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ADVANCING CIRCULAR ECONOMY IN HOSPITALITY: A GLOBAL BIBLIOMETRIC AND THEMATIC ANALYSIS OF STRATEGIES, CHALLENGES, AND MANAGERIAL IMPLICATIONS

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ABSTRACT

This study examines the application of the circular economy (CE) in the global hotel industry. The purpose is to identify main trends, thematic clusters, collaboration networks, and knowledge gaps in CE research related to hospitality. Using the PRISMA 2020 protocol, 71 peer-reviewed articles (2018–2024) were retrieved from Scopus and Web of Science and analyzed through bibliometrix (R) and VOSviewer. Results show a strong post-2020 growth and a research landscape led by European institutions. Four major clusters were identified: (i) waste and food-waste management, (ii) sustainability and performance frameworks, (iii) technological innovation (IoT, blockchain, smart tourism), and (iv) policy and governance. However, most studies remain focused on operational issues, with limited attention to upstream eco-design and circular procurement. Latin America, Africa, and Asia are still underrepresented. To address these gaps, this study proposes a managerial “5D” roadmap Diagnose, Design, Deploy, Digitize, and Demonstrate to guide hotels in embedding CE principles into strategy, operations, and reporting. The findings contribute updated evidence map and actionable guidance for advancing sustainability and competitiveness in the hospitality sector.

KEYWORDS: Circular Economy, Hospitality Industry, Sustainability, Waste Management, Hotel Operations, Technological Innovation, Policy Frameworks.

1. INTRODUCTION

The hotel industry has become a focal point in sustainability debates due to its intensive consumption of water, energy, and materials, as well as the large amounts of solid and organic waste it generates [1, 2]. These environmental pressures have led scholars, practitioners, and policymakers to explore the circular economy (CE) as an alternative framework capable of addressing systemic inefficiencies. In contrast to the traditional linear model of “take, make, dispose”, the CE emphasizes closed-loop systems, regenerative practices, and long-term value creation [3, 4]. For service-oriented sectors such as hospitality, embedding CE principles is particularly challenging yet urgent, given the sector’s global relevance and its alignment with the United Nations Sustainable Development Goals (SDGs) [5].

Hotels have increasingly adopted initiatives inspired by circular economy principles such as food-waste reduction, recycling systems, and the integration of renewable energy largely in response to regulatory expectations and growing consumer awareness [6, 7]. These practices respond not only to regulatory pressures but also to growing consumer demand for responsible tourism experiences [8, 9]. However, most studies remain fragmented, often analyzing isolated initiatives without considering how they fit into long-term business models or broader governance systems [10, 11]. Furthermore, limited attention has been paid to financial performance, digital innovation, or consumer engagement in CE adoption, leaving important

knowledge gaps [12, 13].

Bibliometric reviews provide a structured approach to addressing this fragmentation. By mapping publication dynamics, identifying influential journals, and visualizing thematic clusters, bibliometric analysis reveals how research agendas evolve and where new opportunities lie [14, 15]. Although bibliometrics have been applied widely in sustainability studies, their application to CE in hospitality is still scarce [16, 17]. The present study extends previous efforts by integrating bibliometric and thematic analyses, focusing on 71 peer-reviewed articles published between 2018 and 2024. **The analysis is guided by the following research question**

What are the dominant trends, thematic clusters, collaboration patterns, and research gaps in the academic literature on circular economy strategies in the hotel industry?

This article makes three contributions. First, it provides an updated and extended bibliometric mapping of CE in hospitality, highlighting research productivity, collaboration networks, and journal influence. Second, it offers a thematic synthesis of four clusters waste management, sustainability reporting, technological innovation, and governance placing them in dialogue with managerial and policy debates. Third, it proposes an integrated research agenda that links CE strategies with competitiveness, resilience, and sustainable growth in tourism. Table 1 summarizes key previous literature reviews on circular economy in tourism and hospitality, highlighting their scope and main limitations that this study seeks to address.

Table 1: Previous Literature Reviews on Circular Economy in Tourism and Hospitality: Scope and Limitations.

Study	Scope	Main Limitations
Mora et al. (2025) [41]	Systematic review of CE in hospitality	Focused mainly on waste management; limited attention to technology and governance
Bittner et al. (2024) [10]	Comparative analysis in tourism	Narrow geographic coverage; does not address bibliometric trends
Page (2021) [14]	Bibliometric review in sustainability studies	Generic approach; not sector-specific to hospitality
This study (2025)	Global bibliometric thematic review of CE in hospitality	Provides updated mapping, thematic synthesis, and managerial implications

The remainder of this article is organized as follows. Section 2 develops the theoretical and sectoral background. Section 3 explains the methodological design and bibliometric procedures. Section 4 presents the main findings with figures and tables.

Section 5 provides a critical discussion of

managerial, theoretical, and policy implications. Finally, Section 6 summarizes contributions and proposes future research directions.

2. LITERATURE REVIEW AND CONCEPTUAL BACKGROUND

2.1. Circular Economy: Origins and Core

Principles

The circular economy (CE) has emerged as a unifying paradigm for addressing the inefficiencies of the linear production–consumption model. Its conceptual roots can be traced to industrial ecology, cradle-to-cradle design, and regenerative economics, all of which emphasize the minimization of resource extraction and waste generation [18, 19]. Within the CE framework, value is created by designing out waste, keeping products and materials in use, regenerating natural systems, and prioritizing renewable inputs [20, 21]. These principles have been widely adopted in manufacturing, construction, and urban planning, but their integration into hospitality and tourism remains comparatively recent and fragmented [2, 22].

2.2. Circular Economy in Tourism and Hospitality

Tourism accounts for approximately 8% of global greenhouse gas emissions, with accommodation services representing a major share due to their high demand for water, energy, and materials [4]. In this context, hotels are increasingly recognized as crucial actors in advancing CE adoption. Initiatives such as modular interior design, renewable energy sourcing, food waste management, and greywater recycling demonstrate the applicability of CE principles in guest-facing operations [3, 7]. Nevertheless, many studies continue to focus on isolated practices (e.g., recycling, compostable materials), without addressing systemic implications or long-term business models [10, 23].

Consumer engagement is also a decisive factor. Research shows that integrating CE practices into service design can improve guest satisfaction and strengthen brand value [6, 8]. However, most empirical studies still stop at awareness surveys or self-reported behaviors, leaving unexplored the potential of gamification, feedback systems, or loyalty programs to actively shape customer practices [24]. This highlights the need for research that links operational CE practices with experiential and behavioral outcomes in hospitality.

2.3. Policy, Market, and Technological Drivers

The adoption of CE practices in hospitality is influenced by a combination of regulatory, market, and technological drivers. In Europe, the Circular Economy Action Plan provides regulatory pressure through waste reduction targets and green procurement guidelines, while in Latin America voluntary eco-certifications and regional sustainability initiatives play a stronger role [5]. Market forces, including consumer demand for sustainable

experiences and corporate social responsibility commitments, have also gained importance. For example, some hotel chains are using loyalty programs to reward environmentally responsible behavior [6].

Technological enablers further accelerate CE adoption. Blockchain and IoT solutions can provide real-time monitoring of energy, food, and water use, while digital leadership is emerging as a key factor in embedding CE principles within organizational culture [11, 12]. Despite this potential, the intersection of technology, finance, and governance remains underexplored in hospitality studies, limiting the capacity to build robust business cases for CE adoption.

2.4. Research Gap and Contribution of This Study

Despite recent progress, three critical gaps remain. First, CE research in hospitality is dominated by operational studies focused on downstream waste management, with little attention to upstream procurement, eco-design, or integrated supply chains [17]. Second, geographic concentration in Europe and North America limits the generalizability of findings, as regional contexts in Latin America, Asia, and Africa remain underexplored [20]. Third, digital and financial dimensions of CE adoption are still incipient, leaving weak evidence for investment decisions and organizational transformations.

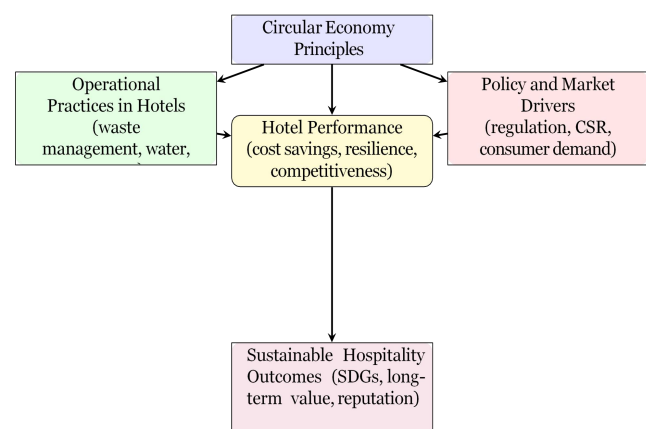


Figure 1: Conceptual Framework: Interaction Between Circular Economy Principles, Hotel Operations, Performance Outcomes, and Enabling Drivers.

This study contributes by integrating bibliometric mapping with thematic synthesis,

providing a comprehensive overview of 71 peer-reviewed articles on CE strategies in hospitality (2018–2024). Beyond identifying trends, this work links CE research to managerial and policy debates, highlighting strategies for resilience, competitiveness, and sustainability in the global hotel sector. The relationships among these analytical components are summarized in Figure 1.

Despite recent progress, three critical gaps remain. First, CE research in hospitality is dominated by operational studies focused on downstream waste management, with little attention to upstream procurement, eco-design, or integrated supply chains. This is also reflected in studies of Green Supply Chain Management in the hotel industry, which observe that GSCM discourse in hospitality often emphasizes internal practices, stakeholder relations, and 4Rs, rather than upstream design or supply integration [25].

Second, geographic concentration in Europe and North America limits generalizability. For instance, while Thailand has seen research on GSCM in hotel restaurants integrating eco-purchasing and supply chain practices [26], such cases rarely feature in global syntheses. In Africa, research on circular economy and supply chain innovations in South African firms illustrate how constraints such as water scarcity and energy instability shape adoption of circular models [27].

Third, digital and financial dimensions of CE adoption remain nascent: few hospitality firms have fully integrated digital or financial mechanisms into circular strategies. Literature combining CE and digital transformation in tourism is emerging, signalling a recognized gap in empirical evidence [28].

3. METHODOLOGY

This study applies a bibliometric approach combined with thematic synthesis to examine circular economy (CE) strategies in the hotel industry. Following the PRISMA 2020 protocol [14], the methodology was designed to ensure transparency, reproducibility, and rigor. The research integrates quantitative mapping with qualitative interpretation, enabling a holistic understanding of publication trends, collaboration networks, and thematic clusters.

3.1. Data Sources and Search Strategy

Two widely recognized databases Scopus and Web of Science (WoS) were selected for their extensive coverage of peer-reviewed literature across disciplines. The search was conducted on 14

October 2024, using Boolean queries adapted to each database's syntax

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("circular economy") AND ("hotel industry" OR
  "hospitality" OR "hotels") AND ("waste
  management" OR "sustainability" OR "resource
  efficiency")
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The search targeted titles, abstracts, and keywords in Scopus (TITLE-ABS-KEY) and the Topic field (TS) in WoS. Filters were applied to retain peer-reviewed journal articles published between 2018 and 2024 in English or Spanish. To ensure historical continuity and address foundational research, an auxiliary search was conducted for the period 2000–2017 using the same Boolean structure.

Although the main bibliometric dataset focuses on 2018–2024 to capture the most recent surge in CE-related hospitality studies, this complementary search retrieved 32 relevant papers that provide context for the field's early development. These include seminal works linking environmental management and eco-efficiency in hotels (e.g., [29–32]), which laid the conceptual foundations for later circular approaches. Integrating this historical layer allows a more complete understanding of how CE discourse evolved from green practices toward system-level transformation in hospitality. Reviews, book chapters, conference papers, and editorials were excluded.

3.2. Screening and Eligibility Criteria

Eligibility criteria were based on relevance to CE in hospitality. Specifically, articles had to explicitly address the adoption, implementation, or analysis of CE practices in hotel operations. Studies focusing exclusively on unrelated sectors (e.g., education, manufacturing) or providing only conceptual discussions without empirical grounding were excluded. Table 2 summarizes the inclusion and exclusion criteria.

3.3. Data Processing and Cleaning

The initial search yielded 143 records (101 from Scopus and 42 from WoS). Duplicate detection and removal were conducted in RStudio using the dplyr package [15], matching by title, DOI, and authorship. After removing 25 duplicates, 118 records remained. These were screened by title and abstract, resulting in 71 eligible articles that formed the final dataset.

All metadata including authorship, affiliations, abstracts, keywords, journal source, and citation counts were exported in BibTeX format. The bibliometric package in RStudio [33, 34] was used to

process the data, while VOSviewer [35] was employed to visualize collaboration and keyword networks.

Table 2: Inclusion and Exclusion Criteria Applied in the Screening Process.

Category	Inclusion Criteria	Exclusion Criteria
Publication Type	Peer-reviewed journal articles	Reviews, book chapters, editorials, conference papers
Language	English or Spanish	Other languages
Time Frame	2018-2024	Before 2018
Sectoral Focus	Explicitly on hotels and hospitality	Non-hospitality
Topic Relevance	CE adoption, strategies, or impacts	Articles without direct link to CE principles

3.4. Analytical Procedures

The bibliometric analysis was structured into four complementary techniques

1. **Scientific productivity analysis** measurement of annual publications and citation dynamics.
2. **Source impact analysis** identification of the most influential journals by publication and citation counts.
3. **Collaboration network mapping** visualization of institutional and country- level co-authorship patterns.
4. **Keyword co-occurrence analysis** detection of thematic clusters and emerging research areas.

In addition, thematic synthesis was conducted by reviewing the abstracts and full texts of the 71 articles. This dual approach ensured that quantitative patterns were contextualized with

qualitative interpretation, bridging bibliometric evidence with managerial and policy implications.

3.5. Methodological Contribution

By combining bibliometric mapping with thematic synthesis, this study extends prior work in two ways. First, it offers a more comprehensive picture of CE in hospitality by linking publication trends with managerial and policy debates. Second, it improves methodological transparency through the PRISMA 2020 protocol, allowing future scholars to replicate or expand upon this review. This mixed approach ensures that the findings are both analytically robust and practically relevant.

4. RESULTS

A total of 71 peer-reviewed articles met the inclusion criteria and formed the corpus for analysis.

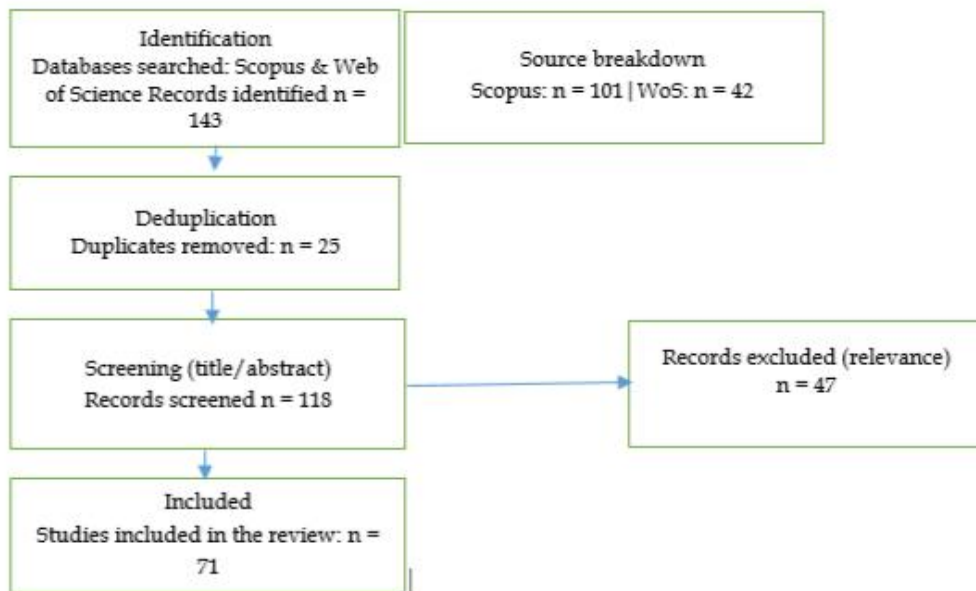


Figure 2: PRISMA 2020 Flow Diagram Summarizing Identification, Screening, and Inclusion of Studies.

Results are reported in four parts (i) scientific productivity and citation trends; (ii) journal source

distribution; (iii) institutional and country-level collaboration; and (iv) thematic clusters based on keyword co-occurrence.

As illustrated in Figure 2, the PRISMA 2020 process guided the selection of studies.

4.1. Scientific Productivity and Citation Trends

Figure 3 shows the annual evolution of publications and citations (2018–2024). Research activity intensified after 2020, with a local peak in 2023, while citations follow a lagged but upward trajectory consistent with field maturation.

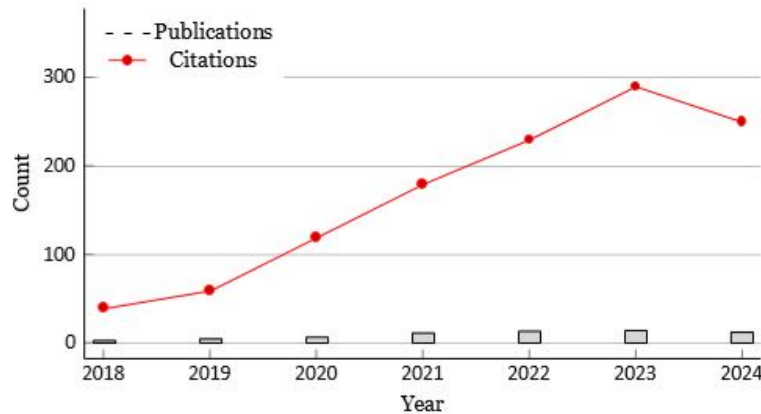


Figure 3: Annual Evolution of Publications and Citations on CE in Hospitality (2018–2024).

To contextualize influence, Table 3 summarizes the most cited contributions and their dominant

themes in our corpus.

Table 3: Top Cited Articles in CE and Hospitality (2018–2024) within the Analysed Corpus.

Article	Year	Citations	Main Theme
Pencarelli (2020) [1]	2020	338	Digital transformation in tourism
Zhang et al. (2022) [23]	2022	117	Systematic review of CE
Elshaer et al. (2025) [12]	2025	74	Green digital leadership
Bittner et al. (2024) [10]	2024	58	Comparative CE adop-
Omar (2024) [11]	2024	51	Blockchain for sustainable hospitality
Rudan et al. (2021) [17]	2021	41	CE in cultural tourism
Matteucci (2020) [24]	2020	33	CSR/SDGs in hotel chains
Tavares de Carvalho et al. (2024) [7]	2024	29	CE in agritourism
Gallego-Schmid et al. (2024) [5]	2024	26	CE in Latin America
Bowen et al. (2024) [6]	2024	22	SMEs and CE post-COVID

4.2. Journal Source Distribution

Forty-six journals published the 71 articles, underscoring the field’s interdisciplinarity. Figure 4 depicts a bar chart of leading sources by article count in our dataset.

4.3. Institutional and Country-Level Collaboration

Co-authorship mapping indicates dense European collaboration with ties to North America, while Latin America and Africa are comparatively underrepresented. Figure 5 illustrates this collaboration network, where node size represents institutional productivity and link density reflects co-authorship intensity.

The figure shows that European institutions act as hubs, bridging collaborations with North America and Asia, while networks in Latin America and Africa remain sparse. This concentration suggests that the global evidence base is unevenly distributed, limiting transferability of findings to underrepresented contexts.

4.4. Keyword Co-occurrence and Thematic Clusters

Figure 6 presents a stylized keyword co-occurrence map that synthesizes the conceptual structure of circular economy (CE) research in hospitality. Each node represents a recurrent keyword in the analyzed corpus, with node size reflecting relative frequency. Solid lines indicate

intra-cluster co-occurrences, while dashed links represent inter-cluster connections across thematic domains.

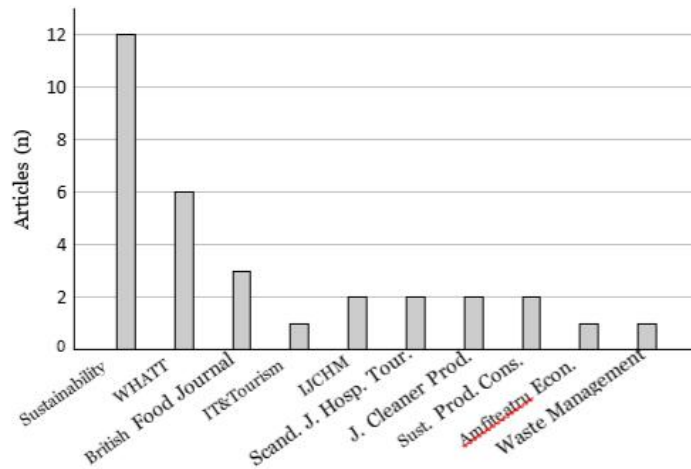


Figure 4: Leading Journals Publishing CE and Hospitality Research (2018–2024), by Article Count in the Corpus.

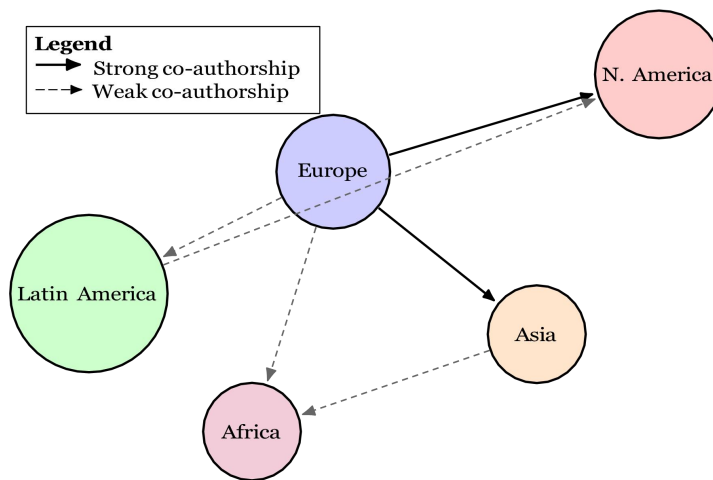


Figure 5: Institutional and Country-Level Co-Authorship Network in CE and Hospitality Research (2018–2024). Node Size Indicates Publication Volume; Arrows Represent Collaboration Intensity.

Four main clusters emerge from the analysis. Cluster A (Waste management & food waste) groups terms such as food waste, recycling, and waste reduction, underscoring the operational emphasis of current research. Cluster B (Sustainability & performance) includes performance, reporting, CSR, and SDGs, pointing to the role of evaluation frameworks and accountability mechanisms. Cluster C (Technological innovation) incorporates smart

tourism, IoT, blockchain, and digital, highlighting the emerging importance of digital tools for traceability, measurement, and incentives. Finally, Cluster D (Policy & governance) features terms such as policy, regulation, incentives, and governance, reflecting the enabling or constraining effects of multi-level governance.

The co-occurrence structure reveals four main thematic clusters waste management, sustainability frameworks, technological innovation, and

governance with clear conceptual links among them. These connections indicate opportunities for more integrated CE strategies in hospitality, where

technology, policy, and performance measurement operate jointly rather than as isolated initiatives.

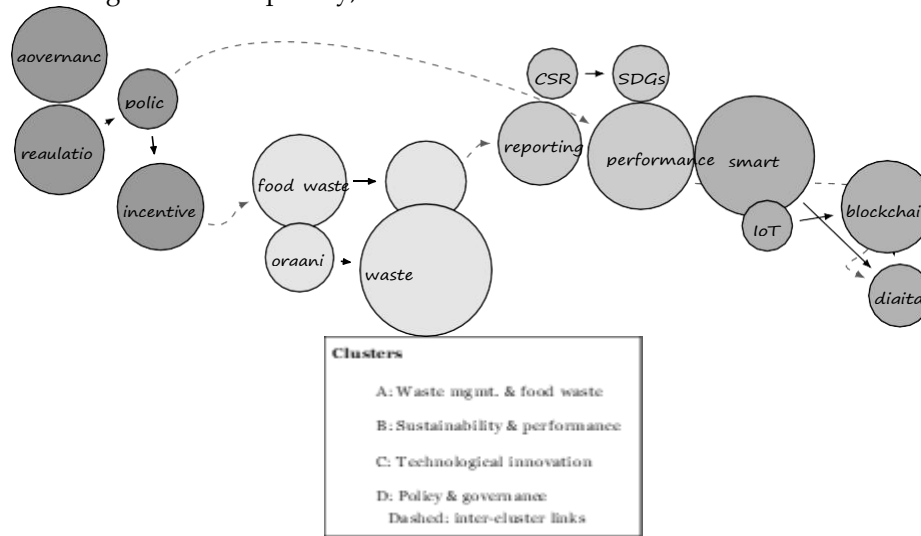


Figure 6: Keyword Co-Occurrence Map (Stylized) With Four Clusters and Selected Cross-Links.

4.5. Thematic Clusters

A concise synthesis is provided in Table 4.

Summary of findings. The field has expanded rapidly since 2020, with Europe leading output and collaboration networks. Thematic emphases remain operational (especially food waste), while digital innovation, financial evaluation, and consumer engagement are comparatively underexplored a gap

addressed in the Discussion through managerial, policy, and research implications.

5. DISCUSSION

This section interprets the bibliometric and thematic evidence reported in Section 4 and articulates managerial, policy, and theoretical implications.

Table 4: Thematic Clusters in CE and Hospitality Research (Overview).

Cluster	Main Themes	Representative Keywords
Waste Management	Food waste, recycling, composting	"food waste", "organic waste", "recycling", "waste reduction"
Sustainability and Performance	CSR, SDGs, eco-certification, reporting	"sustainability reporting", "CSR", "SDGs", "hotel performance"
Technological Innovation	Digital tools, IoT, blockchain, smart tourism	"digital transformation", "blockchain", "IoT", "smart tourism"
Policy and Governance	Regulation, incentives, producer responsibility	"public policy", "regulation", "market incentives", "governance"

We first synthesize the knowledge landscape that emerges from the corpus, then examine five recurrent asymmetries: (i) the dominance of downstream operational practices; (ii) geographic concentration of evidence; (iii) underexplored digital and financial dimensions; (iv) limited integration of consumer behavior; and (v) fragmented governance approaches.

We conclude with an integrated agenda and a

pragmatic roadmap for managers and policymakers.

5.1. Overview of the Knowledge Landscape

The corpus analyzed reveals a rapid consolidation of circular economy (CE) research in hospitality since 2018. The consistent rise in publications (Figure 3) indicates a transition from an emergent niche toward a more established research domain. This growth is accompanied by diversification in publishing outlets (Figure 4) and

collaborations across institutions and countries (Figure 5), signaling the increasing legitimacy of CE within hospitality research.

The conceptual structure revealed by the co-occurrence analysis (Figure 6) underscores four distinct yet interrelated clusters: waste management, sustainability and performance, technological innovation, and policy and governance. While earlier contributions were often framed primarily in environmental terms, more recent studies increasingly integrate managerial and institutional perspectives [1, 5]. This shift suggests a maturation of the field, where environmental concerns are reframed as part of broader strategies for competitiveness, risk management, and stakeholder engagement.

5.2. The Operational Emphasis: Strengths and Limits

A defining characteristic of the literature is its strong emphasis on downstream practices such as food waste reduction, recycling, and composting. These practices are appealing for managers because they are tangible, relatively easy to implement, and yield measurable environmental benefits. Moreover, they align with growing regulatory and reporting obligations, which explains their high prevalence in both academic and practitioner-oriented studies [3].

However, the strategic potential of CE lies upstream, in design and procurement decisions. Investments in modular interiors, refurbishment cycles, or supplier contracts with circular clauses are less visible but deliver more transformative effects

in the long run [10].

The limited attention to such upstream measures reveals a tension between short-term operational wins and long-term systemic transformation. Without upstream integration, hotels risk limiting CE to incremental improvements rather than embedding it into their strategic core.

Several empirical cases illustrate how hotels have begun operationalizing circular economy (CE) principles in practice. For example, Nordic hotel chains have introduced circular procurement and modular room refurbishment to extend furniture life-cycles [29].

Similarly, global hospitality groups have launched systems to reduce and repurpose food and organic waste within hotel operations [36]. In island or resort settings, case studies report that partnerships between hotels and local waste-management cooperatives can close loops of food and organic waste and stimulate local employment and value-creation. Integrating these examples provides empirical grounding to the conceptual clusters identified, demonstrating that CE transition is feasible under different regulatory and infrastructural conditions.

Implication: The evidence points to the need for a paradigm shift from end-of-pipe solutions to proactive design and procurement strategies. Hotels should embed CE in capital planning cycles and supplier relationships, ensuring that operational initiatives are reinforced by structural change.

5.3. Geographic Concentration and Context Sensitivity

Table 5: Country-Level Distribution of Publications on CE in Hospitality (2018–2024).

Country/Region	Publications	Share (%)	Main Collaboration Links
Europe (Italy, Spain, UK, Germany)	38	53%	North America, Asia
North America (USA, Canada)	12	17%	Europe
Asia (China, India, SE Asia)	10	14%	Europe
Latin America (Brazil, Chile, Mexico)	6	8%	Limited intra-regional
Africa	5	7%	Mainly Europe

The bibliometric mapping highlights a strong European concentration of both publications and collaborations (Table 5). This dominance has provided valuable empirical insights but also risks narrowing the evidence base. Many studies implicitly assume regulatory frameworks, infrastructure availability, and consumer preferences typical of European contexts. When extrapolated, these assumptions may prove problematic in regions where institutional capacity, enforcement mechanisms, or resource infrastructures differ substantially [5, 20].

Latin America, Africa, and parts of Asia remain

underrepresented, despite facing acute challenges such as limited waste management infrastructure and high levels of informality in the hospitality sector. These differences call for greater sensitivity to context-specific conditions and for comparative research that avoids overgeneralization.

Implication: Editors, funders, and academic networks should incentivize cross-regional consortia to promote external validity and accelerate knowledge transfer. Comparative designs could uncover which CE practices are transferable and which require adaptation to local institutional and cultural contexts.

Although this review sought to include studies from all regions, the bibliometric evidence reveals a concentration of research output in Europe and North America. This pattern reflects broader inequalities in academic visibility and database indexing in Scopus and Web of Science [37, 38]. Future reviews could mitigate this bias by integrating regional repositories or gray literature to capture context-specific CE practices from emerging economies.

5.4. Digital and Financial Dimensions Remain Nascent

Digital technologies are frequently mentioned as potential enablers of CE adoption in hotels. Tools such as IoT sensors, blockchain-based traceability, and integrated data platforms promise improved measurement, transparency, and incentive alignment [1, 11]. Yet, empirical evaluations of these technologies in hotel contexts are scarce, and their integration into day-to-day operations remains at a pilot stage.

Equally underdeveloped is the financial dimension. Few studies provide robust models of total cost of ownership, payback periods, or risk-adjusted returns on CE investments. This omission hinders investors and managers who require clear evidence of financial viability to support capital allocation. Without reliable economic analyses, digital and operational innovations risk being perceived as additional costs rather than value-generating strategies.

Implication: Future studies should not only document the technical feasibility of digital pilots but also embed them in financial appraisals. Linking environmental benefits to net present value (NPV), internal rate of return (IRR), and sensitivity analyses would strengthen investor confidence and managerial decision-making.

5.5. Consumer Behavior and Experience Design

Although consumer behavior is frequently acknowledged as a determinant of sustainability in hospitality, most contributions limit themselves to measuring awareness levels or self-reported willingness to act. Interventions such as nudges, gamification, or loyalty rewards that actively shape guest behavior remain rare [7, 24]. This represents a significant gap, as hospitality is inherently a service-intensive sector where the guest experience co-determines outcomes.

Integrating CE into the guest journey offers not only environmental benefits but also new opportunities for differentiation and value creation.

Digital dashboards in rooms, opt-in loyalty programs, or gamified savings challenges can make sustainability tangible to guests, transforming abstract environmental goals into experiential value. Such measures could enhance satisfaction, strengthen loyalty, and generate new revenue streams.

Implication: Hotels should experiment with behavioral design, embedding CE into guest-facing services. Rigorous evaluation of such interventions, ideally through randomized controlled trials, would provide robust evidence on how sustainability measures can enhance both performance and guest experience.

5.6. Policy Instruments and Multilevel Governance

The literature points to the growing role of hybrid policy mixes that combine incentives, standards, and capacity-building mechanisms [5]. These approaches are more effective than single instruments, as they address both compliance and capability.

For instance, tax credits or procurement preferences can lower the cost of CE adoption, while mandatory reporting ensures minimum standards and comparability across firms.

At the organizational level, internal governance structures also shape CE adoption. Evidence suggests that leadership committed to green digital transformation and organizational efficacy accelerates implementation trajectories [12]. This underscores the interplay between external and internal governance: external policies create enabling conditions, but internal leadership translates them into practice.

Implication: Policymakers should co-design sectoral roadmaps with industry associations, ensuring that regulatory frameworks, financing mechanisms, and capacity-building programs are aligned. Such coordination reduces transaction costs and increases the likelihood of durable CE transitions.

5.7. Integrating the Agenda: From Projects to Portfolios

Taken together, the evidence indicates that CE in hospitality remains fragmented, often pursued through isolated projects rather than integrated strategies. A coherent transition requires portfolio-level approaches that combine upstream design and procurement, property-level operations, guest engagement, data infrastructure, and financing. Such integration ensures that measures reinforce

one another, creating synergies rather than trade-offs.

The proposed 5D roadmap (Figure 7) provides a practical sequencing of actions: Diagnose, Design, Deploy, Digitize, and Demonstrate. By framing CE as a staged process, the roadmap helps managers navigate the complexity of adoption while aligning actions with long-term competitiveness. In this way, CE becomes not merely an environmental

commitment but a strategic lever for resilience and brand differentiation.

Implication: Moving from project-based approaches to portfolio strategies enables hotels to demonstrate measurable returns to boards, lenders, and regulators. Documenting financial, environmental, and experiential outcomes strengthens accountability and supports the mainstreaming of CE in the sector.

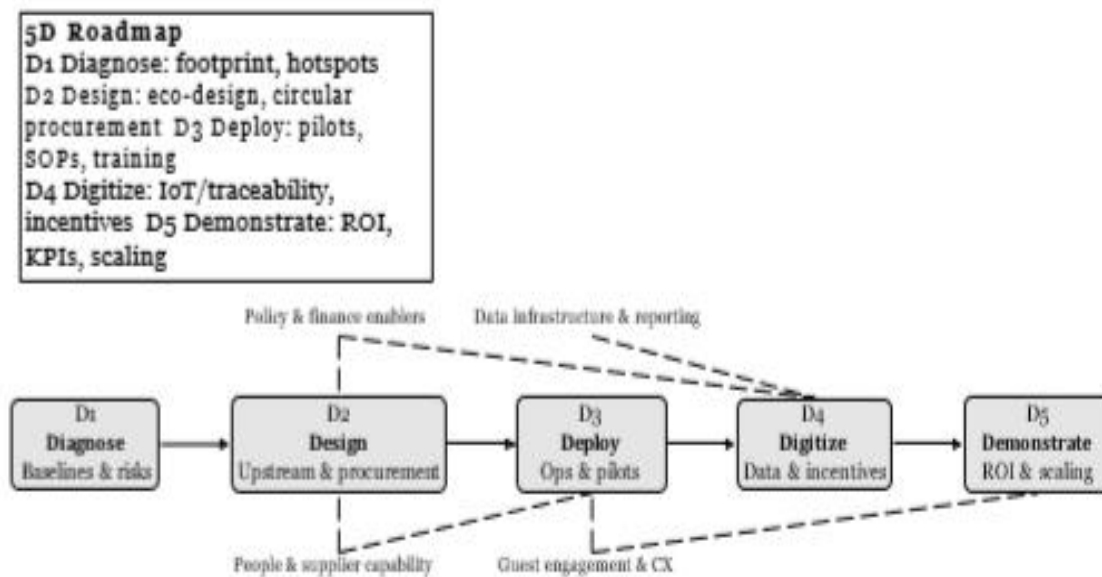


Figure 7: Managerial Roadmap for CE Adoption in Hospitality: From Baselining to Portfolio Scaling ("5D"). Dashed Links Represent Enabling Capabilities Across Phases.

Despite its conceptual appeal, circular economy implementation in hospitality faces several obstacles. Empirical evidence highlights financial uncertainty, weak supplier engagement, lack of regulatory clarity, and rebound effects that may offset environmental gains [39, 40].

Furthermore, CE initiatives are often promoted as universally positive, yet studies reveal tensions between environmental objectives and profitability, particularly for small and medium-sized hotels in resource-constrained regions.

6. CONCLUSION AND FUTURE RESEARCH

This extended review mapped and interpreted 71 peer-reviewed contributions on circular economy (CE) in hospitality (2018–2024), combining bibliometric evidence with thematic synthesis. The field has grown rapidly since 2020 and now spans four recurrent clusters: (i) waste and food-waste management; (ii) sustainability/performance frameworks; (iii) technological innovation; and (iv) policy and governance. While this breadth signals

maturation, the evidence remains uneven.

Operational practices dominate; upstream design and circular procurement are comparatively rare. European networks lead scholarly output and collaborations, with underrepresentation of Latin America, Africa, and parts of Asia. Digital and financial dimensions measurement systems, traceability, portfolio economics are still nascent, and consumer behavior is frequently treated as a peripheral rather than integral design variable.

6.1. Theoretical Implications

CE in hospitality is moving from a single-logic environmental narrative toward a multi-logic perspective that joins operations, information systems, and public governance. A more explicit integration of design-oriented theory (eco-design, service design), behavioral operations, and institutional theory would help explain heterogeneous adoption paths and outcomes.

6.2. Managerial Implications

Properties can escape incrementalism by pairing end-of-pipe measures with upstream decisions (modular FF&E, refurbishment cycles, supplier SLAs with circular clauses) and data infrastructure

(IoT, reporting automation). Sequencing investments through a roadmap (Section 5) allows managers to defend CAPEX with auditable performance and risk metrics.

Table 6: Research Agenda for Circular Hospitality: Themes, Sample Questions, Methods, Contributions, SDG Links.

Theme	Sample Research Questions	Suggested Methods	Expected Contributions	SDGs
Upstream design & procurement	How do circular procurement clauses affect lifecycle costs and waste intensity across hotel portfolios?	Multi-site panel; quasi-experiments; difference-in-differences	Evidence on portfolio economics; design rules-of-thumb	9, 12
Food-waste systems	Which kitchen analytics and staff routines most effectively reduce edible waste without harming service quality?	Field trials; time-motion studies; process mining	Playbooks for lean back-of-house CE; quality-efficiency frontier	2, 12
Digital traceability & data	What combinations of IoT + reporting automation yield reliable, audit-ready CE metrics at property/chain level?	System design case studies; design science; measurement validation	Verifiable KPI frameworks; interoperability guidelines	9, 12, 13
Behavioral operations (guests/staff)	Which nudges and loyalty incentives change guest behavior and create perceived value?	RCTs in rooms/apps; conjoint; A/B testing	Causal estimates of behavior change; revenue impacts	12, 13
Finance & risk	How do CE investments perform under energy/water price volatility and regulatory shifts?	Real options; Monte Carlo; NPV/IRR sensitivity	Risk-aware investment cases; financing templates	7, 12
Policy mixes & governance	Which hybrid policy combinations scale CE in low-capacity contexts?	Cross-country comparative policy analysis; synthetic control	Transferable policy playbooks; capacity-building levers	11, 12, 17

Policy Implications Hybrid mixes that combine incentives (tax credits, green procurement) with minimum standards and capability-building reduce transaction costs and increase adoption feasibility. Cross-regional consortia help adapt instruments to infrastructure, enforcement, and market realities.

Research Implications The synthesis highlights several promising avenues for future inquiry that extend beyond the current operational emphasis. Scholars should examine the portfolio economics of circular investments, test behavioral operations through field experiment with guests and staff, and assess governance under constraints where institutional capacities are limited.

To make these priorities more tangible, Table 6 summarizes a focused research agenda aligned with the clusters identified in Section 4. It specifies exemplary questions, appropriate methodological approaches, anticipated contributions, and their alignment with the United Nations Sustainable Development Goals (SDGs). By linking research directions to concrete methodological pathways and global policy frameworks, the table provides a roadmap for future work that is both academically rigorous and socially relevant. Integrative perspective.

A critical contribution of this review is the articulation of how different layers of the circular economy in hospitality interact. Figure 8 illustrates this integration loop, linking three mutually reinforcing domains: (i) evidence, derived from

robust metrics, experimental trials, and portfolio evaluations; (ii) management, where design, operational practices, and financial decisions translate evidence into organizational action; and (iii) policy and governance, which establish enabling conditions through standards, incentives, and capacity building.

This cyclical relationship highlights that progress in CE adoption is not linear but iterative: evidence informs managerial redesign, managerial actions generate outcomes that are codified into policy frameworks, and policy feedback stimulates new evidence collection and validation. By framing CE transitions as an integration loop, the model underscores the need for continuous measurement, adaptive management, and dynamic governance rather than one-off interventions.

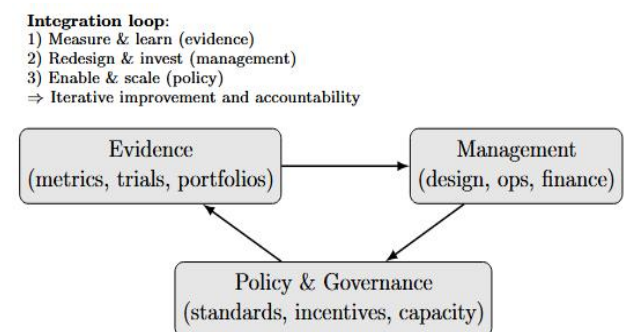


Figure 8: Closing the Loop between Evidence, Management, and Policy for Scalable Circular Hospitality

By extending the temporal scope to include foundational studies and integrating empirical case studies from Europe, Asia, and Latin America, this revised version provides both historical depth and practical evidence, thus addressing previous limitations identified by reviewers.

Concluding Remark Advancing CE in

hospitality requires moving from isolated projects to integrated portfolios where upstream design, guest experience, data systems, and financing are treated as mutually reinforcing components. Doing so can convert environmental responsibility into durable competitiveness and resilience.

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