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An Assessment of Environmentally Sustainable Practices in The Hotel Industry: A Case Study of Hotels in Delhi NCR

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ABSTRACT

The hospitality industry is one of the most significant drivers of economic development, while at the same time being closely associated with environmental pollution. This research evaluates the current status and success of eco-friendly activities in hotels in the Delhi NCR area. In the following quantitative survey, 270 managers, employees, and sustainability officers from different hotels and resorts completed a structured questionnaire. The research focuses on the relationship between waste management, energy efficiency, water conservation, green procurement and the overall sustainability performance of the hotels. Multiple regression analysis is used to investigate the extent to which these sustainability initiatives affect hotel performance and their significance. It also focuses on the difference in sustainability adoption by hotels, including luxury, mid-range, and budget rooms. The preliminary study further concludes that energy efficiency and green procurement have a significant influence on sustainability performance, while operational issues constrain waste management activities. This study is valuable for the development of knowledge about sustainability in a developing country context by offering insights into the current state of sustainability practices in the Indian hotel industry. Finally, the study provides insights for hotel managers, policymakers, and regulatory bodies to enhance their environmental measures in the hospitality industry. This is a clear implication that policy support, technology improvement, and the adoption of appropriate employee training programs should be encouraged to improve sustainability in the sector.

Keywords: Environmental sustainability, hotel industry, Delhi NCR, multiple regression, waste management, energy efficiency, water conservation, green procurement, sustainable hospitality

INTRODUCTION

Through employment creation, development of infrastructure and provision of services to both local and international tourists, the hospitality industry has remained a major player in the economy. In this regard, hotels have a vital position, especially in large metropolitan areas such as Delhi NCR, as these are areas that generate a significant demand for business and tourist accommodation. As tourism continues to grow, the demands on the hotel structure and functions also rise which resulting in emerging issues about sustainability. Hotels require a vast amount of energy and water, and produce a large amount of solid waste and emissions, which are critical concerns because of their impact on the environment (Chaini et al., 2024).

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With climate change being a global issue and corporations being held to standards for sustainable operation, sustainability in the hotel industry has emerged. Eco-friendly actions such as proper disposal of waste, wise use of water and energy, and purchasing goods that are friendly to the natural environment are not luxuries but necessities for business survival. Kumari et al. (2024) have pointed out that adopting sustainable practices remains beneficial to hotels as doing so leads to improvements to the company's public image, compliance with the regulatory legislation, as well as customers' expectations. They not only contribute towards environmental conservation but also have the benefits of cutting costs of operation and retaining customers.

Delhi NCR forms a very interesting case study in this regard because of the rapid expansion of concrete structures in this region. It is vital to note that the area under study is influenced highly by urban development and most notably by economic factors; thus, it is home to different types of hotels of varying capacities, bearing different degrees of inclination and driving force towards adopting sustainable measures. Mehta and Agarwal (2021) noted that consumers are paying attention to the environmentally sustainable efforts when choosing a hotel, especially in the star category. Moreover, Gupta et al. (2023) opine that the levels of green practices play a crucial role in shaping guest satisfaction, revisit intentions, and hotels' performance.

Nevertheless, significant gaps in implementation continue to persist in even today's health care organizations. According to Chopra (2013), while business travellers expect sustainable services, several hotels fail to measure up to the standards of sustainability. The main issues here are that there are no clear guidelines, funding, or frequent professional development in these areas, especially in mid-price and budget hotels. With these dynamics, there is a need to identify and analyze the extent environmental sustainability strategies are being practiced in various categories of hotels in Delhi NCR. This study, therefore, aims to evaluate the extent to which such practices have been practiced, the degree to which they have improved the sustainability performance of firms, and the variation in the use of the practices across categories.

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Problem Statement

Investment in sustainable practices in the Indian hotel industry has been modest and disparate, even though consumers have gradually become sensitive to green hospitality options. While five-star and luxury hotels have formed strategies like rainwater harvesting, segregation of waste, and energy-efficient lights, budget and mid-segment hotels are unsatisfied with basic compliance due to the unavailability of resources as well as a lack of knowledge (Agarwal, 2023; Chopra, 2013). Moreover, in spite of the fact that there are many hotels that call themselves 'green,' the extent of such measures and the effectiveness of these actions are questionable. According to Chaini et al. (2024), while there are calls for sustainability, operational inefficiency, primarily in waste management, is still prevalent.

It could be, therefore, argued that in addition to identifying the mere existence of sustainability practices, there is also a lack of understanding of the extent of their implementation across the different types of hotels. Specifying which of the components of sustainable development has the greatest impact on the overall performance of hotels is also another knowledge gap that has not been well examined in the literature or explored within the Indian context.

Objectives

- To identify and compare currently practiced sustainable environmental practices in hotels in Delhi NCR.
- To assess the influence of waste management, energy efficiency, water conservation, and green purchasing/local procurement on sustainability performance.
- To examine the factors influencing the level of practical implementation of sustainability in luxury, mid-price range and budget hotels.

Literature Review

Theoretical Background: Environmental Sustainability in Hospitality

This sector has turned out to be one of the biggest players in the global and domestic economies, and the continued expansion of this industry has raised concerns relating to its sustainability impact. Environmental sustainability in hospitality means the management of resources with

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minimal negative impacts on the environment in order to enhance service quality and achieve an effective chain of sustainability (Mohd Rasdi et al., 2023). The incorporation of green management has shifted from a compliance activity to becoming the key strategic activity, especially for emerging metro cities like the Delhi NCR (Verma and Chandra, 2018). Singh et al. (2011) noted that such core pioneers as the ITC Green Center have shown that environmental programmes can remain as profitable strategic business managerial programmes that add value to the brand while achieving operational excellence in the long run.

Waste Management Practices in Hotels

Among all the organization's operational issues, waste management has been increasingly prominent and challenging in hotels. Thus, according to Nath (2014), there is a clear connection between successful waste management and revenues that stems from the fact that hotels implementing the circular economy strategies decrease their expenses and the negative impact on the environment. Kumari et al. (2024) also indicated that in the existing five-star hotels in Delhi NCR, the selective waste segregation, composting system, and tracking food waste management complied with the current regulations as well as gained competitive advantages. Nonetheless, according to Gandhi et al. (2019), there is a high percentage of unutilized food waste in hotels, and only a few hotel chains consider ways such as biogas production.

Energy Efficiency Techniques

Energy consumption is one of the main issues of cost and burden to the hospitality industry. This is true because hotels apply energy in many places that include lighting, heating, ventilation, air conditioning, kitchen services, as well as laundry. Technological enhancements such as energy-efficient lighting, smart temperature controls and renewable energy are today integrated into all segments of the hotel. Mehta and Agarwal (2021) highlight that such initiatives not only lower energy bills but also influence consumer preference, especially among eco-conscious guests. In addition, Bharwani and Mathews (2023) on fulfilling their sustainable luxury, it is no longer an oxymoronic to have energy-saving mechanisms for attracting luxury hotel clients who are now wise towards the environment.

Water Conservation Approaches

Conserving water is a key factor in carrying out business sustainability, particularly for a hotel in a region that faces water scarcity, such as Delhi NCR. Such methods as low-flow fixtures, rainwater harvesting, and grey water recycling are becoming more popular nowadays (Sinha & Fukey, 2020). Munjal and Munjal identified how heritage hotels successfully use modern

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technology in water conservation, which is the focal point of the property. However, there's still a problem of implementation because of the infrastructural deficiencies and laxity in the policy compliance.

Green Procurement Strategies

Green procurement refers to buying items that are friendly to the environment, as well as manufactured in a way that will not harm the environment. In the hotel industry, it may be biodegradable products like soap, natural materials used in bed linens, and locally produced food products. According to Gupta et al. (2023), green procurement plays an essential role in customer satisfaction and revisit intention. This is supported by Shanti and Joshi (2022), who state that sustainable procurement generates brand image and customer confidence among hotel consumers. Nonetheless, in his article of the year 2013, Chopra acknowledges that risks, costs, and drawbacks associated with the supply chain hamper the extent of implementation of such practices in smaller and budget hotels.

Empirical Studies: Insights from India and Abroad

Considering the current circumstances in the Indian hospitality sector, the level of sustainability that the hotels implement ranges from low to high. The findings of Kumari et al. (2024) also revealed that while five-star hotels in Delhi NCR are using sustainability as a distinctive dimension, mid-range and budget hotels are lacking in this aspect, owing to several financial and operational issues. This is in line with the conceptual framework advanced by Sharma et al. (2023), whereby authors establish that organizational culture, leadership commitment, and customer pressure are the key mediating factors influencing the implementation of sustainability.

Gupta et al. (2023) examined the consumer responses in regard to green practices in luxury hotels. Regarding their research, they concluded that environmentalism was positively associated with an increase in guest satisfaction, inclusive ratings, and guest loyalty. In the same way, Verma and Chandra (2018) concluded that the organizations that implemented effective sustainability initiatives received more positive outcomes, including better employee motivation, improved organizational image, and improved sustainability.

Research has it that sustainability initiatives enhance environmental and financial performances around the globe through case studies. In a study on the various hotels in Bangalore, conducted by Shanti & Joshi (2022), it was discovered that the green practices enhanced brand image and business competitiveness. Sinha and Fukey also mentioned that

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while adopting the circular economy concepts from overseas, flexible and unique strategies can be adopted in the Indian context for hotel businesses.

Chopra (2013) offered a cross-sectional examination of the expectation change in business travelers from 2007 to the specified study period. The study shows a positive trend towards green accommodation, where companies are serious about conservation instead of just paying lip service to it. While reviewing the socio-economic potential of tourism development in the Delhi area, Parwez (2013) highlighted that the sustainable development of the tourism sector in the area in question would add value to the socio-economic growth of the region by creating employment opportunities as well as developing infrastructure. Finally, Bharwani & Mathews (2023 were able to present the modern concept of luxury, which demonstrates that sustainable practices are no longer an add-on luxury but are in fact an imperative necessity of the rapidly evolving landscape of the hospitality business.

RESEARCH METHODOLOGY

This research therefore uses a quantitative, descriptive and cross-sectional survey approach to evaluate the extent to which sustainable practices affect the sustainability index of hotels in Delhi NCR. The target population comprises consumption hotels regardless of their classification as luxury, mid-range, or low-cost. A total of 270 respondents, covering hotel managers, employees, and sustainability officers, were chosen using a stratified random sampling approach to get a broad cross-section of hotels. The data was administered through a structured questionnaire developed with references to the perceptions of four independent variables of sustainability practices in hotels, including waste management, energy efficiency, water conservation, and green procurement, and one dependent variable of hotel sustainability performance.

The conceptual framework helps to apply multiple regression analysis to determine the impact of each independent variable on the dependent variable. The use of ANOVA analysis will be carried out to analyze the differences in the sustainability practices of the different categories of hotels. Descriptive statistics will be computed using Statistical Package for the Social Sciences (SPSS) or an appropriate software package.

DATA ANALYSIS

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Descriptive Statistics for Sustainability Variables

Table 1: Descriptive Statistics			
	Mean	**Std. Deviation**	**N**
SUSTAINABILITY PERFORMANCE	25.3852	5.02334	270
WASTE MANAGEMENT	19.4074	3.75018	270
ENERGY EFFICIENCY	18.8222	3.73045	270
WATER CONSERVATION	14.6815	3.40708	270
GREEN PROCUREMENT	11.3630	2.62419	270

The descriptive analysis examines the central tendencies and variability of sustainability-related practices of hotels in Delhi NCR. The mean score for Sustainability Performance is the highest (M = 25.39), which can be considered a moderate approximation to the perception of sustainability outcomes. Among the independent variables, Waste Management has a mean of 19.41 while Energy Efficiency has a mean of 18.82, which means that these practices are more implemented as compared to the other practices. The remaining aspects of the sustainability policy received a lower score: Water Conservation scored 14.68, and Green Procurement scored 11.36. It could be seen that the standard deviations are moderate, and thus, the sustainability practices significantly vary between hotels.

Descriptive Statistics for Sustainability Variables

Table 2: Residuals Statistics[a]					
	Minimum	**Maximum**	**Mean**	**Std. Deviation**	**N**
Predicted Value	11.4096	32.4728	25.3852	4.36642	270
Residual	-8.02584	4.77456	.00000	2.48361	270
Std. Predicted Value	-3.201	1.623	.000	1.000	270
Std. Residual	-3.207	1.908	.000	.993	270
a. Dependent Variable: SUSTAINABILITYPERFORMANCE					

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Residual Statistics

The following residual statistics show that the regression model for Sustainability Performance is statistically significant. The Predicted Values range between 11.41 and 32.47, whereby the mean of the actual data set is 25.39, making the model a good fit. This shows that the residuals are very small since their mean is 0 and has a standard deviation of 2.48, which also indicates that the prediction error is minimum and the distribution of the residuals is symmetrical. The rest of the standardized residuals are mostly below 3, making it easier to tell that the data has no major outliers. These results further assert that the regression model chosen for the underlying analysis is valid and suitable.

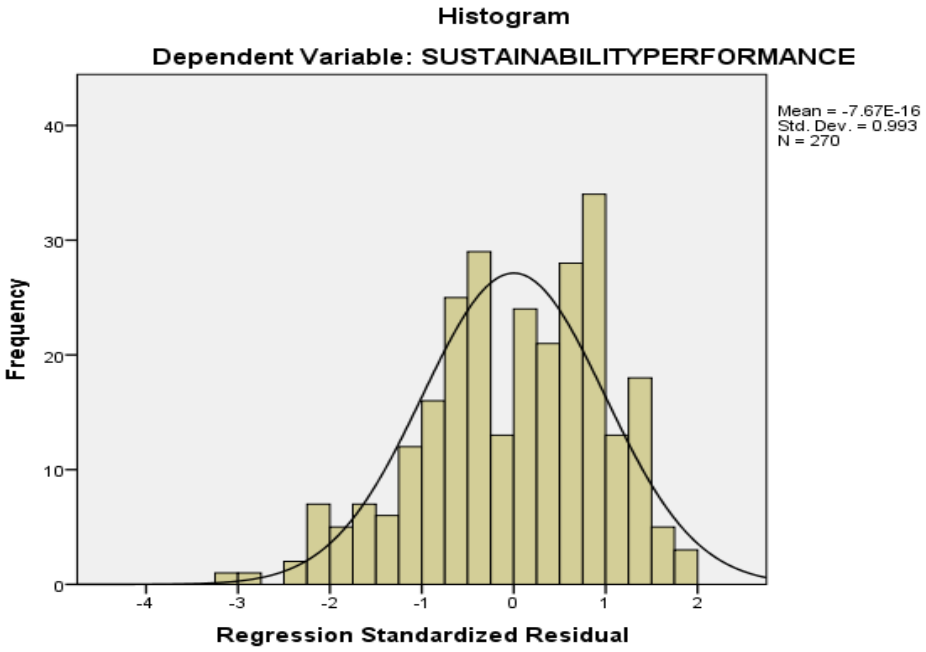

Figure 1: Regression Standardize Residual

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Table 3: Correlations						
		SUSTAINABILITY PERFORMANCE	WASTE MANAGEMENT	ENERGY EFFICIENCY	WATER CONSERVATION	GREEN PROCUREMENT
Pearson Correlation	SUSTAINABILITY PERFORMANCE	1.000	.861	.625	.421	.434
	WASTE MANAGEMENT	.861	1.000	.753	.399	.397
	ENERGY EFFICIENCY	.625	.753	1.000	.455	.413
	WATER CONSERVATION	.421	.399	.455	1.000	.628
	GREEN PROCUREMENT	.434	.397	.413	.628	1.000

Pearson correlation analysis suggested a significant positive correlation of sustainability with all four independent variables. Sustainability Performance has the highest coefficient of determination with Waste Management at 0.861, implying it has a significant influence on sustainability. Energy Efficiency links highly positively with CE Index, plier 0.625, while green procurement and Water Conservation show moderate correlation rates of 0.434 and 0.421, respectively. There are also medium to high levels of correlation between independence, for instance, between Waste Management and Energy Efficiency (r = 0.753); these practices may be integrated. In the same respect, all the variables contribute to sustainability.

Table 4: Collinearity Diagnostics								
Model		Eigenvalue	Condition Index	Variance Proportions				
				(Constant)	WASTE MANAGEMENT	ENERGY EFFICIENCY	WATER CONSERVATION	GREEN PROCUREMENT
1	1	4.912	1.000	.00	.00	.00	.00	.00
	2	.039	11.267	.03	.08	.06	.20	.23
	3	.021	15.156	.90	.06	.10	.09	.01
	4	.019	16.179	.06	.02	.00	.69	.75
	5	.009	23.426	.01	.85	.83	.02	.00
a. Dependent Variable: SUSTAINABILITY PERFORMANCE								

From the Collinearity Diagnostics table, it is clear that multicollinearity in the context of the independent variables is not severe. The readability parameters have revealed that the Condition Index values are below the critical value of 30, with 23.426 being the highest, implying that there is not high multicollinearity. Therefore, Variance Proportions indicate that there are no two Variables that have high coefficient values (above 0.80) in the same dimension, except Dimension 5, in which both waste management and energy efficiency scored 0.85 and 0, 83 respectively. This indicates that there is a certain level of correlation between these two variables, but not very high to affect the model. In all, the diagnostics show that the predictors satisfy the necessary conditions for regression analyses.

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Table 5: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.869[a]	.756	.752	2.50228	.756	204.772	4	265	.000
a. Predictors: (Constant), Green procurement, Waste management, Water conservation, Energy efficiency									
b. Dependent Variable: SUSTAINABILITYPERFORMANCE									

The Model Summary shows that all the independent variables are significantly correlated to the dependent variable labelled Sustainability Performance. Analyzing the coefficient of determination and the coefficient of correlation: The R value is 0.869, which indicates high correlation, while the R^2 is 0.756 which means that 75.6% of the variation in the sustainability performance can be explained by the four independent variables: Waste Management, Energy Efficiency, Water Conservation and Green Procurement. Here, the Adjusted R^2 of 0.752 supports its stability regarding the number of independent variables. The F-statistic obtained is 204.772 and is significant to an extent of $p < 0.001$, which depicts that the overall regression model is statistically significant and reliable.

Table 6: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5128.664	4	1282.166	204.772	.000[b]
	Residual	1659.277	265	6.261		
	Total	6787.941	269			
a. Dependent Variable: SUSTAINABILITYPERFORMANCE						
b. Predictors: (Constant), GREENPROCUREMENT, WASTEMANAGEMENT, WATERCONSERVATION, ENERGYEFFICIENCY						

The analysis of variance table below shows the level of significance of the regression model that has been used to predict Sustainability Performance with four predictors: Waste Management, Energy Efficiency, Water Conservation, and Green Procurement. The F-value of 204.772 and the p-value of (Sig.) of .000 means that the model is significant at the 0.01 level ($p < 0.001$). This implies that the predictor variables account for a considerable amount of variance in sustainability performance. The Regression Sum of Squares of 5128.664 is much

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higher than the Residual Sum of Squares at 1659.277, which affirms the robustness of this model.

Table 7: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.877	.925		2.029	.043		
	WASTE MANAGEMENT	1.171	.062	.874	18.745	.000	.424	2.357
	ENERGY EFFICIENCY	-.131	.064	-.097	-2.029	.043	.404	2.477
	WATER CONSERVATION	.090	.060	.061	1.504	.034	.559	1.790
	GREEN PROCUREMENT	.169	.076	.088	2.214	.028	.578	1.730

a. Dependent Variable: SUSTAINABILITY PERFORMANCE

By using the regression coefficients, it is also possible to establish the specific contribution of each independent variable to Sustainability Performance. Waste Management ($r = 1.171$, $p < .001$) reveals the highest positive impact, which makes it clear that the effective implementation of other sustainability practices has a positive impact. This study also reveals that Green Procurement has a positive impact ($B = 0.169$, $p = .028$), indicating its significance to sustainable hotel operations. Surprisingly, the impact of Energy Efficiency is slightly negative (thic = -0.131, $p = .043$); this may be because of the difficulties in implementing these changes or due to the costs of doing so. Water Conservation, the last, has a relatively small positive impact ($B = 0.090$, $p = .034$). All the VIF values are below 5, thus, there is no evidence for the presence of multicollinearity between independent variables.

DISCUSSION AND RECOMMENDATIONS

Currently, the Indian hospitality industry has witnessed a shift towards embracing a more sustainable environment due to concerns of environmental degradation and conservation. As Bharwani and Mathew (2023) pointed out in the past, it was almost impossible to talk about sustainability in hospitality; however, the tables have turned, and sustainable hospitality has become an identity, especially in luxury brands, where consumers are increasingly becoming

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discerning of their choices. For example, heritage hotels have started selling sustainability as a point of differentiation, modifying the guest journey to include sustainable elements (Munjal & Munjal, 2017). However, operational sustainability still faces several challenges, particularly in areas such as energy and water consumption, waste generation, and green procurement. Verma and Chandra (2018) noted that there is still a limited implementation of green practices in many mid-sized hotels due to cost factors as well as policy issues in place. In order to overcome these gaps, hotels should install smart energy management systems and convert to solar energy. Efficient building fixtures and plumbing systems, such as low-flow fixtures and grey water recycling systems, should also be promoted. These steps not only fit the environmental objectives and concerns but also help in cutting down the operational expenses. A major challenge in the service industry, especially the Indian hospitality sector, is the management of waste. Zheng, Lee, & Manzon (2010) state that the hotel and restaurant industry is a significant producer of municipal solid waste, which is an environmental menace. Gandhi et al. (2019) also revealed that food waste generated in hotels in Jaipur could be processed for the production of biogas, which has both environmental and economic advantages. Indeed, much as these opportunities continue to exist, the separate collection and recycling of waste are still disproportionate across different regions. By CE principles, it is crucial that hotels develop waste-to-energy facilities and collaborate with local recycling firms (Sinha & Fukey, 2020). At the same time, customer awareness and participation are also significant in the process. Sharma (2019) & Chhetri & Kumar (2022) also noted that customer satisfaction was high when hotels declared their sustainable practices and engagement activities, like the use of reusable towels or through mobile check-in. Hotels should thus ensure that they adopt appropriate communication strategies and practices that bring out their stance on environmentalism. Moreover, integrating green procurement policies such as the use of locally sourced and biodegradable products will enhance the green brand image and contribute positively to those economies (Parwez, 2013; Singh et al., 2011).

It has been established that the engagement and well-being of employees are key to success in sustainability within the hospitality industry. Kharb and Kumar (2023) have opined that communication media technology aids in reducing job stress and enhancing employee satisfaction, which in turn has a positive implication on the delivery of green service. It is imperative to provide training to the staff in sustainable best practices, appraise the employees for environmentally friendly behaviors, and foster a culture change. Moreover, Sharma et al.

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(2023) created a model to indicate that consumer behavior decisions depend on the perception that the hotel has concerning sustainability, as well as staff participation in such initiatives. This highlights the fact that there is a need for a comprehensive approach in which more employee aspects have to be addressed hand in hand with more work for customer change. Aggarwal et al. (2024) also support that the guests in mid-market hotels are more conscious about the environmentally friendly services offered to them, and their intended behaviours are believed to have a significant influenced from the visibility and genuineness of these initiatives. As a result, it is necessary to conduct sustainability audits, gather feedback from guests, and disclose results. By such extensive processes, the Indian hotel industry can journey from making mere insignificant gestures towards sustainability and establish it as a standard organizational value and a strategic business advantage.

CONCLUSION

The hospitality industry is quite influential in defining and redetermining the narrative of sustainability as it has a rather large environmental impact and is consumer-oriented. This research examined the impact of sustainable practices of waste, energy, water, and procurement practices on hotel sustainability in India. This means that sustainability is no longer optional for firms; it is a primary management priority, to which Bharwani and Mathews (2023) have also opined that even luxury sectors are assuming more environmentally responsible postures. Waste management was another in focus here due to past studies that pointed out that hotel players play a major role in solid waste disposal (Gandhi et al., 2019; Singh et al., 2015). Proper waste management, collection, and disposal also mitigate environmental impacts while augmenting credibility and approval among the targeted guests. Concerning the internal inputs, energy conservation and water management have been noted to enhance effective operation with the help of the framework as proposed by Verma & Chandra (2018) and Sharma et al. (2019).

Similarly, the transitions toward green purchasing to buy environmentally friendly products and working with suppliers who are also environmentally friendly reflect the general evidence in circular economy trends in the hospitality industry (Sinha & Fukey, 2020). These changes are not only due to the emerging regulations and market forces, but also due to customers' demands (Sharma et al., 2023; Chhetri & Kumar, 2022). It is often viewed that if a hotel focuses on the important aspect of sustainability, it can be regarded as a responsible and contemporary brand. It is now evident that integrated sustainability approaches have positive impacts beyond

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operational effectiveness and efficiencies: customers, employees and sustained organization competitiveness (Aggarwal et al., 2024; Kharb & Kumar, 2023). Sustainability, therefore, should be recognised as a strategic expense and not a cost.

FUTURE SCOPE

Future research can look into how other factors, such as the use of technology, staff and customers, may affect sustainable hospitality. Future studies at the broader regional level need to extend the analysis to include budget hotels will improve the understanding of the elements of inclusive sustainability transitions.

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