ENVIRONMENTAL MANAGEMENT IN HOTELS: SUSTAINABLE TECHNOLOGIES AND PRACTICES APPLIED IN HOTELS[1]

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Introduction

Tourism, like other Brazilian economy sectors, has presented a high growth rate in recent years. As noticed by the Brazilian Tourism Institute - EMBRATUR (2009), Brazil's position has gradually evolved in the competitive ranking of the World Tourism Organization (UNWTO) as one of the most demanded worldwide tourism destinations. The participation of the tourism sector in the Brazilian economy represents 3.7% of gross domestic product – GDP (2013). From 2003 to 2009, the sector grew 32.4% while the Brazilian economy showed growth of 24.6% (MTUR, 2013).

According to the ranking of international tourist receipts of UNWTO (2015), Brazil holds a satisfactory position registering US$ 6.8 billion in foreign tourism income in the year 2014. In the first places appear well-established destinationsin the United Statesfollowed by Spain and China.

Initiatives have been taken by companies, host destinations and the third sector to improve the quality of life of those directly impacted by tourism, as this activity is now perceived as a vector for social and environmental development, once planned according to the precepts of sustainability (Hunter, 1997; Weaver, D., 2012; Pearce et al. 2010). However, tourism, in its most diverse segments, has a vast polluting potential, especially when performed without planning and focused just on immediate economic return. Visual, noise, water and air pollution; environmental deterioration; compromising water supply, electricity and others; are some examples of negative impacts that can be generated by tourism (Zaman, K. et al. 2016; Hsieh & Kung, 2013). Thus, environmental management emerges as an appropriate control administrative tool to avoid damage to the environment (Costanza et al. 1992; Cascio & Mitchell, 1996; Molina-azorín et al. 2015).

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The adoption of environmental management practices brings deep changes to the economic and environmental performance of the organization or destination, as well as their relationship with suppliers, consumers, employees, financing agencies and environmental policies regulators (Andrews et al. 2001). In this sense, tourism-related businesses have sought to adapt to the new trend of incorporating environmentally responsible practices and technologies in many different levels, from change in behaviors to the use of EMSs - Environmental Management Systems (Hsiao et al. 2014; Cumo et al. 2015; Coles et al. 2016; Pace, 2016).

The EMS is a system set up to implement and monitor the environmental protection activities. It presents guidelines to: organize, plan and assign responsibilities; provide human and material resources; and determine procedures to meet the "Environmental Policy" and performance expectations, according to the requirements of the International Organization for Standardization (ISO) 14000.

To evaluate environmental sustainability in tourism, this study choose the hospitality sector. Although seen, at first look, as a clean activity (without emission of pollutants or environmental degradation), the reality demonstrates that important impacts have been dealt with only recently in this sector, such as water consumption, waste deposit, as well as water and energy waste by the guests (Pertschi 2006; Fernández-alles & Cuadrado--marqués 2012; Erdogan & Baris, 2007).

The concept of "sustainable tourism" appears to connect tourism planning with the principles of the Brundtland Report (1987), which conceptualizes sustainable development as "one that meets the needs of the present without compromising the ability of future generations to meet their own needs". This ethical understanding of development was incorporated by the World Tourism Organization (2003), which thus presented "sustainable tourism" as "one that meets the needs of today's tourists and host regions, while protects and expands opportunities for the future". Applied to hotel management, this principle is expressed in the new environmentally friendly technologies, as well as the pursuit of engagement with the host communities of the hotel project.

Beyond environmental concerns, tourism companies seek sustainability through actions that reduce social inequalities and highlight local culture (Kasim, 2006; Rodriguez & Cruz, 2007; Kaushal & Sharma, 2016). To meet these goals, the hospitality sector has a central role in facing the challenges of income concentration, increasing poverty and loss of cultural values, since the sector has an elitist image and its services are designed to meet the demands of the wealthy segments of the society. Therefore, the onus is largely on the hospitality sector to create a sustainable environment around by participating in various conservation and humanitarian activities (Jhamb & Singh, 2016).

The hotel industry has started to implement environmental protection measures in the 1990's, but, like other sectors, mostly large companies took the initiative. Major hotel chains such as Hilton International, InterContinental Hotel Group (IHG), Accor, among others, have shown some concern about the environment. IHG, in conjunction with the World Travel and Tourism Council, pioneered the implementation of sustainable development principles (Middleton & Hawkins, 1998).

The PLANET 21 program, developed by one of the largest hotel chains in the world, is an outstanding example of environmental management strategies and presents 21 actions for a sustainable development, among them:

> **Health:** 63% of the hotels use products with eco-labels (maintenance products, paints or coatings to the floor); 55% of the hotels offer balanced meals in their restaurants; 78% of hotels organize prevention training for staff;
> **Nature:** 84% of hotels have showers with water flow regulators; 68% of hotels adopt a recycling program; 197 hotels participate in reforestation project;
> **Carbon:** 88% of the hotels use low consumption lamps in permanent lighting; 93% of hotels follow up and assess energy consumption every month; 27 hotels utilize renewable energies and 20 of those have solar thermal panels;
> **Innovation:** 91 hotels have at least 3 ecological elements in their rooms (bed sheets, bath towels or paper, for example);
> **Local development:** In France, Germany, United Kingdom, Portugal, Switzerland and South Africa, hotels offer hot drinks (tea, coffee, chocolate) with the fair trade label; More than 5000 employees received training on combating child sex tourism; 60% of hotels purchase and use food from the region; 71% of hotels preserve local ecosystems by avoiding the consumption of endangered sea products;
> **Jobs:** 129 hotels organize trainings on language skills improvement for their employees; 109 hotels organize trainings on psychosocial risks.
> **Dialogue:** 24% of hotels in franchising are operating in accordance with the Standard level of the chain's Charter 21 tool (ACCOR,n.d.)

Regarding inovation in sustainability iniciatives, there is an evident competitive advantage of some hotel chains with respect to the adoption of Sustainable Technologies and Practices (STPs) in their environmental management plans. Sustainable technologies examined by this research can be defined as Barbieri (1997, p. 139) as those employed within the environmental management in the management and use of natural resources based on "sustainability or respecting the ecosystems capacity limits". Sustainable practices would be those defined by Barbieri as "productive and marketing practices aiming the reducion of inputs [...] reuse and recycling. Environmental management programs for hosting are the beginning of the process that seeks the sustainability of tourist destinations and hotels. As pointed by Dias & Pimenta (2005), hotels represent the largest sector within the tourism economy, therefore, must be seen as key components in the process of sustainable management of tourist destinations.

In the corporate segment, data from the Brazilian Association of Corporate Travel Agencies (ABRACORP, 2012) reveal growth in the domestic market in three main products: air transport, lodging and car rental. In air transport, there was growth of 13.3% in sales compared to the previous year (2011), a total of BRL 4.92 billion in sales. In lodging, an increase of 20.1%, with sales representing BRL 2.02 billion – 40.2% for

independent hotels. Finally, with car rental the increase was 8.4%, with sales amounting to BRL 185.7 million.

The hospitality sector in the Brazilian state of Paraiba (PB) has followed the growth of the segment at national level. It has witnessed a large increase in the number of hotels, especially in the capital city of *João Pessoa*. According to the Paraiba Tourism Secretary - PBTUR (2013), the number of hotels in the city grew by 268% in twelve years, from 35 in 2001 to 94 in 2013.

Since most hotels are relatively recent, some of them have adopted environmental measures in their designs, such as: selective garbage collection; rainwater harvesting; solar panel water heating systems; smart lifts; and support to environmental programs, among others. A hotel studied is a noticeable case since it was awarded by the Guia Quatro-Rodas guide (2012) as the ''Brazilian sustainable hotel of the year''. The prize was given for the adoption of STPs since the hotel's construction; also, for the creation of social and environmental responsibility programs, in addition to having received ISO 14001 certification.

This study analyzes which STPs are incorporated by hotels in the city of João Pessoa (PB) as tools that target sustainability in the management of hotel enterprises. Also, the study evaluates the acceptance and participation of guests in the use of these technologies and practices, to enhance the importance given by them to social and environmental responsibility in the hotels sector. Through local visits and the application of questionnaires answered by managers/owners, employees and guests, this study investigated the incorporation of technologies and practices and developed a Sustainability Index for Hotel Management (SIHM). The index was applied in the municipality of João Pessoa and is expected to be applied in other municipalities. Furthermore, the study developed and applied the Guests Requirement for Environmental Matter Index (GREMI), to measure the importance given by guests to hotels that have STPs.

In this sense, the study aimed to set a baseline of STPs applied to hotels in João Pessoa to enable the assessment of its development in future scenarios and to contribute to advance the measurement of a more general concept of sustainable tourism.

2. Methods

Study area

The research area is the region that comprises the most touristic zone in the municipality of João Pessoa – Paraíba – Brazil (Fig. 1). It includes the neighborhoods of *Cabo Branco*, *Tambaú* and *Manaíra*. All neighborhoods are located at the municipality's coastal zone.

The 14 hotels were chosen according to the hotel guide of the Brazilian Association of the Hotel Industry (ABIH/PB). Hotel categories varied between 3 and 4 stars, according to the former classification of EMBRATUR, with a number of rooms between 50 and 200. This study considers this number of rooms to be reasonable for an organizational structure that incorporates social and environmental technologies and practices to business management.

Figure 1 - Research area.
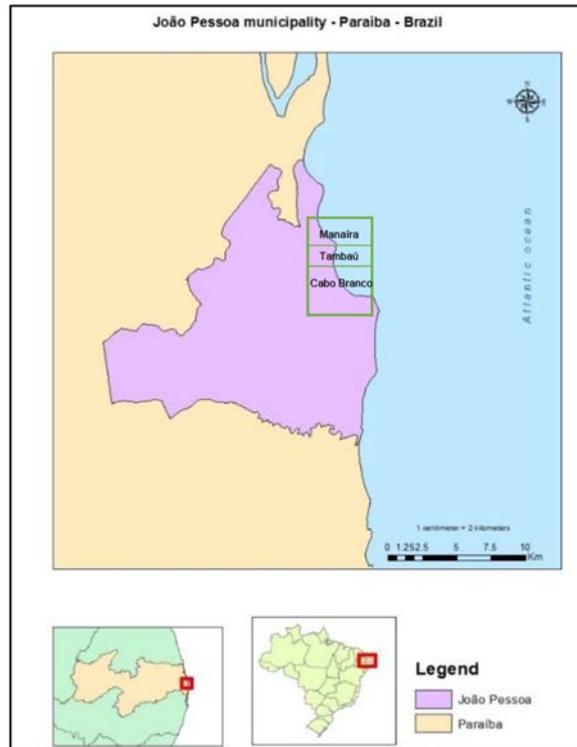
Source: Made by the authors.

To choose the technologies and practices that define the contents offered at work, was set to be made a first visit to hotels to raise what are the technologies and practices adopted, and so a reference framework was drawn up with all STPs found, which formed the basis for the development of indexes.

Data collection

The method used was the inductive. According with Marconi and Lakatos (2009, p. 85), inductive method is when, from a case, is possible to induce general observations. Induction or inductive conclusion is the passage of a finite set of cases for a larger set (possibly infinite) of cases, i.e., the confirmation of individual cases becoming an affirmation of a general law. With the induction of a group of 14 hotels interviewed, was made an inductive conclusion. The method used was systematic observation, non-participant and individual, following the concepts of Marconi and Lakatos (2009, p. 179). The method of systematic observation is one in which the observer holds special attention to some aspects of the field of study, establishing standardized procedures to your evaluation.

The non-participant observation is that in which the interviewer, although come into direct contact with the object of study, do not become an integral part of it. Individual observation is one in which only one researcher operates.

Through the application of questionnaires to owners/managers, a quantitative/ qualitative survey was carried out to investigate the STPs used in the construction and management of hotels and the existence of environmental certification. During the visits, 14 questionnaires were answered by the owners/managers of the hotels surveyed; 51 questionnaires, by employees; and 25 questionnaires, by hotel guests. Through the application of questionnaires to the employees (receptionists, housekeeping staff, among others), this study assessed: their perception about STPs applied at the hotel; their contribution of using these technologies and sustainable practices; how they have incorporated them in their daily routine; and, if they have adopted some of the STPs at home.

In addition to managers and employees, the questionnaires were applied to hotel guests, randomly, to investigate how they evaluate the environmental concern of the hotels and how it has influenced their hotel selection. The aim was to measure the level of requirement for sustainable practices of consumers to hotel services.

The visits were made between 18/03/2013 and 23/08/2013. Only two hotels, one of the pre-selected in the definition of the study area, refused to participate in the survey. One of them, by claiming that they had problems with researchers in the previous year and would not be exposed, and the other, for lack of time, as well as two hotels that had changed for the category of flat during the research and therefore could not be part of the research universe.

It is important to stress that the request for the application of questionnaires to employees and guests was denied in some establishments, and for this reason, it was only possible to achieve the total of 51 employees and 25 guests interviewed. There have been allegations that company policy prohibits surveys with guests, even when the researcher clarified that data and hotel names would be kept confidential.

Indexes HMSI and GREMI development

After data tabulation, a diagnosis was made to assess the application of STPs in the hotel sector in João Pessoa. The diagnosis was made through the creation of the Hotel Management Sustainability Index (HMSI), structured according to specific parameters, using data collected from questionnaires.

For the HMSI development, specific data obtained from the questionnaires with owners/managers were selected (Fig. 2). For each parameter a weight measure was set that is equivalent to its importance in the context of the index (from 0 to 2 or 0 to 3) and so the weighted average of each hotel was calculated by dividing the sum of scores by the maximum possible (51 points). Technologies and practices are in Figs. 3 and 4.

After obtaining the HMSI of each hotel, the study has calculated an average of HMSIs to determine the general index of the hotels surveyed.

The study also developed a Guests Requirement for Environmental Matter Index (GREMI). Using selected data from the questionnaires applied to the guests a weight

Figure 2 – Forms to estimate the HMSI and GREMI

Form to estimate the Hotel Management Sustainability Index (HMSI)

1	How many sustainable technologies are applied in the hotel?			
	Total number			

2	How many sustainable practices are adopted in the hotel?			
	Total number			

3	Have the hotel offered trainings with environmental subjects?		
	Yes: 8	No: 0	

4	Is the hotel environmental certified?			
	Yes: 4	No: 0	No, but intend to: 1	

5	Has the manager invested in environmental marketing?		
	Yes: 4	No: 0	

Result		
Sum:		
HMSI:		*Sum ÷ (maximum score: 39)*

Form to estimate Guest Requirement for Environmental Matter Index (GREMI)

1	How important for you is the adoption of these sustainable practices by hotels?				
	None: 0	Low: 1	Medium: 2	High: 3	Very High: 4

2	Do you prefer hotels that adopt sustainable practices in its management strategies?		
	Yes: 3	Indifferent: 1	No: 0

3	Are you willing to pay a little more for hotels that adopt sustainable practices?	
	Yes: 3	No: 0

4	Would you mind to reduce the amount of times the exchange of towels and clothes for a greater economy of natural resources?	
	Yes: 0	Maybe: 1	No: 2

5	Do you have any of these technologies and practices at home?	
	Yes: 2	No: 0

6	How do you evaluate the influence in your decision when choosing for hotels that adopt sustainable practices?				
	Does not influence me: 0	Low: 1	Medium: 2	High: 3	Very high: 4

Result		
Sum:		
GREMI:		*Sum ÷ (maximum score: 18)*

Source: Made by the authors

for each item (0 to 2; 0 to 3; 0 to 4) was stipulated. The index was created by the sum of the results obtained, divided by the maximum number of points that could be obtained (maximum number = 18), as shown in Figure 2. The total was added and divided by the number of respondents to calculate the GREMI general index.

To validate the GREMI results, the method used was a comparison with another survey called TripBarometer, conducted by the internet portal Tripadvisor, from December 2012 to January 2013, with 35.042 travelers, from 26 countries; this survey analyzed the importance given by travelers to hotels that adopt STPs. The results of TripBarometer validated the GREMI, since there is close similarity between the index developed by TripAdvisor and the GREMI. Through the Tripadvisor website, we reviewed guests' comments about the hotels surveyed to verify the existence of any technology or practice applied by hotels in these comments.

3. Results and discussion

Several studies have shown that energy efficiency is a crucial factor in the reduction of several environmental impacts, especially in countries that use energy from fossil fuels. (Chan et al., 2005; Pérez-Lombard et al., 2008; Kneifel, 2010). Despite the low carbon intensity of the generation of electric power in Brazil, when compared with China, United States and the European Union (6 times less, 4 times less and 3 times less, respectively), the reduction in electricity consumption is still seen as one of the main forms of reducing CO_2 emission (EPE, 2016). In the tourism sector, energy consumption and resource management are listed as main issues in Agenda 21 for the travel and tourism industry (WTO and Earth Council, 1995).

The results of technologies applied at hotels (fig. 3) demonstrate the clear option for technologies that reduce energy consumption and, indirectly, generate financial advantages. Alexander and Kannedy (2002) presented an example of this competitive advantage regarding the use of automatic shutdown equipment at the hotel Hyatt Regency International, in New Zealand, at a cost of US$ 16,000.00, with return over investment in 14 months, through annual savings of US$ 14,000.00. In this sense, the adoption of these technologies can be considered as a great competitive advantage for companies seeking environmental certifications and an important contribution to cost reduction.

Another relevant aspect is the number of buildings featuring solar water heating systems. When visiting the hotels and checking their infrastructure it was possible to notice that many of them have the architectural design adapted to the incorporation of instruments of resource economy and even some that had no such concern in the initial project but renovated their structure for the possible incorporation of this technology.

Despite the relatively small number of installations of solar water heating (SWH) systems in Brazil, the country has shown rapid growth on this way. According to Sawin (2011), the countries that had more SWH facilities in the year of 2009 were China, Germany, Turkey, Japan and Greece. However, Chan et al. (2013) claimed that, in recent years, new installations of SWH have suffered a decline in Europe due to the economic recession. Nonetheless, this decline was balanced by an increase in installations in Brazil,

China, India and Japan, with China reaching the position of the largest producer and seller of SWH in the world (Xie et al., 2012).

Figure 3 – Sustainable technologies applied to surveyed hotels.
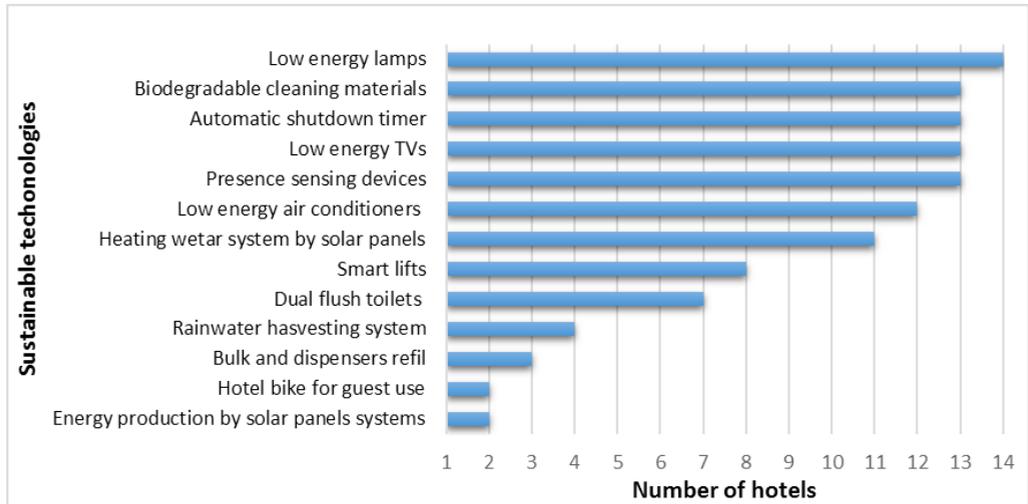
Source: Made by the authors

According to the TripBarometer (2013), one of the most commonly used sustainable technologies in Brazilian hotels is low consumption lamps (85% of respondents). Another significant technology is biodegradable cleaning products (51% of respondents), which shows a good performance of surveyed hotels in João Pessoa, since, within the research universe, all hotels had low consumption lamps and 78% of respondents used biodegradable cleaning materials. In this regard, Chen et al. (2005) showed that about 95% of the 41 hotels surveyed in Germany claim to use biodegradable cleaning materials.

Among the sustainable practices adopted (Fig. 4), the most common was using decoration of local artists, followed by the purchase from local suppliers (from less than 100 km distant), in addition to cooperating with waste scavengers. Based on the results, it is remarkable that the adoption of the most common practices aims to comply with the legal obligation established by municipal Law 5.738, of 29 August 1988, which establishes the obligation of local artist exhibition at the buildings in João Pessoa built after the law became effective. Therefore, the compliance aspect of this attitude is obvious and common practices of entrepreneurs seeking environmental competitiveness are still irrelevant.

Another interesting initiative adopted by 57% of hotels surveyed is the trade with local suppliers, which connects the enterprises with the social dimension of their sustainability ideal. This initiative contributes to the development of local commerce at various business levels (farmers, small businesses, local manufacturers, etc.), in addition to reducing the ecological footprint, since the amount of CO_2 that would be produced by more distant transport has been reduced.

Figure 4 - Sustainable practices applied to surveyed hotels.
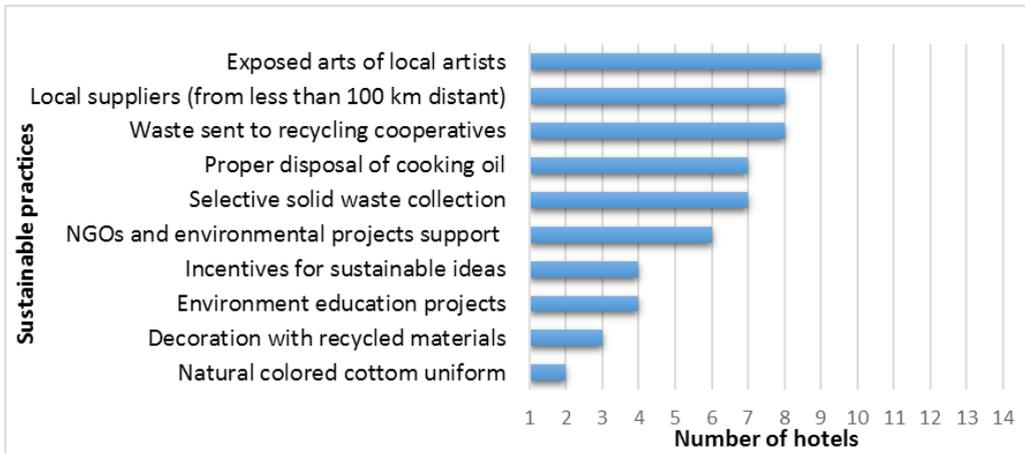
Source: Made by the authors

When green marketing is considered (Ottman, 1993), results show unexpressive initiatives by the surveyed hotels, which probably do not recognize investment in green marketing as a competitive advantage. One of the surveyed hotels supports the Manatee Project that was developed in the municipality of Baía da Traição (PB) and sells stuffed toys, made by the local community. The manager mentioned that they donate funds to support the project. The hotel exhibits a DVD (available in the rooms) that shows the project design and the ways to support it. The hotel uses the manatee logo in their printed advertisement material as additional support to the project.

Another strategy that deserves attention is an illustrative timeline panel featuring the main sustainable practices carried out throughout the history, to raise guests' awareness for some of their programs and demonstrate their competitive advantage.

Selective waste collection and distribution to the waste pickers Cooperative was a prominent practice, although only 57% of the hotels carry out this practice. On one hand, many hotel professionals claimed that the pickers "no longer collect" waste; on the other hand, the authorities responsible for waste collection (who were also interviewed) claimed that the hotels were not fulfilling their duties in waste separation. The separate collection and sending it to the waste pickers' cooperative was a prominent practice. Although only 57% of the hotels carry out this practice, many hoteliers claimed that the pickers who "no longer collect" waste, on the other hand, the authority responsible for the waste collection (which was also interviewed) claimed that the hoteliers were not fulfilling their duty to separate the waste. This claim is unfounded in the Law 12,305/10 National Solid Waste Policy (NSWP). The law obligates the companies to take responsibility for the correct disposal of their waste, by following the reverse logistics. Such a dilemma was resolved through a meeting we proposed, involving the President of the Brazilian Hotel Industry Association (ABIH/PB) and the representative of the municipal waste collection agency

(EMLUR/JP), where they signed a cooperation agreement to guarantee the adequate separation (for part of the hoteliers) and regular collection (by the associations). After the compromise, we believe that the percentage of hotels that went back to perform this practice had significant increase, which was relatively significant when compared with the research of Erdogan and Baris (2007), which pointed out that 71.8% of hotels in Ankara (Turkey) have no relationship with recyclers and only 12.8% cooperate quietly with these companies. Once again, it became apparent that the practice also appears to be performed, not by initiative of owners and managers, but to meet a legal requirement that gradually has been deployed, despite little supervision, in the State of Paraiba.

Such a dilemma was solved by proposing a meeting between the President of the Brazilian Association of the Hotel Industry (ABIH-PB) and the representative of the municipal Waste Collection Company, where they signed a cooperation agreement to guarantee the adequate separation (for part of the hotel professionals) and regular collection (by the waste pickers cooperative). After the commitment, we believe that the percentage of hotels that returned to this practice has significantly increased if compared with the research by Erdogan and Baris (2007), which pointed out that 71.8% of hotels in Ankara (Turkey) have no relationship with recyclers and only 12.8% cooperate with these companies.

Hotel management sustainability index - HMSI

Through the HMSI, this study concludes that, as shown by the General index (0.48), hotels in Joao Pessoa present a medium level (between 0.40, and 0.59) of investments and practices focused on sustainability of the management of enterprises in the sector (Fig. 5). It turns out that the hotels are well divided in low, medium and high levels and only one hotel achieved the very high level, showing that the hotel business in João Pessoa is at a satisfactory level, despite the lack of data for comparison with other Brazilian municipalities.

Figure 5 – Hotel management sustainability index (HMSI) result
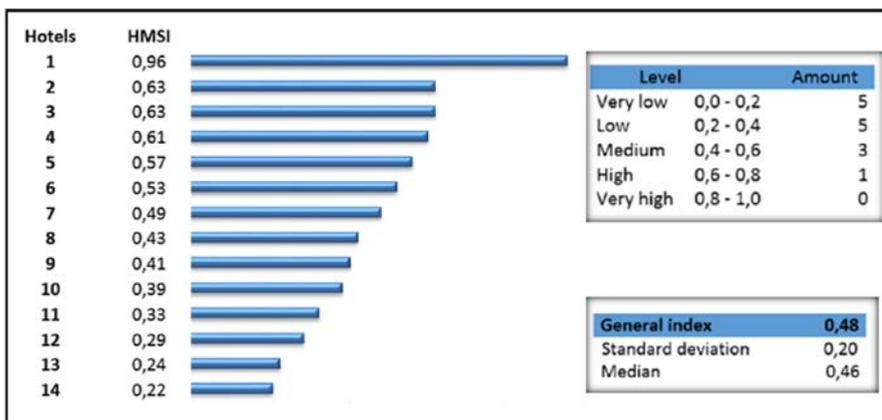
Source: Made by the authors

Other result shows the average HMSI of hotels that belong to hotel chains and those who are independent companies. It was found that, overall, the HMSI is higher for those hotels belonging to hotel chains (0.47 against 0.33), excluding one hotel that has a high HMSI and does not belong to any hotel chain, contributing to considerably raise the index for independent hotels. Thus, it appears that the hotel chains present in João Pessoa have adopted management tools focused on sustainability and that, in many cases, they seek competitive advantage through social and environmental measures in favor of their members' image.

Through the analysis of guests' comments on the Tripadvisor website, it was possible to notice that the main features evaluated are location, sleeping quality, room, assistance, cost benefit and cleaning. The results of guests' comments about STPs adopted by hotels have shown few references within a large universe of comments, representing that this aspect, unless perceived and considered at the hotels searching, is not mentioned in general assessments or comments. Even the hotel that has a marketing plan disclosing sustainable actions had few comments regarding its technologies and practices, with the exceptions of guests that have mentioned the fact that a hotel offers bikes for its guests.

Assessment of guests requirement for sustainable practices

Several studies dedicated to the environmental management in hosting diverge about the viability and financial return of the incorporation of sustainable technologies and practices. On one hand, authors argue that investments in environmental management bring financial return (Porter & Van Der Linde 1995; Russian & Fouts, 1997; Judge & Douglas, 1998; Segarra-oña et al., 2012); on the other hand, some authors defend that environmental initiatives bring negative impacts on financial performance (Walley & Whitehead, 1994; Lamb & Sarkis, 1997; Thornton et al., 2003). Despite the divergence and complexity of the topic, since many variables must be considered (category, location, economic scenario, organizational maturity), the attitudes of guests during their stay were recognized as an influence on dynamics of the hotel environmental management. As pointed by Zhang et al. (2012), "...*in service processes, customer inputs are, of course, a part of the actual service being delivered, thus directly affecting the resource efficiency of the process.*"

To evaluate the participation of guests in environmental management processes, this study has also dedicated a section to evaluate how guests assess hotels that adopt STPs in management processes, as well as whether they adopt sustainable practices and technologies in their homes (Fig. 6). Through the GREMI, this study concluded that, in general, interviewed guests showed a high level of requirement for the adoption of STPs (GREMI = 0,68). This result demonstrates that hospitality sector investments in João Pessoa must go beyond the compliance with environmental law and that the incorporation of environmental policy must be fundamental for companies who plan to meet the new demands of consumers who are attracted to the environmental differential.

When asked about their willingness to pay a little more for hotels to adopt STPs, 68% of the guests replied that they would pay more. This demonstrates that the social and environmental differential of hotels brings some flexibility in the classification of rates,

which makes the results point to a slight tendency to support the group of researchers who defends that there is an improvement in the financial performance of the companies that invest in environmental management. Susskind (2014), did the same questioning in his research in New York, and stated that 45% of guests were willing to pay more to support hotels that adopt sustainable initiatives.

Figure 6 – HMSI results of hotels belonging hotel chains.
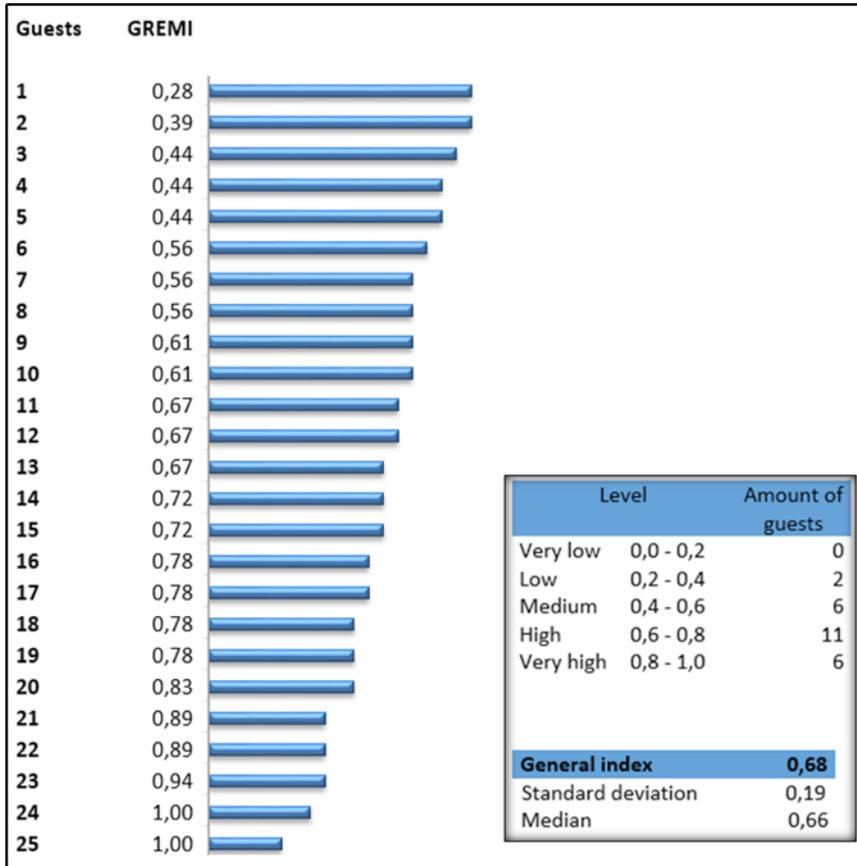
Source: Made by the authors

The study also found out that the GREMI results (Fig. 6) are compatible with those presented by Tripadvisor in their internet portal. The TripBarometer (2013) assessed the importance given by tourists to sustainable practices in hosting, which indicates that 79% of travelers around the world claimed to give importance to the adoption of sustainable practices. Besides that, 91% of hoteliers around the world believe that it is important to be sustainable.

4. Conclusion

Considering the objectives of this research to analyze the incorporation of STPs at hotels in João Pessoa, the results showed that environmental management in hosting is at an intermediate stage of incorporation of STPs, since many of the hotels surveyed had several strategic tools in the process of management. However, considering the voluntary nature of entrepreneurs, the study concluded that many of the technologies have critical economic bias, since the economy of natural resources is a major factor in cost reduction, especially because a significant part of the surveyed hotel professionals sees cost reduction as the main competitive advantage.

Regarding the practices identified, it was possible to notice that most of them are focused on legislation compliance, such as the correct disposal of cooking oil or local artists' interventions. In addition, some practices, such as waste separation and partnership with recycling cooperatives are not effective due to lack of articulation of involved bodies.

The increasing importance given by consumers regarding social and environmental initiatives in the hospitality sector is remarkable and requires new attitudes towards this niche market. New marketing strategies should draw the image of environmental initiatives, since only two of the hotels surveyed did mention STPs applied by them.

In addition to the hotels surveys, internet websites that evaluate hotels and touristic destinations should include the socio-environmental subject in their assessments to raise awareness of guests and tourists about the importance of sustainability practices in tourism. Although there are some punctual initiatives, such as the research of the website Tripadvisor about guests' requirement regarding social and environmental attitudes of companies, the constant assessment made by guests only mentioned items such as comfort, assistance quality, cleanliness, among others.

During the development of the research, the main claim of the hoteliers on the difficulties of deploying sustainable technologies was the cost of the initial investment and the uncertainty on investments return. Therefore, new incentive programs from public funding, as the BNDES ProCopa Turismo (BNDES, 2012) are the key role to increase the incorporation of new technologies. One of the original intentions of the research was to investigate the cost of deploying sustainable technologies (such as wind energy projects, use of rainwater, among others) and the average return on investments. However, the unavailability of companies that develop such projects, of which were requested numerous budgets, was the main limitation for advancing research, even after the researchers get a series of technical specifications requested by the companies.

We suggest that future studies use the indexes developed as evaluation method of sustainability in hotel management to generate a database that could serve as a basis for comparison between tourist destinations. Also, it is expected that this study may encourage more hotel managers to adopt EMS in the future, understanding that this is a first step to a necessary shift of new behavioral management paradigm. Therefore, new approaches might go deeper in the assessment methods and include detailed inputs of EMSs, like energy and water consumption, carbon footprint and new technologies.

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ENVIRONMENTAL MANAGEMENT IN HOTELS: SUSTAINABLE TECHNOLOGIES AND PRACTICES APPLIED IN HOTELS

Abstract: The 1990s highlighted the creation of new business dynamics focused on environmental responsibility. In the tourism sector, hotels have incorporated this concept in an attempt to improve the efficiency of natural resource use and quality of life. As a result, sustainable technologies and practices became part of the management strategies of many companies and new legal obligations and business incentive programs have arisen. Through interdisciplinary analysis, this study analyzed environmental management in hotels through the incorporation of sustainable technologies and practices and considering guests' requirement of social and environmental responsibility. By means of questionnaires answered by hotel owners/managers and guests, the study assessed environmental management in hotels using a sustainability index. The overall level of sustainability in hotel management in João Pessoa, Brazil was considered intermediary and guests' requirements regarding environmental matters were high.

Keywords: sustainability, innovation, environmental management.

Resumo: A década de 1990 destacou a criação de novas dinâmicas de negócios focadas na responsabilidade ambiental. A hotelaria incorpora o conceito na tentativa de melhorar a eficiência no uso dos recursos e a qualidade de vida. Como resultado, práticas e tecnologias sustentáveis foram incorporadas à gestão ambiental de muitas empresas e novas obrigações legais e programas de incentivo empresarial foram desenvolvidos. Através de análise interdisciplinar, o estudo analisa a gestão ambiental hoteleira, pela incorporação de tecnologias e práticas sustentáveis, além do nível de exigência dos hóspedes com a responsabilidade socioambiental dos hotéis. Pela aplicação de questionários com gerentes e hóspedes, o trabalho avalia a gestão ambiental nos hotéis através de um índice de sustentabilidade, além de um índice de exigência de hóspedes no quesito ambiental. O nível de sustentabilidade na gestão hoteleira na cidade de João Pessoa, Brasil, foi apontado como intermediário e o nível de exigências dos hóspedes, como alto.

Palavras-chave: sustentabilidade, inovação, gestão ambiental.

Resumen: La década de 1990 destaca la creación de nuevas dinámicas de negocios centrados en la responsabilidad ambiental. En el sector turístico, hostelería incorpora este concepto intentando mejorar la eficiencia de la calidad de vida de comunidades y uso de los recursos naturales. Como resultado, tecnologías sostenibles y prácticas entran en las estrategias de

gestión de muchas compañías y nuevas obligaciones legales y programas de incentivos se presentan. Por análisis interdisciplinario, el trabajo analiza la gestión medioambiental en instalaciones de alojamiento, como lo demuestra la incorporación de tecnologías y prácticas sostenibles. Además del requisito de los clientes acerca responsabilidad socio-ambiental. A través de cuestionarios con los propietarios/gerentes y los clientes, el trabajo evaluó la gestión ambiental en los hoteles por un índice de sostenibilidad. El nivel global de la sostenibilidad en la gestión de hotel en João Pessoa, Brasil, se consideró intermediario y alto, el requisito de huéspedes en materia ambiental.

Palabras clave: sostenibilidad, innovación, gestión ambiental.