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# Assessment of the energy efficiency practices in the hotel industry

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## Abstract

The study evaluates the application of the energy efficiency practices in the hotel industry. It explores the determinants of energy consumption in three and four-star hotels in Macedonia. The research investigates the impacts of several elementary components of the energy practices, by measuring the current level of influence. The data were obtained by an online survey conducted among managers and processed by descriptive statistics and factor analysis. The results point out some alarming facts, i.e. these types of hotels lack policies on general environmental issues. The managers pose some high awareness of the benefits produced by this concept, which is due to the highly positive perception of the environmental protection. The lack of subsidies at local and national level is identified as the most profound constraint along with the technical limits of the hotel facilities and costs increase. The study recommends some new approaches in challenging the hotel industry to decrease the operating costs and suggests that managers are in need for better understanding of the importance of the energy efficiency practices.

**Key words:** energy efficiency, perception, environmental practices, hotels.

## 1. Introduction

Hotels are one of the most energy intensive facilities with correspondingly high energy costs. They are ranked among top five in terms of energy consumption in the tertiary building sector (minor only to food services and sales, health care and certain types of offices) [1]. So, there is an inevitable relationship between the hotel industry development and the environmental and energy efficiency impacts. The main intention of the management is to focus its activities to reduce the operating costs

by introducing new sources of energy that preserve the environment and create an eco-friendly establishment. Due to the fact that clean and well preserved environment is one of the main preconditions for high quality service generally in the hospitality-oriented facility, the dependent nature of the hotel development may be concluded.

The energy efficient practices are extremely important to hotels since they provide savings of 20 percent or more due to the fact that among all operating costs, those of energy utilities are the ones of the most controllable [2]. Cutting the operating costs increases the profit and allows improved competitiveness on tourism market. The introduction of the energy efficient practices allows enriched guests comfort, increased hotel aesthetic value, reduced maintenance system failures and so forth. These practices enable the environment protection by reducing carbon dioxide, methane, nitrous oxide and other harmful emissions that provoke global-warming and climate changes.

This study is designed to provide information on the extent how the hotel industry meets the energy efficiency practices in terms of the current level of involvement. It investigates the general nature of the environmental protection, solid waste management, resource usage and protection, as well as the benefits and constraints in applying the energy efficient practices. The intention is to pose some valuable findings in the hotel management for cutting the operational costs based on saving energy. In addition, the research aims to increase the energy efficiency and environmental awareness among the hoteliers and other tourism oriented parties.

For that purpose, the paper covers several sections. After the introductory part, Section 2 provides a brief overview on literature addressing the environmental performance and energy practices, as well as benefits for the hotel industry. Section 3 encompasses the methodology and research frame-



work. Section 4 presents the main analysis, discussion and findings, while the future challenges and recommendations are noted in the last section.

## 2. Literature review

There is a large body of literature arguing the necessity of always having in mind the environment, thus introducing environmental protection programs in the hotel activities in terms of reducing the energy consumption, recycling, composting food scraps etc. [3], [4], [5], [6] and [7]. Even more, some academics put an accent on developing a management system that is in compliance with the legislation, education and economic development policy [8] and [9], while others point to the environmental planning and management [10], [11], [12] and [13]. Moreover, some critical research note that the mode of hotel industry production, distribution and consumption contribute to environmental crises [14] and [15].

Furthermore, it is noted that hotels have noticed the benefits from improving the environmental performance generally by reducing the operational costs [16] and [17] and sustaining the competitive advantage, the increased demand for eco-friendly hotels etc. [18], [19] and [20]. Additionally, various regulations serve as primary instruments of action for hotels in the line of fulfilling obligatory regulations for health and safety, environmental taxes, building standards etc. This leads to the necessity of developing industry benchmarking [21], [22] and [23].

## 3. Methodology and data

The study took qualitative and quantitative methods. The qualitative approach included literature review on main publications of the interest addressing the application of energy efficiency practices in other countries. Furthermore, a number of publications of interest were carefully followed, along with websites for updates on environmental protection initiatives.

The quantitative approach covered data obtained from an online survey. The data were collected via questionnaires administered by managers of three and four -star hotels in Macedonia. To determine the sampling frame, a list of these hotel types was provided by the Sector of Tourism within the Min-

istry of Economy upon which, a total of 111 three and four-star hotels were identified. A pilot test was launched in order to check the validity of the questionnaire. The survey was conducted during May-June 2015 with a follow-up reminder to each non-respondent approximately each week. The overall response rate was 31.5% (23.9% of all three-star hotels, and 43.2% of all four -star hotels). Such low response rate was expected due to the lack of personal contact and less binding [24], [25] and [26].

The questions were structured in five sections whereas some included two-choice questions, while in others a five-point Likert scale was applied (1 = very low; 5 = very strong). General hotel data are addressed in Section I, while 32 indicators were selected among the indicators that are already applied and discussed by [27], [28] and [29]. The indicators were structured in four sections. Section II comprised of 12 questions defining the environment policy. Section III incorporated 9 questions for measuring indicators for solid waste management. Section IV included 11 questions for assessing the usage and savings of resources. Section V covered 10 questions in the line of measuring the managerial perception on benefits and constraints for applying the energy consumption concept in the hotels.

The statistical evaluation of obtained data was performed by the software package SPSS. The novelty of this study is that the Likert items are observed as ordinal and not interval data, which is a less applied approach in tourism research [30], [31], [32], [33], [34], [35] and [36]. In terms of multivariate data analysis method, we used the Categorical Principal Component Analysis (CAT-PCA) technique to reduce the number of variables, while the reliability of the components is checked by the Cronbach Alpha. The scores of three perception components were compared by Kruskal-Wallis tests. The hotels' classification, in terms of indicators for benefits and constraints for applying the energy efficiency practices, is made by establishing medians in the components scores.

## 4. Findings and discussion

The study found that generally, the surveyed three and four-star hotels have almost the same attitudes towards the investigated questions al-

though they differ in the size and number of employees. Generally, in terms of working history, they are well positioned hotels on tourism market with over 15 years of working experience. On average, the three-star hotels have nearly 10 employees and up to 50 rooms, while the four-star hotels have up to 30 employees and over 50 rooms.

The summarized results from the questions covering the section on general environmental issues are noted in Table 1. Generally, it is found that hotels do not hold a Certificate for energy efficiency, do not prepare reports on environmental protection and do not have an employee responsible for activities related to the environmental

protection. The vast majority of the hotels do not have either Eco label (66.3%), or Eco certificate (76.8%). This is not in favor of supporting the European environmental impact assessment regulation. This legislation started to develop in the 1970s and since then, many documents, action plans and standards have been established by the European Union. Besides industry, energy, transportation and agricultural sections, tourism is also introduced as a segment which must conform to the Fifth Environmental Action Program. Due to the fact that Macedonia is a candidate country for EU membership, much attention must be put to the hotels to meet the internationally set standards.

Table 1. Frequency distribution on general environmental issues (%)

Item	3-star hotels		4-star hotels		Total	
	Yes	No	Yes	No	Yes	No
Certificate for energy efficiency	37.5	62.5	52.6	47.4	45.1	<b>54.9</b>
Plan for environmental protection	53.3	46.7	73.7	26.3	<b>63.5</b>	36.5
Reports on environmental protection	26.7	73.3	31.6	68.4	29.1	<b>70.9</b>
Eco label	20.0	80.0	47.4	52.6	33.7	<b>66.3</b>
Eco certificate	20.0	80.0	26.3	73.7	23.2	<b>76.8</b>
Employee responsible for environmental protection	31.3	68.8	47.4	52.6	39.3	<b>60.7</b>
Award for environmental protection	0.0	100.0	0.0	100.0	0.0	<b>100.0</b>
Availability of information for guests	68.8	31.3	68.4	31.6	<b>68.6</b>	31.4

Table 2. Summarized key results

Component	Sub-component	Item	Loading	Mode*
I. Environmental policy (Alpha = 0.71)	Environmental protection	I <sub>1</sub> -Employees training	0.724	3
		I <sub>2</sub> -Prevention interventions	0.608	3
		I <sub>3</sub> -ISO 14000	0.554	2
		I <sub>4</sub> - Hotel's surrounding pollution	0.501	2
II. Resources (Alpha = 0.66)	Usage and savings	I <sub>5</sub> -Central control cooling/heating	0.681	5
		I <sub>6</sub> - Changing towels	0.529	5
		I <sub>7</sub> -Key-card control	0.505	4
		I <sub>8</sub> - Saving lights	0.369	4
		I <sub>9</sub> - Solar	0.306	3
III. Perception (Alpha = 0.82)	Benefits	I <sub>10</sub> - Environmental protection	0.722	4
		I <sub>11</sub> -Reduced operational costs	0.712	4
		I <sub>12</sub> - Improved image	0.679	4
		I <sub>13</sub> -Enhanced competitiveness	0.634	4
		I <sub>14</sub> -More guests	0.392	3
	Constraints	I <sub>15</sub> - Lack of subsidies	0.657	4
		I <sub>16</sub> - Cost increase	0.601	3
		I <sub>17</sub> - Technical limits	0.601	3
		I <sub>18</sub> - Not informed	0.521	3
		I <sub>19</sub> - Not interested	0.521	3

Note: \*Mode (level of influence) 2=low; 3=medium; 4=strong; 5=very strong.

Even more, none of the surveyed hotels have ever received an award related to the environmental protection although they have been working for over 15 years. However, the positive impulse is detected in the preparation of written plans for environmental protection and providing information to guests about the environment protection, which points to rather social responsibility of the hotels and the lack of energy efficiency practices.

Table 2 reports the most important summarized results i.e. only those loadings exceeding 0.5 representing the correlations between the items and components. The last column reports the most frequent response to each attitude statement. The findings suggest that in general, the management holds a positive attitude towards the energy efficiency practices. The CATPCA indicates three components accounting for 75.1% of total variance and the Cronbach Alpha coefficients are above 0.6 pointing out to acceptable reliability of each component.

Component 1, in Table 2 referred as Environmental policy, addresses the indicators for interventions and knowledge on environmental protection. The managers perceive the employees' training as the most important indicator due to the fact that employees are ideally positioned not only to identify drafts, leaks, unnecessary lightening and other signs of the energy waste, but to provide the energy efficiency advice. Yet, this determinant is assessed with medium influence on the hotel's business, so hoteliers provide limited staff environmental training. This is very disappointing when having in mind that staff training and awareness may cut hotels energy costs from 2-10% in addition to other energy efficiency measures [2: 5].

In the same line there is the finding for the prevention interventions as a factor with medium influence. Furthermore, the management claims to have very low knowledge of the environmental protection standard ISO 14000, which points to the limited environmental awareness and concern. The most surprising element is the final item in this component. It addresses the hotels' surrounding pollution resulting as the only factor with a very low influence on the hotels' business. The surveyed hotels stated to have extremely small amount of environmental pollution in the surroundings, so this factor has low impacts when

assessing the extent of activities related to the environmental protection.

Component 2, in Table 2 referred as Resources, reflects the managerial perception on the energy use and resource conservation. Due to the fact that the use of energy is a cost factor, it was expected that the hotels take measures to reduce the conventional energy sources and replace it with some renewable sources. However, the findings are alarming since they point out to extremely limited use of alternative sources of energy and new innovative approaches in saving energy consumption. The loadings for the items referring geothermal energy, bio fuel, photo-cell lighting, "smart rooms", dimming system and the use of treated water, are far below the critical values so they are missed from Table 2. The low impact of these determinants indicates that they are meaningless for the hotels' energy efficiency concept. The central cooling/heating system along with the guest demands for linen and towel changes are assessed as very strong factors of an influence on the business. The guests' awareness of energy efficiency is constantly rising by having the choice to use the same towels and linens for the duration of the stay rather than to incur the environmental costs of laundering them each day. This conservative measure is practiced by each hotel and simultaneously increases the guest satisfaction and loyalty by showing their care for energy efficiency and climate change. Similarly, hotels pay large attention to the use of energy saving systems that control every appliance in rooms and key-card control system that provides no power unless the room-key is inserted. This, along with the energy saving light bulbs, is found as a resource with strong impacts. Not surprisingly is the medium usage of the solar energy.

Component 3, in Table 2 referred as Perception, gathers the benefits and constraints in applying the energy efficiency practices. The first subcomponent identifies the benefits as the most intensive factor with strong impacts on the hotels' business. More precisely, the managers perceive the items which refer to the environmental protection, reduced operational costs, improved image and enhanced competitiveness as strong determinants, in order to introduce and sustain the energy efficiency practices. So, three and four-star hotels regard these issues as of better interest than the increase of the number of guests. The summarized

results confirm the findings as in [37], [12], [38] as well as [39] that although being aware of the importance of the energy consumption and environmental protection, yet its stewardship is not a top priority. Namely, the problem is the gap between the environmental awareness and the daily practice of the hotels. The transformation from awareness into practice is constrained by the high costs for applying the energy efficient practices. So, the second sub-component of the Perception component, identifies the main constrains by their power of limits. As expected, the lack of subsidies by the local and central government is identified as a factor with a strong influence. It is logical that the hotels will apply the energy saving methods and solid waste management only if they minimize the related expenditures. The study found that an average of 59.2% of total surveyed hotels, make waste selection. It is interesting to note that 100% of the managers responded that their hotel will select the waste only if the local government provides subsidies. This supports the market postulate for minimization of costs and maximization of profit so that for the hotel can survive. All other surveyed indicators in this subgroup (technical limitations of the hotel facility, the increase of costs, as well as the lack of information and interest) are perceived as medium influencing factors for the hotels' business.

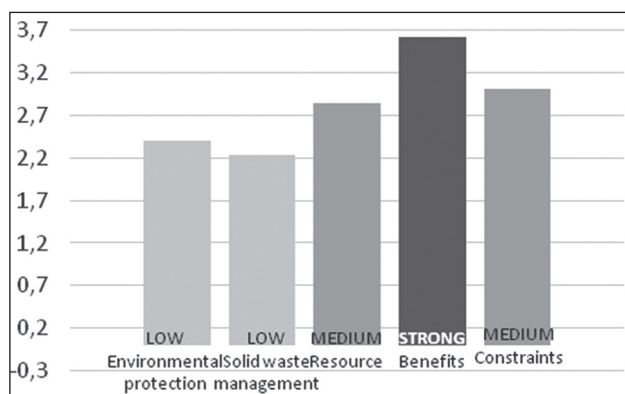


Figure 1. Managerial perception on factors of influence

Figure 1 presents the factors of influence i.e. the average value of managerial perception of three and four-star hotels. It indicates the percentages of managers ranked as having a positive perception when addressing the surveyed items. As noticeable, the managers strongly perceive only

the Benefits, while the Resources and Constraints are with a medium impact. The overall calculations on Environmental protection and Solid waste management are found to be with a low impact. In this line are the computed Kruskal-Wallis tests representing the median of each component and indicating almost an identical perception of the managers of different hotel type. Furthermore, the Mann Whitney U tests ( $p < 0.01$ ) show some statistical significance of differences between the medians. The nonparametric correlations (Spearman's  $\rho = 0.67$ ;  $p=0.000$ ) between the hotel's size and the managerial perception score (in terms of the components resulting from the CATPCA) point out to a positive correlation between the hotels and the energy efficiency practices.

## 5. Conclusion and recommendations

Hotels, on one hand, consume some substantial quantity of energy, water and other non-durable products, thus provoke some considerable environmental impacts. On the other hand, they rely on the clean nature and unpolluted environment as a core value for the hotel industry. Tourists more often abandon tourism destinations in poor environmental conditions and trace for hotels with eco label, eco certificate and certificate for energy efficiency. Consequently, the hotel industry is becoming increasingly environmentally responsible by taking care of the energy efficiency.

The study assessed the current nature of the energy efficiency practices in three and four -star hotels. It determined and discussed five types of indicators for perception of:

- Activities associated with environmental protection;
- Solid waste management;
- Resource usage and protection;
- Benefits and
- Constraints.

The study found that hotels may benefit from the environmental pro-activeness which is important for the performance and development of the tourism. Yet, among the top management there is a lack of interest regarding the energy efficiency practices. The blame is put on the restricted financial resources and high operation costs for the lim-



ited application of renewable resources. Due to the economic and socio-political problems, the hotels are often faced with existential difficulties. Hence, the environmental issues have just recently come to attention, unlike the Scandinavian countries where the environmental protection is of high importance and quality and has long received political and financial support at local and national level.

Based on the survey findings, the study recommends that managers should focus on shifting the professional ethics, developing and exerting a wide range of the energy efficient practices in the first line by introducing some renewable sources of energy. That will result in the reduction of the energy consumption. Consequently the hotels may benefit from the energy conservation measures not only by saving money, but also in ensuring comfort to the guests and staff. These kinds of measures are good investments in terms of:

- Quick low-cost or no-cost solutions, like: dimming system; HVAC settings in lobbies, offices and peripheral rooms; covering the pools and hot tubs to diminish heat loss; setting housekeeping procedures to motivate the staff; training the registration staff to book rooms in clusters etc.; or
- Longer-term solutions, like: re commissioning; an upgrade to more-efficient lighting (compact fluorescent lamps, light-emitting diode bulbs, ‘group re-lamping’ etc.); an installment of occupancy sensors; an upgrade of the chiller; the use of smart vent hoods in the kitchen; the use of efficient water heating systems; ozone and tunnel washers; heat-recovery systems; heat pumps in swimming pools; adjusting the building management system; control vending machines, etc.

The study also urges the need for applying the environmental protection as well as the energy efficient concept and more frequent penalties to the environmentally unsound concepts practiced in the hotels. Instead of being focused on some quick economic benefits, the hotels should generate some more pro-environmental attitudes among managers. This is particularly effective if hotels prepare Energy Management Plans as tools that assists them in initiating, monitoring and tracking the energy savings. These kinds of activities are

generally focused on measuring the results which cut the operating costs. It is evident that a three-fold approach must be implemented addressing:

- Technological change (to introduce and upgrade technologies that are constantly improving and becoming more efficient);
- Behavioral change (to influence the behaviors of guests and employees as well as to improve knowledge and skills); and
- Organizational change (to set up policies, procedures and practices that can assist in driving down the utility costs).

During the research, several limitations occurred which might be addressed in some future work. Namely, although the presented data are reliable, it is difficult to establish to what extent the information is representative speaking of the overall hotel industry in Macedonia, since the managerial perception of the five-star hotels is missing. The study may be enhanced by extending the sample in the line of increasing the response rate, as well as to spread the target location within other countries. However, it must be taken into consideration that the goal of the study was to identify which indicators can be overcome by hoteliers requiring minimum information input.

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