DEVELOPING SUSTAINABLE ENERGY-SAVING STRATEGIES IN FIVE-STAR HOTELS IN SHARM EL-SHEIKH CITY, EGYPT

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ABSTRACT

The main aim of this research is to develop operational strategies for sustainable energy-saving in the hotel industry. Accordingly, this research was based on the analytical approach. The research population is the staff of Sharm El-Sheikh hotels in Egypt. A random stratified sample including managers and employees of five-star hotels was selected. Out of the approximately 770 questionnaires that were sent out, 532 were returned, and 238 were deemed invalid. The research results demonstrated the high level of building energy-saving strategies (BESS), staff energy-saving strategies (SESS), and customer energy-saving strategies (CESS). In addition, the results revealed that the level of building energy-saving strategies is moderately and positively correlated with staff energy-saving strategies and customer energy-saving strategies. The level of staff energy-saving strategies is moderately and positively correlated with customer energy-saving strategies. Consequently, five-star hotels are required to continuously adopt sustainable energy-saving strategies in an integrated manner to achieve the maximum efficiency of operational performance, which maximizes the achievement of the hotels' goals. Finally, this research presents sustainable energy-saving strategies related to the building, employees, and customers, which can be used as a managerial tool to improve the level of operational performance efficiency in the hotel industry.

KEYWORDS: Operational Strategies, Operational Performance Efficiency, Sustainable Energy-Saving Strategies.

1. INTRODUCTION

Energy saving is a continuous issue for every establishment in hospitality industry; where one of the most crucial requirements for sustainable hotels is energy saving (Hanna and Farouh, 2012). Despite being the hotel industry as a largest energy consumption (Georgei & Bombeck, 2012), hotels ranked

among the top contributors to environmental pollution, which they use a notable and excessive amount of energy and resources (Mbasera *et al.*, 2016; Sharif *et al.*, 2022). Specifically, there is a notable disparity in energy saving efficiency between hotel types, with higher-category hotels demonstrating a greater commitment to energy conservation, such as energy management programs and carbon audits (Wang *et al.*, 2018). As a result, investing in energy-efficient usage can lead to significant savings in energy consumption, operational expenses, and bills, often achieved through strategies, policies, and actions (Sharif *et al.*, 2022).

Adopting environmentally friendly practices generally supports hotels in increasing revenue through increased customer satisfaction (Anuwichanont *et al.*, 2011), enhanced reputation, positive brand effects (Chen & Chen, 2012), lower hotel costs through waste, energy, and water reduction (Eldemerdash & Mohamed, 2013), and competitive differentiation (Hays & Ozretić-Došen, 2014). Hotels can achieve goals by implementing energy-saving practices, reducing capital costs, reducing emissions, increasing customer satisfaction, operating more profitably, and reducing non-renewable energy resources (Saad *et al.*, 2012). Furthermore, according to Abdel-aal and Kouzmal (2016), these practices support in achieving profitability and competitive advantages. Approximately, hotels might save up to 65% on energy expenses with the use of cutting-edge energy management systems (Hassan, 2017). As a result, hotels need to take notice and begin implementing eco-friendly strategies such reducing solid waste, saving electricity, and conserving water (Sayed, 2021). The hotel industry heavily relies on energy for various activities, resulting in increased water usage. Therefore, implementing water-saving practices can help reduce energy consumption (Sharif *et al.*, 2022).

In recent years, the subject of energy saving has garnered increasing attention by researchers (Wang *et al.*, 2018). For example, hotel customers are becoming more concerned as they become aware of the harm that is being done to the environment and the excessive use of energy, water, and resources (Bohdanowicz, 2006). In addition, excessive consumption of energy, water, and material during hotel operations are responsible for around 75% of environmental pollution (Bohdanowicz and Martinac, 2007). Accordingly, hotels are among the top five in the commercial building sector for energy consumption (Karagiorgas *et al.*, 2007). Wherefore, hotel operators were more motivated to enhance energy efficiency due to rising energy resource prices and mounting pressure from stakeholders and governments (Bohdanowicz, 2006; Erdogan & Baris, 2007; Ali *et al.*, 2008). Particularly, the issue of energy waste arises from staff members' ignorance of energy-saving practices and their disregard for the particular energy usage in the various hotel departments (Scanlon, 2007; Ali *et al.*, 2008). As

people's knowledge and desire for sustainability practices have grown, the hotel industry has responded to this trend by evolving and progressing to become a more environmentally friendly institution (Hu *et al.,* 2010). On the contrary, energy waste in hotels is primarily due to employee mishandling, lack of energy-saving systems, inadequate funding, technical expertise shortage, and lax laws (Saad *et al.,* 2012). Global environmental concerns have increased companies' awareness of the need to modify their products and services to be more sustainable (Jolink & Niesten, 2015).

For energy-saving practices in Egypt, there is a severe lack of environmental knowledge, which negatively impacts the ecosystem and how energy and water are used. Therefore, Shackley (1999) advised hotels to switch to renewable energy sources and reduce their energy consumption; Barakat *et al.* (2003) advised hotels to monitor and cut back on energy consumption; and Saad *et al.* (2012) stated that the initiative aims to promote renewable energy use among hoteliers, implement energy management programs, and utilize organic waste for cooking fuel. For instance, Georgei & Bombeck (2012) found that Sharm El-Sheikh hotels fail to meet environmental standards due to lack of public and recorded data on energy use and unwillingness to provide such data. In addition, Saad *et al.* (2012) stated that improper equipment and gadget usage by staff members is the primary factor that might result in energy waste at Sharm El-Sheikh hotels. The majority of hotels in Hurghada and Sharm El Sheikh are lacking in principles and expertise about environmental standards. These hotels also consume enormous quantities of energy (Hassan, 2017).

Because employees have to put in more labor and undergo more training, employees are less committed to green practices and are more likely to quit (Sharif *et al.,* 2022). There are no limits on how much electricity or water customers may use, Hurghada's five-star hotels use more of both. Evidently, customers who are unaware of the benefits of conserving energy and water use more energy than is necessary (Amer *et al.,* 2023). In order to improve the proper work environment, productivity, and quality of work, Moftah *et al.* (2023) suggested that performance level be one of the primary criteria for choosing hotel leaders in five-star hotels in Cairo. Hospitality researchers are advised by Abdelmawgoud *et al.* (2024) to investigate sustainable energy-saving strategies that are applied to Egypt's hotel industry. Based on the preceding study, energy saving is a significant worldwide economic problem for sustainable development and environmental preservation. The core research gap relates to the lack of sustainable energy-saving strategies in five-star hotels. Consequently, the purpose of this research is to develop operational strategies for sustainable energy saving in five-star hotels in Sharm El-Sheikh city in Egypt.

2. LITERATURE REVIEW

2.1. ENERGY CONSUMPTION AND SAVING

The hotel industry consumes an average of 84% of total energy, primarily electricity for air conditioning (Deng & Burnett, 2000). As a consequence, establishments face ongoing energy-related issues, necessitating a focus on renewable energy sources and energy efficiency to reduce carbon emissions (Nakata *et al.,* 2011). In actuality, energy imbalance has grown for ten years, reaching 52% in 2018 and accounting for 60% of trade deficit. Reduced resources and global oil price increase contribute to decline (Lu *et al.,* 2013). As per Becchio *et al.* (2016), hotels contribute to 40% of global energy consumption and one-third of GHG emissions. Urbanization is expected to increase building energy use, with urbanization contributing to over 75% of emissions by 2030.

The global trend towards environmental protection and renewable energy sources is gaining popularity, emphasizing the need for sustainable design and the integration of more renewable energy technologies (Parpairi, 2017). Energy and water consumption has grown as a result of rising living standards and customer goods demand (Marinopoulos & Katsifarakis, 2017). Lowering hotel energy consumption is crucial for a country's economy to become more energy-efficient and environmentally friendly, and is a primary goal of energy policy in many nations (Chwieduk, 2017). One of the primary tenets of the European energy policy is energy efficiency, which encompasses all economic sectors (Bianco *et al.,* 2017). To enhance a hotel's energy efficiency, it is crucial to reduce energy consumption, utilize advanced technology, and improve hotel operations (Buso *et al.,* 2017). Tourism significantly impacts the energy consumption and total load profile of communities with isolated energy systems (Beccali, 2018). Global warming benefits energy usage by affecting energy usage. Implementing energy-saving practices and encouraging renewable power production are recommended, especially in high-energy-consumption enterprises (Pablo-Romero, 2019).

Mechri and Amara (2021) revealed that there is a significant link between the fluctuations in tourism traffic and the potential for energy-wasting behavior in hotel constructions. The zero-carbon building concept is gaining support due to its significant role in the transition to a carbon-free economy, particularly in the building sector like hotels (Crespi *et al.,* 2021). The need for scholarly investigation is urgent to understand effective strategies to decrease the substantial carbon footprint of five-star hotels (Salehi, 2021). Hotels significantly impact climate change due to their high energy

consumption, influenced by employees and customers, with staff often initiating practices to reduce resource utilization (MacAskill *et al.*, 2023).

2.2. ENERGY SAVING STRATEGIES IN EGYPT

Energy waste is a persistent and serious problem in Egypt's hotel sector. For instance, the study of Shackley's (1999) noted that there is an increasing need to transition to renewable energy sources and minimize energy usage. This requirement stems from the rising cost of conventional fuels. As a result, Barakat *et al.* (2003) suggested that hotels keep an eye on and cut back on their energy usage. According to Saad *et al.*, (2012), hotels are increasingly utilizing renewable energy sources, with 22.2% using solar power for water heating and kitchen and HVAC systems. To promote sustainable practices, policies and organic waste collection stations should be implemented. In addition, Sharm El-Sheikh hotels are not adhering to environmental practices due to the lack of publicized and documented information on energy use (Georgei & Bombeck, 2012). The Egyptian government is reducing subsidies for electricity, natural gas, and LPG, the primary fuels used by the hotel industry, to reduce energy waste in the short to medium term (EBRD, 2013).

In Cairo and Alexandria hotels, the yearly energy consumption of hotel buildings is reduced by almost 20% when there is a Window-to-Wall Ratio of 0.20 and appropriately shaded windows (Hanna and Farouh, 2014). In addition, Hurghada and Sharm El-Sheikh hotels in Egypt lack environmental awareness and energy efficiency, potentially reducing energy bills, operational expenses, and consumption through investments in more sustainable practices (Hassan, 2017). According to Abdou *et al.* (2020), green hotel practices involve energy-efficient appliances, recycling greywater, renewable energy programs, water-efficient devices, linen and towel reuse, waste management, recycling, and reusable objects. In addition, Sayed (2021) stated that the hotel implemented green practices such as recycling bins in lobby and rooms, energy-efficient light bulbs in guest rooms, and green certificates as tourist-accepted green practices. According to Sharif *et al.* (2022), hotel staff members are less likely to adhere to green practices and are more likely to quit due to the increased workload and required training. According to Amer *et al.* (2023), Hurghada's five-star hotels have implemented sustainable practices, including solar energy systems, green training, energy-efficient air conditioning units, drought-tolerant gardens, watering at dusk, and limiting water consumption. They also offer eco-friendly luxury goods without plastic packaging.

2.3. INTERNATIONAL ENERGY SAVING STRATEGIES

Numerous researchers have taken an interest in the energy issue due to its link to the sustainability movement. For example, implementing eco-friendly practices, such as energy saving, will systematically advance ecologically sustainable development (Diamantis and Ladkin, 1999). In addition, a variety of variables, including hotel class and year of construction, are examined in relation to energy use in hotels (Deng & Burnett, 2000). Energy efficiency and renewable energy sources are crucial for creating sustainable societies that balance environmental preservation and economic progress (Nakata *et al.*, 2011). The generation of hot water, heating, and cooling contribute 10% of the nation's total energy consumption from Greek hotels (Moiá-Pol *et al.*, 2005; HES, 2011). Renewable Energy Technologies (RET) is an effort aimed at achieving EU environmental policies, with a particular focus on Greek hotels. However, according to Karagiorgas *et al.* (2007), solar systems were the most often utilized RET, with RETs being utilized in just 11 hotels. According to Butler (2008), reduced energy, waste, water, emission, operating, and maintenance costs might be profitable for green hotel operators.

Specifically, hotels in southern Europe are experiencing a 25-30% increase in energy usage due to their extensive services and 24/7 operations (Michalena & Lagos, 2011). Greek hotels primarily generate hot water and space conditioning, accounting for 72-75% of energy consumption, but implementing energy efficiency practices can reduce usage by 10% to 15% (HES, 2011). Many hotels view eco-friendly practices as a moral choice, cost-cutting, brand recognition enhancement, market differentiation, and fulfilling corporate social responsibility (Radwan *et al.*, 2012). Any firm might cut energy savings by as much as 20% by using green practices (Yusof & Jamaludin, 2013). In today's market, hotels can improve their reputation and efficiency by being environmentally friendly, especially in waste management and energy efficiency (Chen and Chen, 2012; Rahman *et al.*, 2012; Punitha and Rasdi, 2013). For example, Malaysian hotel operators have mostly implemented green practices related to energy, trash, and water (Yusof and Jamaludin, 2013).

The hotel industry significantly impacts the environment by excessively using non-durable products, energy, and water, causing direct or indirect damage to the environment (Chan *et al.*, 2014; Noor & Kumar, 2014). The hotel industry faces challenges in reducing environmental risks and transitioning to a more eco-friendly sector due to ongoing environmental issues (Jones *et al.*, 2014). Nonetheless, research on hotels' environmental

policies and the environmental behavior of its staff members is still lacking and frequently disregarded (Chou, 2014). After employee costs, water and energy consumption are second in importance among hospitality costs (Escalera and Perez, 2014). While implementing green practices inside a business is the primary goal, individual employee roles are also very important (Lamm *et al.*, 2015). Even if a hotel uses very little non-renewable resources and doesn't cause any major environmental damage, its effects are nevertheless noticeable when taken as a whole (Nezakati *et al.*, 2015). Hotels and resorts are implementing water-efficient appliances, smart taps, gas-powered kitchens, and educating staff on resource conservation, particularly for those with limited education (Ihalawatta *et al.*, 2015).

To improve staff practices, staff knowledge, training, SOPs updates, incentives, water-efficient technologies, and resort investment in renewable energy systems are essential (Abdel-aal and Kouzmal, 2016). The hotel sector may profit economically (Anatasia *et al.*, 2001; Chen & Chen, 2012; Singal, 2014), gain a competitive edge, and increase customer happiness and loyalty by implementing green practices (Pereira-Moliner *et al.*, 2015). Commercial buildings account for about 44% of all energy usage (Parpairi, 2017). According to likelihood and effect, environmental hazards continue to rank among the top five major risks (Bahadure, 2017). A number of other studies, including those by Kalayci and Koksal (2015), and Kapusuzoglu (2014) highlighted energy use as one of the primary causes of environmental deterioration. According to Said *et al.* (2017), cutting hotel energy use lowers greenhouse gas emissions, which contributes to environmental conservation. Energy efficiency practices include using less energy to accomplish the same goals, saving energy, cutting expenses associated with operations, lowering carbon emissions and footprint, and boosting competitiveness (Said *et al.*, 2017).

In addition, there has been a drop in global energy supply and an increase in energy costs (Khan and Chang, 2018; Norton *et al.*, 2012). Hotels waste 42% of energy for heating and cooling; prompting increased energy-saving measures due to rising costs, government pressure, and environmental awareness among customers and the hotel industry (Mensah & Blankson, 2013; Cingoski & Petrevska, 2018). The hotel's ability to become a green hotel is also benefited by the workers' perspective and degree of engagement (Klewtong, 2018). In addition, The UNWTO aims to reduce tourist industry emissions by 50% by 2035, as the hotel sector contributes over 20% of these emissions (UNWTO, 2018). The hotel industry must prioritize energy efficiency and utilize renewable energy resources and technology to comply with EU environmental legislation (Bohdanowicz, 2007; Vourdoubas, 2018; Zientara *et al.*, 2020). The EU environmental policies are being implemented by these nations to decrease energy consumption and carbon

emissions, thereby enhancing energy efficiency (Sayegh *et al.*, 2021). In an effort to appeal to environmentally concerned customers, hotels have made investments in energy-efficient lighting fixtures and arrangements (El-Sayed and Abed, 2021). In addition, implementing energy-efficient practices in hotels enhances aesthetics, customer comfort, and reduces energy system breakdowns. Strategies include adopting energy-efficient equipment, training staff, providing resources, replacing outdated electronics with modern technology, and sharing a sustainability policy with staff (Sharif *et al.,* 2022).

2.4. SUSTAINABLE LIGHTING STRATEGIES

Hotel energy consumption quotas are crucial for promoting hotel energy efficiency by accurately determining the true amount of energy consumption (Zhao, 2012). For example, four rated hotels used 280.1, 237.7, 186.3, and 143.6 kWh/m2/year, with average guest room energy consumption of 26.7, 25.0, 14.6, and 9.4 MWh/room/year (Wang, 2012). In addition, Xin *et al.* (2012) discovered that the initial implementation stage of four- and five-star luxury hotel buildings in Hainan's energy consumption quota ranged from 69.23-96.75 kWh/m2, with guestroom numbers and electricity being key determinants. Moreover, Lu *et al.* (2013) stated that double glazing windows significantly impact energy consumption, necessitating energy-efficient and financially sound retrofitting of existing buildings to achieve nearly-zero energy building (nZEB) goals. According to Becchio *et al.* (2016), these assessments encompass not only the building industry but the whole energy system. The necessity of combining sustainable design with additional Renewable Energy Technologies (RET) is emphasized (Parpairi, 2017). Finally, Marinopoulos & Katsifarakis (2017) explored sustainable swimming pool solutions in Thessaloniki, Greece, including the use of light roofs, geothermal heat pumps, photovoltaic panels, and solar thermal collectors.

By putting into practice financially viable energy efficiency measures, it could be possible to achieve primary energy savings of 1.6 TWh (13%) in 2030 (Bianco *et al.*, 2017). According to Buso *et al.* (2017), utilizing efficient technology can enhance hotel energy efficiency, ensuring superior comfort for guests, thereby reducing investment costs and enhancing overall visitor satisfaction. For example, five-star hotels in China consume 54%, 13%, and 27% more energy than the upper limits of EUI intervals in the cold zone, hot summer/cold winter zone, and hot summer/warm winter zone (Sheng, 2018). Implementing solar energy systems can reduce energy consumption and regulate seasonal variations in the hotel business, utilizing thermal or electric energy storage and building automation control systems

(Beccali, 2018). In particular, the development and implementation of a suitable energy plan necessitates prior knowledge of the energy and water patterns within the hotel and accommodation sector (Mechri & Amara, 2021). It is difficult to meet the zero-carbon objectives due to the high energy usage of comfort-based hotel operations (Crespi *et al.*, 2021). Luxury hotels in Iran have a significantly higher energy and carbon footprint than similar hotels, necessitating measures like economic sanctions, alternative energy sources, corporate energy conservation, regular energy performance assessments, and sharing best practices (Salehi, 2021).

2.5. SUSTAINABLE WATER STRATEGIES

The use of advanced technologies like nanotechnology and advanced filtration systems can significantly improve the efficiency of water treatment processes (Marinopoulos & Katsifarakis, 2017). In addition, sustainable practices, involving collaboration between researchers, policymakers, and industry stakeholders, are crucial for identifying leaks, reducing water loss, and minimizing harm in global water quality and availability issues (Mechri & Amara, 2021). The water management program has highlighted the need for strengthened soak pit foundations, the construction of ground tanks during the dry season, and the flexibility of tank size based on funding availability (Sugesti *et al.,* 2023). The implementation of water-saving practices, including remodeling rooms, has been influenced by guest numbers and effectiveness, raising concerns about their impact on consumer behavior (Antonova, 2023). Moreover, it is projected that engaging with customers to reduce wasteful water consumption would save more money than reducing gas and electricity use (MacAskill *et al.,* 2023). Finally, for water saving practices, using the kitchen sink - instead of a common water bucket - might encourage water savings by utilizing the precise amount of water necessary for washing vegetables. In addition, it can improve the effectiveness of minimizing cross-contamination (Sugesti *et al.,* 2023).

2.6. SUSTAINABLE TRASH STRATEGIES

Hotels often neglect environmental duties and fail to adopt sustainable waste management techniques, making it difficult for them to effectively reduce their environmental impact (Radwan *et al.,* 2010; Radwan *et al.,* 2012). Trash management improves energy efficiency, social, economic, and environmental issues in hotels by reusing and recycling food waste, minimizing plastic use, and treating soil as natural fertilizers (Rawal & Takuli, 2021). The hospitality sector produces around 35 million tons of solid trash annually, encompassing various waste types in the hotel and restaurant industry (Juvan *et al.,* 2023). Trash management is crucial for sustainable hotels, promoting environmental conservation through single-

use goods reduction, composting, recycling, food waste reduction, and proper disposal of hazardous trash (Trikon, 2023).

Waste management is crucial, especially in developing nations' five-star hotels, and the hospitality industry. It involves handling kitchens, cafeterias, restaurants, policies, service planning, and disposal through reuse, recycling, and donation (Kattiyapornpong *et al.,* 2023). The hospitality industry's waste poses a significant sustainability challenge, and employee training is considered the most effective strategy for waste mitigation (Diaz-Farina *et al.,* 2023). According to Abdelmawgoud (2023), in order to enhance food waste management and operational efficiency, hotel managers ought to adopt sustainable food operations best practices. Finally, Sobti *et al.* (2024) displayed that hotels implement effective waste management practices, including waste audits, waste reduction, recycling, composting, hazardous waste management, employee training, stakeholder engagement, and continuous improvement, promoting sustainability in their operations.

3. METHODOLOGY

3.1. RESEARCH APPROACH

The aim of this research is to develop operational strategies for sustainable energy saving. Accordingly, this research is based on the analytical approach.

3.2. QUESTIONNAIRE LAYOUT

The research questionnaire is divided into two parts; the first part is concerned with the public information which includes the following points: job, department, gender, age, and qualification. The second part is concerned with the energy saving strategies (Parpairi, 2017). These strategies include building energy-saving strategies (BESS) (15 items), staff energy-saving strategies (SESS) (6 items) and customer energy-saving strategies (CESS) (4 items). In addition, all items of variables were distributed on the Likert five-scale scale from very low (1) to very high (5). The form of questionnaire has been created as a tool to gather data on the research variables.

3.3. RESEARCH POPULATION AND SAMPLE

The research population is the staff of Sharm El-Sheikh hotels in Egypt. The sample is represented by the staff of five-star hotels. The random stratified sample is used because the sample includes categories of managers and employees in collecting data. Five-star hotels were chosen because they use more energy in their operations and various services compared to other

categories of hotels. Sharm El-Sheikh, Egypt's main tourist destination is renowned for its seaside resort. The high temperatures and humidity in winter and summer significantly increase electricity demand, indicating that hotels consume significant energy during these seasons (Georgei & Bombeck, 2012). Moreover, hotels in Sharm El-Sheikh do not apply energy saving practices sufficiently due to the low level of environmental saving awareness (Saad *et al.*, 2012; Hassan, 2017; Sharif *et al.*, 2022). Since statistics on the total number of hotels staff (managers and employees) in Sharm El Sheikh are not available, the size of the population is considered to be unlimited. Therefore, the following statistical equation is used to calculate the sample size.

$$n = \frac{Z^2 \times \hat{P}\,(1-\hat{P})}{\varepsilon^2} = \frac{1.96^2 \times 0.5\,(1-0.5)}{0.05^2} = 384.16 \approx 385$$

Where:

- $\hat{P}$= Probability of achieving the studied characteristic in the population (0.5)
- z = Confidence Level of 95 % (1.96)
- ε = Error Proportion (0.05)
- n = Sample Size (385)

To achieve a 95% confidence level, 385 or more questionnaires are required, with a 50% expected response rate, requiring twice the sample size. Consequently, the number of distributed questionnaires is 770.

3.4. DATA COLLECTION

The questionnaire was used as a tool of collecting data from five-star hotels in Sharm El Sheikh and was distributed in paper form during the period from August 2023 to December 2023 for a period of five months. About 770 questionnaires were distributed, 532 of which were returned, while 238 were invalid.

3.5. DATA ANALYSIS TECHNIQUES

Based on the main aim, this research proposed the following hypotheses:

- **H1:** Building energy-saving strategies (BESS) have a significant effect on customer energy-saving strategies (CESS).
- **H2:** Building energy-saving strategies (BESS) have a significant effect on staff energy saving strategies (SESS).
- **H3:** Staff energy-saving strategies (SESS) have a significant effect on customer energy-saving strategies (CESS)

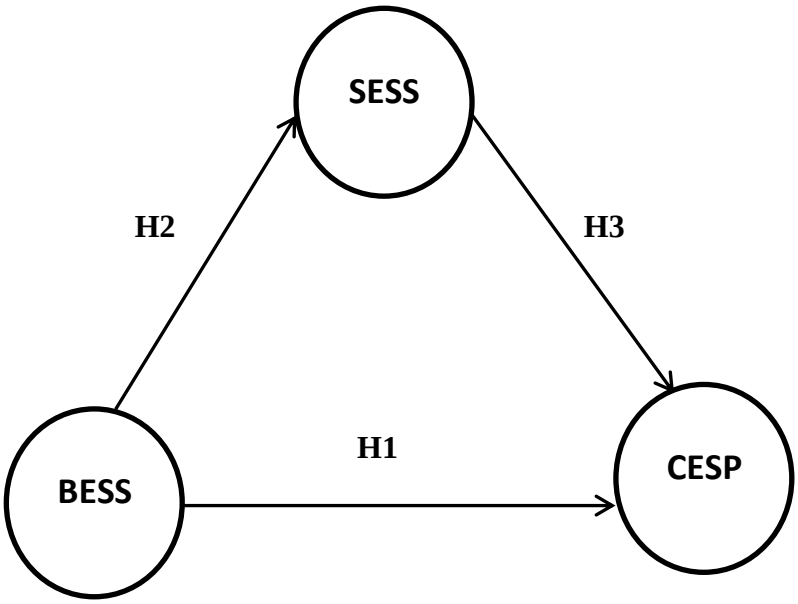

Figure (1): The Research Conceptual Framework

To test these proposed hypotheses, correlation and regression tests are used to determine the nature of the relationships between the research variables.

3.6. Data Validity and Reliability

3.6.1. Data Validity

Table (1): Data Validity of Research Variables Using Factor Analysis

Variables		
Communalities	**Initial**	**Extraction**
BESS1	1.000	0.719
BESS2	1.000	0.905
BESS3	1.000	0.888
BESS4	1.000	0.865
BESS5	1.000	0.756
BESS6	1.000	0.822
BESS7	1.000	0.849
BESS8	1.000	0.787
BESS9	1.000	0.765
BESS10	1.000	0.773
BESS11	1.000	0.707
BESS12	1.000	0.745

BESS13	1.000	0.757
BESS14	1.000	0.891
BESS15	1.000	0.841
Building Energy-Saving Strategies	**1.000**	**0.805**
SESS1	1.000	0.727
SESS2	1.000	0.904
SESS3	1.000	0.869
SESS4	1.000	0.701
SESS5	1.000	0.642
SESS6	1.000	0.739
Employee Energy Saving Strategies	**1.000**	**0.764**
CESS1	1.000	0.804
CESS2	1.000	0.855
CESS3	1.000	0.731
CESS4	1.000	0.672
Customer Energy Saving Strategies	**1.000**	**0.766**

According to table (1), exploratory validity is achieved in this research by factor analysis, which is a useful step in improving the research's components. All variables have extraction values that are stated to be higher than the suggested threshold of more than 0.40. This demonstrated the statistical validity of the latent variables obtained from the component analysis and their significant contribution to the comprehension of the research's constructs.

Table (2): KMO and Bartlett's Test

No.	**Variables**	**Tests**			
		Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**Bartlett's Test of Sphericity**	
		Value	Level	**Approx. Chi-Square**	**Sig.**
1	Building Energy-Saving Strategies (BESS)	0.830		1052.550	0.000
2	Staff Energy-Saving Strategies (SESS)	0.768		349.703	0.000
3	Customer Energy-Saving Strategies (CESS)	0.437		67.525	0.000

Additionally, by analyzing the sample size and sampling adequacy for each variable in this research, the KMO test is utilized to determine if the data is suitable for factor analysis. The KMO measurement quality assurance test scores ranged from 0.437 to 0.830, indicating that there is a significant degree of common variation across the variables in the research dataset, as indicated by table (2).

3.6.2. DATA RELIABILITY

Table (3): Data Reliability Using Cronbach Alpha Test

No	Variables	Items	Cronbach Alpha Value	Validity Coefficient*
1	Building Energy-Saving Strategies (BESS)	15	0.920	0.959
2	Staff Energy-Saving Strategies (SESS)	6	0.835	0.914
3	Customer Energy-Saving Strategies (CESS)	4	0.443	0.666
Total		**25**	**0.733**	**0.846**

* Validity Coefficient = √ Reliability Coefficient

According to table (3), to guarantee measurement consistency and stability among questionnaires and to maintain trust in the instrument's results over time, a reliability test employing Cronbach alpha score is an essential research step. Cronbach alpha values showed that the scales' internal reliability is satisfactory, ranging from 0.443 to 0.920. Furthermore, a key component in determining the research's dependability is the validity coefficient, which is sometimes referred to as squared multiple correlations or commonalities.

4. DATA ANALYSIS & RESULTS DISCUSSION

About 770 questionnaires were distributed to the staff of five-star hotels in Sharm El-Sheikh city; 532 forms were returned and valid for analysis, while 238 were invalid. By analyzing the research data, the results of the research came as follows:

4.1. The Descriptive Statistics of Sample Demographic Data

Table (4): The Frequency of Demographics Data

No	Factors	Items	Freq.	%
1	Job	Managers	120	22.6

		Employees	412	77.4
2	Department	Top Management	32	6.0
		Rooms Division	184	34.7
		Food and Beverage	158	29.7
		Human Resources	114	21.4
		Maintenance & Engineering	38	7.1
		Other	6	1.1
3	Gender	Male	367	69.0
		Female	165	31.0
4	Age	20 or less	286	53.8
		21-29	6	1.1
		30-40	171	32.1
		41-64	63	11.9
		65 and over	6	1.1
5	Qualification	Secondary	139	26.2
		University	292	54.8
		Postgraduate	101	19.0

Table (4) shows the frequency of demographic data for the study respondents. It turns out that most of the respondents are male (69%), 20 or less years (53.8%), university graduates (54.8%), employees (77.4%), and rooms' division department (34.7%).

Table (5): Descriptive Statistics of Building Energy-Saving Strategies

No.	Statements	Mean		SD	Level
		Statistic	Std. Error		
1	Start designing a sustainable hotel by taking into consideration the site's orientation and the microclimate.	3.00	0.115	1.053	Moderate
2	Use sustainable construction materials with less embodied energy; renovations use less energy than a new building; and greening existing buildings is a great opportunity to cut down on carbon emissions.	3.04	0.125	1.145	Moderate

3	Reuse and recycle materials waste from construction site (stone, soil, etc).	3.17	0.132	1.211	Moderate
4	Use as much as possible building materials extracted and manufactured locally.	3.25	0.132	1.211	Moderate
5	Increased thermal insulation of building floors, walls and roof.	3.52	0.124	1.135	High
6	Apply energy efficient window glazing and insulation.	3.90	0.100	0.913	High
7	Choose appropriate shading devices according to orientation.	3.82	0.110	1.008	High
8	Maximize natural light penetration and views.	4.02	0.094	0.864	High
9	Allow for natural ventilation.	4.24	0.077	0.705	Very High
10	Green roof is a very efficient way to insulate the top of the building.	4.19	0.237	2.170	High
11	Plan to use mostly renewable sources for the energy systems.	3.83	0.112	1.028	High
12	Incorporate mechanical systems that are designed in zones of operation. This will allow complete shutdown of heating/cooling systems on empty floors.	3.44	0.139	1.274	High
13	Select lighting fixtures that can be equipped with energy efficient lamps.	4.21	0.097	0.893	Very High
14	Use low-emitting, environmentally friendly paints.	3.96	0.114	1.046	High
15	Preserve local vegetation (especially large trees) as much as possible during construction; and the design of the garden is very important	3.95	0.115	1.052	High

	for the building's cooling strategy.				
Mean		**3.70**	**0.122**	**1.11**	**High**

Table (5) shows the descriptive statistics for the implementation level of building energy-saving strategies. The level is 3.7 out of 5 (Std. 1.11), this is considered a high level of mean. This result is consistent with the literature review, where adopting environmentally friendly practices generally supports hotels in increasing revenue through increased customer satisfaction (Anuwichanont *et al.*, 2011), enhanced reputation, positive brand effects (Chen & Chen, 2012), lower hotel costs through waste, energy, and water reduction (Eldemerdash & Mohamed, 2013), and competitive differentiation (Hays & Ozretić-Došen, 2014). In addition, global environmental concerns have increased companies' awareness of the need to modify their products and services to be more sustainable (Jolink & Niesten, 2015). Moreover, Wang *et al.* (2018) revealed that five-star hotels in Egypt have implemented energy management programs and carbon audits. Finally, Sharif *et al.* (2022) stated that investing in energy-efficient usage can lead to significant savings in energy consumption, operational expenses, and bills, often achieved through strategies, policies, and actions.

Shackley (1999) advised hotels to switch to renewable energy sources and reduce their energy consumption; Barakat *et al.* (2003) recommended hotels to monitor and cut back on energy consumption; and Saad *et al.* (2012) stated that hotels can achieve their goals by implementing energy-saving practices, reducing capital costs, reducing emissions, increasing customer satisfaction, operating more profitably, and reducing non-renewable energy resources. In addition, Hassan (2017) revealed that hotels might save up to 65% on energy expenses with the use of cutting-edge energy management systems. Moreover, hotels should adopt eco-friendly strategies like reducing solid waste, conserving electricity, and conserving water to reduce environmental impact (Sayed, 2021). Lower waste might be advantageous for green hotels (Butler, 2008). Better waste management in hotels addresses social, economic, and environmental issues by reusing and recycling food waste, reducing plastic usage, and treating soil for natural fertilizers (Rawal & Takuli, 2021). Implementing environmental conservation strategies like reducing single-use items, composting, recycling, minimizing food waste, and disposing of hazardous waste can save hotels money and reduce their environmental impact (Trikon, 2023). Hotel businesses can enhance sustainability through efficient waste management practices, audits, waste reduction, recycling, composting, hazardous waste management, staff training, stakeholder involvement, and continuous improvement (Sobti *et al.*, 2024).

Tarigan *et al.* (2020) stated that hotel management's emphasis on improving the implementation of green procurement policies and collaborating with suppliers' results in improved green performance, which increases operational efficiency and reduces waste. In addition, Astawa *et al.,* (2020) stated that the choice of environmentally friendly suppliers has a good and considerable influence on the adoption of environmentally friendly purchasing in five-star hotels. Hassan *et al.,* (2022) displayed the adoption of sustainable practices in purchasing process management has significant positive impacts, while the challenges faced by star hotels in Cairo hinder their adoption. Rismayanti *et al.,* (2023) revealed that when the green purchasing program is implemented correctly, a sustainable environment is promoted and the neighborhood gains. In contrary, hotels are considered to be a high consumption of energy (Georgei & Bombeck, 2012; MacAskill *et al.,* 2023; Chen & Chen, 2012) and cause environmental pollution (Sharif *et al.,* 2022); and customers are not motivated to use renewable energy sources or energy-saving practices through cheap and heavily subsidized energy prices (Georgei & Bombeck, 2012). In addition, Saad *et al.,* (2012) reported that hotels do not follow any energy-saving environmental quality systems. Georgei & Bombeck (2012) reported that Sharm El-Sheikh hotels do not follow many environmental standards, such as the scarcity of public and registered data on energy use in hotels, and the unwillingness of hotels to provide such data. Moreover, Hassan (2017) stated that hotels lack principles and expertise regarding environmental standards, and thus consume a large amount of energy. Finally, Sharif *et al.,* (2022) revealed that employees are less committed to green practices.

Table (6): Descriptive Statistics of Staff Energy-Saving Strategies

No	Statements	Mean		SD	Level
		Statistic	Std. Error		
1	Staff education on hotel energy saving policies.	4.15	0.090	0.829	High
2	Training of staff regarding room cleaning (water and energy conservation while preparing a guestroom).	4.11	0.093	0.850	High
3	Training of staff in bars /restaurants/laundry room regarding energy conservation (switching off kitchen appliances when not needed, hot irons in laundry room, etc.).	4.13	0.094	0.861	High

4	Employ local employees to support local economy.	4.31	0.074	0.676	Very High
5	Training staff to help in the regular inspection and maintenance program.	3.73	0.108	0.986	High
6	Create a green team which managers, supports and implements all sustainable practices and programs, and organize training meetings to introduce staff to new environmentally friendly procedures.	2.99	0.133	1.217	Moderate
Mean		**3.90**	**0.099**	**0.90**	**High**

Table (6) shows the descriptive statistics for the implementation level of staff energy-saving strategies. The level is 3.9 out of 5 (Std. 0.90), this is considered a high level of mean. This result is consistent with the literature review, as the hotel industry has evolved to become more environmentally friendly as people's awareness and desire for sustainability practices increase (Hu *et al.*, 2010). In addition, Saad *et al.* (2012) stated that the initiative aims to promote renewable energy use among hoteliers, implement energy management programs, and utilize organic waste for cooking fuel. Finally, Diaz-Farina *et al.,* (2023) stated that staff training is considered the most effective waste reduction method due to its higher preventative impact compared to other waste management techniques.

On the contrary, the issue of energy waste arises from staff members' ignorance of energy-saving practices/strategies and their disregard for the particular energy usage in the various hotel departments (Scanlon, 2007; Ali *et al.,* 2008). In addition, energy waste in hotels is primarily due to employee mishandling, lack of energy-saving systems, inadequate funding, technical expertise shortage, and lax laws (Saad *et al.,* 2012). Moreover, Georgei & Bombeck (2012) found that Sharm El-Sheikh hotels fail to meet environmental standards due to lack of public and recorded data on energy use and unwillingness to provide such data. Jolink & Niesten (2015) showed that global environmental concerns have increased companies' awareness of the need to modify their products and services to be more sustainable. Finally, Sharif *et al.*, (2022) stated that employees are underperforming due to a lack of commitment to green practices and a higher likelihood of quitting.

Table (7): Descriptive Statistics of Customer Energy-Saving Strategies

No.	Statements	Mean		SD	Level
		Statistic	Std. Error		
1	Involvement in towel and linen reuse program (using them for more than one day).	4.39	0.090	0.822	Very High
2	Education, through leaflets, on hotel environmental policies and benefits from energy conservation.	4.35	0.097	0.885	Very High
3	Green information box located in the lobby (bike routes, local walking maps, bus & metro route maps, community event brochures).	3.39	0.136	1.242	Moderate
4	Rewards for guests with lower water and energy usage.	2.52	0.160	1.468	Low
Mean		**3.66**	**0.121**	**1.10**	**High**

Table (7) shows the descriptive statistics for the implementation level of customer' energy-saving strategies. The level is 3.66 out of 5 (Std. 1.10), this is considered a high level of mean. This result is consistent with the literature review, where hotel customers are becoming more concerned as they become aware of the harm that is being done to the environment and the excessive use of energy, water, and resources (Bohdanowicz, 2006). In addition, MacAskill *et al.* (2023) stated that there is a greater potential for financial savings by interacting with customers to minimize unnecessary water usage, as opposed to lowering gas and electricity use. On the contrary, customers' worries regarding environmental degradation are lessened as a result (Bohdanowicz, 2006). Moreover, Amer *et al.*, (2023), mentioned that Hurghada's five-star hotels use more electricity and water than necessary, indicating that customers are unaware of the benefits of conserving energy and water.

Table (8): Correlation and Regression Analysis of Research Variables

Independent Variable	Dependent Variable	R	R^2	β	a	b	Sig
Building Energy-Saving	Staff Energy-	0.596**	0.355	0.596	1.818	0.563	0.000

Strategies (BESS)	Saving Strategies (SESS)						
Building Energy-Saving Strategies (BESS)	Customer Energy-Saving Strategies (CESS)	0.544**	0.296	0.544	1.718	0.525	0.000
Staff Energy-Saving Strategies (SESS)	Customer Energy-Saving Strategies (CESS)	0.458**	0.210	0.458	1.838	0.468	0.000

**Correlation is significant at the 0.01 level (2-tailed).

Table (8) shows the correlation and regression analysis between research variables. The results revealed that the level of building energy-saving strategies (BESS) is moderate positively correlated with staff energy-saving strategies (SESS) and customer energy-saving strategies (CESS). In addition, the level of staff energy-saving strategies is moderate positively correlated with customer energy-saving strategies. Moreover, the results stated that the value of standardized coefficients (Beta) are 0.596 between building energy-saving strategies and staff energy-saving strategies; 0.544 between building energy-saving strategies and customer energy-saving strategies; 0.458 between staff energy-saving strategies and customer energy-saving strategies.

Consequently, the integration of energy saving strategies related to the building, staff and customers affects the operational performance of the hotel, as adopting environmentally friendly practices generally supports hotels in increasing revenue through increased customer satisfaction (Anuwichanont *et al.,* 2011), enhanced reputation, and positive brand effects (Chen & Chen, 2012). In addition, effective energy-saving strategies can help hotels accomplish their goals by lowering capital costs, cutting harmful emissions, raising customer satisfaction at a cheaper cost, operating the hotel more profitably, and using fewer non-renewable energy resources (Saad *et al.,* 2012). These strategies lower hotel costs through waste, energy, and water reduction (Eldemerdash & Mohamed, 2013), and competitive differentiation (Hays & Ozretić-Došen, 2014). Moreover, hotels might save up to 65% on energy expenses with the use of cutting-edge energy management systems (Hassan, 2017). As a result, hotels need to take notice and begin implementing eco-friendly strategies such reducing solid waste, saving electricity, and conserving

water (Sayed, 2021). Based on the results of statistical analysis, this research presented the empirical model as shown in figure (2).

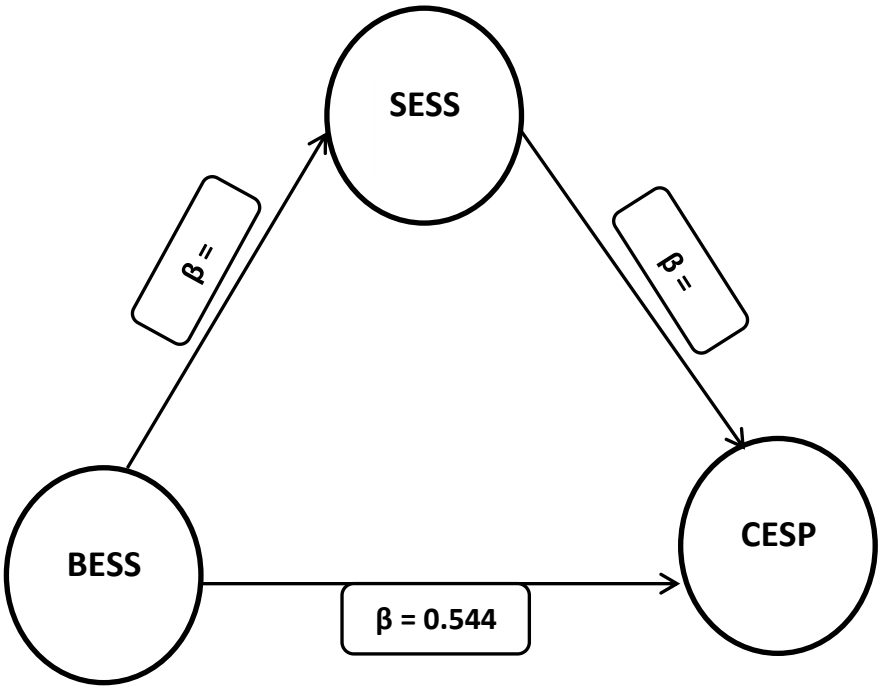

Figure (2): The Research Empirical Model

CONCLUSION

The main aim of this research is to build operational strategies for sustainable energy saving. Accordingly, this research is based on the analytical approach. The research population is the staff of Sharm El-Sheikh hotels. A random stratified sample including managers and employees of five-star hotels is selected. Out of the approximately 770 questionnaires that were sent out, 532 were returned, and 238 were deemed invalid. The research results demonstrated a highly implementation level of building energy-saving strategies (BESS), staff energy-saving strategies (SESS), and customer energy-saving strategies (CESS). In addition, the results revealed that the level of building energy-saving strategies is moderate positively correlated with staff energy-saving strategies and customer energy-saving strategies. The level of staff energy-saving strategies is moderate positively correlated with customer energy-saving strategies. Accordingly, five-star hotels are required to continuously adopt sustainable energy-saving strategies to improve its operations performance.

Although the level of implementation of energy saving strategies related to the building, staff or customers was at a high level, there is a group of strategies

that were at a moderate level and need to be improved. For building energy-saving strategies, hotels should improve the level of these strategies; staff designs a sustainable hotel by considering the direction of the site and the local climate; use sustainable building materials with less energy, renovations consume less energy than new buildings. Greening existing buildings is a great opportunity to reduce carbon emissions; reuse and recycling waste materials from the construction site (stone, soil, etc.); and use as much locally extracted and manufactured building materials as possible.

In addition, staff energy-saving strategies include establish a "green team" that manages, supports, and implements all sustainable practices and programs; organizing training meetings to familiarize employees with the new environmentally friendly procedures. Moreover, customer energy-saving strategies include "green box", which is an information box located in the lobby (bicycle routers, local walking maps, bus and metro route maps, community event brochures); and bonuses for guests with low water and energy consumption. Accordingly, five-star hotels are required to continuously adopt sustainable energy-saving strategies in an integrated manner to achieve the maximum efficiency of operational performance, which maximizes the achievement of the hotels' goals. Finally, this research presents sustainable energy-saving strategies related to building, staff and customers, which can be used as a managerial tool to improve the level of operational performance efficiency in hotel industry.

6. RECOMMENDATIONS

Based on the results of this research, it presents the following recommendations:

- Continuously adopt sustainable energy-saving strategies in an integrated manner to achieve the maximum efficiency of operational performance, which maximizes the achievement of the hotels' goals.
- Improving the implementation level of energy-saving strategies related to the hotel establishment from moderate to very high level. These strategies include:
    - Designing a sustainable hotel by considering the direction of the site and the local climate.
    - Adopting sustainable building materials with less energy, renovations consume less energy than new buildings.
    - Greening existing buildings is a great opportunity to reduce carbon emissions.
    - Reusing and recycling waste materials from the construction site (stone, soil, etc.).
    - Using as much locally extracted and manufactured building materials as possible.

- Enhancing the implementation level of energy-saving strategies related to the hotel employees from moderate to very high level. These strategies include:
    - Establish a "green team" that manages, supports, and implements all sustainable practices and programs.
    - Organizing training meetings to familiarize employees with the new environmentally friendly procedures.
- Improving the implementation level of energy-saving strategies related to the hotel customers from moderate to very high level. These strategies include
    - Developing green box, which is an information box located in the lobby (bicycle routers, local walking maps, bus and metro route maps, community event brochures).
    - Granting bonuses for customers with low water and energy consumption.

7. LIMITATIONS AND FUTURE RESEARCH

The research focuses on five-star hotels in Sharm El-Sheikh, Egypt, from August 2023 to December 2023. It suggests researchers should assess sustainable energy-saving strategies from customers' perspectives, examine their impact on hotel operational and financial performance, and improve the implementation level in the hotel industry.

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