

Barriers and drivers of sustainable hotel implementation: A systematic review

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ABSTRACT

Sustainability is becoming progressively important in the hospitality industry, especially in the implementation of sustainable practices in hotels. This study is a systematic literature review (SLR) that aims to explore the barriers and drivers of sustainable hotel implementation across four key pillars: economic, social, environmental, and cultural. The paper synthesizes existing studies from 2020 to 2026 to identify factors that hinder and promote sustainability in hotels. Barriers include financial constraints, lack of awareness, and complex regulations, while drivers such as cost savings, improved guest experiences, and government incentives play significant roles. The analysis suggested potential strategies to help hotels navigate these barriers and utilize key drivers to reach sustainability. The mapping of potential strategies highlights the need for integrated policies, employee training, and technology investments. The study demonstrates that stakeholder engagement in facing challenges is key to the successful implementation of sustainability in hotels. The implications of this research are essential for guiding hotel management, policymakers, and society in building and supporting sustainable practices within the hospitality industry.

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1. INTRODUCTION

Sustainability is essential for long-term business success, particularly within the hospitality sector. Although the global tourism and hospitality industry acts as a major catalyst for economic prosperity, it simultaneously imposes substantial pressure on both environmental and socio-cultural systems [1], [2]. The growing integration of the policies of sustainability in the hospitality sector demands the development of new operational models that balance economic, ecological, and social performance [3]. However, scientific consensus indicates that rapid growth in this sector significantly degrades global environmental functions, evidenced by massive energy and water demands. Consequently, many hotels have implemented environmental management policies to preserve ecosystems and enhance human well-being. To this end, the industry has launched various sustainability initiatives, including adopting eco-labels, implementing sustainable operational practices, and establishing formal environmental management systems [4]. Beyond

operational practices, hotels create lasting impacts through social and cultural experiences that resonate with guests and local communities. These findings have significant implications for policy formulation and government strategies in the tourism and hospitality sectors, aligning with the United Nations Sustainable Development Goal (SDG #9), which focuses on the advancement of industry, innovation, and infrastructure [5].

In order to support global goals on sustainability, a comprehensive international policy landscape has emerged. Organizations like the Global Sustainable Tourism Council (GSTC) provide foundational blueprints, setting international standards and accreditation systems for sustainability in travel and tourism, offering clear benchmarks for policies and practices [6]. GSTC defines a sustainable hotel by criteria in four main areas: representing effective sustainable management, taking full advantage of social and economic benefits to the local community, preserving cultural heritage, and minimizing environmental harm [7]. True sustainability requires a holistic approach that integrates managerial practices with natural resource preservation, social responsibility, and profit maximization. Sustainable hospitality requires integrating managerial practices that integrate the preservation and use of natural resources efficiently with social responsibility and profit maximization [8].

The hospitality sector faces a critical tension between increasing policy support and the low rate of operational implementation of sustainability practices. Governments and global entities recognize tourism as a key driver for economic growth and poverty alleviation, making it essential for governments to create enabling environments through modern policies, regulations, and incentives that promote sustainable business models [9]. However, significant gaps in management, cohesion, and collaboration remain. The lack of financial incentives hinders the development of pro-environmental behaviors and necessitates complex processes to obtain permits for eco-friendly installations, increasing both initial costs and administrative complexity [10], [11]. Financial incentives, such as funding availability and fee reductions, are often crucial for hotels aiming to transform their operations [12]. Additionally, deficiencies in policy formulation and stakeholder collaboration create barriers to achieving sustainability. Experts say the lack of a long-term vision, a vague definition of sustainable tourism, and an ineffective bureaucracy are the main obstacles. When combined with the tendency to prioritize short-term economic gains over environmental and social concerns, these factors create systemic resistance, weakening regulatory efforts toward sustainability [13].

Sustainability implementation is shaped by internal and external factors. Hotels must understand these elements to develop effective solutions. There are internal and external barriers to implementing a sustainable hotel. Financial constraints represent the most dominant and consistently cited internal barrier [11]. External factors often involve conflicts of interest and market volatility. Market dynamics, such as seasonal fluctuations in occupancy rates, create economic uncertainty, making hoteliers reluctant to commit capital to long-term eco-friendly improvements. Drivers provide the necessary momentum to overcome systemic roadblocks, deriving from both market opportunities and institutional support. The primary commercial driver is the pursuit of competitive advantage and market leadership [12]. To ensure the sustainability of the hotel implementation, it is essential to develop potential strategies based on the primary barriers, supported by factors that impact these barriers. The potential strategies should be grounded in the sustainability aspects of economic, social, environmental, and cultural dimensions. Therefore, the potential strategies are expected to support hotels in implementing sustainable operations while maintaining consumer needs and profitability.

The primary goal of this SLR is to synthesize the current research findings of the factors influencing sustainable hotel implementation across the economic, social, environmental, and cultural aspects, and to critically leverage the identified drivers to build potential strategies that can support the implementation of sustainable hotels. The present study analyzes the sustainable hotel implementation that systematically synthesizes the relationship between identified barriers and drivers to formulate actionable potential strategic guidelines and comprehensive sustainable hotel implementation. From an industrial engineering standpoint, this systematic review synthesizes evidence on barriers and drivers of sustainable hotel implementation to develop operational improvement strategies. This aligns with industrial engineering principles of process optimization, systems integration, and stakeholder engagement. Therefore, to support this systematic review on sustainable hotel implementation, the present study aims to solve the following research questions:

- RQ1. What are the barriers and drivers to the implementation of sustainability in hotels?
- RQ2. What potential strategies can help ensure the successful implementation of sustainability in hotels?

Over the past five years (2020–2025), the academic community has increasingly utilized SLR and meta-analyses to understand the adoption of sustainability in the hospitality sector [14]. These studies have successfully established the importance of sustainability as an operational priority and have extensively documented the general categories of barriers and drivers [15]. Few studies, such as Alotaibi et al. [15], have analyzed the challenges and opportunities of implementing sustainable hotel facilities. However, the study focuses on the discussion of facilities and operations. This research aims to extend these findings by addressing the implementation of the entire system, including operations, management, guest perspectives, government support, and the impacts that will be observed from the existing challenges. This study adds value by linking the barriers and their supporting factors. Later, it will be implemented to develop potential strategies focused on the economic, social, environmental, and cultural aspects derived from the literature.

The subsequent sections of this review are organized as follows: Section 2 explains the methodology used, including how to search and select articles, selection criteria, and data analysis techniques used to compile the research results. Section 3 presents the synthesized findings regarding the categorized barriers and drivers, mapping specific drivers to countermeasures designed to overcome the critical barriers identified, and also elaborates upon the derived potential strategies to implement sustainability in hotels. Finally, Section 4 discusses the conclusions, implications of the findings, limitations of the study, and directions for future research in the sustainable hospitality scope.

2. MATERIALS AND METHODS

2.1. Introduction to SLR Approach

We conducted an SLR to examine and provide a reliable evaluation of the barriers, drivers, and parties involved—including the relationships among these factors—to develop a systematic strategic framework for implementing sustainable hotels and to identify potential avenues for future research in this area. Following the methodology outlined by PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) [16]. Compared to narrative or scoping reviews, an SLR provides a more rigorous framework for evaluating evidence, discovering trends, and pinpointing crucial gaps in the literature [17].

2.2. Scope Definition

To directly answer the specific research questions, articles that focused strictly on general sustainability without a specific application to hotel operations or management were excluded. The detailed eligibility criteria for article selection are presented in [Table 1](#).

Table 1. Inclusion/exclusion criteria

Inclusion Criteria	Exclusion Criteria
The article has direct relevance to the defined research objective	The article was not relevant to the study's research objective
The article discusses influential factors that form sustainable hotel implementation, including an analysis of the interrelationships among economic, social, environmental, cultural, and regulatory dimensions	The article's focus was too narrow (e.g., only one specific regulation or the use of technologies in detail) and failed to connect with or address other influential factors
The article gives empirical and conceptual knowledge about sustainable practices in hotels	The article did not report on the actual implementation of sustainable practices in hotels.
The article discusses the future of sustainability in the hotel industry	The article did not discuss the development and future of the implementation of sustainability in hotels.

2.3. Operational Definition

The category and subcategory were developed by combining empirical findings from the article content with theoretical insights drawn from a review of existing literature [18]. To ensure absolute consistency and objectivity during the data extraction and coding process, key concepts were strictly operationalized as follows:

2.3.1. Barrier to Sustainable Hotel Implementation

A barrier to sustainable hotel implementation is defined as an internal or external factor that impedes, constrains, or systematically creates difficulties for the adoption of sustainability practices within a hotel. The categorization of barriers was formulated by synthesizing the eligible references, drawing upon prior research by Khalil et al. [19]. Data qualified as a barrier only if it demonstrated specific obstacles, the hospitality sector context, and documented impacts on sustainability practices.

2.3.2. Driver to Sustainable Hotel Implementation

Drivers of sustainable hotel implementation are factors that enable, incentivize, or facilitate the adoption of sustainability in hotels. The categorization of drivers was formulated using the framework by [20], tailored to the subject of the present study. Eligible literature was then classified into these predefined driver categories based on the following considerations: specific enabling mechanisms, the hospitality sector context, and applicability to hotels.

2.4. Reference Research Strategy

We searched the Scopus database from 2020 to 2026 for relevant literature. To identify which sources to include, we first set search criteria based on the research questions. The scope of eligible literature for this research was limited to published, English-language, peer-reviewed articles. The specific query used was: ("barrier*" OR "enabler*" OR "driver*") AND ("sustainable" OR "sustainability") AND ("hotel*"). The eligibility of the paper was first determined by the independent review of titles and abstracts against the defined criteria. Furthermore, the full text of promising studies was examined for final inclusion. The initial search resulted in 129 articles (identified by keywords).

2.5. Article Full-Text Assessment

To ensure the methodological credibility and empirical validity of the synthesized literature, a stringent assessment process was integrated into the full-text evaluation phase. The quality assessment framework was systematically constructed, drawing upon the three main sections identified by the developed Critical Appraisal Skills Programme (CASP) [21], alongside established SLR principles adapted for hospitality research. Each article was subsequently evaluated against these three predefined dimensions to guarantee contextual relevance and data reliability alignment with the review's objective:

1. Dimension 1: Relevance clarity (Score: 1-3)
 - 1 = Barriers/drivers mentioned but poorly defined
 - 2 = Barriers/drivers clearly identified, applicable to hotels
 - 3 = Explicitly maps barriers/drivers with mechanisms explained
2. Dimension 2: Methodological rigor (Score: 1-3)
 - 1 = Conceptual/opinion-based
 - 2 = Empirical study with basic data
 - 3 = Rigorous empirical study (mixed-methods, statistical analysis, or longitudinal)
3. Dimension 3: Data completeness (Score: 1-3)
 - 1 = Mentions barriers/drivers but sparse detail
 - 2 = Adequate discussion with some context
 - 3 = Comprehensive with evidence, examples, quantification

A quality assessment threshold was established at ≥ 6 , representing a moderate-to-strong quality level that reflects a 67% performance score across the evaluated dimensions. This threshold effectively balances the inclusion of relevant evidence with rigorous quality standards. Furthermore, the multi-phase filtering process inherently functioned as an additional layer of quality assurance. The progressive application of these strict criteria ensured that only highly relevant, empirically grounded articles examining explicit barriers and drivers within the hotel context were retained for the final synthesis.

2.6. Article Selection and Filtering

A comprehensive, multi-stage evaluation process was utilized to ensure the final selection consisted solely of highly relevant and rigorous peer-reviewed articles:

1. Phase I: Automated Database Filtering

During the initial phase, a series of automated filters was applied in the Scopus database to establish a rigorous inclusion baseline. To ensure the synthesis of contemporary and high-quality evidence, the search was restricted to peer-reviewed journal articles published in English between 2020 and 2026. Non-journal sources, such as conference proceedings, editorials, and commentaries, were strictly excluded. Furthermore, the scope was refined by limiting the results to highly relevant subject areas, specifically Business, Management, Environmental Science, Social Sciences, and Engineering. Following the application of these automated parameters, 94 articles were retained for the subsequent screening phase.

2. Phase II: Title and Abstract Screening

The reviewer manual examined all 94 articles' titles and abstracts against the inclusion criteria (Table 1). We excluded articles that did not meet the inclusion criteria. Articles that successfully passed the manual title and abstract screening were subsequently evaluated for accessibility. As seven articles were found to be inaccessible, a total of 86 articles were retained for full-text review.

3. Phase III: Full-Text Assessment

To guarantee methodological rigor, the 86 articles that passed the initial screening underwent a detailed full-text evaluation. We excluded studies that lacked explicitly identified barriers or drivers, operated outside a definitive hospitality context, or provided insufficient detail for robust data extraction. Additionally, we evaluated the final selection using the quality assessment framework detailed in Section 2.5. Article Full-Text. Furthermore, studies that did not align with the operational definitions provided in Section 2.3 Operational Definition were omitted to maintain conceptual consistency. This stringent assessment procedure successfully eliminated irrelevant or low-quality papers, resulting in a final selection of 51 high-quality articles. The results of the full-text eligibility assessment are presented in Table 2. Moreover, Figure 1 maps out the flow diagram of the SLR stages in the present study

Table 2. Results of the full-text eligibility assessment

Ref	Relevance Clarity	Methodological Rigor	Data Completeness	Total Score	Decision
[22]	2	2	3	7	Include
[23]	3	2	3	8	Include
[24]	2	2	3	7	Include
[11]	3	3	3	9	Include
[10]	2	2	2	6	Include
[25]	2	2	3	7	Include
[26]	1	3	2	6	Include
[27]	2	2	3	7	Include
[28]	2	3	2	7	Include
[29]	3	3	3	9	Include
[30]	2	2	2	6	Include
[31]	3	2	2	7	Include
[32]	3	3	3	9	Include
[33]	2	3	2	7	Include
[34]	3	3	3	9	Include
[35]	3	3	3	9	Include
[36]	2	3	3	8	Include
[37]	2	2	2	6	Include
[38]	3	3	2	8	Include
[39]	3	3	3	9	Include
[40]	2	2	2	6	Include
[41]	2	2	2	6	Include
[42]	2	3	2	7	Include
[43]	2	2	2	6	Include
[44]	3	3	3	9	Include

Ref	Relevance Clarity	Methodological Rigor	Data Completeness	Total Score	Decision
[45]	2	3	3	8	Include
[46]	3	3	3	9	Include
[47]	3	2	3	8	Include
[48]	2	2	3	7	Include
[49]	3	2	3	8	Include
[50]	2	3	3	8	Include
[51]	2	2	2	6	Include
[52]	2	2	2	6	Include
[53]	2	2	3	7	Include
[54]	3	3	3	9	Include
[3]	2	2	2	6	Include
[55]	3	2	3	8	Include
[56]	3	3	3	9	Include
[57]	2	3	3	8	Include
[58]	2	2	2	6	Include
[59]	1	3	2	6	Include
[60]	3	3	3	9	Include
[61]	3	3	3	9	Include
[62]	2	3	3	8	Include
[63]	2	3	2	7	Include
[64]	3	3	3	9	Include
[65]	2	2	2	6	Include
[66]	3	3	3	9	Include
[67]	2	2	2	6	Include
[68]	3	3	3	9	Include
[69]	3	3	3	9	Include

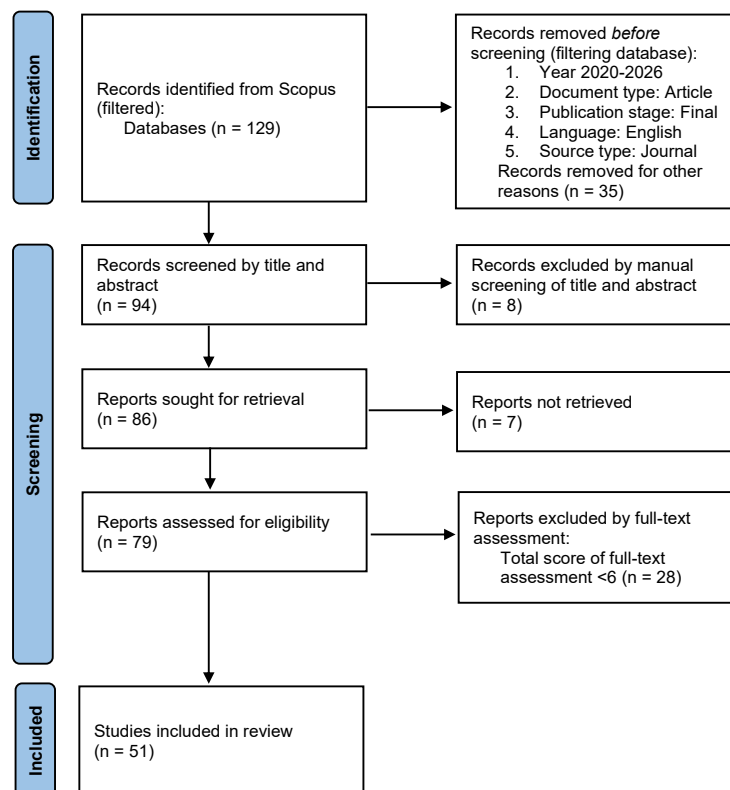


Figure 1. Flow diagram of the SLR stages in the present study

3. RESULTS

The results and discussions section presents a synthesis of data on barriers and drivers of hotels developed from the reviewed articles. Before detailing the specific factors, a methodological overview of the selected top-tier literature is presented to establish the empirical rigor of the synthesized data. The identified factors related to barriers and drivers were categorized into four groups. The economics category addresses financial factors that either hinder or motivate stakeholders to implement sustainable hotel management. The social category focuses on the larger consumer market, including behavioral aspects like environmental awareness, cultural factors, and internal operations of the hotel. The management and policy category includes government policies, regulations, and company policies related to the implementation of sustainable hotels. The technology category covers the technologies supporting the implementation of sustainable hotels, including their technical feasibility and the necessary components, such as renewable energy adoption and information systems. The identified drivers are then connected with the identified barriers, and in this study, potential strategies are developed that can be applied to hotel sustainability practices.

3.1. Methodological Overview of Selected Articles

Of the 51 articles included in this review, those achieving the maximum quality score (Score = 3) demonstrated robust and distinct methodological approaches. A critical analysis of these top-tier studies reveals several defining methodological characteristics that contribute to their empirical reliability and robust findings. A primary characteristic of the high-quality articles is the extensive use of advanced quantitative modeling to test complex, multi-variable relationships [36], [39]. The majority of the top-tier studies utilized Partial Least Squares Structural Equation Modeling (PLS-SEM) to rigorously evaluate direct, mediating, and moderating effects within hotel sustainability frameworks [29], [36], [39], [44], [61], [64], [66]. Additionally, software such as AMOS was employed to conduct exploratory and confirmatory factor analyses, ensuring valid measurement and structural models [29]. Some studies use the sampling method to gather data [29], [32], [36], [39], [57], [64].

To overcome the limitations of single-method research, several high-scoring studies employed mixed-methods designs. Researchers frequently combined preliminary qualitative phases—such as in-depth interviews with hotel managers or industry experts—with large-scale quantitative surveys to contextualize and validate their measurement scales [39]. Furthermore, methodological innovation was evident through hybrid techniques, such as integrating PLS-SEM with fuzzy-set qualitative comparative analysis (fsQCA) to identify complex, synergistic pathways leading to green consumer behavior [32]. For studies focusing on broader operational and environmental impacts, sophisticated econometric and input-output models were prevalent. High-quality assessments of eco-efficiency and carbon emissions frequently integrated Data Envelopment Analysis (DEA) with Environmentally Extended Input-Output (EEIO) models [34]. These were often paired with spatial-temporal analyses and panel Tobit regression models to identify both internal and external driving factors of sustainability at regional levels [54].

The methodologies of these leading articles are firmly rooted in established behavioral and management theories, most notably the Theory of Planned Behavior (TPB) [50], [56] and the Resource-Based View (RBV) [39]. Data collection procedures were highly structured, relying on multi-point Likert scales with robust sample sizes typically exceeding 200 respondents [50], [56], [57]. To mitigate common method bias, some studies utilized advanced sampling strategies, such as gathering dyadic data simultaneously from hotel guests and staff to provide a multi-perspective analysis of sustainable practices [56]. Overall, the methodological rigor of these top-tier studies—characterized by advanced statistical modeling, hybrid analytical tools, and strong theoretical foundations—provides a highly credible evidence base for understanding the complex drivers and barriers of sustainable hotel implementation.

3.2. Identified Barriers to Sustainable Hotel Implementation

Barriers are identified as factors that impede the implementation of sustainable hotels. The study has compiled 12 barriers from the reviewed articles, as presented in [Table 3](#).

Table 3. Barriers to sustainable hotel implementation

Barriers	References Mentioning Barriers (N)
Economics (BE) Category	
Limited budget for small hotels in developing regions (BE1)	[10] (N = 1)
High operational costs (BE2)	[29], [41], [43], [49] (N = 4)
High initial costs (BE3)	[43], [46], [49], [67] (N = 4)
Difficult to commit to long-term investments (BE4)	[24] (N = 1)
Social (BS) Category	
Lack of awareness of sustainability (BS1)	[11], [22], [24], [43], [51], [58] (N = 6)
Cultural influence (BS2)	[42], [53], [67], [68] (N = 4)
Guest knowledge and attitude for green products (BS3)	[31], [32], [56] (N = 3)
Under-trained staff regarding sustainability practices (BS4)	[10], [24], [25], [31] (N = 4)
Management and policy (BM) Category	
Unclear internal policies and external regulations (BM1)	[10], [24], [25], [37], [41], [51] (N = 6)
Lack of standardization (BM2)	[25] (N = 1)
Complexity of environmental standards (BM3)	[37], [41] (N = 2)
Technology (BT) Category	
Complex and costly infrastructures (BT1)	[41], [67] (N = 2)

Table 3 reveals that sustainability barriers span all categories, with interconnected relationships. It is essential to note that the barriers are interrelated. This indicates that the lack of awareness of sustainability and unclear internal policies and external regulations are the most frequently cited obstacles in the literature. There are also significant barriers identified. The economic category also highlights notable barriers, such as high initial costs for implementing eco-friendly services and technologies, as well as the substantial initial investment required to install environmentally friendly technologies that can attract investors [22], [29].

3.3. Identified Drivers to Sustainable Hotel Implementation

Drivers enable successful, sustainable hotel implementation by overcoming identified barriers. This study identified 19 drivers organized into economic, social, management, and technology categories. Table 4 represents drivers for the sustainable hotels implementation of this study.

Table 4. Drivers to sustainable hotels implementation

Drivers	References Mentioning Drivers (N)
Economics (DE) Category	
Cost savings from energy efficiency (DE1)	[23], [25], [28], [29], [34], [39], [49], [50], [58], [67] (N = 10)
Operational efficiency (DE2)	[30], [40], [43] (N = 3)
Social (DS) Category	
Guest experiences related to sustainability (DS1)	[10], [26], [31], [45], [64], [65] (N = 6)
Eco-friendly services (DS2)	[28], [32], [39], [46], [53], [65] (N = 6)
Responsible leadership (DS3)	[35], [36] (N = 2)
Growing guest awareness (DS4)	[38], [57], [64] (N = 3)
Training and development for employees (DS5)	[22], [25], [31], [32], [37], [39], [43], [46], [66], [68] (N = 10)
Enhanced local supply chain (DS6)	[32] (N = 1)
Management and policy (DM) Category	
Incentives for sustainable practices (DM1)	[10], [22], [24], [25], [26], [37], [41], [46], [50], [67] (N = 10)
International frameworks (DM2)	[58], [60] (N = 2)

Drivers	References Mentioning Drivers (N)
Collaboration with stakeholders (DM3)	[3], [30], [33], [37], [41], [43], [47], [67] (N = 8)
Corporate Social Responsibility (CSR) practices (DM4)	[27], [45], [61], [62], [69] (N = 5)
Regulatory simplification (DM5)	[41], [46] (N = 2)
Policies and standards (DM6)	[48], [59], [61] (N = 3)
Quality management (DM7)	[44] (N = 1)
Employees' reward for sustainability contributions (DM8)	[63] (N = 1)
Technology (DT) Category	
Eco-technologies (DT1)	[23], [25], [34], [46], [52], [54], [60], [61] (N = 8)
Energy-efficient technologies (DT2)	[25], [29], [30], [60], [61], [65], [67] (N = 7)
Infrastructure investment (DT3)	[28], [41], [47], [52], [60], [67] (N = 6)

Table 4 reveals that sustainability drivers span all categories, demonstrating highly interconnected and mutually supportive relationships. It is essential to note that these driving factors operate synergistically rather than in isolation. This indicates that cost savings from energy efficiency, comprehensive training and development for employees, and robust incentives for sustainable practices are the most frequently cited enablers in the literature. There are also significant drivers identified within specific dimensions. The economic and management categories highlight notable momentum, such as the pursuit of operational efficiency and proactive government policies that effectively catalyze the adoption of environmentally friendly technologies and services.

4. DISCUSSION

4.1. Interconnections of Sustainability Barriers

A widespread lack of sustainability awareness [24], heavily intertwined with cultural influences, forms a critical barrier among guests, employees, and management. Guests believe that the impact of sustainability campaigns in hotels is insufficient. This is substantiated by several articles that describe guests' knowledge and attitudes toward green practices as an important barrier to sustainability implementation [31], [56], that behavior possibly leads to a reluctance to pay a premium for green products [11], [25]. Additionally, hotel employees also fail to perceive the impact of sustainability implementation. Beyond the limited perceived impact of sustainability, insufficient employee training and professional advice in sustainable practices remain a common issue [25].

The knowledge gap regarding sustainability among guests and hotel employees is due to a barrier in the form of unclear external regulations [24], [25], [51], which leads guests to feel that sustainability implementation is not a priority. Additionally, clear internal hotel policies are often not supported by management standardization [25], resulting in employees and supply chains failing to comply with sustainability practices. A lack of formal policies usually results in sustainability being eliminated from the overarching business strategy [24]. Another barrier that hinders the effective implementation of sustainability by hotel management is the complexity of environmental standards [41].

While some sustainability initiatives generate short-term returns, hotels should see them as long-term strategic investments rather than isolated benefits. There are difficulties in committing to long-term investments, which ultimately results in fewer investors being interested in investing in sustainable hotels [24]. Investment and financial support challenges are prevalent among small hotels in developing regions. Small hotels in developing regions receive support from local universities and NGOs, but often lack financial resources [10]. As a result, the implementation of technologies supporting the facilities, services, and infrastructure necessary for sustainability practices is often hindered [41], [67]. Barriers to sustainable hotel implementation are interconnected, creating a complex challenge across economic, social, environmental, and cultural dimensions.

4.2. Mechanisms of Sustainability Drivers

The identified drivers to sustainable hotel implementation (in Table 4) illustrates that the majority of drivers are interconnected and mutually supportive. Cost savings from energy efficiency, training and development for employees, and incentives for sustainable practices were identified as the most commonly discussed drivers in the reviewed articles. In fact, cost savings derived from energy efficiency [67], such as renewable energy uses [49] and waste of resources reduction [10], [23], can simultaneously serve as a powerful driver for sustainable hotel implementation. Proactive government policies, including lowering the taxes paid [28], incentives [22], [67], renewable energy [49], and green practices regulations [25], represent another robust driver for sustainability within this sector. Hotels have shown tangible financial benefits through the implementation of energy-saving practices and technologies. Significant incentives include long-term cost savings from reduced energy consumption, which can make waste management more optimized [10], and efficient resource utilization. Increasing operational efficiency alongside energy efficiency can effectively mitigate high operational costs [67]. For example, minimizing food waste directly means a reduction in operational expenses [55]. In pursuing energy efficiency and supporting government policies, employee awareness of sustainable practices is also necessary [10]. This imperative is effectively supported by robust training and development programs for employees [22], [32], [43], [46] and rewarding sessions [43], [63]. Setting appropriate and measurable environmental goals is needed to encourage and incentivize employee actions towards defined sustainability goals [63].

Sustainability implementation is also driven by external demand factors, which are reflected in the significant attention paid to eco-friendly services [32], [39], [46], [53], such as the use of eco-labeling products and services [28], [57] and guest experience related to sustainability [64], [65]. This market dynamic is fueled by increased guest awareness [38]. By displaying their recent environmental progress, hotels can effectively prove that their ecological efforts provide real benefits to society. This demonstrable commitment goes beyond mere imagery and is essential to drive strong and sustainable tourism [64]. When hotels proactively integrate sustainable practices, they not only meet guests' expectations but also strengthen their brand image [57], so that it can develop positive reciprocity from the market that supports sustainability investments. However, there is a considerable gap in the literature highlighting the broader social aspects. Responsible leadership and the enhancement of the local supply chain receive the least attention. Although social development and community engagement are fundamental principles of UN sustainable tourism [31], the lack of focus on this implies that much research still limits sustainability to internal operational boundaries, ignoring the holistic impact on the broader destination ecosystem. Strengthening relationships with local communities through fair procurement is an important mechanism that must be strengthened to ensure destination-responsible sustainability. This is a benefit that can be supported by operational innovation [32]. Responsible leadership enhances environmental performance mediated by the organization's green culture [35], [36]. This mechanism reflects leaders who champion eco-friendly policies and instill the core values of environmental responsibility [35].

The management and policy category establishes the essential institutional framework underlying sustainability commitments, thereby necessitating effective management strategies to prevent social degradation [70]. The success of sustainable energy initiatives relies heavily on the coordinated collaboration among key stakeholders (such as hotel management, government, and financial investors) [67]. In the context of collaboration, quality management is recognized as an important precursor to absorption capacity and sustainability. Effective knowledge management positively influences organizational resilience [71]. This is achieved through management commitment, analysis of stakeholder requirements, cooperation with partners, process compliance monitoring, and internal knowledge sharing [33], [44]. To support management's efforts to implement sustainability, easily applicable regulation is essential, which can be implemented through efficient regulatory clarity and licensing, standardized technical criteria, and more accessible licensing for small decentralized technologies (such as desalination or greywater reuse) [41]. Finally, by developing and disseminating clear environmental policies and energy efficiency standards [48], management can effectively adopt an organizational culture of sustainability and environmental responsibility [61]. Corporate Social Responsibility (CSR) practices establish an ethical framework for managing both social and environmental impacts, while also driving circular economy practices [45], [69], [72]. The framework emphasizes social outcomes, such as employment numbers and economic performance [62]. Moreover, the reliance on external

standards is seen as based on an international framework that guides hotels in adopting sustainability practices globally [58].

The implementation of sustainability in hotels requires strategic investment in eco-technologies [28], [46], [61] and energy-efficient technologies [29], [34] that aim to reduce the environmental footprint while sustaining operational performance. These technologies are specifically designed to reduce energy consumption [29], improve waste management efficiency [25], and enrich the guest experience. The engagement of top management with eco-technology is critical to influence sustainability internally, which ultimately affects competitive advantage [61].

4.3. Development of a Strategic Framework: Mapping Drivers to Barriers

The framework derived from this discussion of barriers and drivers is defined as targeted potential strategies to address the identified barriers. This mapping underscores the necessity for coordinated interventions across economic, social, managerial, and technological categories. The following analysis details the specific mechanisms of these countermeasures. Mapping barriers to drivers for the potential strategies of sustainable hotel implementation is presented in Table 5.

Table 5. Mapping barriers to drivers: potential strategies for sustainable hotel implementation

Barriers	Drivers/Potential Solutions
Economics (BE) Category	
Limited budget for small hotels in developing regions (BE1)	Incentives for sustainable practices (DM1)
High operational costs (BE2)	Cost savings from energy efficiency (DE1) Operational efficiency (DE2)
High initial costs (BE3)	Incentives for sustainable practices (DM1) Infrastructure investment (DT3)
Difficult to commit to long-term investments (BE4)	Incentives for sustainable practices (DM1)
Social (BS) Category	
Lack of awareness of sustainability (BS1)	Growing guest awareness (DS4) Training and development for employees (DS5) Employees' reward for sustainability contributions (DM8)
Cultural influence (BS2)	Eco-friendly services (DS2)
Guest knowledge and attitude for green products (BS3)	Guest experiences related to sustainability (DS1) Eco-friendly services (DS2) Growing guest awareness (DS4)
Under-trained staff regarding sustainability practices (BS4)	Responsible leadership (DS3) Training and development for employees (DS5)
Management and policy (BM) Category	
Unclear internal policies and external regulations (BM1)	International frameworks (DM2) Policies and standards (DM6) Quality management (DM7)
Lack of standardization (BM2)	Policies and standards (DM6) Quality management (DM7)
Complexity of environmental standards (BM3)	Regulatory simplification (DM5)
Technology (BT) Category	
Complex and costly infrastructures (BT1)	Eco-technologies (DT1) Energy-efficient technologies (DT2) Infrastructure investment (DT3)

4.3.1. Economics Category Strategies

Economic sustainability requires balancing short-term cash flow needs with long-term value creation. Limited budgets and high initial costs are primary obstacles, particularly for small and medium-sized hotels (SMEs). Primary solutions include:

1. Government incentives and financial support packages [10], [22].
2. Demonstrating cost savings from energy efficiency and operational improvements [67].
3. Access to infrastructure investment financing [41], [47]. When external markets fail to provide a positive ROI, government intervention becomes essential. Successful examples show that financial support combined with technical assistance significantly improves hotel sustainability commitment [10].

4.3.2. Social Category Strategies

Social sustainability addresses human dimensions—awareness, behavior, and values. The hospitality industry's human-centric nature makes social factors critical to success. Key strategies include:

1. Transparency in communicating environmental progress and benefits [64].
2. Comprehensive employee training programs that build knowledge and skills [22], [32], [43].
3. Recognition and rewards for employees implementing sustainable practices [43], [63].
4. Culturally sensitive approaches that respect local values while promoting sustainability [68]. Technology alone fails without human adoption. Thus, investment in social sustainability must parallel technology investment.

4.3.3. Management and Policy Category Strategies

This category examines the regulations for hotel operations. The external regulatory environment and internal management policies determine the boundaries on how hotels can operate. The barriers here are characterized by uncertainty, lack of standardization, and complexity, while the drivers offer standardization, clarity, and structural support. Management and policy form the institutional framework enabling sustainability. Unclear regulations and fragmented policies create uncertainty. Key strategies include:

1. Establishing clear, internally aligned sustainability policies that mandate practices rather than relying on individual initiative [24].
2. Adopting international standards (ISO, GSTC) that provide globally recognized benchmarks [58], [60].
3. Simplifying regulatory requirements through efficient licensing and standardized technical criteria [41].
4. Implementing quality management systems that ensure compliance and facilitate knowledge sharing [33], [44]. International frameworks are particularly valuable for SMEs, as they provide proven models without requiring custom development.

4.3.4. Technology Category Strategies

The final category discusses the infrastructure and technology role required for the implementation of sustainable practices. Technology is the driver that enables economic efficiency and social engagement, but it comes with its own set of implementation challenges. Technology enables economic efficiency and environmental protection, but requires careful implementation. Key strategies include:

1. Investment in renewable energy and energy-efficient technologies that reduce operational costs [29], [49].
2. Waste management systems that optimize resource use [10], [25].
3. Water conservation technologies, including rainwater harvesting and greywater reuse [41], [47].
4. Smart management systems that optimize operations [67]. Technology adoption must be coupled with organizational commitment from top management [61] and infrastructure support from the government [67]. Gradual, phased implementation often works better than comprehensive overhauls, particularly for small hotels.

5. CONCLUSION

5.1. Key Conclusions

Sustainable hotel implementation is a systemic operational challenge that requires the seamless integration of economic, social, managerial, and technological dimensions. Strategic insights and recommendations:

1. High initial technology costs (BE3/BT1) act as the primary operational bottleneck. Recommendation: Hoteliers must integrate financial planning and technology adoption simultaneously, leveraging external incentives (DM1) to drive the efficiency and cost savings (DE1, DE2) required for rapid ROI.
2. Eco-technologies inherently fail without robust human adoption. Recommendation: To overcome critical deficits in awareness and skills (BS1, BS5), capital investments in targeted employee training (DS5) and guest engagement (DS2, DS4) must strictly parallel technological expenditures.
3. Unclear internal policies (BM1, BM2) severely derail sustainability efforts. Recommendation: Hotels, particularly SMEs, must adopt established management frameworks (e.g., ISO standards) or join industry consortia (DM2) to stabilize compliance and scale green operations effectively.

Ultimately, transitioning to a sustainable hospitality sector is a highly achievable challenge. By systematically mapping strategic drivers to their corresponding barriers—treating barriers as process bottlenecks and drivers as optimization parameters—stakeholders can confidently navigate economic constraints toward a resilient, profitable, and regenerative hotel industry.

5.2. Implications

This systematic review and meta-analysis have practical implications that cover a wide range of stakeholders, including businesses, investors, consumers, and the government. The analysis provides solutions for practitioners in implementing sustainability practices as a foundation for hotel operations, thereby achieving the shared goal of sustainability in the tourism sector, especially the hospitality sector. Practices that can be implemented include reducing operational costs for businesses, increasing customer awareness, providing training for employees in implementing sustainability practices, rewarding those who successfully implement them, and providing services that align with sustainability practices, avoiding a mere image.

In practice, government support is essential. Government initiatives include providing incentives for businesses that implement sustainability practices effectively and in accordance with standards, establishing regulations and standards that are easy to understand and implement, and encouraging investors to invest in infrastructure that supports sustainability practices in the hospitality sector.

Viewed through an industrial engineering lens, sustainability barriers represent process bottlenecks, while drivers offer optimization opportunities. Internally, methodologies like Lean Six Sigma can mitigate operational inefficiencies by reducing non-value-added activities. Externally, advanced operational analysis requires quantitative systems modeling, such as Structural Decomposition Analysis (SDA) and Multi-Regional Input-Output (MRIO) models, to track holistic resource footprints across the supply network [59]. Because indirect resource consumption in upstream supply chains often outweighs direct hotel impacts, leveraging these macro-analytical tools enables management to optimize trade structures and supply chain integration, successfully transforming abstract environmental goals into measurable, data-driven operational procedures.

5.3. Limitations and Future Research

This review, while comprehensive, has methodological limitations that must be acknowledged. First, the restriction of scope. The exclusive reliance on the Scopus database and English-language peer-reviewed articles limits the coverage of the literature. This may lead to selection bias, particularly by excluding non-English literature. Second, the Confinement of the Timeframe. The systematic search was restricted to the period 2020 – 2026. While ensuring relevance, this excludes studies published before 2020, limiting the ability to analyze the long-term evolution of sustainability impact. Third, the Specific Inclusion Criteria. The inclusion criteria specifically required relevance to studies interconnected with sustainability dimensions, such as economic, social, environmental, and cultural criteria. On the other hand, the exclusion criteria omitted studies that were primarily focused on specific operational methods, detailed regulatory frameworks, or sustainable technology operations that did not directly address sustainable hotel implementation. Therefore, this created a limitation by excluding studies that discussed detailed sustainability practices within specific technical scopes.

To address theoretical and practical gaps, future research should focus on areas requiring exploration and developing a model business. Future research should examine the implementation of sustainable hotels, investigating the long-term effects of sustainability practices by developing a conceptual framework for hotel sustainability strategies. The conceptual framework could outline how sustainable practices can be

implemented in hotels, considering the circular economy, customer satisfaction, and government support. Future research could also examine the gap between currently implemented strategies and future strategies. To advance beyond conceptual frameworks, the validation of these strategies must now evolve from qualitative synthesis to robust quantitative analysis. Leveraging data-driven operational analysis—such as large-scale text processing, agglomerative clustering of consumer reviews, and topic modeling of sustainability feedback—will provide the empirical weight necessary to translate these identified drivers into precise, actionable engineering solutions for hotel management.

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DECLARATION OF AI-TOOL USAGE

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