared on order.

The questionnaire revealed that hotel guests were unhappy about the mosquitoes and stray dogs at the poolside and auditorium/restaurant. Management stated that the Resort was sprayed every 3 months by Rid-O-Pes however; the mosquitoes could be due to uncovered garbage receptacles and stagnant water in the clogged drainage system. These findings resonate with that of George *et al.* (2007) which reported that the majority (60.3%) of tourism accommodations stated that mosquitoes were their major cause for concern, even though 35% either had a private company or members of staff who would spray the facility on a regular basis.

Interviews revealed that chemicals were received in drums and bags and stored onsite. It was observed that chemicals were stored in the generator room, storage room, and in the salon and spa. These rooms were located in separate buildings, except for the salon and spa which was located in Hotel Building 2. The generator room was located off premises while the storage room was located on the ground floor of the conference room and Macaw Restaurant. These rooms were observed to be maintained in a relatively good condition with daily inspection by Salon and General Manager for any spillage and leakage of chemicals. The proprietor stated there had never been an incident or accident (e.g. spills, fires, injuries) involving these materials. Fuel retaining structures were built separately for the storage of flammable and combustible liquids such as diesel and were kept off site. Diesel was stored in 400gal metal barrels, which was acceptable based on the EPA Environmental Guidelines for Transportation, Storage and Occupational Handling of Chemical/Industrial Hazardous Waste (2011). All containers were adequately labelled with contents in accordance with the EPA (2011). It was further observed that chemical containers were closed when not in use in compliance with the EPA (2011) Environmental Guidelines. Employees were observed wearing protective gloves when cleaning and handling chemicals in the hair salon and spa, however, it was noted that the gardener and maintenance staff failed to wear protective devices when handling toxic and chemicals such as diesel, pesticide, and insecticide. The EPA Environmental Guidelines (2011) specified personal protective devices shall be worn by employees handling chemicals.

Institutional Arrangements for Environmental Management

Based on the criteria used for evaluation of institutional arrangements, the facility scored 8 out of 30 which can be classified as poor (see Table 6). The range for assessment was good = >20 – 30, satisfactory = 10 – 20, and poor = 0 – <10.

Table 6
Institutional Arrangements at Aracari Resort

Indicators	Score
Environmental Policy	1
Knowledge of Policy	0
Visibility of Policy	0
Monitoring and enforcement capacity	0
Submission of Monitoring reports	0
Environmental records are kept	0
Monitoring of environmental impacts	1
Environmental impact training	0
Health and Safety Committee	0
Monitoring Equipment	1
Health and Safety Training	1
Awareness of environmental permit	0
Implementation of emergency protocols	1
Employee awareness of emergency protocols	1
Implementation of EMP	2
Total	8/30

Interviews with the agencies and CEO revealed that the EPA permit and GTA license expired in 2011 and 2013, respectively. The CEO stated that an Environmental Management Plan (EMP) was submitted to the EPA in 2005. Measures including solid and liquid waste measures for environmental management outlined in the approved EMP were implemented. Interviews with

EPA officials revealed that monitoring reports were not submitted to EPA. Further, interviews with the CEO revealed environmental records were not well kept. The CEO also added that this was the facility's first environmental audit since it began operations in 2008. According to EPA officials, the resort was last visited in May, 2010 because of noise nuisance complaints from community members. The EPA officials stated the facility failed to comply with the noise conditions of the permit. Additionally, interviews with the CEO revealed that a beauty salon and spa was added to the facility in June 2010. In respect of these updates to the operation, interviews also revelaed that the company did not approach the EPA. This goes against the terms and conditions of the permit, which stated:

> The holder of the permit shall not construct, alter, expand or replace any plant, structure, equipment, apparatus, mechanism or thing that may discharge or from which may be discharged a contaminant into any part of the environment in accordance with this Permit. (Environmental Permit, 2005, p. 1)

The Aracari Resort has an environmental policy which states, "Aracari Resort shall conduct its work and operations with due regard to the need to maintain safe conditions and minimise or eliminate any acts which may be damaging to the environment (EMP, 2005, p. 1)." Based on the interviews, 100% of employees were not aware of the existence of the environmental policy. Observations revealed that it was not posted in strategic locations throughout the Resort. The employees interviewed were unaware of the terms and conditions of the environmental permit or any formal training in respect of environmental impacts. It was found that 9 of the 15 employees interviewed participated in a two-day international training session by GTA in hotel management, customer service, culinary skills, bartending, and first-aid. The CEO indicated that environmental issues had not yet been incorporated as part of employee training. The CEO also indicated that there was no environmental officer or any other person with responsibility for environmental issues at the resort.

Conclusion and Recommendations

The environmental audit revealed satisfactory performance regarding the quality of effluent, energy and water use, waste, and noise. The health and safety performance of the resort was classified as good while the compliance with institutional arrangements for environmental management was deemed poor. The overall performance of the resort was therefore satisfactory. The management of the resort however, needs to work on improving areas of deficiency, especially compliance with the guidelines and procedures in their environmental management plan and permit.

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