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Adoption of Environmental Management Practices in the Hotel Industry in Sri Lanka

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ECONOMICS & THE ENVIRONMENT

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Contents

Abstract

Environmental management has not received the attention that it deserves in the case of the hotel industry in Sri Lanka although sustainable growth in the industry requires consideration of such practices. Our study assesses the adoption of good environmental management practices in the Sri Lankan hotel industry, focusing on energy, water, solid waste and waste water management. The study is based on data from 78 registered hotels in the Western Province of Sri Lanka. We obtained primary data on the environmental management practices using a pretested structured questionnaire. In addition to the cross-sectional data, we collected panel data on electricity consumption from these hotels for 2009–2013. The results show that the highest number of practices, 3.7 on average, adopted by hotels is in energy management. The average number of water management practices is 2.6. Low adoption rates are observed for waste water and solid waste management practices. The results from Poisson and Probit regression models show that the hotel characteristics and customer characteristics are significant determinants of the adoption of good practices with large hotels, chain-affiliated hotels and classified hotels more likely to adopt them. Analysis of electricity consumption shows that the occupancy rate and involvement of the hotels in environment management projects lead to a reduction in electricity consumption. From a policy perspective, small hotels, independent hotels, and unclassified hotels need to be motivated to adopt good environmental management practices through training, capacity building and financial support.

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1. Introduction

The end of the civil war in May 2009 has seen a revival in the tourism industry in Sri Lanka. While the South Asian region showed an annual growth rate of 4 percent in international tourist arrivals, Sri Lanka recorded a double digit growth of 18 percent in 2015 for a sixth straight year (UNWTO, 2016). Tourist arrivals in Sri Lanka have increased by almost four times, from 0.45 to 1.8 million, between 2009 and 2015 (SLTDA, 2015). The World Travel Market Industry Reports for 2011, 2012, and 2013 have identified Sri Lanka as one of the five emerging travel and tourism powerhouses in the world (World Travel Market, 2013).

In order to reap the benefits of the tourism industry boom, the government of Sri Lanka has designed a tourism development strategy which has set a target of 4 million tourists annually by 2020 (SLTDA, 2011). It has also put in place several initiatives to cater to the inevitable demand for hotel accommodation that would be generated by the targeted number of tourists via investments in new accommodations as well as expansion of existing accommodation facilities. However, it is not very clear whether the focus on numerical targets is accompanied by attention to the environmental sustainability aspects of the industry.

The accommodation sector is highly reliant on two natural resources, namely, water and energy for all its operations. It also generates waste. In the case of Sri Lanka, the hospitality industry ranks as the most energy intensive, there by facing high energy costs. In a report identifying good practice guidelines on environmental management for Sri Lankan hoteliers, Miththapala (2011) estimated that the energy costs constitute 18 percent of the total operational costs of the hotels. Research has also found that water consumption per guest in a hotel can be around three times that of a person staying at home (Barberán *et al*. 2013). The increasing number of tourist arrivals therefore only increases the already high amounts of energy and water consumption while generating higher amounts of waste. Considering both the economic and environmental factors, it is thus important that hotels undertake investments in efficient energy and water management practices and effective waste management approaches.

Adoption of good environmental management practices promotes sustainable utilization of water and energy resources while proper waste management minimizes the potential negative impacts on the environment. Although improving energy efficiency has been a key concern in many economic sectors of the country, not much attention has been paid to the monitoring of water consumption by the industrial sector. According to Miththapala (2011), however, there is potential to save 20 percent of the current energy and water consumption levels and to reduce waste generation by 20 percent if the hotel industry were to adopt good management practices. Better environmental management practices would also result in reduced operational costs. Given current global concern with environmental sustainability, such practices would undoubtedly enhance the reputation of the hotels leading there by to increased consumer demand.

Existing literature on the environmental management practices of firms shows that interest in environmental protection in the corporate sector has shifted gradually towards a proactive approach to environment with internal motivations and changes in corporate culture and management practices (Henriques and Sadorsky, 2003; Blackman, 2007; Khanna and Speir, 2007). The present study focuses on the proactive measures adopted by

the hotel industry in Sri Lanka with regard to environmental management. Though there are regulations in place requiring environmental impact assessments of new hotel projects, there are no such regulations in place for the mandatory adoption of environmental management practices with regard to energy, water and waste in the hotel industry, making such adoption thus purely voluntary. Our study examines what motivates hotels to adopt environmental management practices and the internal and external factors that affect such adoption.

The literature indicates that three main factors determine a firm's motivation to adopt environmentally-friendly practices: namely, innovation characteristics, organizational characteristics and external environmental characteristics (Le *et al*., 2006). Segarra-Oña *et al*. (2012) have shown that the size of the hotel and the organizational characteristics influence whether a positive correlation obtains between the ISO 14001 certification of hotels and their revenue. A study by Gil *et al*. (2001), based on the Spanish hotel industry, measures the impact of selected hotel characteristics, such as age of facilities, size, and chain affiliation, on environmental performance, the tested variables of which are important to our study. Hotel chains adopt standardized practices among the individual hotels that come within their purview, which may include environmental management practices. This gives chain-affiliated hotels an advantage over independent hotels, among which are: training on environmental protection techniques, methods and activities; opportunities to be included in programs or activities that are already operational or that are known to be useful; technical advice on how to start up such activities; and easy access to more ecological markets (Gil *et al*., 2001). Studies have also found the manager's characteristics and customers' characteristics to be a significant determinant of environmental management (Hojat *et al*., 2010). Dief and Font (2010) have shown that a manager's personal values and organizational competitiveness explain the particular environmental management practices in place, which would ultimately lead to more visible financial returns. In his study based in Costa Rica, Rivera (2002) incorporates what he terms 'green customers'.

A number of other studies have attempted to come up with indicators or proxy variables to measure the environmental performance of hotels. Mamingi *et al*. (2008) take into consideration environmental news featuring the firms in the print media as a factor that changes the environmental performance of firms. The receipt of environmental awards is an indicator used by Klassen and McLaughlin (1996) in gauging the impact of environmental management on a firm's performance. In contrast, Aragon-Correa (1998) uses indicators such as the sponsorship of events focusing on the environment, periodic natural environmental audits, residue recycling, etc. in explaining a firm's environmental orientation. Given the relevance of such criteria in the Sri Lankan context, in addition to the adoption of environmental management practices, our study takes into account the receipt of environmental awards and certifications as a measure of the environmental performance of Sri Lankan hotels under study.

Among the environmental management practices, sustainable use of energy would be of great interest to firms because it leads to a reduction in the cost of energy in both the short- and long-run. Thus, in addition to analyzing the adoption of environmental management practices and measures using the cross-sectional data discussed above, we analyze panel data on electricity consumption and investigate the impact of the involvement of the hotels in environment management projects on electricity consumption. In Sri Lanka, an initiative at the national level to promote environmental management practices in the hotel sector has been the Greening Sri Lanka Hotels (GSLH) Project, a European-funded project under the Switch Asia Program, which was administered by the Ceylon Chamber of Commerce[1]. The evaluation of the impact of the project on the electricity consumption of hotels that were involved provides valuable insights to policy makers on formulating policies and strategies that would promote sustainable tourism.

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[1] The project was designed to enhance the environmental performance of Sri Lankan hotels through improvement of energy, water and waste management systems, reduce the cost of operations, and increase the market acceptance of Sri Lankan hotels by promoting them as low carbon foot print green hotels. Both registered and unregistered hotels had the opporrnity to get involved with the project voluntarily. The project not only created awareness on sustainability among hotels all over Sri Lanka by providing consultation and technical inputs to identify areas for improvement and to quantify the savings, it also provided work force training and resource management interventions. Approximately 358 hotels in Sri Lanka have benefited through

In the context of Sri Lanka, there has not been any comprehensive study conducted to assess the adoption of good environmental management practices in the accommodation sector and to examine the factors affecting such adoption. Given the fact that the Sri Lankan tourism industry is showing a significant revival following the end of civil war, such study becomes a prioritized policy research need in order to ensure the environmental sustainability of the industry. The research is timely as the Sri Lankan government is in the process of expanding the tourism industry and hotel accommodation in collaboration with an enthusiastic private sector.

The study will assess environmental management practices in hotels in Sri Lanka and investigate the factors affecting the adoption of good environmental management practices. The specific research questions that the study intends to answer are: (a) what is the level of adoption of water, energy and waste management practices by hotels in Sri Lanka ? (b) What are the factors determining the adoption of water, energy and waste management practices in the hotels in Sri Lanka ? The study shows that hotel and customer characteristics play a significant role in the adoption of good environmental management practices by hotels. Among hotel characteristics determining the adoption of good practices are the number of employees per room and the age, classification, chain affiliation, size category and location of the hotel. Additionally,the purpose of visit and origins of customers also have a significant impact in this regard. The study also finds that the involvement of the hotels in environment management projects leads to a reduction in electricity consumption per guest night.

2. Data

The study is based on primary and secondary data collected from hotels in the Western Province registered with the Sri Lanka Tourism Development Authority (SLTDA). The categorization of tourism accommodation units of the SLTDA includes hotels, guest houses, bed and breakfast units, restaurants, boutique villas, and establishments that offer water sports. We selected tourist hotels for the present study as they are operated on a larger scale compared to the other categories and, given the scale of operations, the consumption of energy and water as well as waste generation of this category of accommodations would be comparatively higher when compared with other accommodation unit categories.

The Western Province is selected as the study area as it has the highest number of registered tourist hotels at the provincial level in Sri Lanka. There are three districts in the Western Province, namely Colombo, Gampaha and Kalutara (Figure 1), which have 110 hotels in all according to the list of registered hotels obtained from the SLTDA. However, we found that 16 of the listed hotels were not functioning during the period of the survey, which therefore were removed from the sample. Of the 16 hotels, five were being refurbished, six could neither be contacted nor located by the researchers, and two had been acquired by other hotels in the sample. The list also included two duplicate sets of hotels while one hotel, though registered as a hotel, was identified to be a residence unit. Of the 94 hotels thus available for the survey, only 78 participated in the survey, as 16 hotels declined the request due either to their busy schedules or inability to obtain permission from the management. The survey response rate as a result was 83 percent.

We collected primary data for the study from the hotels using a structured questionnaire (see Appendix A). The questionnaire included questions on basic hotel information, details of the officer responsible for environmental management, environmental management of the hotel in general, details on energy, water and waste management, involvement in relevant environment-related programs, environmental certifications/awards, impacts of adopting environmental management practices, constraints associated with adopting environmental management practices, and motives for adoption.

The questionnaire was pre-tested and fine-tuned based on interviews with key experts in the tourism, energy, waste and water sectors of Sri Lanka. The study did not adopt an e-mail survey to collect data as the responses of the hotels to an email survey might depend on the environmental consciousness of the hotels, resulting in sample bias. Furthermore, previous studies by Dief and Font (2010) and Garay and Font (2011) have shown rather low rates of response to email surveys. Moreover, given that the population of registered hotels is comparatively low in the

present instance, a low response rate could also result in a small sample which is not adequate for an econometric analysis. Hence, the study attempted to carry out face-to face interviews with all the hotels in the sample to collect information. The respondents to the questionnaires were the officers in charge of environmental management (energy, water and waste) of the hotel.

We undertook the survey of the 78 hotels in the sample between August 2013 and March 2014. The process of data collection involved several steps. In the first round, we contacted the hotels in order to identify the officer responsible for environmental management and to collect his or her contact details. In the second round, the identified officers were contacted in order to explain the purpose of the survey, after which formal request letters were sent. Once appointments were granted, trained enumerators visited the hotels to conduct face-to-face interviews. In the case of most hotels, the same hotel had to be visited more than once as the respondents were not in a position to give their records on energy, water, waste and other environmental performance indicators during the first visit.

In addition to the cross-sectional data, we collected panel data on electricity consumption[2] from the selected hotels for five years from 2009 to 2013. The panel data set included data on electricity consumption, occupancy level, and involvement in the environmental management project described below. Occupancy refers to the percentage of rooms occupied by guests out of the total number of rooms. Only 49 hotels out of the 78 were able to provide electricity consumption and occupancy data for at least one year. In the case of some hotels, though electricity consumption data were provided, approval was not granted by the senior management to the respondents to reveal occupancy-level data. Only 30 hotels were registered with the Greening Sri Lanka Hotels Project. Hence, the number of data points from a surveyed hotel varied between 1 and 5 depending on data availability. Thus, the panel is unbalanced since all the hotels in the sample did not provide data for all the years. The total number of observations for the panel data analysis is 128.

3. Model and Estimation Methods

3.1 Model

This section discusses a conceptual model to examine the factors that influence adoption of different environmental management practices by hotels. We assume that hotels are profit maximizers and that they adopt environmental practices only if their expected long-term profits with adoption (π^A) is higher than their expected profit without adoption of environmental practices (π^N). Expected long-term profits are called *latent* variables since they are not observed, and we assume that they depend linearly on a number of observable characteristics (X):

$$\pi^A = X\beta^A + \varepsilon^A \qquad\qquad (1)$$

$$\pi^N = X\beta^N + \varepsilon^N \qquad\qquad (2)$$

where β^A and β^N are the unknown parameters, and ε^A and ε^N are error terms. We observe the decision of the firm to adopt environmental practices or not and assume that adoption occurs under the following condition:

$$\text{Firm adopts if } \pi^A > \pi^N \qquad\qquad (3)$$

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[2] During the survey, it was found that a majority of hotels do not have water consumption data. Many hotels obtain ground water at zero price as a result of which data on extraction volume is not often maintained by the hotels. This constrained the assessment on water consumption. Also, maintenance of waste generation data was very poor, thus waste generation levels could not be considered in the assessment. Electricity consumption was the most convenient data to obtain, as it is recorded in the bills. However, hotels do not maintain proper records on other energy sources such as firewood, gas etc. Thus, panel data analysis for energy consumption assessment was limited to electricity consumption only.

This can be equivalently written as

Firm adopts if $X\beta + \varepsilon > 0$ (4)

where $\beta = \beta^A - \beta^N$ and $\varepsilon = \varepsilon^A - \varepsilon^N$. This can be written in probabilities as:

Prob (adoption) = Prob$(X\beta + \varepsilon > 0)$ (5)

Thus, the adoption of environmental management practices depends on the different characteristics pertaining to the hotel (X).

3.2   Adoption of environmental management practices

The study examines the present status of the hotel sector in relation to environmental management and identifies the factors that determine the level of adoption of good practices. The level of adoption is measured as the number of practices adopted under each category, namely, energy, water and waste management. Waste management is considered under two broad categories, namely, solid waste management and waste water management. The study does not focus on pollution-related aspects. Nor does it include variables relating to environmental compliance, such as fines and penalties, warnings by environmental regulators, etc. The study focuses instead on assessing hotel-level efforts relating to voluntary compliance with environmental good practices.

Approaches to measure the environmental orientation of firms vary depending on their ability to explain actual environmental management practices and their practical feasibility. The current study analyzes multiple measures of environmental management. These include: (i) environmental management practices in energy, water and waste management and (ii) other environmental management measures.

3.2.1   Energy, water and waste management practices

Key informant interviews and secondary information sources were used to identify the specific common practices under energy, water and waste management which are currently being adopted by the hotels.

Energy Management Practices

Energy-saving management practices include use of energy-efficient lighting methods, solar power, key switches, efficient air conditioners, biomass boilers, LED TV, and light timers. The contribution of each practice towards energy savings depends on the intensity of adoption. For instance, savings due to energy-efficient lighting is dependent on the percentage of energy efficient bulbs used out of the total number of bulbs used in a particular hotel. On the other hand, in the case of practices such as key switches, they undoubtedly contribute to energy savings.

Water Management Practices

Water-saving management practices include dual flush toilets, linen and towel reuse, low flow showers and taps, use of treated waste water for watering the garden, rain water harvesting and sensors in toilets. Some of the water management practices need the involvement of the customers to save the amount of water consumed. For instance, correct handling of dual flush toilets and linen and towel re-use can only be undertaken with the customer's involvement. However, other water management practices, such as low flow showers and taps, re-use of treated waste water and sensors in toilets definitely lead to water savings.

Waste Management

Waste management is analyzed under two categories, namely, waste water management and solid waste management for the following reasons. Firstly, we found that approaches to the management of waste water and solid waste were different from one hotel to another. Secondly, the adoption of waste water management practices were found to be less common when compared with solid waste management.

Solid Waste Management: With regard to solid waste management, over 65 percent of the hotels' waste is collected by the municipal council. However, this paper only considers sustainable solid waste management practices. Hence, giving out waste to the municipal council or private collectors to be dumped at garbage sites was not taken into consideration in analyzing the adoption of good solid waste management practices. The sustainable solid waste management practices assessed by the study include composting, recycling, solid waste segregation, 3R policy (reduce, re-use and recycle), and animal feed, the practices listed being not mutually exclusive always. For instance, the 3R policy includes recycling practice.

Waste Water Management: Only good waste water management practices were considered in the econometric model as in the case of solid waste management. Accordingly, waste water treatment and biogas production are the two practices which are analyzed through the model. Hence, septic tanks and discharging to the municipal drainage system were not taken into account in the econometric model.

3.2.2 Other environmental management measures

The key informant interviews revealed that most hotels do not maintain proper databases in regard to energy, water and waste management. Therefore, we identified other environmental approaches or proxy variables to measure the environmental management practices of the hotels since the selection of suitable outcome variables that better explain the environmental orientation of the hotels is crucial in gauging the interest in and success of Sri Lankan hotels in sustainable environment strategies. This study uses five proxy variables to measure the level of environmental orientation of the hotels.

The first indicator of environmental performance is the maintenance of monthly records in relation to environmental management. Maintenance of proper records on a regular basis provides the opportunity to assess the degree of consumption of energy and water resources as well as generation of waste. Proper records also allow the monitoring process. Therefore, the presence or absence of a record gives some idea of the hotel's interest in energy and water consumption and waste generation. Secondly, the study uses the receipt of relevant environmental awards, certifications and other forms of recognition in relation to water, energy and waste management. The third proxy variable considered by the study is the presence of an Environmental Management System (EMS) at the hotel, which can be considered as an indicator although it does not provide a comprehensive picture of the environmental orientation of the hotels. The fourth proxy variable is implementation of an environmental policy in the hotel, which is another indicator of a hotel's motivation for better environmental management. The final variable is the involvement of the hotel in a sustainable environmental management program or project which too goes some way towards signaling the environmental orientation of the hotel.

3.2.3 Econometric models and estimation methods

The discussion above shows that a number of different practices can be listed under each category. We found it difficult to give a rank to each individual practice since there are no comprehensive estimates on their contributions towards resource use efficiency. Thus, in analyzing the determinants of adoption of energy, water management practices, waste water management practices, and other measures, we counted the number of practices separately for each category (energy, water, waste water, and others) and used the count data model. Following the model developed above, the Poisson regression model (Greene, 2012) can be specified as:

$$\text{Prob} (Y = y_i \mid X_i) = \frac{e^{-\lambda_i} \lambda_i^{y_i}}{y_i!} \qquad (6)$$

where y_i is the number of management practices (0, 1, 2,....) adopted by hotel i, and λ_i is the parameter representing both the mean and variance of y_i. The most common specification for λ_i is as follows:

$$E(y_i \mid X_i) = \lambda_i = e^{X_i \beta} \qquad (7)$$

where X_i denotes independent variables. They include hotel characteristics, responsible officer's characteristics and customer characteristics.

Hotel Characteristics:

Size of the hotel is an important variable which has been found to be a significant determinant of environmental orientation in several studies (Segarra-Oña *et al*. 2012; Gil *et al*. 2001). Thus, in the case of Sri Lanka, we thought it would be interesting to find out if size is a key determinant of the adoption of environmental management practices by hotels where **size** is measured in terms of the number of rooms. For the purposes of our study, we use a standard definition of size according to which hotels having rooms more than or equal to 50 are deemed large while those below that number are deemed small. The study also hypothesizes that the number of employees could be a determinant of its environmental orientation because staff time is needed to undertake certain environmental management practices. For purposes of standardization, the number of permanent employees were divided by the number of rooms and the **number of permanent employees per room** was used in the analysis. Though our study tested seasonal and casual employees in the models, they did not become statistically significant. The number of permanent employees is thus identified as the suitable category since environmental management practices are to be undertaken as part of a hotel's day-to-day operational activities. Previous studies, including Gil *et al*. (2001), have also found the Age of the establishment to be an important variable as the environment-related behavior of a hotel can change over time. This is even more important given the number of new hotel investment projects that have appeared in Sri Lanka following the end of the Civil War in 2009. Star classification of the hotels is also considered as a possible determinant of environmental orientation in the current analysis. In order to obtain a star classification, hotels need to fulfill a set of requirements which index the quality of service. By incorporating the star classification, we intended therefore to gauge how it impacts on environmental orientation. Since differentiation among the different star classes from 1 to 5 was not easy, we included the star classification in binary form to simply denote if a hotel has obtained a star classification or not. **Chain affiliation** can also have implications for the adoption of environmental management practices as explained in section 1. We also considered **Location** of the hotel as a possible determinant of a hotel's environment orientation. In the study area, location-wise categories mainly included city hotels vs beach hotels. The inclusion was mainly to determine whether there were any differences between the two categories with regard to the adoption of environmental practices.

Characteristics of Responsible Officer:

Hojat *et al*. (2010) and Dief and Font (2010) have found manager characteristics to be of significance in relation to environmental management. We have therefore included the **number of years of experience of the officer in charge of environmental management**.

Customer Characteristics:

The present study does not involve a customer survey and therefore it cannot directly incorporate the environmental consciousness of customers in its assessment of a hotel's environmental orientation. It considers two aspects of customers for which data can be obtained from the hotel. They include the **origin of the customer** measured as a percent of foreign customers and the **purpose of the customer's visit**, whether recreational or business, measured as a percent of customers.

We used the Poisson model, specified above, for analyzing the determinants of the adoption of energy, water and waste water management practices, and other measures. In the case of solid waste management, there were some overlaps in terms of the solid waste management practices identified in the survey. For instance, as solid waste segregation is a step in composting, the assessment is not based on the number of practices adopted for waste management. Instead, the dependent variable takes the binary form to indicate whether the hotels are practicing at least one of the identified sustainable solid waste management practices. To analyze the determinants of adoption of solid waste management practices, we used the Probit model. Following the model developed above, equation (5) can be written as:

$$Prob(Y_{sw} = 1 \mid X_i) = Prob\ (\varepsilon_i > - X_i\beta) = \Phi(X_i\,\beta) \tag{8}$$

where Y_{sw}=1 if the hotel practices at least one sustainable solid waste management practice, X_i denotes a vector of the same explanatory variables defined in the above model, and $\Phi(.)$ is the standard normal probability distribution.

The above two models, i.e., the Poisson model and Probit model in equations (7) and (8), are estimated using the cross-sectional data of hotels by the maximum likelihood estimation (MLE) method with hetero scedasticity robust estimates of standard errors. The Poisson model is based on the assumption that the mean of the count dependent variable equals its variance. The negative binomial is used if the variance is greater than the mean, referred to as over-dispersion. We check this assumption using the data and the likelihood-ratio test.

3.3   Consumption of electricity

In addition to analyzing the adoption of environmental management practices using the cross-sectional data discussed above, we analyzed panel data on electricity consumption from the selected hotels for five years, 2009–2013. We adopted the panel data model because it was difficult to collect a sufficient amount of relevant cross-sectional data adequate for an econometric model from all the hotels. Further, the panel data model allows us to identify the behavior with regard to electricity consumption, over the given time period, of the same hotel. This also enables us to measure the impact, if any, of the hotel's involvement with the Greening Sri Lanka Hotels project. The objective of the analysis ultimately is to assess, using panel data, the performance of the hotel with regard to the level of the consumption of electricity against changes in occupancy level and its involvement in the project.

We used electricity consumption per guest night for a year as the dependent variable. It was calculated by dividing the total electricity consumption by the total number of guest nights in the same year. We used the average occupancy level as an independent variable to examine the degree and nature of change in electricity consumption as occupancy levels increase. We included the number of years of involvement with the Greening Sri Lanka Hotels (GSLH) project in order to assess its impact on hotel-level electricity consumption because of the support hotels receive from the project.

The model was limited to the inclusion of these variables due to the non-availability of other data over the years. However, the fixed effects control for the unobserved hotel characteristics as well as time-specific effects. The fixed effects model is specified with two-way error components:

$$EC_{it} = \gamma_1 OC + \gamma_2 IP_{it} + \alpha_i + w_t + u_{it}$$

where EC_{it} denotes the natural log of electricity consumption (in kwh) per guest night of ith hotel in year t, OC_{it} denotes the occupancy rate of ith hotel in year t (measured as a proportion of rooms occupied by guests for a year), IP_{it} denotes the number of years of involvement with the Greening Sri Lanka Hotels (GSLH) project of ith hotel in year t, γ_1 and γ_2 are unknown parameters to be estimated, α_i represents hotel-specific effects that are time-invariant, w_t denotes time-specific effects that are hotel-invariant, and u_{it} is the error term. The above panel data model was estimated using the ordinary least squares method. The hotel-specific effects and time-specific effects can be regarded as being either fixed or random. Since the data are only for a very small number of time periods (five years), which are not representative, we use fixed effects for time-specific effects while the model is estimated using year dummies. For the hotel-specific effects, we estimate the model using both fixed and random effects and compare the model using the Hausman test.

4. Results and Discussion

4.1 Descriptive statistics

Table 1 presents the descriptive statistics of the characteristics of hotels, responsible officers, and customers. Small hotels comprise roughly 40 percent of the sample while large hotels comprise the rest of the sample. The average number of rooms of the hotels in the sample is 85. While roughly 68 percent of the hotels have star ratings from one to five, the rest (32 percent) are not star-classified. The percentages of hotels under one, two, three, four and five star ratings are, respectively, 10, 9, 14, 19 and 15 percent of the total number of hotels in the sample

(see Figure 2). The size of the hotels (in terms of number of rooms) increases as the star rating increases (Figure 3). Location-wise, about 35 percent of the hotels are in cities, as shown in Table 1. The average percent of foreign customers in the hotels is 63 percent. The average percent of customers whose visit was for recreational purposes is 45 percent.

Table 2 presents the percentage of hotels adopting various management practices under energy, water and waste management practices as well as other environmental management measures. The most commonly adopted energy management practices included the use of energy efficient lighting methods (88 percent), solar power (69 percent), and key switches (60 percent). With regard to water management, around 79 percent of hotels use dual flush toilets while 56 percent of hotels encourage linen and towel reuse. The percentage of hotels possessing sewerage treatment plants is 42 percent while only 8 percent of the hotels undertake biogas production using waste water. Around 22 percent of the hotels adopt composting and recycling. With regard to other environmental measures, around 37 percent of the hotels maintain energy, water and waste records while nearly 40 percent of the hotels have environment policies. The percentage of hotels with EMS is around 28. Around 28 percent of hotels are involved in environment-related projects and programs though only 19 percent of the hotels have received relevant awards and certifications.

Table 3 presents the descriptive statistics on the number of environmental management practices and measures adopted by the hotel. The results show that the highest number of practices can be seen under energy management with the average number of energy management practices at 3.74. This could be due to the fact that savings due to the adoption of energy management practices are significant in the overall operational cost of the hotels. The fact was further confirmed during key informant interviews. The average number of practices for water management practices is 2.64. The lower numbers for the adoption of water management practices could be due to the low cost of water consumption, when compared to energy consumption. Also, as highlighted earlier, many hotels use ground water as their source and ground water consumption involves only the energy cost of extraction as it comes at a zero price. It is noteworthy however that more than 95 and 94 percent of hotels adopt at least one practice for energy and water management, respectively. The adoption of waste management practices is much lower than energy and water management practices. The average number of waste water management and solid waste management practices is at 0.54 and 0.42, respectively. When the counts of all the other environmental management measures (maintenance of monthly records in relation to environmental management, receipt of relevant environmental awards, certifications and other forms of recognition, presence of an EMS at the hotel, implementation of an environment policy in the hotel, involvement of the hotels with sustainable environmental management programs or projects) are considered, the average number of other environmental management measures per hotel is around 1.63. It shows that the adoption of other environmental management measures is more common than individual practices under water and waste management.

The histograms in Figure 4 show that energy management practices are more or less normally distributed and that most of the hotels have four energy management practices. The distribution pattern is more or less similar when it comes to water management with most hotels having three water management practices. With regard to waste water and solid waste management, there is a skewed distribution, according to which a majority of the hotels do not show even a single practice under each category.

We calculated a pair-wise correlation matrix (see Appendix B) to gauge the relationship among the number of energy, water, solid waste, waste water management practices and other environmental management measures. It showed the number of energy management practices and the number of water management practices to be positively correlated with a coefficient of 0.59, which indicates hotels adopting energy management practices to be more likely to adopt water management practices and vice versa. We also found significant correlation coefficients among all environmental management practices and measures.

4.2   Determinants of adoption of environmental management practices and measures

In this section, we present and discuss results of regressions in order to examine the factors that influence the adoption of environmental management practices and measures by the hotels. We estimate five regression models: four count data models and one Probit model. The count data models are estimated for energy, water and waste

water management practices, and for other environmental management measures. The Probit model is estimated for solid waste management practices, as discussed in Section 3.

For the count data models, we consider the Poisson and Negative binomial models. As discussed in Section 3.2.3, the Negative binomial model is used if the variance is greater than the mean, known as over-dispersion. We check this assumption using the data. As reported in Table 2, we find that the standard deviation is less than the mean for the number of energy and water management practices. For waste water and other measures, we conducted the likelihood-ratio test with the null hypothesis which shows that there is no over-dispersion. According to the test results, there is no over-dispersion as the p-value is much greater than 0.05. Thus, we estimate the count data models using Poisson regression.

Table 4 presents the marginal effects, standard errors for coefficients, and goodness of fit estimates for all the regression models. Accordingly, pseudo R2 values for energy, water, waste water, solid waste management practices and other measures are 0.09, 0.12, 0.12, 0.23, and 0.13, respectively.

The regression results show that the size of the hotel has a positive and statistically significant impact on the adoption of environmental management practices. The size category is a binary variable, where it takes the value 0 when the number of rooms in a hotel is less than 50 and takes the value 1 when the number is more than or equal to 50. The size category is statistically significant at the 5 percent level for the number of energy management practices while it is 1 percent for water management, waste water management and other environmental measures. The Poisson regression results show that the large hotels tend to adopt 0.6 more energy management practices, on average, when compared to the small hotels. This may be attributed to the fact that the energy cost becomes a considerable overlay for the large hotels given their size so that they are more likely to make an investment in energy saving. The results also show that the large hotels adopt 0.9 more water management practices, 0.5 more waste water management practices, and 1.3 more other environmental measures in comparison with small hotels. In the case of waste water management, this may be due to the fact that the establishment of proper waste water treatment plants entails a cost in the form of an initial investment, which only the large hotels can afford.

The number of employees per room is statistically significant at the 1 or 5 percent level in the models for energy, other environmental management measures, and solid waste management practices. The Poisson regression results imply that when the number of permanent employees per room increases by one person, the number of energy management practices increases by 0.35 and the number of other environmental measures by 0.2. The Probit results show that when the number of permanent employees per room increases by one person, the probability of adopting solid waste management practices increases by 12 percent. The age of the hotel is a significant determinant of environmental management practices, at the 1 percent level, for the number of energy management practices only.

The star classification of a hotel is a significant determinant of the adoption of different environmental management practices. The star classification is a binary variable, which is equal to 1 if the hotel has a star classification. The star classification is significant at 1 percent level for water management practices and at 5 percent level for other environmental measures. The results indicate that when a hotel becomes star-classified, the number of water management practices and other environmental measures tend to increase by 1.05 and 0.57, respectively. Although the existing classification system in Sri Lanka does not impose stringent requirements relating to the environmental management aspects of a hotel, we find that the probability of adoption of good environmental management practices increases when a hotel becomes a classified hotel.

The chain affiliation of a hotel is a significant determinant of the adoption of different environmental management practices. When a hotel is chain-affiliated, the number of energy management practices, water management practices, and other environmental measures tend to be higher by 0.73, 0.83, and 0.83, respectively. Though the regression models attempted to see the impact of the characteristics of the officer in charge of environmental management on a hotel's environmental orientation, this variable was not statistically significant.

Customer characteristics show a significant relationship to the adoption of energy management practices, with the percentage of foreign customers positively affecting the adoption of energy management practices at the 1 percent

significance level. This implies that when the percentage of foreign customers increases, the hotels tend to adopt more energy saving practices. This variable was not significant for water, waste and other management aspects. The percent of customers at the hotel for recreational purposes also significantly affects the tendency to adopt energy and solid waste management practices by the hotel.

The results are in line with the findings of previous studies (e.g. Gil *et al*.2001) where, too,the age of facilities, size and chain affiliation are significant determinants of the adoption of good practices. However, our study measures only voluntary efforts towards better environmental management; it does not concern itself with regulatory pressures that have been the focus of other such studies, for e.g., Khanna and Speir (2007).

4.3   Determinants of electricity consumption

The descriptive statistics given in Table 5 show that the annual average occupancy level of the hotels is around 64 percent, with an increasing trend in the occupancy rates over the period between 2009 and 2013. The Greening Sri Lanka Hotels Project commenced its activities in 2011 and wound up in 2013. Thus the maximum number of years of project involvement is 3 years. The average electricity consumption per guest night is around 59 kwh.

Table 6 presents the results of regressions for the purpose of investigating the factors that influence the electricity consumption per guest night. We used the Hausman test to determine whether to use the fixed effects or the random effects. Given that the probability value of the test is much greater than the 0.05 probability level (Table 6), there is no significant difference between the two models. Thus, the test supports the random effects model.

The regression results show that the coefficient of the occupancy rate is negative and statistically significant at the 1 percent level. This shows that the change in electricity consumption per guest night decreases with an increase in the occupancy rate. A 1 percent point increase in the occupancy rate leads to around 1 percent decrease in the electricity consumption per guest night. Given the increasing trend in tourist arrivals to Sri Lanka, the occupancy rates of hotels too are likely to go up and, in turn, such increases will likely lead to a reduction in the electricity consumption per guest night.

Interestingly, the number of years of involvement with the project shows a negative and statistically significant relationship to annual electricity consumption per guest night. Hence, an increase in years of involvement by one year reduces the average electricity consumption per guest night by around 6 percent. This is attributable to the provision of capacity building and training support by the Project as well the adoption of better management practices by the participating hotels which would result in energy savings.

5. Conclusions and Policy Recommendations

The study assessed the adoption of good environmental management practices in hotels using three measures, namely, assessment of the specific number of environmental management practices, assessment of other environmental measures, and assessment of electricity consumption.

The highest number of practices, 3.7 on average, adopted by hotels is in energy management. The average number of water management practices is2.6. Roughly 95 and 94 percent of hotels adopt at least one practice of energy and water management, respectively. We observed low adoption rates for waste water management practices and solid waste management practices. The analysis shows therefore that the hotels are more motivated to adopt good energy management practices than other environmental management practices as the energy cost constitutes a significant portion of the total operational costs.

The results show that certain hotel characteristics and customer characteristics play an important role in determining the adoption of good environmental management practices and measures. Accordingly, large hotels, chain-affiliated hotels and classified hotels are more likely to adopt good management practices. The number of permanent employees per room is also a significant determinant. Therefore, from a policy perspective, adequate attention must be paid to the problems and constraints facing small hotels in reducing operational costs and making their businesses more environmentally-oriented, which would enable them to enjoy a better

market advantage. The support for small hotels can be in the form of capacity building, raising awareness on good environment management practices and financial assistance. As the results reveal classified and chain affiliated hotels to be more environmentally-oriented than other hotels, policy makers should strive to create better awareness among independent and unclassified hotels on the advantages of adopting environmental good practice.

The assessment of consumption data reveals that both the occupancy rate and the involvement of the hotels in environment management projects lead to a reduction in electricity consumption per guest night. In fact, a year of involvement in the "Greening Sri Lanka Hotels" project reduces electricity consumption by around 6 percent on average. This shows that the hotel industry requires effective awareness creation as well as capacity building for the purpose of better environmental management

Acknowledgements

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Tables

Table 1: Descriptive statistics of characteristics of hotel, responsible officer and customers

Variable	Mean	Std. Dev.
Hotel Characteristics		
Size category(1= large hotels with number of rooms 50 or more, 0 = otherwise)	0.60	0.49
Number of permanent employees per room	1.2	0.84
Age of the hotel (years)	24.3	28.66
Star classified(1=star classified, 0 = unclassified)	0.68	0.47
Chain affiliation(1=chain affiliated, 0=independent)	0.23	0.42
City hotel (1=city hotel, 0=otherwise)	0.35	0.48
Characteristics of Responsible Officer		
Number of years in the present post	7.4	9.2
Characteristics of Hotel Customers		
Percentage of foreign customers	62.6	30.2
Percentage of local customers	32.2	27.5
Percentage of the recreation purpose customers	45.0	39.3
Percentage of all other purpose customers	55.0	39.27

Table 2: Energy, water, solid waste and waste water management practices and other measures

Management Practice (7.12)	Percentage of Hotels Adopting the Practice
Energy Management Practice	
a) Use of energy efficient lighting methods	88
a) Use of solar power	69
b) Key switches	60
c) Efficient air-conditioning	45
d) Biomass boilers	06
e) Use of LED TV	04
f) Light timers	03
Water Management Practice (8.6)	
a) Dual flush toilets	79
b) Linen and towel reuse	56
c) Low-flow shower and taps	50
d) Use of treated waste water for watering the garden	50
e) Rain water harvesting	02
f) Sensors in toilets	02
Waste Water Management Practices (9.5)	
a) Sewerage treatment plants	42
b) Septic tanks	36
c) Biogas production	08
d) Municipal drainage system	08
Solid Waste Management Practice (9.4)	
a) Composting	22
b) Recycling	22
c) Solid waste segregation	18
d) Dumping at a site	17
e) Collected by private collectors	14
f) 3R system (Reduce, Reuse, Recycle)	13
g) Animal feed (piggery)	08
Other Environmental Management Approaches	
a) Environmental records	37
b) Presence of environment policy	40
c) Presence of EMS	28
d) Involvement in relevant project	38
e) Awards and certifications	19

Table 3: Descriptive statistics of environmental management practices and measures

Variable	Number of Practices or Measures				Adoption of at least One Practice / Measures	
	Mean	Standard Deviation	Min	Max	Proportion	Standard Deviation
Energy management practices	3.74	1.86	0	9.00	0.95	0.22
Water management practices	2.62	1.44	0	7.00	0.94	0.25
Waste water management practices	0.54	0.68	0	3.00	0.45	0.50
Solid waste management practices	0.42	1.34	0	5.00	0.42	0.50
Other environmental management measures	1.63	1.77	0	1.63	0.60	0.49

Table 4: Determinants of adoption of good environmental management practices and measures

Dependent Variable	No. of Energy Management Practices	No. of Water Management Practices	No. of Waste Water Management Practices	No of Other Environmental Measures	Solid Waste Management Practices (1 if adoption of at least one practice, 0 otherwise)
Model	Poisson Model Marginal Effect	Poisson Model Marginal Effect	Poisson Model Marginal Effect	Poisson Model Marginal Effect	Probit Model Marginal Effect
Hotel Characteristics					
Size category	0.590**	0.858***	0.462***	1.263***	–0.010
	(0.295)	(0.285)	(0.145)	(0.291)	(0.118)
Number of permanent employees per room	0.353***	0.155	0.082	0.209**	0.116***
	(0.151)	(0.114)	(0.058)	(0.139)	(0.045)
Age of the hotel	0.010***	–0.002	–0.002	0.002	–0.001
	(0.039)	(0.002)	(0.002)	(0.004)	(0.002)
Star classified	0.367	1.049***	–0.124	0.565**	0.079
	(0.334)	(0.260)	(0.128)	(0.340)	(0.116)
Chain affiliation	0.726***	0.832***	0.142	0.832***	0.086
	(0.354)	(0.265)	(0.134)	(0.314)	(0.133)
City hotel	–0.537	–0.340	–0.186	0.346	–0.079
	(0.375)	(0.264)	(0.155)	(0.323)	(0.124)
Characteristics of Responsible Officer					
Years in the present post	–0.021	0.012	–0.007	0.005	0.002
	(0.236)	(0.014)	(0.009)	(0.019)	(0.007)
Customer Characteristics					
Percent of foreign customers	0.012***	0.041	0.012	0.001	0.003
	(0.0061)	(0.045)	(0.014)	(0.004)	(0.002)
% of customers for recreational purposes	0.010***	0.003	0.001	0.003	0.003***
	(0.045)	(0.003)	(0.001)	(0.004)	(0.001)
Number of observations	78	78	78	78	78
Pseudo R^2	0.09	0.12	0.12	0.23	0.13

Notes: *, ** and *** denote significance at 10%, 5% and 1%, respectively. Heteroscedasticity robust standard errors are in parentheses.

Table 5: Descriptive statistics of electricity consumption, occupancy and project involvement by year

Year	Electricity Consumption per Guest Night (kwh)		Average Annual Occupancy Rate (percentage of rooms occupied out of the total number of rooms for a given year)		Number of years of involvement with the Project	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
2009	59.80	55.45	50.11	22.66	0	0
2010	61.31	53.41	57.09	17.18	0	0
2011	61.35	49.62	64.31	18.09	0.25	0.44
2012	57.56	52.34	65.45	16.64	0.81	0.80
2013	58.00	60.45	66.40	15.82	1.20	1.35
Overall	59.21	53.09	63.55	17.66	0.62	0.93

Table 6: Determinants of electricity consumption per guest night

Variable	Fixed Effects Model	Random Effects Model
Dependent Variable: Natural Log of Electricity Consumption (in kwh) per guest night		
Independent Variables		
Average Annual Occupancy Rate	–0.010***	–0.010***
	(0.002)	(0.002)
Number of Years of Involvement with the Project	–0.062**	–0.057**
	(0.029)	(0.029)
Year Dummy 2010	–0.044	–0.042
	(0.063)	(0.062)
Year Dummy 2011	–0.011	–0.010
	(0.063)	(0.063)
Year Dummy 2012	0.053	0.051
	(0.068)	(0.068)
Year Dummy 2013	0.060	0.056
	(0.079)	(0.077)
Constant	4.193***	4.161***
	(0.090)	(0.090)
Number of Hotels (for hotel specific effects to be fixed or random)	49	49
Number of Observations	128	128
R^2 (within)	0.446	0.446
Hausman test: Chi-square statistics	0.90	
[p-value]	[0.989]	

Notes: *, ** and *** denote significance at 10%, 5% and 1%, respectively.

Figures

Figure 1: Distribution of Registered Hotels in Sri Lanka
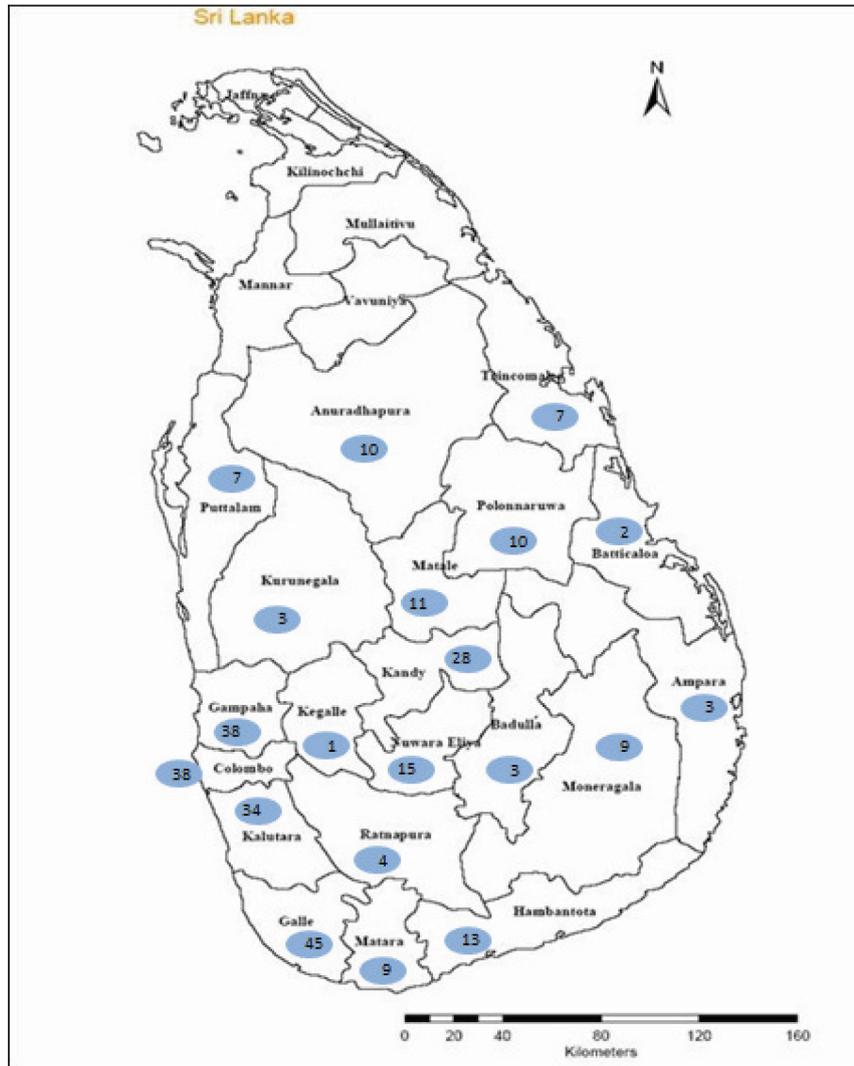
Figure 2: Percentage of Hotels by Star Classification
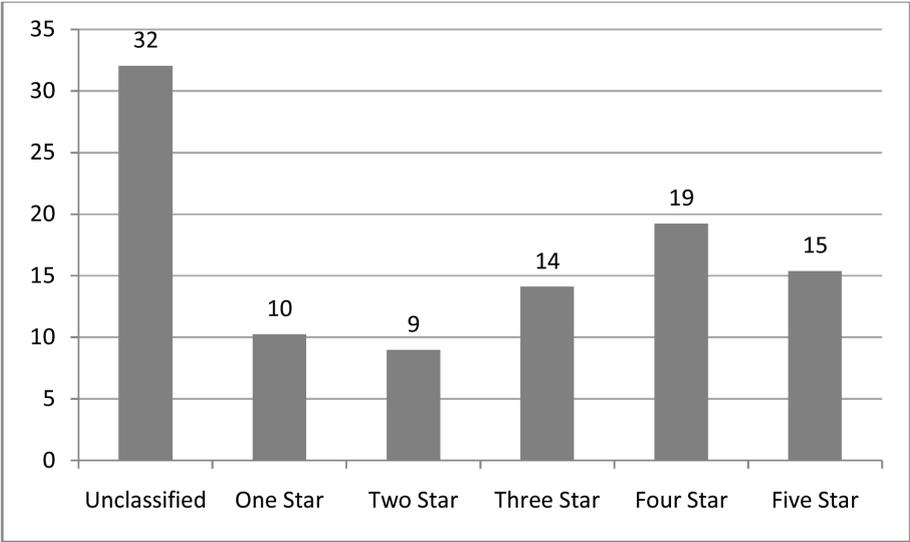
Figure 3: Average Number of Rooms by Star Classification
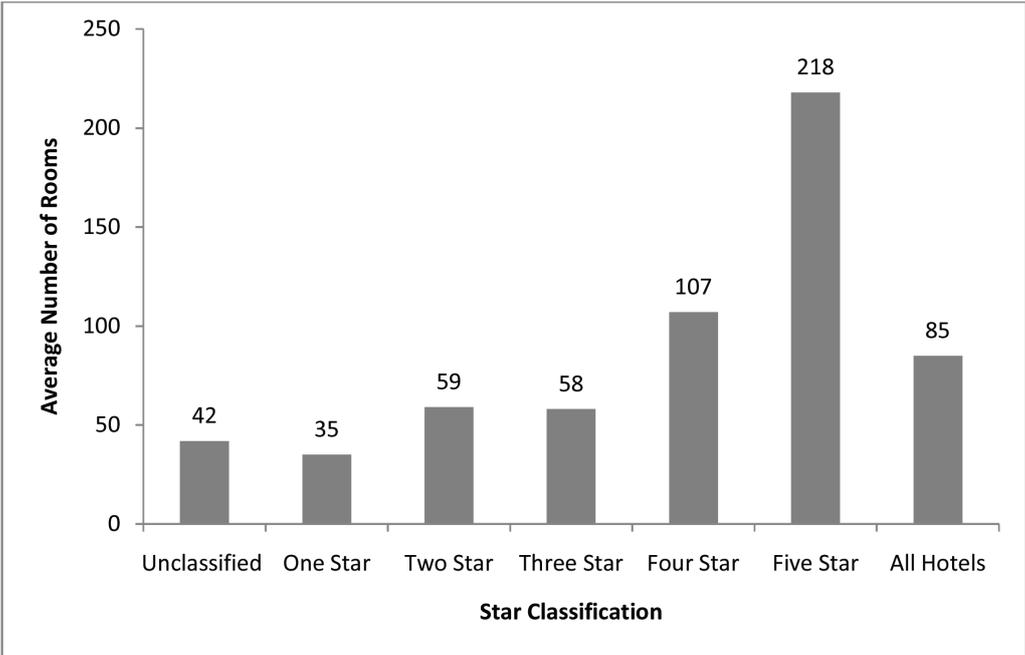
Figure 4: Histograms of Number of Managment Practices and Measures
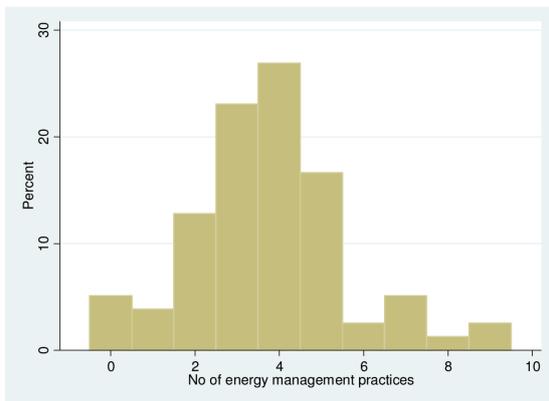
(a) Energy Management
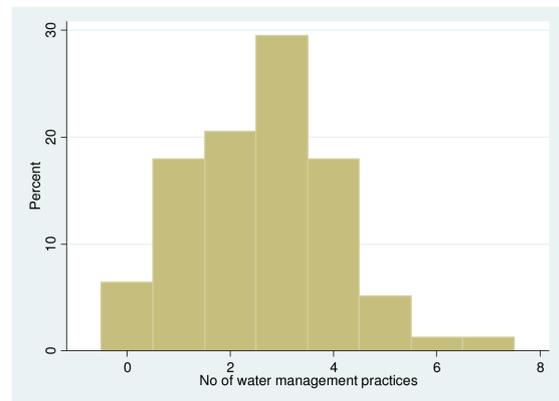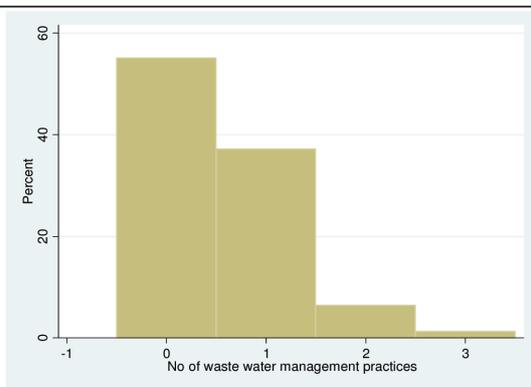
(b) Water Management

(c) Waste WaterManagement
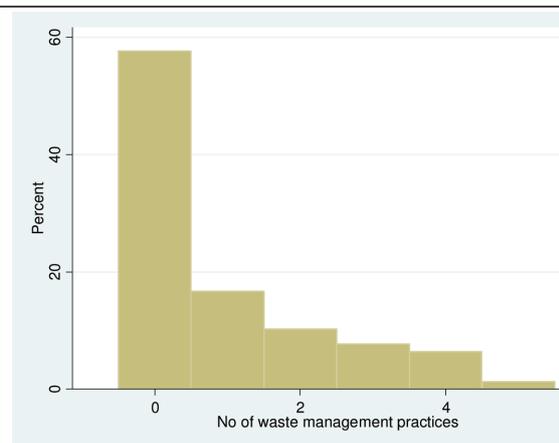
(d) Solid Waste Management
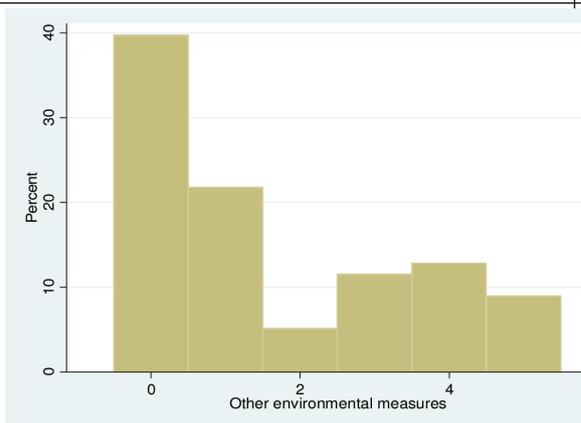
(e) Other Environmental Management Measures

Appendices

Appendix A: Survey Questionnaire

Environmental Management Practices in the Hotel Sector in Sri Lanka

Survey Questionnaire

Institute of Policy Studies of Sri Lanka

2013-2014

Hotel Identification Number	

Name of the Hotel	

Name of the Enumerator	

Date	

Section 1: Respondent information

1.1	Name of the primary respondent	

1.2	Position	

1.3	Year of birth	

1.4	Gender	1. Male	2. Female

1.5	Level of Education	a) G.C.E Ordinary Level or Equivalent
		b) G.C.E Advance Level or Equivalent
		c) Degree
		d) Postgraduate Degree/Diploma

1.6	Professional Qualifications	a)
		b)
		c)
		d)

1.7	Please mention your service periods as given below (number of years)	
	I. In the present post	
	II. In this hotel	
	III. In the tourism industry	
	IV. Service outside the industry	

1.8	Other Respondents	
	(a) Name	**(b) Designation**
	1.	
	2.	
	3.	

Section 2: Basic Information of Hotel

2.1	Year of Establishment	

2.2	What are the number of rooms under each room category	
	(1) Room category	(2) Number
	a)	
	b)	
	c)	
	d)	
	e)	
	f) Total	

2.3	Which of the following best describes your hotel		
	2.3.1 Star Classification	2.3.2 Location based classification	2.3.3 Luxury Level
	1. One star	1. City hotel	1. Luxury hotel
	2. Two star	2. Beach hotel	2. Mid-range hotel
	3. Three star	3. Other (please specify):	3. Budget hotel
	4. Four star		4.Other (please specify): ....
	5. Five star		
	6. Unclassified		

2.4	What is the type of property ownership of the hotel at present?	1. Locally owned and operated		
		2. Internationally owned and operated		
		3. Part of an international chain or a group		
		4. Part of locally operated chain or a group		
		5. Other: Please specify:\n\n............................		
2.5	Name the owner of the hotel (Name of the owner/group/ chain)			

| 2.6 | Has there been any change/s in the ownership of the hotel in the past? | 1. Yes | 2. No |
| | If yes, go to Q2.7; If no, go to Q2.8 | | |

2.7	If yes, please provide the details of the previous ownerships		
	(a) Year of change	(b) Previous ownership (please use the codes given in the Q)\n\n1. Locally owned and operated\n\n2. Internationally owned and operated\n\n3. Part of an international chain or a group\n\n4. Part of locally operated chain or a group\n\n5. Other: please specify	(c) Name of previous owner\n\n(Name of the owner/group/ chain)
	1.		
	2.		
	3.		
	4.		

2.8	What are the numbers of permanent, casual and seasonal employees of your hotel ?	
	a) Permanent	
	b) Casual	
	c) Seasonal	
	d) Total	

2.9	What are the numbers of employees in terms of skill categories ?	
	a) Managerial Scientific and Professional	
	b) Technical Clerical Allied and Supervisory	
	c) Manual and Operative	
	d) Total	

| 2.10 | Was your hotel built according to a green concept ? | 1. Yes | 2. No |
| | If yes, go to Q2.11\n\nIf no, go to Section 3 | | |

| 2.11 | If yes, name the concept. | |

Section 3: Profile of customers

3.1	What are the percentages of local and foreign customers of your hotel ?	
	1. Local customers	
	2. Foreign customers	

3.2	From which countries do your customers come from? Please mention the names of the countries and the percentages of customers in descending order. (please provide at least a rough estimate, in case proper data are not available)	
	(a) Country	(b) Percentage
	1.	
	2.	
	3.	
	4.	
	5.	

3.3	Please provide the percentages of the customers by purpose (please provide at least a rough estimate, in case proper data are not available)	
	(a) Purpose	(b) Percentage
	1. Business	
	2. Recreation	
	3. Religious/cultural	
	4. Other: please specify:	

Section 4: Structure and facilities of the hotel

4.1	What is the total site area of the hotel (in square meters)	

4.2	What is the total built-up area of the hotel (in square meters)	

4.3	What is the total air-conditioned area of the hotel (in square meters)	

4.4	What is the total roof area of the hotel (in square meters)	

4.5	What is the number of storeys of the hotel	

4.6	What is the number of buildings of the hotel	

4.7	Facility	a) Number	b) Area (m²)
	I. Restaurants		
	II. Banquet halls		
	III. Swimming pools		
	IV. Pool bar		
	V. Kitchens		
	VI. Spa		
	VII. Golf club		
	VIII. Administrative/service areas		
	IX.		
	X.		

4.8	Please provide details of the restaurants		
	(a) Name of the restaurant	**(b) Seating capacity**	**(c) Average occupancy**
	1.		
	2.		
	3.		
	4.		
	5.		

4.9	Please provide details of the banquet halls		
	(a) Name of the banquet hall	**(b) Seating capacity**	**(c) Average occupancy**
	1.		
	2.		
	3.		
	4.		
	5.		
	6.		
	7.		
	8.		

4.10	Please provide details of the swimming pools			
	(a) Name of the swimming pool	**(b) Water capacity (cubic meters)**	**(c) Time interval of changing water (days)**	**(d) Time interval of adding chemicals (days)**
	1.			
	2.			
	3.			
	4.			
	5.			

Section 5: Environmental management in the hotel

5.1	Do you have an environmental policy in your hotel?	1. Yes	2. No
	If yes, please request a copy of the environmental policy -> Go to Q5.2 *If no, go to Section 6*		

5.2	If yes, when did you formulate the policy? (year)	

5.3	If yes, what motivated your hotel to formulate an environmental policy ?	1. Better management of environmental resources
		2. Marketing advantage
		3. Influence of competitors
		4.
		5.

5.4	What are the components of the environmental policy
	1. Energy management
	2. Water management
	3. Waste management
	4. Sound management
	5. Carbon emission reduction
	6. Other: Please specify:………………………………………………..

5.5	How do you rate the proper implementation of the policy	1. Implemented very well
		2. Implemented to a certain degree
		3. Only some components are implemented
		4. Very limited implementation
		5. Not implemented at all

5.6	What are the benefits of having an environmental policy ?	1. Improved environmental performance
		2. Easy management of energy, water and waste
		3. Cost reduction
		4. Marketing advantage
		5. Other: *please specify*………………………………………….……

Section 6: Environmental Management Systems (EMS)

6.1	Are you familiar with Environmental Management Systems?	1. Yes	2. No

6.2	Do you have an Environmental Management System (EMS) in your hotel ?	1. Yes	2. No
	If yes, please request a copy of the EMS document -> Go to Q6.3 *If no, go to Q6.8*		

6.3	If yes, when did you start implementing the EMS? (year)	

6.4	If yes, what motivated your hotel to adopt EMS ?	1. Better management of environmental resources
		2. Marketing advantage
		3. Influence of competitors
		4.
		5.

6.5	How do you rate the proper implementation of the EMS ?	1. Implemented very well
		2. Implemented to a certain degree
		3. Only some components are implemented
		4. Very limited implementation
		5. Not implemented at all

6.6	What are the components of the EMS
	1. Energy management
	2. Water management
	3. Waste management
	4.
	5.

6.7	What are the benefits of having an EMS ?	1. Improved environmental performance
		2. Easy management of energy, water and waste
		3. Cost reduction
		4. Marketing advantage
		5.

6.8	Do you maintain monthly records on energy, water consumption and waste generation in the hotel		
	a) Energy	1. Yes	2. No
	b) Water	1. Yes	2. No
	c) Waste	1. Yes	2. No

6.9	If yes, when did you start maintaining the monthly records? (Year)	
	a) Energy	
	b) Water	
	c) Waste	

6.10	What are the reasons for maintaining the records (can give multiple answers)
	1. Useful in managing the resources
	2. Influence of a project
	3. Required for green certification
	4. Other: *please specify*:

6.11	**If the hotel does not maintain records**, what are the reasons for not maintaining the records (can give multiple answers)
	1. Lack of staff for maintaining data
	2. Lack of skills and training on maintaining data
	3. Not of specific use
	4. Other: please specify:

6.12	Do you allocate funds for environmental management in the hotel ?		
	a) Energy management	1. Yes	2. No
	b) Water management	1. Yes	2. No
	c) Waste management	1. Yes	2. No

6.13	If yes, please provide the amount of funds allocated per year (LKR/year)	
	a) Energy management	
	b) Water management	
	c) Waste management	

6.14	To what extend have each of the following groups influenced the hotel to improve environmental management of the hotel					
	Group	**1. No influence**	**2. Little influence**	**3. Some influence**	**4. Strong influence**	**5. Very strong influence**
	a) Customers	1	2	3	4	5
	b) Competitors	1	2	3	4	5
	c) Corporate management	1	2	3	4	5
	d) Share holders	1	2	3	4	5
	e) Employees	1	2	3	4	5
	f) Trade associations	1	2	3	4	5
	g) Local community	1	2	3	4	5
	h) Environmental organizations	1	2	3	4	5
	i) Sustainable tourism projects	1	2	3	4	5
	j) Government	1	2	3	4	5
	k) Media	1	2	3	4	5

Section 7: Energy Management

7.1	What are the main sources of energy used in your hotel ?						
	Activity/place	1. Electricity	2. Fuel wood	3. LPG	4. Solar	5. Biogas	6. Other
	a) Air conditioning	1	2	3	4	5	6
	b) Hot water	1	2	3	4	5	6
	c) Steam	1	2	3	4	5	6
	d) Lighting	1	2	3	4	5	6
	e) Laundry	1	2	3	4	5	6
	f) Kitchen	1	2	3	4	5	6
	g) Street/garden lighting	1	2	3	4	5	6
	h)	1	2	3	4	5	6

7.2	Where does most of your energy consumption take place?	

7.3	What is the total energy consumption of your hotel in 2009, 2010, 2011, 2012 and 2013 ?						
	Energy Source	Unit	(1) 2013	(2) 2012	(3) 2011	(4) 2010	(5) 2009
	a) Electricity						
	b) Fuel wood						
	c) LPG						
	d) Solar						
	e) Biogas						
	f) Other						

7.4	What is the total energy cost of your hotel in 2009, 2010, 2011, 2012 and 2013 ?					
	Energy Source	(1) 2013	(2) 2012	(3) 2011	(4) 2010	(5) 2009
	g) Electricity					
	h) Fuel wood					
	i) LPG					
	j) Solar					
	k) Biogas					
	l) Other					
	m) Total					

7.5	Provide details of monthly energy consumption in the format given in the Table 1	

7.6	Do you have an energy policy in your hotel ?	1. Yes	2. No
	If yes, please request a copy of the policy		

7.7	Are there renewable energy sources in the hotel			
	a) Solar systems	1. Yes	2. No	*If yes, go to Q7.8*
	b) Bio-gas	1. Yes	2. No	*If yes, go to Q7.9*
	c) Wind power	1. Yes	2. No	*If yes, go to Q7.10*

7.8	If your hotel has solar systems, please provide the details of the solar system/s					
	1. Type of solar system	2. Year of establishment	3. Total installed capacity of the system (kW)	4. Is the system functional?	5. If functional, specify the actual savings because of this system per year	
					a) In energy units (kwh)	b) In monetary terms (LKR)
	1.			1. Yes 2. No		
	2.			1. Yes 2. No		
	3.			1. Yes 2. No		

7.9	If your hotel has biogas, please provide the details of the solar system/s						
	1. Biogas system	2. Year of establishment	3. Total installed capacity of the system (kW)	4. Is the system functional ?		5. If functional, specify the actual savings because of this system per year	
						a) In energy units (kwh)	b) In monetary terms (LKR)
	1.			1. Yes	2. No		
	2.			1. Yes	2. No		
	3.			1. Yes	2. No		

7.10	If your hotel has wind power system please provide the details						
	1. Wind power system	2. Year of establishment	3. Total installed capacity of the system (kW)	4. Is the system functional ?		5. If functional, specify the actual savings because of this system per year	
						a) In energy units (kwh)	b) In monetary terms (LKR)
	1.			3. Yes	4. No		
	2.			3. Yes	4. No		

7.11	What are the constraints for not adopting renewable energy sources			
	Constraint	1. Solar	2. Biogas	3. Wind
	a) Lack of awareness	1	2	3
	b) Lack of knowledge and expertise	1	2	3
	c) Initial cost is too high	1	2	3
	d) Difficulty in obtaining loans	1	2	3
	e) Space constraints	1	2	3
	f) Negative impacts on the view of the hotel	1	2	3
	g) Maintenance problems	1	2	3
	h) Not economical	1	2	3
	i) Other (please specify):	1	2	3

7.12	What are the energy management/conservation methods adopted by your hotel (*Can give multiple answers*)
	h) Use of energy efficient lighting methods
	i) Efficient air-conditioning
	j) Use of solar water heaters
	k) Biomass boilers
	l) Key switches
	m)
	n)

7.13	What are the motives for the adoption of energy conservation methods ?
	a) Cost reduction
	b) Marketing advantage
	c)
	d)
	e)
	f)

7.14	How many employees have you assigned for energy management activities in the hotel ?			
	a) Designation	b) Number of employees	c) Percentage of time in energy management	d) Salary (LKR/ month)
	I.			
	II.			
	III.			
	IV.			
	V.			

Section 8: Water Management

8.1	What are the sources of water used by your hotel
	a) Ground water
	b) National Water Supply and Drainage Board
	c)
	d)
	e)
	f)

8.2	What are the average monthly water consumption levels at the following places of your hotel (in cubic meters - m^3)?	
	a) Guest rooms	
	b) Kitchen	
	c) Public washrooms	
	d) Laundry	
	e) Swimming pools	
	f) Garden	
	g)	
	h)	

8.3	What is the total water consumption of your hotel in 2009, 2010, 2011, 2012 and 2013? (in cubic meters (m^3))	
	a) 2013	
	b) 2012	
	c) 2011	
	d) 2010	
	e) 2009	

8.4	What is the total cost of the water usage of your hotel in 2009, 2010, 2011, 2012 and 2013 ? (LKR)	
	a) 2013	
	b) 2012	
	c) 2011	
	d) 2010	
	e) 2009	

8.5	Please provide details of monthly water consumption in the format given in the Table 2

8.6	What are the water conservation/management methods adopted by your hotel
	g) Dual flush toilets
	h) Low flow shower and taps
	i) Linen and towel reuse
	j) Use of treated waste water for watering the garden
	k)
	l)

8.7	What are the motives for the adoption of water conservation methods?
	g) Cost reduction
	h) Marketing advantage
	a)
	b)
	c)
	d)

8.8	How many employees have you assigned for water management activities in the hotel ?			
	a) Designation	b) Number of employees	c) Percentage of time in energy management	d) Salary (LKR/month)
	1.			
	2.			
	3.			
	4.			
	5.			

Section 9: Waste Management

9.1	What is the average quantity of solid waste generated on a daily basis in the hotel ?		Unit	

9.2	What is the average amount of waste water generated on a daily basis in the hotel?		Unit	

9.3	What are the total quantities of solid waste and waste water generated in 2011 and 2012 in the hotel ?					
	Type of waste	(1) 2013	(2) 2012	(3) 2011	(4) 2012	(5) 2012
	a) Solid waste					
	b) Waste Water					

9.4	What are the solid waste management methods adopted by your hotel ?
	h) Dumping at a site
	i) Collected by the municipal council
	j) Solid waste segregation
	k) Composting
	l) Recycling
	m) 3R system (Reduce, Reuse, Recycle)
	n)

9.5	What are the waste water management methods adopted by your hotel ?
	a) Septic tanks
	b) Sewerage treatment plants
	c) Biogas production
	d)
	e)
	f)

9.6	Please provide details of monthly solid waste and waste water generation in the format given in Table 3

9.7	How many employees have you assigned for waste management activities in the hotel ?			
	a) Designation	b) Number of employees	c) Percentage of time in energy management	d) Salary (LKR/ month)
	I.			
	II.			
	III.			
	IV.			
	V.			

Section 10: Performance of the Hotel

10.1	How do you see the average room occupancy of the hotel at present, when compared to that during the period of the War ?
	a) Significant improvement
	b) Slight improvement
	c) Same
	d) No improvement
	e) Decline in room occupancy

10.2	How do you rate the revenue through the events held in the banquet halls, when compared to that during the period of War?
	a) Significant improvement
	b) Slight improvement
	c) Same
	d) No improvement
	e) Decline in revenue

10.3	What are the average monthly occupancy rates of your hotel in 2011 and 2012 ?
	a) 2013
	b) 2012
	c) 2011
	d) 2010
	e) 2009

10.4	What is the total revenue from rooms of your hotel in 2011 and 2012? (LKR)	
	a) 2011	
	b) 2012	

10.5	What are the total revenues from banquet halls of your hotel in 2011 and 2012? (LKR)	
	a) 2011	
	b) 2012	

10.6	Provide details of monthly occupancy details and revenue in the format given in Table 4

10.7	Provide details of events and revenue in the format given in Table 5

Section 11: Involvement in Sustainable Tourism Projects/Programs

11.1	Have you got involved in any project/program promoting environmental sustainability of your hotel ?	1. Yes	2. No

11.2	If yes, please provide the details of them					
	1. Name of the project/Program	2. Areas covered			Types of benefits received 1. Financial support 2. Training 3. Provision of knowledge and awareness 4. Other: please specify	4.How do you rate the usefulness of the projects/programs to improve environmental management in your hotel? 1. Very useful 2. Useful 3. Not of much use 4. No impact at all
		i.Energy	ii.Water	iii.Waste		
	1.					
	2.					
	3.					
	4.					

Section 12: Environmental Certifications / Awards / Labels

12.1	Have you obtained any certification/label/award related to sustainable environmental management in your hotel?	1. Yes	2. No

12.2	Award/ certifications/labels	1. Year	2. Coverage		
			a) Energy	b) Water	c) Waste
	a) National Green Awards				
	b) Green Globe				
	c) Earth Check				
	d) Ecotel				
	e) LEED				
	f) The EPA Energy Star				
	g) ISO 14001				
	h)				

Section 13: Benefits and Constrains of Adopting Environmental Management Practices

13.1	In addition to improving environmental performance, how important are the following factors in motivating your hotel to implement environmental management practices?				
	Factor	1. Not important	2. Somewhat important	3. Important	4. Very important
	a) Market advantage	1	2	3	4
	b) Reduction of costs	1	2	3	4
	c)	1	2	3	4
	d)	1	2	3	4
	e)	1	2	3	4
	f)	1	2	3	4
	g)	1	2	3	4
	h)	1	2	3	4
	i)	1	2	3	4

13.2	What are the constraints in terms of adopting environmental management strategies?
	a) Lack of will and commitment of the top management
	b) Environmental management is not a top priority
	c) Perception that costs outweigh the benefits
	d) Insufficient human resources
	e) Lack of financial resources
	f) Difficulties in obtaining loans
	g) Lack of technical knowhow
	h) Constraints due to the structure of the hotel
	i) Space constraints
	j) Other: *please specify*:………………………..

Section 14: Refurbishments

14.1	Is your hotel undergoing any refurbishments at present?	1. Yes	2. No

14.2	What is the amount of money invested in refurbishment? (LKR)	

14.3	Where do funds come from?	

14.4	Will there be a change in the size of the hotel after refurbishment?	1. Yes	2. No
14.5	If yes, what will be the number of rooms after refurbishment?		

14.6	Will there be a change in the structure of the hotel after refurbishment?	1. Yes	2. No

14.7	What will be the major structural changes in the hotel after refurbishment?
	1.
	2.
	3.
	4.
	5.

14.8	Are you planning to introduce any 'green' concept to the hotel through this refurbishment process?	1. Yes	2. No

14.9	What will be the new additions/changes to energy management/conservation in the hotel after the refurbishment ?
	1.
	2.
	3.
	4.
	5.
14.10	What will be the new additions/changes to water management/conservation in the hotel after the refurbishment ?
	1.
	2.
	3.
	4.
	5.
14.11	What will be the new additions/changes to waste management in the hotel after the refurbishment?
	1.
	2.
	3.
	4.
	5.
Remarks	

Appendix B: Correlation Coefficients for Number of Management Practices

	Energy Management Practices	Water Management Practices	Solid Waste Management Practices	Waste Water Management Practices	Other Environmental Management Measures
Energy management practices	1.0000				
Water Management Practices	0.5862***	1.0000			
	(0.0000)				
Solid Waste Management Practices	0.4694***	0.4106***	1.0000		
	(0.0000)	(0.0002)			
Waste Water Management Practices	0.3269***	0.3471***	0.2615***	1.0000	
	(0.004)	(0.0018)	(0.0768)		
Other Environmental Management Measures	0.4899***	0.5166***	0.4457***	0.2551***	1.000
	(0.0000)	(0.0000)	(0.0000)	(0.0242)	