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THE ENERGY EFFICIENCY ASPECTS OF SUSTAINABLE HOTEL AND TOURISM INDUSTRY IN JOHOR, MALAYSIA

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Abstract

Energy efficiency plays a vital role and significantly contributes to reduce energy consumption and environmental impact. This research addresses the need for sustainability in Malaysia's hotel and tourism sector, focusing on the adoption and application of green building elements, particularly in the context of energy efficiency. Amidst the challenges posed by the Covid-19, this research investigates the level of acceptance of green building elements among hoteliers in Johor as the case study. Besides, the research objective is to identify the obstacles faced by hotel operators in applying aspects of energy efficiency. The research methodology adopted quantitative approach through questionnaire among 104 of hoteliers in Johor. The findings emphasize the importance of energy efficiency in promoting sustainability, offering recommendations on the efficient use of technology, personnel training programs, and sustainable practices to improve operational efficiency and meet the growing demand for environmentally responsible tourism. This research provides valuable insights to position Johor hotels as leaders in the global movement towards a more sustainable and high resilience of hotel and tourism sector.

Keywords: Energy Efficiency, Energy Consumption, Hotel and Tourism Industry, Johor and Malaysia

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INTRODUCTION

Tourism plays a crucial role in Malaysia's economy, contributing significantly to the national Gross Domestic Product (GDP) and employment rates. In recent years, the hotel and tourism industry has grown rapidly, making Malaysia one of the most popular tourist destinations in Southeast Asia. Johor, strategically positioned as a gateway between Singapore and Malaysia, holds an essential role within the national hotel and tourism industry. This state boasts diverse attractions ranging from the Legoland Malaysia Resort to beautiful beaches and national parks. It remains a primary hub for domestic and international tourists seeking various experiences from leisure to business travel. Johor's strategic location, coupled with its well established infrastructure, has fostered significant investments in tourism, resulting in a booming hospitality sector.

The impact of the previous COVID-19 pandemic, however, brought unprecedented disruption to the tourism and hospitality sectors worldwide. Malaysia was no exception. The sudden closure of borders, travel restrictions, and a general decline in consumer confidence led to massive financial losses for hotels and resorts, airlines, tour operators, and related service providers. According to data from the Malaysian Association of Hotels, the industry experienced revenue losses exceeding RM7 billion in 2021, following an earlier loss of RM6.5 billion in 2020. Hotels and other accommodations had to reduce their workforce, suspend operations, or even close permanently due to the drastic decline in revenue. This crisis revealed the fragility of the industry and the urgent need to implement more resilient and sustainable practices to better cope with future uncertainties. Energy efficiency is one of the key strategies that can help the industry recover and revitalize. In addition to reduce the operational costs through lower usage of utility bills, energy efficient measures align with global sustainability standards and consumer expectations. Travelers are seeking eco friendly accommodations and are willing to pay a premium for services that adhere to green practices. The adoption of energy efficient strategies thus serves a dual purpose which it aligns with environmental and sustainability goals (Siti Nor Fazillah et al., 2024) and provides a pathway toward economic recovery (Cottam, 2022).

In Malaysia, the Green Building Index (GBI) has been instrumental in promoting the adoption of energy efficient and sustainable practices. This certification system measures the environmental performance of buildings, providing clear guidelines for architects, developers, and property managers to design and maintain structures that minimize their environmental impact. As the tourism and hospitality sector seeks to align with global standards, incorporating energy efficient elements such as LED lighting, optimized HVAC systems, and renewable energy sources like solar panels is imperative (Azhgaliyeva, 2022). However, implementing these practices has proven challenging. Financial

constraints, especially in the wake of COVID-19, remain a primary concern for many hoteliers. Additionally, a lack of technical knowledge, resistance to change, and concerns about upfront costs have slowed the transition toward greener operations. Despite these challenges, studies show that long term savings from energy efficient measures often outweigh the initial investment, providing both economic and environmental benefits (Glass, 2020).

This research aims to explore the extent to which energy efficient practices are currently being adopted by Johor's hoteliers and to identify the primary barriers hindering their implementation. By understanding these challenges, this research further investigates the practical solutions that will enable the hospitality sector in Johor to recover, adapt, and eventually lead in sustainable tourism practices. A focus on energy efficiency will not only assist Johor in remaining a top tourist destination but also set a precedent for the rest of Malaysia's hospitality industry to follow.

LITERATURE REVIEW

The concept of green elements forms the cornerstone of sustainable practices in construction and infrastructure management. The term 'green building' encompasses a range of practices and design principles aimed at reducing the environmental impact of structures throughout their lifecycle. This means minimizing resource consumption during construction, operation, and demolition phases while ensuring occupant health and comfort. By integrating environmentally responsible and resource efficient practices into the built environment, green buildings are designed to address energy consumption, water usage, indoor air quality, and waste generation. In Malaysia, the Green Building Index (GBI) provides a comprehensive certification system to recognize and reward buildings that adhere to high standards of sustainability. The GBI is the country's primary rating tool for green buildings and focuses on six criteria: energy efficiency, water efficiency (WE), indoor environmental quality (EQ), sustainable site planning and management (SM), material and resources (MR), and innovation (IN).

Sustainable Tourism

Sustainable tourism is a holistic approach that seeks to balance the economic, environmental, and socio cultural aspects (Abakumov and Beresten, 2023) of tourism development. It minimizes negative environmental and socio cultural impacts while maximizing economic benefits for host communities and stakeholders. In this context, sustainable tourism encourages responsible and ethical travel behaviour, ensuring that tourism activities contribute positively to destinations and local populations. The United Nations Environment Programme (UNEP) identifies energy efficiency as a critical element of sustainable tourism.

As the tourism sector grows, so does its environmental footprint. The hospitality industry, which includes hotels, resorts, and other accommodations, accounts for a significant portion of global carbon emissions. This impact stems from energy intensive activities like heating, cooling, lighting, and transportation. As tourists increasingly prioritize eco friendly travel options, adopting sustainable practices, particularly energy efficiency, has become crucial for the hospitality sector.

Environmental Benefits

Sustainable tourism practices help minimize negative environmental impacts. By reducing energy consumption through measures like efficient lighting, HVAC systems, and renewable energy sources, the sector can significantly cut its carbon emissions (López-Bernabé et al., 2021). Furthermore, water conservation, waste management, and habitat preservation also contribute to sustainable development. Hotels that implement these measures help protect natural resources and biodiversity, which often serve as key attractions.

Socio Cultural Benefits

Sustainable tourism aims to preserve and celebrate local culture and heritage. This includes promoting authentic cultural experiences, respecting indigenous customs, and ensuring that tourism does not commodify or exploit local traditions. Sustainable practices can lead to inclusive and community focused tourism development, where local businesses and artisans directly benefit from increased visitor spending.

Economic Benefits

While sustainable tourism emphasizes environmental and cultural preservation, it also drives significant economic benefits. It supports local businesses, creates employment opportunities, and fosters a stable source of income for host communities. Sustainable practices like energy efficiency reduce operating costs for hoteliers, translating into higher profit margins over time. Additionally, tourists are often willing to pay a premium for environmentally friendly accommodations, creating a competitive advantage for those who prioritize sustainable operations.

The tourism industry's transition to sustainable practices requires cooperation between stakeholders, governments, and local communities. Governments can play a pivotal role by setting clear regulations, providing incentives for sustainable initiatives, and raising awareness about responsible tourism. Moreover, organizations like the Global Sustainable Tourism Council (GSTC) provide comprehensive standards that help guide destinations and businesses in implementing best practices. Ultimately, sustainable tourism is not a temporary trend but a critical strategy for ensuring the long term viability of the

tourism sector. Energy efficient and environmentally conscious practices are not only desirable from an ethical standpoint but also offer practical benefits that enhance the competitiveness and resilience of businesses in the evolving tourism landscape.

Energy Efficiency in Hotel and Tourism Industry

Energy efficiency in hotel and tourism industry is crucial due to the industry's high energy consumption, which directly affects both the environment and operational costs. Hotels, often operating 24/7, rely on energy intensive systems for heating, cooling, lighting, and other guest services. This presents a significant opportunity to reduce energy use and operational costs while simultaneously improving profitability and environmental sustainability.

Efficient Lighting

Lighting systems in hotels can account for a substantial portion of total energy use. Replacing traditional incandescent bulbs with LED lighting can significantly reduce energy consumption. LEDs are more efficient, longer lasting, and can produce better illumination, thereby improving both energy savings and guest experience (Shamri et al., 2022).

HVAC Systems

Heating, ventilation, and air conditioning (HVAC) systems are the largest energy consumers in many hotels. Upgrading to energy efficient HVAC systems, such as those equipped with smart thermostats and motion sensors, can significantly optimize performance. These systems automatically adjust to guest presence or absence, ensuring minimal energy wastage. Regular maintenance and cleaning also improve efficiency (López-Bernabé et al., 2021).

Renewable Energy Sources

Incorporating renewable energy sources, such as solar panels or wind turbines, allows hotels to generate their own electricity. Solar water heating can significantly reduce energy used for hot water production. While the initial investment may be high, the long term savings and potential government incentives make renewable energy an attractive option (Said et al., 2017).

Water Management

Efforts to implement energy efficiency often intersect with water management strategies.

Operational Benefits

Energy efficient practices reduce utility costs, allowing hoteliers to reinvest savings in improving guest services, staff training, or marketing. Reduced consumption also aligns with global sustainability goals and can enhance a hotel's brand reputation, attracting environmentally conscious travelers willing to pay a premium for eco friendly services.

Overall, energy efficiency initiatives are fundamental for modern hospitality businesses. By adopting efficient lighting, HVAC systems, and renewable energy sources, hotels can significantly reduce their environmental footprint and operating costs while strengthening their competitive edge in a rapidly evolving industry (Said et al., 2017).

Barriers to Implement Energy Efficiency Practices

Financial Constraints

The most pervasive barrier cited was the high upfront cost of investing in energy efficient technologies. Hotels, especially smaller ones, often operate on thin margins and cannot justify these costs, particularly in the context of a post COVID-19 financial recovery. The pandemic has exacerbated existing financial challenges, leaving many hoteliers struggling to break even or repay loans incurred during the industry's downturn. Although investments in LED lighting, HVAC upgrades, and renewable energy sources like solar panels promise long-term savings, the initial capital required remains prohibitive for many establishments (López-Bernabé et al., 2021). As a result, hoteliers are hesitant to invest in technologies that, while environmentally beneficial, could strain their short-term finances.

Technical Knowledge

Another significant barrier identified is the lack of technical expertise regarding energy efficient technologies and their integration into existing systems. Many hoteliers are unfamiliar with the nuances of these advanced systems, such as smart thermostats, energy management software, or renewable energy integration. Without clear technical guidance or expertise, hoteliers face challenges in selecting appropriate solutions that align with their specific infrastructure and operational needs. This often leads to hesitation in implementing new technologies due to concerns about compatibility, maintenance requirements, or the fear of making costly mistakes. In some cases, existing systems are outdated, and hoteliers are unsure how to incorporate new energy efficient measures without substantial retrofitting.

Resistance to Change

Resistance to change is another barrier that prevents some hoteliers from adopting energy efficient practices. This resistance is rooted in skepticism about the return on investment (ROI) of such measures. Many decision makers believe that the savings are either exaggerated or would take too long to materialize (Muszaffarsham et al., 2022). They are also wary of disrupting established operational practices or inconveniencing guests during the transition to new systems. For instance, shifting to energy efficient lighting or modifying HVAC systems may require temporary closures, further impacting revenues and customer satisfaction. Additionally, a lack of staff awareness or support for these changes can lead to internal resistance, slowing the adoption process.

Operational Challenges

The survey also highlighted operational challenges such as insufficient staff training and a lack of internal processes for monitoring and managing energy consumption. Some hotels lack dedicated personnel responsible for energy management, making it challenging to implement and sustain energy saving initiatives effectively. Furthermore, older hotels often have aging infrastructure, which complicates the integration of newer, energy efficient systems.

External Factors

External factors, such as inconsistent government incentives or unclear regulations, also affect the adoption of energy efficient practices. While some incentives exist, many hoteliers believe they are insufficient or too complex to apply for. Additionally, a lack of clear regulatory requirements or industry standards regarding energy efficiency means there is no immediate pressure to adopt such measures.

Addressing these barriers requires a multifaceted approach involving financial, technical, and educational support (Muszaffarsham et al., 2022). Overall, while the barriers are significant, the survey data indicates that overcoming them is possible with coordinated efforts from hoteliers, government agencies, and industry associations. Implementing a supportive framework will help reduce costs, provide technical guidance, and foster a culture of sustainability, ultimately encouraging wider adoption of energy efficient practices in Johor's hospitality industry.

Theoretical Framework of Energy Efficiency towards Sustainable Hotel and Tourism Industry

Throughout the literature of sustainability tourism including the environmental, socio cultural and economic benefits, it reflects to energy efficiency in hotel and

tourism industry. The following theoretical framework is developed to strengthen the structure of this research.

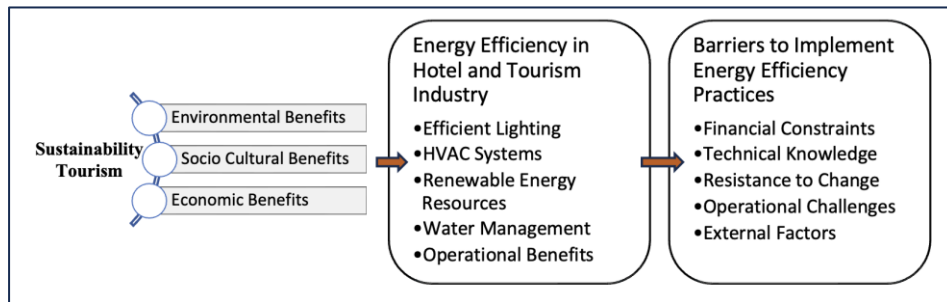


Figure 25 Theoretical Framework of Energy Efficiency towards Sustainable Hotel and Tourism Industry

Figure 1 presents the conceptual relationship between sustainable tourism, energy efficiency in the hotel and tourism industry, and the barriers to implementing energy efficient practices. Sustainable tourism is framed around three core dimensions environmental, socio-cultural, and economic benefits which collectively emphasize the need for tourism development that minimizes environmental degradation, promotes cultural integrity, and ensures long-term economic viability. Energy efficiency serves as a key component of sustainable tourism, focusing on operational improvements that reduce resource consumption while enhancing performance and profitability. Practices such as efficient lighting, HVAC system upgrades, renewable energy utilization, water management, and other operational innovations are essential strategies that contribute to environmental conservation and cost reduction.

The figure also highlights that despite these recognized benefits, several barriers hinder the widespread adoption of energy efficient measures in the tourism sector. Among the most significant obstacles are financial constraints, particularly the high upfront costs of new technologies, and a lack of technical knowledge that limits effective implementation. Additionally, resistance to change, operational challenges, and external factors such as inadequate policies or market conditions further impede progress. Overall, the framework underscores that achieving sustainability in tourism requires not only technological and operational advancements but also institutional support, financial incentives, and continuous capacity building to overcome these implementation barriers.

RESEARCH METHODOLOGY

This study adopts a quantitative, cross sectional survey design to investigate the acceptance and implementation of energy efficient practices among hoteliers in

Johor, Malaysia. The research aims to assess current energy management practices and identify barriers that hinder efficiency improvements within the hospitality sector. The target population comprises hotel managers and decision makers from 3 star to 5 star hotels, as these establishments possess more complex infrastructure and higher energy demands, making energy efficiency crucial for both profitability and sustainability. A purposive sampling method is employed to ensure that only respondents with relevant expertise and authority participate, thereby enhancing the reliability and applicability of the findings. The list of participating hotels was compiled using publicly available tourism directories and industry association databases, ensuring a representative overview of Johor's hospitality industry.

Data Collection

The data is collected through a structured survey distributed to hotel managers and decision makers via email. The survey contained a combination of close ended and open ended questions to capture the idea and insights from the respondents. A total of 104 respondents are involved and this methodology ensures a balanced approach to understanding both the numerical and narrative aspects of the hoteliers' experiences with energy efficiency. The survey structure are as follows:

1. **Demographic Information:** This section includes questions about the participant's position, hotel size, and star rating to contextualize responses.
2. **Current Practices:** Participants were asked to indicate their hotel's current energy efficient practices, such as using LED lighting, upgrading HVAC systems, or installing renewable energy sources. They also ranked these practices based on their perceived effectiveness.
3. **Barriers to Implementation:** This section aims to identify the primary barriers to implementing energy efficient practices, including financial constraints, lack of technical expertise, and resistance to change. A Likert scale was used to measure the severity of each barrier.
4. **Solutions and Recommendations:** Open ended questions allowed respondents to suggest potential solutions for overcoming the barriers. Suggestions could include staff training programs, technological advancements, or governmental support.

DATA ANALYSIS

Ethical standards are maintained throughout the research process. Participation is voluntary, and respondents are assured of their anonymity and confidentiality. They are informed about the study's objectives and had the opportunity to withdraw at any point. The data is securely stored, and only aggregated findings

are reported. The collected data is analyzed using a combination of statistical and thematic analysis.

Statistical Analysis

The demographic data and responses to closed ended questions were summarized using descriptive statistics, including frequencies, percentages, and measures of central tendency. In analysing the objective 2 of the research, the barriers faced by hotel operators in implementing energy aspects are analysed using Relative Importance Index (RII). RII is used to rank the barriers in implementing energy efficiency practices. Through RII, further actions can be strategized as a solution to overcome the barriers.

Thematic Analysis

Open ended responses are analyzed through thematic coding to identify recurring themes related to barriers and potential solutions. These insights are used to supplement the quantitative findings and provide richer context. While this methodology provides valuable insights into energy efficiency practices among Johor hoteliers, several limitations are noted.

RESEARCH FINDINGS

Positive Acceptance of Energy Efficiency

Survey data reveal that there is 85% significant acceptance of energy efficient practices among hoteliers in Johor. Despite varying operational scales and strategies, most respondents recognize the environmental and economic benefits of incorporating energy efficient elements into their establishments. This research involves 3 stars hotel (27%), 4 stars hotel (49%) and 5 stars hotel (24%). The survey data reveal that there is significant acceptance of energy efficient practices among hoteliers in Johor.

Despite varying operational scales and strategies, most respondents recognize the environmental and economic benefits of incorporating energy efficient elements into their establishments. For instance, LED lighting and HVAC upgrades are reported to be among the most adopted measures, influenced by the potential for reduced energy consumption and maintenance costs (Cottam, 2022). Thus, the acceptance of energy efficiency are detailed according to the energy efficiency elements as in Table 1.

Table 1: Research Finding 2: The implementation of energy efficiency elements in practices.

Ranking	Energy Efficiency Elements	Descriptive Analysis
1.	Energy efficiency hardware	52.4%
2.	Smart building management system	42.7%
3.	Energy audit and monitoring	37.5%
4.	Insulation and windows	34%
5.	Certification and green standards	30.1%
6.	Heat, Ventilation and Air Conditioning (HVAC) systems	30.1%
7.	Energy efficient lighting	29.1%
8.	Water heating efficiency	27.2%

Source: Fieldwork Researcher (2024)

Besides, upgrading HVAC (heating, ventilation, and air conditioning) systems emerged as another popular strategy. Many hotels have invested in more efficient HVAC units that automatically adjust based on room occupancy or external climate conditions. The use of smart thermostats and sensors has enabled many establishments to optimize their energy consumption without compromising guest comfort. Several hoteliers reported significant reductions in energy bills following these upgrades, validating the cost effectiveness of this approach. Renewable energy sources like solar panels into hotel operations has gained traction, particularly among larger 4 star and 5 star hotels. Solar panels have been used for electricity generation and heating water, reducing reliance on non renewable energy. Hoteliers highlighted that while the initial investment was considerable, the long term savings combined with potential government incentives made solar panels a financially and environmentally viable solution. Efforts to implement energy efficiency often intersect with water management strategies. Many respondents mentioned the installation of low-flow showerheads, faucets, and efficient irrigation systems as ways to reduce energy usage. By minimizing water consumption, the demand on energy intensive water heating systems is significantly lowered.

Some hoteliers also noted operational changes as a part of their energy efficiency efforts. This includes training staff to be mindful of energy consumption and implementing practices like switching off unused appliances, optimizing laundry schedules, and encouraging guests to reuse towels and linens. These operational changes contribute significantly to overall energy savings and sustainability goals (Cottam, 2022). Overall, hoteliers are not only aware of the long term financial benefits of energy efficient practices but also understand the importance of contributing to global environmental goals. The positive acceptance of these elements indicates a willingness to invest in energy efficiency, paving the way for future advancements and policy support. However, this acceptance is not without challenges, which include high initial costs,

technical knowledge gaps, and the need for more comprehensive staff training programs.

Barriers to Implement Energy Efficiency Practices

Despite the positive acceptance of energy efficient elements among Johor's hoteliers, the survey data reveals several significant barriers preventing broader adoption of these practices. These challenges, primarily financial constraints, technical knowledge gaps, and resistance to change, highlight the complexities of transitioning toward sustainable operations. Table 2 shows the research findings:

Table 2: Mean analysis for barriers to implement energy efficiency practices.

No.	Barriers to Implement Energy Efficiency Practices	Mean
1	Financial constraints	3.80
2	Technical Knowledge	3.74
3	Resistance to Change	3.77
4	OPERATIONAL CHALLENGES	3.69
5	External Factors	4.01

Source: Fieldwork Researcher (2024)

Based on the research findings as presented in Table 2, the most agreed barriers to implement energy efficiency practices among hoteliers is external factors with mean 4.01. While the least agreed barriers to implement energy efficiency practices is technical knowledge with mean 3.74. Financial constraints could be alleviated by offering targeted government grants or low interest loans to hotels investing in energy efficiency. Technical challenges could be mitigated through partnerships with technology providers, creating advisory programs, or organizing training workshops to educate hoteliers on integrating energy efficient systems. Building awareness and demonstrating tangible ROI examples can help reduce resistance to change, as can involving staff in decision making processes and developing comprehensive training programs. The following detailed analysis extract the external factors included as the barriers to implement energy efficiency practices.

Table 3: Research Finding 3: Relative Importance Index (RII) analysis for barriers to implement energy efficiency practices.

No.	Barriers to Implement Energy Efficiency Practices	RII
1	Lack of customer support	0.8777
2	Difficulty in managing and training the staff	0.8233
3	Lack of government regulation and enforcement	0.8019
4	Lack of resources (time, energy and equipment)	0.7864

No.	Barriers to Implement Energy Efficiency Practices	RII
5	Hard to find green suppliers	0.7670
6	High implementation and maintenance costs	0.7592
7	Difficulties and balancing service quality with environmental performance	0.7534
8	Lack of information and knowledge about green buildings	0.7476
9	Lack of support from the owner and management	0.7379
10	Lack of infrastructure to support sustainable tourism	0.7359

Source: Fieldwork Researcher (2024)

Table 3 summarizes the key barriers to implementing energy efficiency practices in the hotel and tourism industry, ranked according to their Relative Importance Index (RII). The results indicate that the most critical barrier is the lack of customer support (RII = 0.8777), suggesting that guest attitudes and preferences significantly influence the adoption of sustainable practices. This is followed by difficulty in managing and training staff (RII = 0.8233) and lack of government regulation and enforcement (RII = 0.8019), both of which highlight organizational and policy-related challenges. Other notable barriers include limited resources, scarcity of green suppliers, and high implementation and maintenance costs, reflecting the operational and financial constraints faced by hoteliers. Lower-ranked but still significant barriers include balancing service quality with environmental performance, insufficient knowledge about green buildings, lack of management support, and inadequate infrastructure for sustainable tourism. Overall, the findings reveal that both internal organizational limitations and external systemic factors hinder the effective implementation of energy efficient practices in the sector.

DISCUSSION

The research findings align closely with global trends in sustainable tourism, emphasizing energy efficiency as a fundamental aspect of environmental conservation. In Johor, the hotel and tourism industry increasingly recognizes the importance of adopting sustainable measures that balance resource efficiency and profitability. The use of LED lighting, upgraded HVAC systems, and renewable energy technologies such as solar panels demonstrates the industry's commitment to reducing carbon emissions and improving operational sustainability. These practices mirror the recommendations of international bodies such as the World Tourism Organization (UNWTO) and the United Nations Environment Programme (UNEP), which identify energy efficiency as a key driver of sustainability in hospitality. Overall, the findings indicate a growing environmental and financial awareness among Johor's hoteliers, consistent with global movements toward greener tourism operations.

Despite this growing awareness, several barriers continue to impede the widespread adoption of energy efficient technologies. Chief among these are financial constraints, particularly the high initial investment costs associated with renewable energy systems and HVAC upgrades. The lingering economic effects of the COVID-19 pandemic have further limited hoteliers' financial capacity, leading to hesitation in pursuing costly sustainability initiatives. This challenge is compounded by managerial resistance to change, often resulting from a lack of technical expertise and skepticism about the long-term benefits of energy efficient investments. Similar patterns have been observed in Europe and North America, where uncertainty regarding return on investment (ROI) and potential operational disruptions have slowed adoption. Consequently, the tension between immediate financial recovery and long term sustainability remains a central obstacle for Johor's hotel sector.

The study also underscores the critical role of government intervention and strategic collaboration in promoting energy efficiency within the hospitality industry. Respondents emphasized the need for clearer policies, financial incentives, and technical support to facilitate the transition toward sustainable operations. International examples from countries such as Australia, the United Kingdom, and the United States highlight the effectiveness of government subsidies, low interest loans, and regulatory frameworks in advancing energy efficient practices. Similarly, Johor's hoteliers can benefit from greater institutional support, staff training, and partnerships with technology providers and industry associations to foster a culture of sustainability. By integrating technological innovation, financial assistance, and long-term strategic planning within a cohesive policy framework, Johor can position itself as a leader in sustainable hospitality balancing environmental stewardship with economic competitiveness in the global tourism landscape.

CONCLUSION

Energy efficiency has become a key driver in revitalizing Malaysia's hotel and tourism sector after the COVID-19 pandemic, offering both economic and environmental benefits. The adoption of sustainable practices such as LED lighting, upgraded HVAC systems, and renewable energy technologies like solar panels helps reduce operational costs, improve efficiency, and enhance brand reputation among environmentally conscious guests. However, the transition faces challenges that require a comprehensive, collaborative approach involving technological innovation, staff training, and strong government support through financial incentives and policy frameworks. Partnerships between hoteliers, technology providers, and industry associations are also essential to promote knowledge sharing and best practices. Overall, integrating advanced technologies, human capital development, and supportive governance can

strengthen Johor's hospitality industry, positioning it as a leader in sustainable tourism and a model of resilience, profitability, and environmental stewardship within Malaysia.

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