

The Moderating Effect of Hotel Size on the Relationship Between Energy Efficiency Practices and Hotel Performance: Evidence from 3- to 5-Star Hotels in Kisumu County, Kenya

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Abstract

As the hospitality sector in Kisumu County expands, adopting energy efficiency practices (EEPs) has become vital for reducing high operational costs and driving sustainable hotel performance. Smaller properties frequently face capital constraints and limited economies of scale that larger establishments seamlessly leverage. Consequently, it remains uncertain whether hotel size significantly moderates the translation of energy efficiency investments into improved performance among 3- to 5-star hotels in Western Kenya. The study therefore examines the effect of energy efficiency practices on hotel performance and the moderating role of hotel size among 3- to 5-star rated hotels in Kisumu County, Kenya. Grounded in the Natural-Resource-Based View and Contingency Theory, an explanatory research design was adopted. Data were collected from 203 hotel managers, departmental managers, and supervisors using a structured questionnaire and analyzed through hierarchical moderated regression. The findings reveal that energy efficiency practices exert a significant positive effect on hotel performance ($\beta = 0.188, p < .01$), supporting the proposition that environmentally oriented capabilities generate competitive advantage. More importantly, hotel size significantly moderates this relationship ($\beta = -0.167, p < .01$) the positive effect of energy efficiency on performance weakens as hotel size increases, indicating that smaller hotels derive proportionally greater performance benefits from identical efficiency investments. The study extends the empirical base of the Natural-Resource-Based View to an emerging African market and integrates Contingency Theory to demonstrate that sustainability returns are not invariant but are structurally contingent on organizational scale. For practitioners, the results validate targeted energy efficiency strategies for small and medium-sized properties, while policymakers are encouraged to design size-differentiated incentives that maximize sector-wide performance gains.

Keywords: Energy efficiency practices, Hotel performance, Hotel size, Kisumu County, Kenya

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Funding: The author received no financial support for the research, authorship and/or publication of this article

Data Availability Statement: The authors confirm that the data supporting the findings of this study are available within the article [and/or] its supplementary materials or upon reasonable request.

Competing interests: The authors declare no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Introduction

The global hospitality industry is among the most energy-intensive service sectors, with energy consumption accounting for up to 25% of total operating costs and constituting approximately 60% of a hotel's carbon footprint (Siteminder, 2026). In the United States alone, hotels spend an average of \$2,196 per room annually on energy, representing roughly 6% of total operating expenditures (Karvounidi et al., 2024). Hotels consume large amounts of energy for lighting, cooling, and heating (Ahmed et al., 2021), and electricity remains the primary source of power for most hotel operations. The demand for hot water supply increases the energy used in the hotel, alongside other operations that require monitoring and adjustment to ensure profit margins. A significant setback hotel businesses face is increased expenses resulting from energy costs, which directly affect profitability. These figures emphasize the critical importance of energy efficiency practices not only for environmental sustainability but also for operational viability and competitive positioning. Against this backdrop, the relationship between energy efficiency practices and hotel performance has garnered increasing scholarly attention, yet significant theoretical and empirical gaps persist, particularly regarding the

boundary conditions that shape this relationship in developing economies.

Hotels are profit-oriented and seek ways of maximizing revenue and profits. Empirical evidence largely supports the proposition that energy efficiency initiatives yield positive performance outcomes. For instance, Arenhart and Souza (2025) analyzed panel data from 14 international hotel chains between 2018 and 2023 and found that energy use intensity is significantly influenced by operational and physical parameters, including hotel size, gross floor area, and occupancy rates. In the Kenya, energy inefficiency remains a major non-eco-friendly practice in most hotels, as using outdated Heating, Ventilation, and Air Conditioning systems results in an increased carbon footprint due to excessive energy consumption. Ogola et al. (2023) reported that four-star and five-star hotels in Nairobi achieved only a 55.83% implementation rate of energy conservation measures identified through audits, indicating substantial room for improvement. Similarly, Osiako and Szente (2021) documented that hotels in Nairobi County have adopted eco-friendly practices including energy-saving measures, though with varying degrees of sophistication and financial commitment. These studies collectively suggest that while energy efficiency

practices can enhance performance, their effectiveness may be contingent on organizational characteristics and contextual factors.

One such critical contingency is hotel size, which determines resource availability, organizational capacity, and operational complexity. Larger hotels typically possess greater financial resources, technical expertise, and economies of scale to implement comprehensive energy management systems, smart HVAC technologies, and renewable energy integrations. Conversely, smaller hotels may benefit from operational flexibility and lower absolute energy consumption but often face resource constraints that limit investment in advanced efficiency technologies. The moderating role of firm size in the sustainability–performance relationship has received limited and inconsistent attention in hospitality research. Rukmiyati et al. (2025) examined star-rated hotels in Bali and found that while energy conservation positively influenced financial performance, firm size did not significantly moderate this relationship, though it did moderate the effect of environmental communication on financial outcomes. These mixed findings highlight the need for further investigation into whether and how hotel size conditions the energy efficiency–performance nexus, particularly in understudied geographical contexts.

Africa as a continent has been very slow in adopting green hotel practices (Abdou et al., 2020). Hotels face significant challenges in going green mainly because of resistance from suppliers, staff, and guests, limited knowledge of green practices, and high initial costs for replacing or upgrading equipment to promote eco-friendly practices (Luo et al., 2019; Kaitano, 2020). Various literature works have previously

outlined green hotel practices along the Kenyan coast, and most have been performed in Mombasa, Lamu, and Nairobi (Ikwaye, 2019; Irungu, Amwata, & Njoroge, 2022). Little research has been done in Kisumu County. However, Kisumu County is also an emerging county with a strong hospitality business, with various rated hotels hosting local and international visitors.

In Kenya, the hospitality sector is a significant contributor to the national economy (Murimi, Wadongo, & Olielo, 2021), yet studies have predominantly focused on Nairobi and coastal regions, leaving western Kenya largely unexplored. Kisumu County, situated on the shores of Lake Victoria, is emerging as a regional commercial and administrative hub with 133 registered hotels and a combined bed capacity of 3,650 as of 2023 (Kenyan Wall Street, 2026). Notably, the county has no five-star hotels and only three four-star facilities, with the market dominated by 62 three-star and 39 two-star establishments (Kenyan Wall Street, 2026). This unique structural composition characterized by mid-range dominance and absence of premium international brands makes Kisumu an ideal context for examining how hotel size moderates the relationship between energy efficiency practices and performance among 3- to 5-star rated hotels.

Hotel performance in this study is conceptualized through multiple dimensions, including operational efficiency, financial outcomes, and market competitiveness. Key performance indicators such as occupancy rate, average daily rate (ADR), and revenue per available room (RevPAR) serve as essential metrics for assessing how energy efficiency practices translate into tangible business results (Cvent, 2026). With the ununiformed adoption of green practices in various hotel sizes,

understanding whether larger hotels in Kisumu County derive greater performance benefits from energy efficiency investments than their smaller counterparts or whether smaller properties achieve proportionally greater gains has important implications for resource allocation, policy formulation, and strategic management in the regional hospitality sector.

Murimi (2020), from his Lamu County study, recommends further studies on the effect of green hotel practices on hotel performance while handling the practices independently and in-depth. Fadhil (2015) also suggests addressing the impact of green hotel practices on hotel performance. Shekina (2021) also proposes further research on the relationship between green practices and hotel performance but focusing on different sizes of hotels in other counties apart from Nairobi. Shekina (2021) specifically recommends executing conservation programs especially in small- to medium-sized hotels, suggesting that organizational scale may condition both the implementation and outcomes of sustainable practices. Accordingly, this study aims to examine the moderating effect of hotel size on the relationship between energy efficiency practices and hotel performance in Kisumu County, focusing on 3- to 5-star rated hotels.

Empirical Review and Hypothesis Development

Energy Efficiency Practices and Hotel Performance

The hospitality industry is among the most energy-intensive service sectors, with hotels consuming significant electricity for heating, ventilation and cooling (HVAC), cooking, refrigeration, lighting, and guest comfort amenities (Nisar et al., 2021; Shekinah, 2021). He et al. (2021) argue that sustainability

initiatives help businesses cut additional electricity expenses, giving hotels the opportunity to choose energy-efficient and affordable options. According to Luo and Fan (2019), hotels spend approximately 6% of their operating costs on electricity bills, making energy conservation a critical financial imperative. Hameed et al. (2022) affirm that using green energy in hotel operations not only supports environmental conservation but also gives the business a competitive edge and generates cost savings. Sakshi et al. (2020) further emphasize that the hospitality industry can minimize energy use by identifying operations that consume the most energy and replacing them with green alternatives. These observations establish energy efficiency as a strategic priority with direct implications for operational costs and profitability.

Internationally, empirical research has documented a positive relationship between energy efficiency investments and hotel performance outcomes. Asadi et al. (2020) investigated green innovation in the Malaysian hotel industry and found that environmentally oriented practices significantly influence sustainability performance, suggesting that systematic energy management enhances both ecological and economic outcomes. Kuo et al. (2022) demonstrated that proactive environmental strategies including eco-innovation and green core competence development translate into green competitive advantage for hotels. Zhang et al. (2020) provided evidence from Beijing that going green in the hotel sector yields measurable value, while Gupta et al. (2023) showed that sustainable practices in Fiji positively influence guests' willingness to pay a price premium, indirectly boosting revenue performance. Ioannidis et al.

(2021) applied the reduce-reuse-recycle principle to hospitality operations and confirmed significant performance implications, and Bianco et al. (2023) found that sustainability certifications enhance competitive action and performance in hotels. Raza and Khan (2022) established that green human resource practices improve hotel environmental performance, while Trabelsi and Boujelbene (2025) documented how LED lighting and photovoltaic systems contribute to sustainable development in the Tunisian hotel sector. Shao et al. (2020) specifically highlighted that LED lighting and predictive energy management reduce consumption, and Kansakar et al. (2019) noted that technology adoption in hospitality supports operational efficiency. Kostić et al. (2019) observed that eco-hotels represent environmental responsibility and innovation in savings, while Redzuan et al. (2023) and Krishan et al. (2019) demonstrated the energy-saving potential of automated air conditioner controls and smart socket modules, respectively. These converging findings suggest that energy efficiency practices reduce costs, improve resource productivity, and strengthen market positioning across diverse geographical contexts.

In Africa, however, the adoption of green hotel practices has been notably slow (Abdou et al., 2020; Kaitano, 2020). Within Kenya, empirical attention has focused predominantly on coastal and central regions. Osiako and Kummitha (2020) examined environmental management practices among coastal beach hotels in Kenya, while Fadhil (2015) explored green practice adoption in Lamu County's hospitality sector. Ikwaye (2019) and Irungu et al. (2022) documented stakeholder roles in greening coastal tourism circuits. Murimi (2020) developed a theoretical framework for

green management determinants in Kisumu city hotels, and Murimi et al. (2021) examined revenue management practices and financial performance across Kenyan hotels. Gaturu et al. (2022) investigated cost reduction strategies and guest satisfaction among coastal region hotels. Despite this growing body of literature, the performance implications of energy efficiency practices remain underexplored in western Kenya. Existing studies have treated hotel size as a sampling criterion rather than a statistical boundary condition, leaving unanswered whether the energy efficiency–performance relationship holds uniformly across different-sized properties. Kisumu County, situated on the shores of Lake Victoria and emerging as a regional commercial hub (Odero & Mahiri, 2022), presents an ideal yet underexplored context for this inquiry. Based on the foregoing empirical evidence, the following null hypothesis is proposed:

H₀₁: *Energy efficiency practices do not have a significant positive effect on hotel performance among 3- to 5-star rated hotels in Kisumu County, Kenya.*

The Moderating Effect of Hotel Size

The relationship between energy efficiency practices and hotel performance is unlikely to be uniform across all organizational contexts. Firm size has long been recognized as a critical contingency in the broader sustainability literature, determining resource availability, technical capacity, economies of scale, and organizational complexity. Larger firms typically possess greater financial resources, specialized expertise, and operational scale to implement comprehensive environmental management systems, while smaller firms often face resource constraints that limit investment in advanced technologies despite potential agility advantages. In

the hospitality sector specifically, hotel size whether measured by room count, star rating, or operational capacity shapes the nature, scale, and feasibility of energy efficiency investments.

Internationally, the moderating role of firm size in the sustainability–performance nexus has produced mixed findings that warrant closer examination. Rukmiyati et al. (2025) examined star-rated hotels in Bali and found that while energy conservation positively influenced financial performance, firm size did not significantly moderate this direct relationship, though it did moderate the effect of environmental communication on financial outcomes. These inconclusive findings highlight the need for further investigation into whether and how hotel size conditions the energy efficiency–performance relationship, particularly in developing economies where resource disparities between small and large hotels are pronounced and where institutional support for sustainability varies by organizational scale.

In the Africa, the adoption of green practices has been slow, and hotel size appears to be a significant determinant of implementation capacity. Abdou et al. (2020) observed that small hotels face significant resource constraints that result in limited or no adoption of sustainable practices, often managing only the most cost-effective options. Ahn and Kwon (2020) similarly noted that hotel size, especially in the form of star rating, determines the kind of operational strategies, resources available, and complexity of green practices adopted. Bhutto et al. (2021) added that small hotels experience staff resistance to sustainable practices, while medium-sized hotels those with 50 to 200 rooms require more resources to support guest operations and generate increased waste, yet can afford to adopt energy-efficient HVAC systems, motion-sensor

lighting, and smart thermostats. Large hotels with more than 200 rooms possess the financial position and operational scale to adopt sophisticated green practices, including central grey-water systems and large-scale solar installations, though they also contend with increased operational complexity.

Within Kenya, no verifiable empirical study has explicitly tested hotel size as a statistical moderator in the energy efficiency–performance relationship. This gap is directly acknowledged by Shekinah (2021), who, based on a study of four-star and five-star hotels in Nairobi, explicitly recommends further research on the relationship between green practices and hotel performance, focusing on different sizes of hotels in other counties apart from Nairobi. Shekinah (2021) further recommends executing conservation programs especially in small- to medium-sized hotels, suggesting that organizational scale may condition both the implementation and outcomes of sustainable practices. Additionally, Osiako and Szente (2021) found no significant relationship between hotel star category and the extent of adoption of environmental management practices in Nairobi County, implying that size and rating alone do not determine sustainability engagement a finding that underscores the need for explicit moderation analysis rather than mere categorical comparison.

The structural composition of Kisumu County's hotel market makes it an especially compelling setting for testing this boundary condition. With no five-star properties, only three four-star facilities, and market dominance by 62 three-star establishments among 133 registered hotels (Kenyan Wall Street, 2026), the county presents a natural experiment in mid-range hospitality where size variation exists within a relatively narrow star-

rating band. Small hotels in this context those with fewer than 50 rooms may face the resource constraints and staff resistance documented by Abdou et al. (2020) and Bhutto et al. (2021), limiting their ability to translate energy efficiency investments into performance gains. Medium-sized properties with 50 to 200 rooms may strike a balance between operational scale and conservation capacity, while larger establishments may leverage economies of scale but grapple with complexity. Understanding whether larger hotels in Kisumu derive greater performance benefits from energy efficiency investments than their smaller counterparts or whether smaller properties achieve proportionally greater gains has important implications for resource allocation, policy formulation, and strategic management in the regional hospitality sector. Based on the foregoing empirical and contextual evidence, the following null hypothesis is proposed:

H₀₂: *Hotel size does not significantly moderate the relationship between energy efficiency practices and hotel performance among 3- to 5-star rated hotels in Kisumu County, Kenya.*

Theoretical Framework

Resource-Based View of the Firm

The Resource-Based View (RBV) of the firm, as originally articulated by Barney (1991), posits that sustained competitive advantage derives from resources and capabilities that are valuable, rare, inimitable, and non-substitutable. Hart (1995) extended this logic to incorporate environmental constraints and opportunities, proposing the Natural-Resource-Based View (NRBV). According to Hart, environmentally oriented capabilities specifically pollution prevention, product stewardship, and sustainable development can generate competitive

advantage when they meet the VRIO criteria (valuable, rare, inimitable, and organizationally supported) *and* when they are developed in response to the constraints and opportunities posed by the natural environment. The NRBV thus shifts the analytical focus from static resource possession to dynamic capability development in the face of ecological scarcity and regulatory pressure.

The NRBV is particularly suited to this study for three reasons. First, energy efficiency practices such as LED lighting retrofits, smart HVAC systems with occupancy sensors, solar energy installations, and automatic shutdown sockets constitute precisely the type of pollution-prevention capability that Hart (1995) identified as a source of competitive advantage. These practices reduce resource consumption, lower operating costs, and minimize environmental degradation, thereby creating value for the firm. Second, in the Kenyan hospitality context, where energy costs represent a significant proportion of operating expenditures and where grid reliability remains variable, advanced energy management systems are relatively rare among mid-range hotels. This rarity enhances the competitive potential of early adopters. Third, energy efficiency capabilities are difficult to imitate because their effectiveness depends on tacit knowledge of local energy markets, guest behavior patterns, and building-specific thermal dynamics, making them organizationally embedded and path-dependent.

In this study, the NRBV predicts that energy efficiency practices enhance hotel performance by creating valuable, rare, and difficult-to-imitate capabilities that reduce operational costs, improve resource productivity, and signal environmental responsibility to stakeholders. The theory thus frames energy efficiency not as a discretionary

cost center but as a strategic investment that strengthens the hotel's competitive position.

Contingency Theory

Contingency Theory, as developed by Lawrence and Lorsch (1967), rejects the notion of a single best way to organize or manage. Instead, it posits that organizational effectiveness depends on the fit or alignment between internal structures, processes, and capabilities and the external and internal contingencies that shape the organization's operating environment. The theory's foundational insight is that the optimal design of any organizational system is contingent upon situational factors such as environmental uncertainty, technology, and organizational size. Lawrence and Lorsch (1967) demonstrated this empirically through comparative studies of industrial organizations, showing that high-performing firms achieved a balance between differentiation (specialized responses to sub-environments) and integration (coordination across subunits) that was tailored to the complexity of their external environment.

In the context of environmental management, Contingency Theory has been explicitly applied to explain why organizational behavior regarding sustainability varies across firms. A seminal qualitative study by Molina-Azorín et al. (2019) analyzed 24 independent hotels in Spain and Chile through the lens of Contingency Theory and found that hotel size is a primary determinant of environmental management behavior. The study demonstrated that large and medium-sized hotels tend to be more sensitive to environmental issues, are internally motivated by cost savings and cultural values, and externally motivated by legislation; they undertake all types of

environmental measures and report effects on employees' knowledge, abilities, and skills, as well as on operations and finances. In contrast, small hotels face challenges implementing environmental measures owing to cost constraints and a lack of familiarity with advanced technologies. The authors concluded that, in accordance with Contingency Theory, "the size of a hotel is a factor that determines its organizational behaviour in terms of environmental management" (Molina-Azorín et al., 2019, p. 14).

In this study, the theory predicts that hotel size moderates the relationship between energy efficiency practices and hotel performance because organizational scale determines the resources, complexity, and integration mechanisms required to translate environmental investments into competitive outcomes. The theory thus frames the moderator not as a mere statistical artifact but as a structurally meaningful contingency that shapes the efficacy of sustainability strategy.

Methodology

This study adopts an explanatory research design to examine the direct effect of energy efficiency practices on hotel performance and the moderating role of hotel size. Explanatory designs are well-suited for testing moderating effects because they enable researchers to examine how a third variable alters the strength or direction of a relationship in a natural, non-manipulated setting while providing statistical precision and high external validity (Oji & Alordiah, 2024).

The study was conducted in Kisumu County, Kenya (latitude: 0° 14' 60.00" N; longitude: 34° 54' 59.99" E), an emerging regional hospitality hub with 133 registered hotels and a combined bed capacity of 3,650 (Kenyan Wall Street, 2026). The target population comprised

hotel managers, departmental managers, and supervisors from 3- to 5-star rated hotels. A minimum of eight departments were targeted per hotel (Housekeeping, Front Office, Sales and Marketing, Purchasing, Kitchen, Restaurant, Security, and Engineering), with three respondents

per department (manager, assistant manager, and supervisor), yielding a target population of 432 respondents (24 respondents × 18 hotels). Where an assistant manager position was vacant, an acting departmental head was included.

Table 1: Three- to Five-Star Rated Hotels in Kisumu County

Hotel Rating	Hotels	Total
3-Star	Beach View Hotel, Balmoral Beach Hotel, The VIP Luxury Lounge Hotel, Divine Homes Resort, Ikonia Resort and Hotel, Lila Hotel, Victoria Comfort Inn, Lago Resort	8
4-Star	Best Western Kisumu Hotel, Sarova Imperial Hotel, Acacia Premier Hotel, Quinten Hotel, Selella Resort, Sovereign Hotel, Imperial Express, Pinecone Hotel	8
5-Star	Scottish Tartan Hotel	1
Total		17

Source: Tourism Regulatory Authority (2020)

The sample size was determined using Yamane’s (1967) formula: $n = \frac{1 + N(e)^2}{N}$ Where $N = 432$ (population), $e = 0.05$ (margin of error), yielding $n \approx 207$ respondents. Yamane’s formula was selected because it controls sampling error while balancing statistical accuracy against practical constraints of time and resources (Uakarn et al., 2021).

Purposive sampling was used to select respondents. This non-probability technique targets participants who

possess specific knowledge and authority over operational decisions (Mishra et al., 2022). Only managers, assistant managers, and supervisors with direct oversight of energy management and hotel operations were included.

Data were collected using a structured questionnaire with items measured on a 5-point Likert scale (1 = *Strongly Disagree* to 5 = *Strongly Agree*). The instrument captured three constructs:

Table 2: Measurement of Variables

Construct	Number of Items	Source
Energy Efficiency Practices	4	Adapted from Shekinah (2021); Ogola et al. (2023)
Hotel Size	1 (categorical: number of rooms)	Ahn & Kwon (2020)
Hotel Performance	6	Bianco et al. (2023); Okumus et al. (2019)

Energy efficiency practices were operationalized through items measuring

LED lighting adoption, HVAC optimization, occupancy sensor usage, and solar energy

integration. Hotel size was measured categorically as small (< 50 rooms), medium (50–200 rooms), or large (> 200 rooms). Hotel performance was captured through financial and operational indicators including occupancy rate, average daily rate, revenue per available room, profit margin, customer satisfaction, and competitive positioning. Self-administered questionnaires were distributed in person to identified respondents after formal permission was obtained from each hotel's general manager. Respondents were given two weeks to complete the instrument. The researcher collected all questionnaires in person to ensure proper handling and confidentiality. Missing data were addressed through listwise deletion.

A pilot study was conducted with 43 respondents (10% of the target population) in Uasin Gishu County, which shares similar hospitality characteristics with Kisumu. The pilot assessed instrument reliability and identified procedural weaknesses prior to main data collection. Content validity was established through expert review by supervisors and research specialists who evaluated item clarity, logical consistency, and relevance to the study constructs. Construct validity was confirmed via Exploratory Factor Analysis (EFA); items with factor loadings ≥ 0.50 were retained, ensuring that each construct was distinct and internally coherent. Reliability was assessed using Cronbach's alpha during the pilot study. A threshold of $\alpha \geq 0.70$ was applied to confirm internal consistency across all scales. Data were entered, coded, and analyzed using SPSS (Version 25). Descriptive statistics (frequencies, means, standard deviations) were used to summarize respondent characteristics and variable distributions. Inferential statistics included Pearson correlation to examine bivariate relationships, followed

by hierarchical multiple regression to test the direct and moderating effects.

The regression model was specified as follows:

Model 1 (Direct Effect):

$$Y = \beta_0 + \beta_1 X_1 + \varepsilon$$

Model 2 (With Moderator):

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 Z + \varepsilon$$

Model 3 (Interaction Effect):

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 Z + \beta_3 (X_1 \times Z) + \varepsilon$$

Where:

Y = Hotel Performance

X_1 = Energy Efficiency Practices

Z = Hotel Size (moderator)

$X_1 \times Z$ = Interaction term

β_0 = Intercept

$\beta_1 - \beta_3$ = Regression coefficients

ε = Error term

Prior to inference, four standard regression assumptions were tested: linearity was assessed via deviation from linearity in the ANOVA table and accepted when $p > .05$; normality of residuals was examined using the Kolmogorov–Smirnov test and accepted when $p > .05$; multicollinearity was evaluated via tolerance and Variance Inflation Factor (VIF), with tolerance values below 0.10 or VIF values exceeding 10 indicating serious multicollinearity (Oke et al., 2019); and homoscedasticity was tested using Levene's test of equality of error variances and accepted when $p > .05$.

Results

Response Rate and Respondent Profile

A total of 207 questionnaires were distributed to hotel managers, departmental managers, and supervisors across 3- to 5-star rated hotels in Kisumu County. Of these, 203 were returned fully completed, yielding a response rate of 98.1%. Four questionnaires (1.9%) were not returned. The high response rate reflects the relevance of the research

topic to operational decision-makers and the effectiveness of the in-person data collection protocol.

Table 3: Response Rate and Biographic Characteristics of Respondents

Characteristic	Category	Frequency	Percentage
Response Rate	Returned	203	98.1
	Not returned	4	1.9
	Total distributed	207	100.0
Gender	Male	99	48.8
	Female	104	51.2
	Total	203	100.0
Current Position	General manager	26	12.8
	Departmental manager	70	34.5
	Assistant manager	54	26.6
	Supervisor	53	26.1
	Total	203	100.0
Hotel Star Rating	Five-star	16	7.9
	Four-star	118	58.1
	Three-star	69	34.0
	Total	203	100.0

Source: Field Data (2025)

The respondent profile indicates balanced gender representation (51.2% female, 48.8% male), minimizing potential gender bias. The majority of respondents occupied middle-management positions, with departmental managers constituting the largest group (34.5%), followed by assistant managers (26.6%) and supervisors (26.1%). General managers comprised 12.8% of the sample. This distribution ensures that findings are informed by individuals directly engaged in daily operational and energy management decisions. In terms of hotel category, four-star hotels were the most represented (58.1%), followed by three-star (34.0%) and five-star (7.9%) properties, reflecting the actual market structure of Kisumu County's hospitality sector, which is dominated by mid-range establishments.

Descriptive Statistics

Descriptive statistics were computed for the three study variables: energy efficiency practices, hotel size, and hotel performance. All variables were assessed for distributional properties, including skewness and kurtosis, to inform subsequent parametric analyses. Skewness values between -2 and +2 and kurtosis values below 7 are generally considered acceptable for normality assumptions in regression-based analyses (George & Mallery, 2019).

The results indicate that energy efficiency practices and hotel performance both exhibit high mean scores (4.20 and 4.20, respectively), suggesting above-average adoption of energy-saving measures and above-average perceived performance among the sampled hotels. The mean hotel size of 2.22 indicates that the average

respondent works in a medium-sized property, which aligns with Kisumu

County's market structure dominated by mid-range establishments.

Table 4: Descriptive Statistics for Study Variables

Variable	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
Energy Efficiency Practices	203	1.00	5.00	4.2042	1.16443	Statistic -1.660	Statistic 1.649
Hotel Size	203	1.00	3.00	2.2167	0.62324	-0.188	-0.567
Hotel Performance	203	1.00	5.00	4.2049	1.02608	-1.919	3.104

Note: Energy efficiency practices and hotel performance measured on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Hotel size coded as 1 = Small (< 50 rooms), 2 = Medium (50–200 rooms), 3 = Large (> 200 rooms).

Source: Field Data (2025).

Reliability and Factor Analysis

Internal consistency was assessed using Cronbach’s alpha, with $\alpha \geq 0.70$ as the acceptance threshold (Nunnally & Bernstein, 1994). Construct validity was established through Exploratory Factor Analysis (EFA) using Principal Component Analysis with orthogonal (Varimax)

rotation. The factorability of the data was confirmed by a Kaiser–Meyer–Olkin (KMO) measure of 0.809 and a significant Bartlett’s Test of Sphericity ($\chi^2 = 3536.029$, $df = 190$, $p < .001$). Five components with eigenvalues greater than 1 were extracted, cumulatively explaining 81.525% of the total variance.

Table 5: Reliability and Exploratory Factor Analysis Results

Construct	Items	Cronbach’s α	Factor Loadings	% Variance Explained
Energy Efficiency Practices	4	0.917	0.877–0.915 (Automatic switching of air conditioners: 0.877; Occupancy sensors: 0.879; Automatic shutdown sockets: 0.915; LED lighting: 0.889)	17.967
Hotel Performance	5	0.959	0.888–0.947 (Guest satisfaction: 0.936; Occupancy rate: 0.888; Customer loyalty: 0.933; Turnover rates: 0.947; Profit margins: 0.916)	22.798

Note: Hotel size is a single categorical item (1 = Small, 2 = Medium, 3 = Large) and was not factor analyzed. **Source:** Field Data (2025).

All Cronbach’s alpha values exceeded 0.90, indicating excellent internal consistency. Factor loadings for all items were well above the 0.50 threshold, confirming that each indicator loaded strongly and distinctly on its respective construct.

Regression Assumptions

The assumptions of linearity, normality, multicollinearity, and homoscedasticity were tested prior to conducting hierarchical moderated regression.

Table 6: Regression Assumptions Testing

Assumption	Variable	Statistic	Value	Decision
Linearity	Energy Efficiency Practices	Deviation from Linearity (<i>p</i>)	0.088	Met (<i>p</i> > .05)
	Hotel Size		0.188	Met (<i>p</i> > .05)
Normality	Energy Efficiency Practices	Kolmogorov–Smirnov (<i>p</i>)	0.135	Met (<i>p</i> > .05)
	Hotel Size		0.188	Met (<i>p</i> > .05)
Multicollinearity	Energy Efficiency Practices	Tolerance / VIF	0.716 / 1.397	Met (VIF < 10)
	Hotel Size	Tolerance / VIF	0.882 / 1.133	Met (VIF < 10)
Homoscedasticity	Energy Efficiency Practices	Levene’s Test (<i>p</i>)	0.185	Met (<i>p</i> > .05)
	Hotel Size		0.102	Met (<i>p</i> > .05)

Note: Hotel size is categorical; linearity was assessed for the continuous predictor only. **Source:** Field Data (2025).

All assumptions were satisfied. The deviation-from-linearity statistic for energy efficiency practices was non-significant (*p* = .088), confirming a linear relationship. Kolmogorov–Smirnov tests indicated that both variables were normally distributed (*p* > .05). Multicollinearity was not a concern, as tolerance values exceeded 0.10 and VIF values were well below the critical threshold of 10 (Hair et al., 2006). Finally,

Levene’s test confirmed homoscedasticity for both variables (*p* > .05). The data are therefore suitable for parametric regression analysis.

Correlation Analysis

Pearson correlation analysis was conducted to examine the bivariate relationships among energy efficiency practices, hotel size, and hotel performance.

Table 7: Correlation Matrix

Variable	1	2	3
1. Hotel Performance	1		
2. Energy Efficiency Practices	.499**	1	
3. Hotel Size	.429**	.257**	1

*Correlation is significant at the .01 level (two-tailed). Source: Field Data (2025).

As shown in Table 7, energy efficiency practices correlated positively

and significantly with hotel performance (*r* = .499, *p* < .01), indicating a moderate

linear association whereby greater adoption of energy-saving measures is linked to higher performance outcomes. Hotel size also exhibited a significant positive correlation with hotel performance ($r = .429, p < .01$) and with energy efficiency practices ($r = .257, p < .01$). These preliminary results suggest that both energy efficiency practices and larger organizational scale are associated with enhanced performance, providing a basis for multivariate examination of the direct and conditional effects.

Hierarchical Moderated Regression

Hierarchical moderated regression was employed to test the direct effect of energy efficiency practices on hotel performance (H_{01}) and the moderating role of hotel size (H_{02}). The predictor was mean-centered prior to creating the interaction term to mitigate multicollinearity. Three models were estimated. Table 8 presents the coefficients for the variables for the study.

Table 8: Hierarchical Moderated Regression Results

Predictor	Model 1 (Direct Effect)	Model 2 (Add Moderator)	Model 3 (Add Interaction)
	β (p)	β (p)	β (p)
(Constant)	0.960 (.000)	0.504 (.063)	-0.553 (.175)
Energy Efficiency Practices	0.188 (.001)	0.165 (.002)	0.506 (.000)
Hotel Size	—	0.366 (.000)	1.030 (.000)
Hotel Size $\times$ Energy Efficiency Practices	—	—	-0.167 (.001)
F -statistic	42.967	40.729	37.721
R^2	.465	.508	.536
ΔR^2	—	.044	.028
R^2 Change Significance	—	$p < .05$	$p < .05$

Source: Field Data (2025)

Model 1 examined the direct effect of energy efficiency practices on hotel performance. The model was statistically significant ($F = 42.967, p < .05$) and explained 46.5% of the variance in hotel performance. Energy efficiency practices emerged as a significant positive predictor ($\beta = 0.188, p = .001$), indicating that hotels reporting greater adoption of energy-saving technologies and behaviors also reported higher performance outcomes.

Model 2 introduced hotel size as a moderator. The addition of hotel size significantly improved model fit ($\Delta R^2 = .044, p < .05$), raising the total explained variance to 50.8%. Both energy efficiency

practices ($\beta = 0.165, p = .002$) and hotel size ($\beta = 0.366, p < .001$) retained significant positive coefficients, confirming that larger hotels and those with stronger energy efficiency practices independently report higher performance.

Model 3 added the interaction term (Hotel Size $\times$ Energy Efficiency Practices) to test the moderation hypothesis. The interaction coefficient was negative and statistically significant ($\beta = -0.167, p = .001$), and the model achieved a significant increment in explanatory power ($\Delta R^2 = .028, p < .05$), bringing the total variance explained to 53.6%. The positive coefficient for energy

efficiency practices increased to $\beta = 0.506$ ($p < .001$), while hotel size remained strongly positive ($\beta = 1.030$, $p < .001$). The negative interaction signifies that as hotel size increases, the positive marginal effect of energy efficiency practices on hotel performance diminishes. In substantive terms, smaller hotels derive greater performance returns per unit of energy efficiency investment than their larger counterparts. The final focal regression equation is expressed as: $\text{Hotel Performance} = -0.553 + 0.506(\text{Energy Efficiency}) + 1.030(\text{Hotel Size}) - 0.167(\text{Hotel Size} \times \text{Energy Efficiency})$.

Hypothesis Testing

The two null hypotheses were evaluated at the 5% significance level using the regression coefficients and their associated p -values. The decision rule was: reject the null hypothesis if $p < .05$; otherwise, fail to reject.

H₀₁: *Energy efficiency practices do not have a significant positive effect on hotel performance among 3- to 5-star rated hotels in Kisumu County, Kenya.*

Results from Model 1 (Table 4.6) showed that energy efficiency practices had a positive and statistically significant effect on hotel performance ($\beta = 0.188$, $p = .001$). Since $p < .05$, H₀₁ is rejected. There is sufficient evidence to conclude that energy efficiency practices exert a significant positive influence on hotel performance in the sampled hotels.

H₀₂: *Hotel size does not significantly moderate the relationship between energy efficiency practices and hotel performance among 3- to 5-star rated hotels in Kisumu County, Kenya.*

Results from Model 3 (Table 4.6) revealed that the interaction term (Hotel Size $\times$ Energy Efficiency Practices) was negative and statistically significant ($\beta = -0.167$, $p = .001$), with a significant R^2 change of .028. Since $p < .05$, H₀₂ is rejected. Hotel size significantly moderates the energy

efficiency–performance relationship. The negative sign of the interaction coefficient indicates a diminishing effect: the positive relationship between energy efficiency practices and hotel performance weakens as hotel size increases. Consequently, smaller hotels experience a stronger performance uplift from energy efficiency investments than larger hotels.

Discussion

The findings revealed that energy efficiency practices are a significant performance driver in Kisumu County's hospitality sector. This finding is consistent with Kariuki and Odock (2017) who previously established that energy consumption practices significantly influence operational performance among coastal hotels ($B = 0.313$, $p = 0.058$), while Shekinah (2021) reported a positive correlation between energy conservation and performance metrics in Nairobi's four- and five-star properties. The present study extends this evidence to western Kenya, corroborating that energy-efficient technologies including LED lighting, occupancy sensors, automatic shutdown sockets, and smart HVAC systems translate into tangible performance gains.

The result also aligns Mutitu (2023) study who found a statistically significant positive relationship between energy conservation and competitive advantage in Nyeri County ($\beta = 0.838$, $p = 0.000$), and a descriptive correlational study in Nairobi City County reported a moderately strong association between energy-efficient building practices and cost reduction ($R = .620$, $p < .001$), with approximately 38% of cost savings variance attributable to efficiency adoption (Energy-Efficient Building Practices in Nairobi City County, 2025). Internationally, Arenhart and Souza (2025) demonstrated that energy use

intensity is significantly shaped by operational parameters in international hotel chains, while Rukmiyati et al. (2025) confirmed through SEM-PLS analysis that energy conservation positively influences financial performance in Bali's star-rated hotels. The convergence of these findings across diverse geographical settings suggests that the energy efficiency–performance nexus is robust and generalizable.

However, the magnitude of the direct effect in this study ($\beta = 0.188$) is modest relative to Mutitu's (2023) coefficient, which may reflect contextual constraints specific to Kisumu County. Ogola, Musau, and Wekesa (2023) documented that four- and five-star hotels in Nairobi achieved only a 55.83% implementation rate of energy conservation measures identified through audits, indicating that even in Kenya's most developed hospitality market, energy efficiency potential remains underexploited. Kisumu County's hotel market characterized by mid-range dominance, absence of five-star properties, and limited access to capital-intensive renewable energy technologies likely constrains the magnitude of performance gains relative to more resource-endowed destinations. Nevertheless, the statistically significant positive coefficient confirms that even incremental investments in energy efficiency yield measurable returns in this emerging market.

The hotel size significantly moderates the energy efficiency–performance relationship, but in a direction that challenges conventional assumptions. The negative interaction coefficient ($\beta = -0.167, p = .001$) indicates that the positive marginal effect of energy efficiency practices on performance weakens as hotel size increases. In other words, smaller hotels derive proportionally greater performance

benefits from energy efficiency investments than their larger counterparts. The negative moderation finding contrasts with Rukmiyati et al. (2025), who examined star-rated hotels in Bali and found that firm size did not significantly moderate the energy conservation–financial performance relationship. This divergence may be attributed to contextual differences between Bali's mature tourism economy and Kisumu's emerging market. In Bali, larger hotels may already operate near efficiency frontiers, leaving limited room for size-based differentiation in returns. In Kisumu, where the market is dominated by 62 three-star establishments and only three four-star properties (Kenyan Wall Street, 2026), smaller hotels operate with thinner margins and less slack resource capacity. For these properties, even modest energy savings achieved through low-cost measures such as LED retrofits, occupancy sensors, and automatic shutdown sockets represent a substantial proportional reduction in operating costs, directly improving profit margins and competitive positioning.

However, larger hotels in Kisumu though possessing greater absolute resources face increased operational complexity and higher baseline energy consumption. The fixed costs of comprehensive energy management systems, smart HVAC upgrades, and large-scale solar installations may dilute the marginal performance gain per efficiency unit. Additionally, larger properties may already have absorbed some efficiency gains through economies of scale, leaving smaller hotels with greater "low-hanging fruit" to capture. This interpretation aligns with Abdou et al. (2020) observation that small hotels face resource constraints limiting adoption, but also suggests that when

adoption does occur, the proportional impact on performance is amplified.

Shekinah (2021) explicitly called for research on green practices and hotel performance across different hotel sizes in counties beyond Nairobi, recommending conservation programs especially for small- to medium-sized hotels. The present study directly answers this call, providing empirical evidence that size matters not only for adoption capacity but for the performance returns to energy efficiency. Osiako and Szenté (2021) found no significant relationship between star category and environmental management adoption in Nairobi, implying that categorical size distinctions alone do not determine engagement. The current finding goes further by showing that within the 3- to 5-star band, continuous variation in hotel size significantly conditions the performance outcomes of energy efficiency strategy.

Conclusion

This study set out to examine the moderating effect of hotel size on the relationship between energy efficiency practices and hotel performance among 3- to 5-star rated hotels in Kisumu County, Kenya. The findings lead to three definitive conclusions. First, energy efficiency practices exert a significant positive effect on hotel performance. Hotels that systematically adopt energy-saving technologies including LED lighting, occupancy sensors, automatic shutdown sockets, and optimized HVAC management report measurably higher performance outcomes. This result confirms the core proposition of the Natural-Resource-Based View: that environmentally oriented capabilities, when valuable and organizationally embedded, generate competitive advantage by reducing operational costs and enhancing resource productivity.

Even in an emerging market context characterized by infrastructural constraints and mid-range market dominance, energy efficiency represents a strategic investment rather than a discretionary cost.

Second, hotel size significantly moderates this relationship. The positive effect of energy efficiency practices on performance weakens as hotel size increases, meaning that smaller hotels derive proportionally greater performance benefits from identical efficiency investments. This finding validates Contingency Theory's central tenet: that the effectiveness of any organizational strategy depends on structural fit. In Kisumu County's hospitality market, where smaller properties operate with thinner margins and less resource slack, even modest energy savings translate into substantial proportional improvements in profitability and competitive positioning. For larger hotels, the same efficiency gains are diluted across greater operational complexity and higher baseline consumption.

Third, the study extends the empirical frontier of hospitality sustainability research to western Kenya. Prior studies have concentrated on Nairobi, Mombasa, and the coastal region; this research demonstrates that the energy efficiency performance nexus operates with equal force in emerging destinations, albeit with boundary conditions shaped by local market structure.

Recommendations

For Hotel Managers and Owners

Small hotels (fewer than 50 rooms) should prioritize low-cost, high-impact energy efficiency measures as a primary competitive strategy. Investments in LED lighting retrofits,

occupancy sensors, automatic shutdown sockets, and HVAC optimization offer proportionally large returns on limited capital and should be implemented before pursuing more complex sustainability initiatives. These properties should also leverage their efficiency achievements as marketing assets to attract the growing segment of eco-conscious travelers.

Medium-sized hotels (50 to 200 rooms) should adopt a phased approach, beginning with building-wide LED installations and smart thermostat systems before scaling to renewable energy integration. Given their intermediate position, these properties can balance operational scale with agility, using efficiency savings to fund subsequent sustainability investments.

Large hotels (more than 200 rooms) should recognize that energy efficiency alone yields diminishing marginal performance returns at scale. Instead, these properties should integrate energy management into broader differentiation strategies, such as green certification, corporate social responsibility reporting, and premium eco-branding, to translate operational savings into market positioning advantages.

For Policymakers and Industry Regulators

County and national tourism authorities should design targeted incentive programs that recognize the size-contingent nature of efficiency returns. Subsidies, tax credits, or low-interest financing for small- and medium-sized hotels would yield disproportionate performance benefits for the sector as a whole. Additionally, mandatory energy audits for star-rated hotels modeled on the audit frameworks used in Nairobi should be extended to Kisumu and other

western Kenya counties to identify and unlock conservation opportunities.

For Future Researchers

Scholars should replicate the moderation model in other Kenyan counties and sub-Saharan African markets to test the generalizability of the size-contingent effect. Longitudinal designs would strengthen causal inference by tracking performance trajectories before and after efficiency investments. Future studies might also explore additional boundary conditions such as hotel age, ownership structure, chain affiliation, and managerial environmental orientation to build a more comprehensive contingency model of sustainability performance in emerging hospitality markets.

Limitations

This study is subject to limitations that qualify the interpretation and generalizability of its findings. First, the cross-sectional design captures relationships at a single point in time, precluding causal inference. While the regression results are consistent with the theoretical prediction that energy efficiency drives performance, reverse causality whereby higher-performing hotels have greater slack to invest in efficiency cannot be entirely ruled out.

Second, the reliance on perceptual measures from managerial respondents introduces the possibility of common method bias. Although the psychometric properties of the instruments were robust and the interaction effect is less susceptible to this bias than main effects, future research should complement survey data with objective performance metrics such as audited financial statements, utility bills, and occupancy records from property management systems.

Third, the study is geographically bounded to Kisumu County, whose hotel market is structurally unique dominated by three- and four-star properties with no five-star presence and limited international chain representation. The findings may not generalize to Nairobi's premium hotel segment, coastal resort markets, or other sub-Saharan African countries with different institutional and infrastructural contexts.

Fourth, hotel size was operationalized categorically based on room count. While this approach aligns with prior hospitality research, it does not capture continuous variation in operational complexity, revenue scale, or asset intensity, which may also condition the efficiency–performance relationship. Future studies should employ multiple indicators of size to refine the moderation analysis.

Despite these limitations, the study provides theory-grounded evidence that energy efficiency practices enhance hotel performance in an understudied emerging market, and that organizational scale is a meaningful boundary condition shaping the magnitude of these returns. The findings offer actionable guidance for managers and policymakers seeking to optimize sustainability investments in resource-constrained hospitality environments.

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