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Energy consumption characteristics of hotel's marketing preference for guests from regions perspective

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ABSTRACT

This research analyzed how hotel's marketing preference for certain guests from different world regions would influence their energy consumption and the revenue generated by them who travel and lodge in Taiwan. Energy consumption data, building information, and hotel operation data were collected from 49 Taiwanese international tourist hotels and 24 standard tourist hotels, which are equivalent to five and four-star hotels. The statistical results show that the energy use among hotels under surveyed ranges between 83 and 408 MJ/guest per night, and could create averaged revenue of US$149 for each guest accommodated. To identify a hotel's primary marketing preference for accommodating certain region of guests, factors of certain regional guest ratios were employed. Multiple-regression model was established to characterize the hotel energy consumption via regional guest ratios. It indicates that the energy consumption varied with hotels' regional guest ratios. It also reveals that hotels with their marketing preference for accommodating guests from Europe and North America would have higher energy use characteristic followed by those aiming for guests from Australia, Asia (excluding Japan and China), Japan, domestic Taiwan, and China in descending order. Multiple regression models were used to investigate relationships between the yearly energy consumption and total revenue of hotels. The models established are statistically reliable and could be beneficial for hotel's marketing, room price fixing, or operating references. The study also reveals that guests from the well developed countries would generally create more revenue. However, additional expenses on energy will also incur for hotels whose marketing preference towards them, which may possibly exceed their profit. In profit-energy costs perspective, it is recommended that hotel targeted for guests from Japan might be the most beneficial in Taiwan.

1. Introduction

The accommodation sector was estimated to account for 21% of world carbon dioxide emissions [1]. The sustainability and competitiveness of tourism partially depends on energy efficiency (reduction in overall energy use) and more intensive use of renewable resources [2]. Understanding energy use in hospitality and accommodation is crucial for the tourism sector because of the rising energy cost. Energy issue in tourism had also been discussed in response to climate change and more sustainable measures should be adopted in tourism industry suggested by the World Tourism Organization (UNWTO) [3]. Furthermore, previous analysis showed that with current high-growth emission trends in tourism, the sector may become a leading global source of greenhouse gases emissions in the future [4]. Buildings have had a considerable effect on energy consumption in Taiwan in the past few decades. The amount of energy consumption related to building operation increased by an averaged 6.5% annual increment during 2005–2010 in Taiwan. Till 2010, energy consumed by domestic building sector has reached 25.5% out of total national energy usage [5]. There are multiple functions in hotel, and their energy consumptions mainly come from the use of lighting, heating, ventilation, air conditioning, hot water provision, elevator transportation, and cooking. Energy use intensity of hotel is estimated as 2.1 times that of dwellings in the United States [6] and 5–15 times that of urban residential buildings in China [7,8]. Research reveals that energy use in hotels ranged between 25 and 284 MJ/guest each night [9], which implies that there is large discrepancy of energy consumption in them depending on hotel types. Various accommodation establishments, including hotels, holiday villages, and vacation homes, consume 90 and 130 MJ/guest per night [10]. Generally, hotel buildings with high energy consumption would have considerable potential for energy efficiency improvement.

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Global tourism has rapidly developed since 2009 in Asia, especially in Taiwan. Annual growth of international arrivals is as high as 26.7% [11]. In addition, favored from moderate political situation between Taiwan and China, the local tourism industry developed rapidly in recent years. Tourists from China visit Taiwan in a growing number year by year. From the archive of visitor arrival data published by the Tourism Bureau of Taiwan (TBT), it indicates that the number of inbound tourists has doubled in the past decade [12] as well as there is a similar trend for domestic travelers [13]. It shows that the inbound arrivals have grown by an average of 11% annually in the past five years, and is 6% for domestic tourists for the same period by referring to Fig. 1. A study shows that although the number of tourists has a considerable effect on gross domestic product, there is also drastic increase in electrical consumption in Marco SAR [14], after introducing gaming industry.

Hotels are categorized in four levels base on the provision of facilities in Taiwan. In December 2010, the total number of first-level international tourist hotels in Taiwan is 68 (with 19,894 rooms). Standard tourist hotels are categorized as second level and there are 36 (5006 rooms) of them. The third level is business hotels with a number of 3,151 providing 123,350 rooms. The fourth level is bed and breakfast facilities with a number of 3548 providing 14,852 rooms [15]. Among these hotels, the first two levels of hotels accommodated around half of the total foreign guests. The number of rooms provided by the first two level hotels increased by 12% and 38% respectively in 2011. The total employees of all hotels are 72,252 persons with total revenue of US$3.3 billion being created. The percentage of staff employed and revenue created by hotel sector are 24.5% and 22.2% respectively out of the whole tourism industry in Taiwan, in 2011.

This study focused on analyzing the energy consumption of hotels with different hosting preferences of guests from different regions. Because foreign guests usually dwell in hotels of the first two levels. Therefore, hotels studied in this research are focus only on the first two levels of hotels, which, compared to international hotel classification system, are rated five-star and four-star. Traditionally, hotels preferred to segment their rooms or services to particular guests. For example, if a hotel targets Japanese guests, the management may decline providing accommodations to Chinese groups because Japanese groups prefer less diverse environments. The Japanese typically believe that diversity in the nationalities of dwellers results in less serenity, which is a concern. If a hotel focuses on hosting guests from Europe or North America, their accommodation management strategies is to give lower priority to domestic guests' requests for accommodation. This is evidenced by the top 10 hotels, which prefer to accommodate Japanese guests. Their Japanese guests account for 53% of their total hosting guests, but it is only 13% in all 73 hotels. The top five hotels, which prefer to accommodate guests from Europe and North America, have 51% of their guests from these two regions. But it is only 14% of all guests in all 73 hotels. It is a notable phenomenon in Taiwan, suggesting that each hotel has its own marketing preferences.

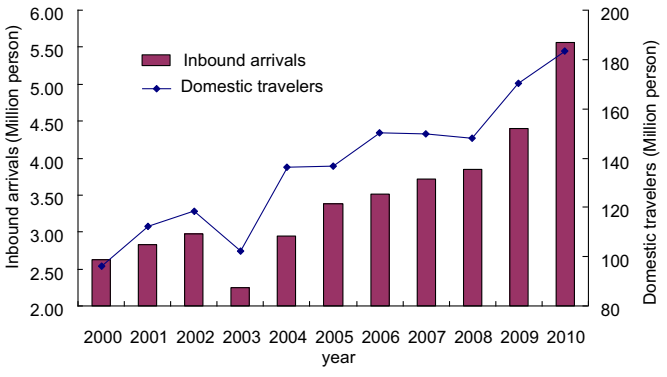

Fig. 1. Inbound arrivals and domestic travelers in Taiwan in the first decade of the twenty-first century.

2. Literature review on energy consumption of hotels

Energy use intensity (EUI) gathered from the public utility company, which is much less costly than end-use metering, had been used to estimate commercial buildings' monthly, seasonal, and annual energy end-use intensity profiles to assess a certain building's energy consumption [16]. Many studies discussed hotel energy consumption in terms of total energy use or EUI. Table 1 shows the recent studies that focused on hotel energy consumption. Twenty-one studies were conducted in the past decade, among them, there are 17 studies focused on EUI of hotels, six studies analyzed the energy use on guest-night basis, and three studies combined both the EUI and the energy consumption from each guest. The EUI could be higher in both hot [17,34] and cold weather [28,38], and is lower in a relatively mild climate [21,25,37]. Many studies analyzed energy use including electricity, gas, and diesel instead of only electrical usage. However, electricity dominates energy consumption and accounts for 53%–83% of the average total energy used [17,24,34,37]. A number of studies collected energy consumption data through field investigations, whereas other studies applied computer simulations of building conditions to estimate energy consumption data. The factors that influence EUI or energy consumption have not received consensus among those research findings. A number of studies were based on star levels or hotel ratings [24,34,36,37]; some focused on building sizes or scales [34,35], and others focused on hotel types or characteristics [28,36,37]. The findings of most studies can be drawn from the conditions of the hotel buildings, which may influence energy use. However, numerous studies showed that various equipment or living condition settings could influence EUI [23,27,32,39]. These studies argued that hotel energy usage should be connected to the hotel operation data, such as occupancy rates, guest rooms, and guests per night [20,24,26,35]. Furthermore, other research discussed energy use profiles in relation to building envelopes and building equipment services. Yik and Wan (2005) [40] studied the adequacy of adopting overall thermal transfer values (OTTV) to reflect actual thermal performance of air-conditioned commercial buildings in Hong Kong, and revealed that OTTV may not truly reflect the thermal performance of a building envelope because interactions among heat gains from different envelope elements and internal sources, and the impacts of room configurations cannot be properly accounted for in OTTV. Yu and Chow's study on savings potential in the energy consumption profile of an air-conditioned commercial building showed that the major energy loading (mainly electricity) can be categorized as HVAC systems, lighting, power provisions for miscellaneous equipment, vertical transportation, and building automation systems [41].

These studies sufficiently discussed energy consumption from several perspectives. However, in relation to our research objective, only six studies referred to energy consumed by each guest. Based on these studies, each guest-night consumption of energy in Vietnam was estimated as 292–457 MJ at four-star hotels, 144–180 MJ at three-star hotels, and 97–148 MJ at two-star hotels [24]. In New Zealand, it was estimated as 155 MJ/guest per night for hotels and 110 MJ/guest per night for bed & breakfast [21]. Through appropriate sampling, the representative energy use per guest was calculated at 191 MJ in Greece [29], and 144 MJ in Queensland [26]. If the research condition is limited to guest numbers as a parameter