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Article info:

Received 12.01.2026.

Accepted 30.06.2026.

DOI – 10.24874/IJQR20.03-07



THE CONVERGENCE OF SUSTAINABILITY, CIRCULAR ECONOMY, AND ESG IN TOURISM: MAPPING RESEARCH TRENDS THROUGH A QUALITY AND PERFORMANCE PERSPECTIVE

Abstract: *The present paper examines the convergence between sustainability (SUS), circular economy (CE), and Environmental, Social, and Governance (ESG) dimensions within tourism through a systematic analysis of scholarly publications indexed in the Scopus database. A dual methodological approach is applied, combining bibliometric analysis and natural language processing–based topic modeling using Latent Dirichlet Allocation (LDA). The bibliometric findings indicate a steady increase in tourism research addressing SUS, CE, and ESG, with sustainability remaining the dominant research domain. Thematic network analysis reveals distinct yet interconnected research clusters: CE primarily emphasizes resource efficiency and waste management, ESG focuses on governance, accountability, and performance-related themes, while sustainability centers on ecotourism and long-term development objectives. Topic modeling further demonstrates a layered structure of the SUS-CE-ESG nexus, where sustainability articulates normative developmental goals, circular economy operationalizes process-level transformation, and ESG embeds measurement and governance mechanisms. By interpreting these dimensions through a quality management and performance lens, the study advances an integrated analytical framework that repositions sustainability in tourism as a measurable, governable, and continuously improvable domain rather than as a purely normative aspiration.*

Keywords: *Natural language processing, Sustainability, Circular economy, ESG, Sustainable Tourism*

1. Introduction

The tourism industry is well known for its economic contributions and environmental implications. As global interest in sustainability increases, there is a need to explore frameworks that promote resource efficiency and alleviate environmental

pollution. In this context, the concepts of Circular Economy (CE), Environmental, Social, and Governance (ESG) factors, and sustainability (SUS) have emerged as important elements in guiding the sector toward more responsible practices (Honorato & Peroni, 2024; Sciortino & De Cantis, 2022). The relationship between the three

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concepts begins with SUS, which defines the normative goals and value framework. CE then provides strategic and operational mechanisms to pursue these goals, while ESG offers metrics and indicators to assess progress and outcomes.

From a quality management perspective, this triadic relationship may also be interpreted as an integrated performance architecture. Sustainability defines the normative quality objectives of tourism systems, the circular economy operationalizes process-level improvements and resource optimization, while ESG provides structured measurement and reporting mechanisms enabling benchmarking, monitoring, and continuous improvement (Carvalho et al., 2025). In this sense, the SUS-CE-ESG nexus extends beyond ethical discourse and becomes a quality-oriented governance and performance framework for tourism development.

In the context of tourism, several sustainable practices have been proposed to positively reform tourism (Purwaningsih et al., 2024), while CE emphasizes the reduction of waste and enhancement of resource efficiency (Agovino et al., 2024), promoting innovative practices that enable a sustainable approach to tourism development (Strippoli et al., 2024). Likewise, ESG frameworks highlight the importance of governance, social equity, and environmental dimensions, which may reflect a broader understanding of the various challenges faced by the industry.

However, despite growing academic and policy interest, a significant research gap remains in understanding how these three paradigms interact and can be integrated into tourism strategies and business practices. Existing studies often address CE, ESG, and sustainability separately, without providing a holistic theoretical or empirical framework that connects environmental efficiency, social responsibility, and governance mechanisms within tourism systems. Moreover, empirical evidence on the practical implementation and measurable impacts of CE and ESG practices in tourism remains scarce, with limited

indicators available to assess their contribution to sustainability goals. Recent cross-national evidence from project-oriented settings similarly shows that ESG integration depends strongly on organizational maturity and clearly defined governance roles (Savić et al., 2025), highlighting the need for structured evaluation architectures in sector-specific contexts such as tourism.

In particular, the absence of an integrated quality-oriented measurement structure that systematically links circular operational indicators with ESG-based evaluation metrics constrains the development of coherent performance management systems within tourism organizations and destinations.

The literature also reveals a lack of research on business models, stakeholder engagement, and digital innovations that could facilitate the operationalization of CE and ESG principles in tourism. Therefore, further investigation is needed to develop integrated models, standardized metrics, and governance approaches that align circular and ESG-driven strategies with sustainable tourism outcomes.

The surge in tourism sustainability research reflects a growing imperative for ethical practices that resonate with global frameworks like the Sustainable Development Goals (SDGs) (Fuchs, 2023). Understanding the convergence of these concepts is vital for addressing the multifaceted challenges of sustainable implementation.

Recognizing the significance of this conceptual nexus, this study adopts a two-fold methodology. It first utilizes bibliometric analysis and thematic networking to visualize key clusters within the SUS-CE-ESG triad. This is complemented by an NLP-driven topic modeling approach to extract latent academic trends and research trajectories.

This methodological combination enables the identification of dominant performance, governance, and process-related research clusters, thereby contributing to a structured understanding of sustainability as a

measurable and systemically organized quality domain.

Beyond mapping the literature, the study aims to elucidate the complex synergies between sustainability, circular economy, and ESG factors. By identifying critical research gaps, the work contributes a holistic understanding of how these dimensions can be operationally integrated. Specifically, it addresses a prominent void in the literature by aligning circular economy strategies with ESG metrics, fostering the development of a more robust and quantifiable framework for sustainable tourism.

By conceptualizing this alignment as a performance-oriented and quality-informed integration mechanism, the study also advances the discourse on how sustainability transitions in tourism can be governed, measured, and continuously improved within structured management systems.

2. Literature Review

Literature review follows a structured conceptual progression, positioning SUS as

the foundational normative framework that defines tourism industry's long-term values. Subsequently, the focus shifts to the CE, which translates these broad goals into strategic and operational mechanisms. Finally, the review explores ESG as the essential toolset for quantifying progress through standardized metrics and indicators. By synthesizing these three dimensions (as illustrated in Figure 1), the following sections illustrate how the tourism sector transitions from abstract ethical commitments to measurable performance outcomes.

This progression also reflects a systemic logic of sustainability governance in tourism, moving from value articulation (SUS), through operational redesign (CE), toward performance monitoring and accountability (ESG). Such a structured transition underscores the increasing need to conceptualize sustainability not merely as an ethical orientation, but as an integrated management architecture capable of guiding strategic planning, operational execution, and evaluative control within tourism systems.



Figure 1. The relationship between the SUS, CE and ESG

2.1. Sustainability and tourism

The literature on **sustainability and tourism** encompasses diverse perspectives addressing environmental, social, and economic challenges within the tourism sector (Carmer et al., 2025; Vujičić et al., 2025). A substantial body of research highlights sustainability-related pressures such as energy consumption, environmental degradation, habitat destruction, and the broader impacts of climate change on tourism systems (Kumar et al., 2023; Pan et al., 2018). In parallel, recent studies emphasize the

growing importance of social sustainability, particularly issues related to labor conditions, worker safety, and well-being in tourism and hospitality, which have gained increased attention in the post-pandemic context (Ciarlante et al., 2024).

Beyond environmental and social dimensions, the literature increasingly recognizes the enabling role of digital transformation in advancing sustainability objectives.

Another stream of literature focuses on the role of digitalization, information

technologies, and information management in supporting sustainable tourism development (Vujičić et al., 2022). Recent research further links sustainability transitions with human-centric digital transformation paradigms, particularly through the emerging Industry 5.0 discourse that integrates technological advancement with environmental and social responsibility (Crnobraja et al., 2024). Research indicates that IT-enabled e-collaboration can enhance coordination and co-creation among tourism stakeholders, especially in rural contexts, facilitating the joint development of products and services, although such contributions remain relatively limited in the existing literature (Purwaningsih et al., 2024). From a systems perspective, information management has also been examined as a key enabler of circular economy principles in tourism, particularly through its application in supply chain management (Ping, 2011).

In addition to technological enablers, conceptual research highlights governance and experiential dimensions of sustainability. Recent conceptual research further emphasizes the role of co-creation and experience design in shaping sustainable tourism value propositions. For instance, Carmer et al. (2025) propose a structured co-creation framework that extends beyond on-site service encounters and integrates pre- and post-experience phases, highlighting how sustainability, stakeholder interaction, and service innovation can be embedded within tourism systems. Such approaches reinforce the argument that sustainability in tourism requires coordinated governance, experiential design, and multi-actor collaboration rather than isolated environmental interventions.

Furthermore, recent studies propose analytical and hybrid methodological approaches to support the alignment of tourism development with the Sustainable Development Goals (SDGs), offering practical guidance for translating sustainability frameworks into actionable strategies (Li et al., 2024). At a more conceptual level, the literature increasingly

calls for a transformative tourism science grounded in ethical considerations and post-mechanistic thinking, emphasizing the need to move beyond purely efficiency-driven models toward more holistic and responsible forms of tourism development (Fuchs, 2023). Taken together, these strands indicate a gradual shift toward system-level perspectives in tourism sustainability research. Sustainability research in tourism increasingly recognizes interdependencies between environmental stewardship, social equity, and economic viability. However, while these dimensions are conceptually acknowledged, the literature still reveals limited integration between normative sustainability principles and structured mechanisms for operational implementation and performance evaluation.

2.2. Circular economy and tourism

The tourism literature increasingly conceptualizes the CE as both a strategic framework and an operational mechanism for advancing sustainability outcomes. A substantial body of research examines CE adoption across tourism-related sectors, emphasizing resource efficiency, waste reduction, circular design, and supply chain resilience. Studies addressing consumer engagement with CE highlight generally positive attitudes but reveal persistent knowledge gaps and socio-economic barriers that hinder effective adoption (Henao-Hincapié et al., 2024). At the organizational level, research identifies key drivers and constraints influencing CE implementation among small and medium-sized enterprises, including governance structures, financial capacity, and sector-specific characteristics (Bittner et al., 2024; González-Moreno et al., 2024).

Financial mechanisms supporting CE transitions in tourism have also received attention, particularly the role of green finance and green bond innovation in supporting sustainable tourism and circular economy integration (Fu et al., 2024). From a

sectoral perspective, CE principles have been explored in hospitality, agriculture, manufacturing, shipbuilding, and cultural heritage, underscoring strategies such as waste valorization, product-life extension, adaptive reuse, and sustainability-oriented technologies (Cong et al., 2023; Gravagnuolo et al., 2024; Mondal et al., 2023; Scipioni et al., 2023).

Tourism-specific applications of CE further address critical environmental pressures, including water scarcity, plastic pollution, low-carbon transitions, and waste generation in destination contexts (Arbulú et al., 2024; Rani et al., 2024; Stankiewicz et al., 2024; Tang et al., 2011). Comparative and longitudinal analyses demonstrate that CE-related indicators, such as renewable resource use and material efficiency, are positively associated with improved waste management and environmental performance in tourism-intensive regions (Gabor et al., 2023; Xu et al., 2022). However, critical perspectives argue that CE frameworks in tourism often underrepresent the role of tourists themselves, revealing conceptual tensions and implementation paradoxes (Sørensen & Bærenholdt, 2020).

Methodologically, the literature reflects growing efforts to evaluate CE performance through systematic reviews, bibliometric analyses, and digital data sources. These studies identify dominant research clusters related to sustainable development, recycling, wastewater treatment, and emissions reduction, while also highlighting the limitations of conventional assessment tools such as Life Cycle Assessment in capturing the added value of circular business models (De Pascale et al., 2023; Dragomir & Dumitru, 2024; Scheepens et al., 2016; Tsironis et al., 2024). Despite this breadth, existing research remains fragmented, with limited integration of CE strategies within a comprehensive tourism-specific sustainability framework.

Although circular economy studies provide concrete operational tools—such as resource-

loop optimization, waste valorization, and supply chain restructuring—their connection to broader governance architectures and standardized performance metrics remains underdeveloped. Consequently, CE is frequently positioned as a technical or environmental intervention rather than as an embedded component of an integrated sustainability governance system in tourism.

2.3. ESG and tourism

In parallel, ESG has gained prominence as a governance and accountability architecture for operationalising global sustainability agendas, particularly under intensified regulatory and institutional pressures. Landmark policy frameworks such as the United Nations Sustainable Development Goals (United Nations, 2015), the Paris Agreement (United Nations Framework Convention on Climate Change [UNFCCC], 2015), and the European Green Deal (European Commission, 2019) increasingly require that sustainability objectives be translated into measurable and auditable practices across sectors, including tourism. In this context, ESG provides structured lenses for embedding environmental responsibility, social equity, and governance integrity into organisational decision-making, while regulatory instruments such as the EU Taxonomy (European Union, 2020) and the Corporate Sustainability Reporting Directive (CSRD) (European Union, 2022) further accelerate the demand for comparable sustainability performance disclosure and accountability mechanisms.

In parallel, the tourism literature increasingly frames ESG factors as essential metrics and indicators for assessing sustainability performance and monitoring progress toward broader development goals. While ESG has traditionally been applied in corporate and financial contexts, recent tourism research extends its relevance to destination governance, social inclusion, environmental impact assessment, and institutional accountability. Studies focusing on

sustainable tourism emphasize the alignment of CE principles and ESG dimensions with the Sustainable Development Goals, particularly in relation to environmental quality, social equity, and long-term resilience (Strippoli et al., 2024).

The social dimension of ESG is reflected in analyses of social tourism programs, resident empowerment, labor conditions, community livelihoods, and social capital formation across diverse geographic contexts (Bianchi et al., 2023; dos Santos et al., 2024; Hussain et al., 2024; Tiku et al., 2022). Governance-related research examines tourism policy networks, institutional power dynamics, and multi-level coordination mechanisms that shape sustainability outcomes (Hojnik et al., 2024; McLeod, 2023). At the environmental level, empirical studies assess tourism's ecological footprint using indicators related to resource depletion, emissions, waste generation, and ecosystem vulnerability (Campos et al., 2023; Idroes et al., 2024; Mejjad et al., 2022).

Beyond its measurement function, ESG also increasingly shapes how tourism organisations and destinations structure governance, risk management, and long-term value creation, particularly in contexts where sustainability reporting requirements influence investment decisions and stakeholder legitimacy. This aligns with broader scholarship that frames sustainability implementation as a socio-technical transition challenge requiring multi-level coordination (Geels, 2010). In tourism, where change is frequently delivered through temporary and inter-organisational initiatives (e.g., destination projects, infrastructure upgrades, circular service redesign, community programmes), ESG indicators can function not only as reporting outputs but also as governance devices guiding project prioritisation, monitoring, and accountability across complex stakeholder ecosystems.

Emerging research further integrates ESG-related indicators into spatial, technological, and systems-based analyses, including

transport connectivity, tourism ecologization, and regional development under carbon neutrality targets (Feng, 2023; Q. Liu, et al., 2024; Yang et al., 2024; Zeng et al., 2023). Research also examines the moderating role of digital technology in the relationship between the environment and tourism system resilience in China (Y. Liu et al., 2024). Cultural, heritage, and creative dimensions of tourism sustainability are also examined through political economy and ecosystem-based perspectives, highlighting tensions between economic growth, social justice, and environmental responsibility (Nag & Sarkar, 2024; Pratt, 2022; Su et al., 2018).

Despite this expansion, ESG-focused tourism studies still often operationalise indicators in ways that remain decoupled from circular economy strategies, meaning that resource-flow interventions (CE) and accountability metrics (ESG) are not systematically theorised as mutually constitutive components of sustainability transitions in tourism systems. This fragmentation limits the ability to explain how circular practices become institutionalised, financed, governed, and evaluated in tourism contexts, and it constrains comparability across destinations and organisational settings.

From a systems perspective, this separation between operational circular interventions and ESG-based reporting mechanisms generates a structural misalignment between action and measurement. Without explicit theoretical integration, ESG indicators risk functioning as reporting outputs detached from operational transformation processes, while CE initiatives may lack standardized evaluative frameworks capable of demonstrating measurable sustainability performance.

While the literature provides extensive insights into CE as an operational mechanism and ESG as a measurement framework, these concepts are largely examined in parallel rather than as integrated components of a unified tourism sustainability approach. No existing study systematically explores their

interrelationship within a tourism-specific analytical framework. The present paper addresses this gap by explicitly linking CE strategies with ESG-based evaluation to advance a more coherent and measurable understanding of sustainability in tourism. By framing this linkage as an integrated conceptual architecture rather than a mere thematic overlap, the study positions sustainability, circular economy, and ESG as mutually reinforcing dimensions within a structured tourism governance and performance ecosystem.

3. Methods and Data

This work utilized data derived from the Scopus website (www.scopus.com) on 16 September 2024, for the combination of keywords “sustainable”, “circular economy”, and “esg” with “tourism”, resulting in 348 CE-related publications, 66 ESG-related publications, and 8800 sustainable-related publications. Note that the choice of these keywords, such as “sustainable” contributed to the largest available information, therefore, justifying the choice of these keywords.

The use of Scopus as the sole data source ensures consistency in indexing standards and citation coverage, allowing for comparability across thematic clusters. While other databases could potentially expand the corpus, maintaining a single standardized source enhances methodological coherence and reduces duplication bias.

We perform a two-faceted analysis, particularly, a bibliometric analysis and a topic analysis. Bibliometric analysis is employed in this study to systematically map and quantify scientific production at the intersection of sustainability, CE, and ESG dimensions in tourism, while natural language processing techniques, specifically topic analysis, are applied to identify dominant themes and examine the commonalities and divergences among these concepts; accordingly, the data are first pre-processed and then analyzed using the Latent

Dirichlet Allocation (LDA) method, following approaches applied in similar studies (Daglis et al., 2025; Tsironis et al., 2024).

The combination of bibliometric mapping and probabilistic topic modeling enables both macro-level structural visualization of the research landscape and micro-level semantic pattern detection. This dual approach strengthens interpretative robustness by integrating quantitative publication trends with latent thematic extraction.

According to Blei and Lafferty (2009):

$$p(\vec{a}) = \frac{\Gamma(\sum_i a_i)}{\prod_i \Gamma(a_i)} \prod_i \theta_i^{a_i-1} \quad (1)$$

In the context of LDA we have the hyperparameters: α which refers to the document-topic density and β which refers to the topic-word density (Madzik et al., 2023). Therefore, they relate to the distributions θ and ϕ , which allow the calculation of the $P(w, z)$ continuous distribution (Griffiths & Steyvers, 2004), defining a continuous distribution of the probability mixture of θ , the set N of mixture z , and the set N of words w :

$$p(\theta, z, w | \alpha, \beta) = p(\theta | \alpha) \prod_{n=1}^N p(z_n | \theta) p(w_n | z_n, \beta) \quad (2)$$

Integrating equation (2), yields the marginal distribution of a document:

$$p(w | \alpha, \beta) = \int p(\theta | \alpha) p(z_n | \theta) p(w_n | z_n, \beta) d\theta \quad (3)$$

The probability of the corpus is derived by obtaining the product of the marginal distributions as:

$$p(D | \alpha, \beta) = \int p(\theta_d | \alpha) \prod_{n=1}^N \sum_{z_n} p(z_n | \theta_d) p(w_n | z_n, \beta) d\theta_d \quad (4)$$

Note that D is the whole corpus and $n = 1, 2, \dots, N$ the documents of this corpus. By counting the posterior expectations in LDA provides the topic.

The posterior topic distributions derived from LDA provide probabilistic representations of latent thematic structures rather than deterministic classifications. Consequently, identified topics should be interpreted as dominant semantic tendencies within the corpus, reflecting prevailing research orientations rather than mutually exclusive thematic categories.

4. Results

4.1. Bibliometric Analysis

First, the scientific production related to the CE, ESG, and sustainability dimensions of tourism is presented, as illustrated in Figure 2.

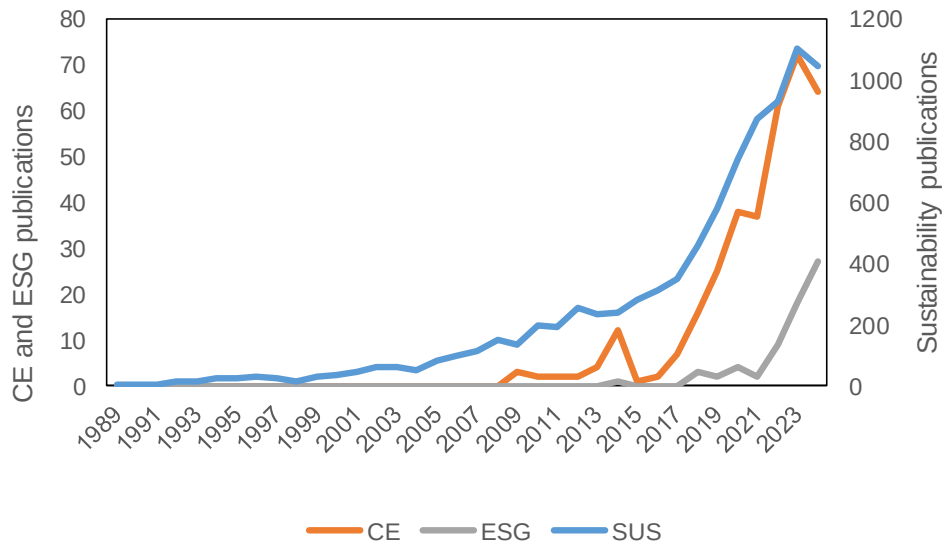


Figure 2. Publications related to Tourism for CE ESG and Sustainability

Based on Figure 2, a similar trend can be identified for all keywords, however, sustainability demonstrates the majority of the publications.

Subsequently, the thematic network derived from the CE, ESG, and sustainability dimensions of tourism is presented (Figure 3). The sustainability thematic map (Figure 3a) reveals two major clusters with a high density of nodes, one centered on sustainable development and the other on ecotourism and tourism development.

The CE thematic map reveals two distinct clusters, one centered on tourism, sustainable development, and the circular economy, and

the other focused on waste management.

The ESG thematic map identifies four clusters addressing (1) sustainability, (2) governance, (3) air quality, and (4) investments and real estate.

The word clouds for the SUS CE, and ESG dimensions of tourism-related publications, are depicted in the Appendix. These word clouds show that CE is related to various aspects, such as waste management, tourism, recycling, etc, ESG sustainability, tourism development, and ecotourism. In contrast, sustainability is related to ecotourism, sustainable and tourism development, and tourism management, as well.

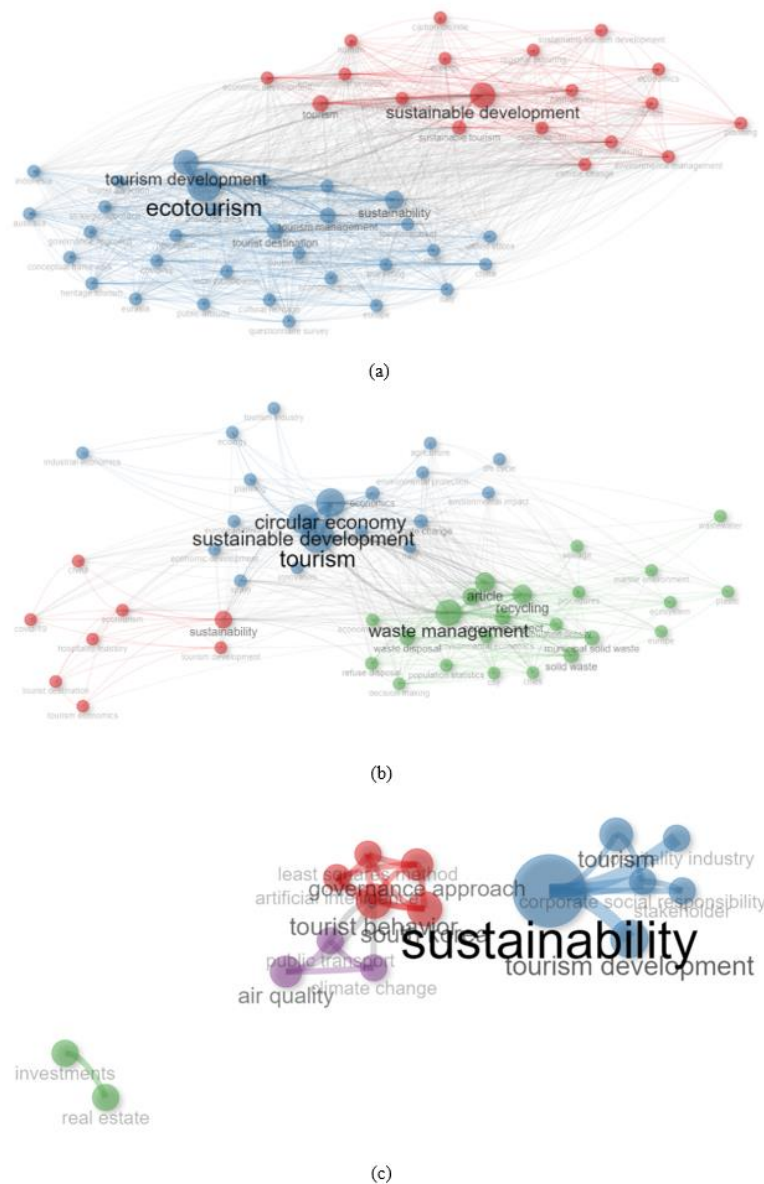


Figure 3. Thematic graph for: a. SUS, b. CE, and c. ESG

4.2. Topic Analysis

The following part presents the results derived from the topic analysis, with the findings illustrated in Figure 4 and Table 1. It can be inferred that several notions related to SUS, CE and ESG are interrelated in the context of tourism through various aspects.

The probabilistic structure of the LDA model enables the identification of dominant semantic groupings without imposing predefined thematic boundaries, thereby allowing the emergent research orientations to surface organically from the corpus. For SUS, Topic 1 centers on sustainable development, and community, while Topic 2

emphasizes sustainable tourism, environmental practices, and local economic impacts. For CE, Topic 1 emphasizes research, waste management, development, economy, and environmental concerns, while Topic 2 highlights sustainability and circular economy. The SUS topics exhibit strong normative and community-oriented characteristics, emphasizing development,

heritage, and local impacts. CE topics, by contrast, reveal a stronger operational vocabulary centered on systems, waste, water, and energy, indicating a resource-flow and efficiency-driven orientation. This differentiation reinforces the interpretation of CE as an implementation-oriented extension of sustainability principles.

Table 1. Topic analysis results for SUS, CE, and ESG dimensions in tourism.

SUS		CE		ESG	
Topic 1	Topic 2	Topic 1	Topic 2	Topic 1	Topic 2
Tourism	Tourism	Research	Tourism	Tourism	Tourism
Development	Sustainable	Based	Circular	Research	Performance
Sustainable	Development	Waste	Economy	Social	Sustainability
Tourist	Research	Development	Sustainable	Sustainable	Environmental
Cultural	Sustainability	Management	Development	Environmental	Firms
Heritage	Environmental	Analysis	Waste	Governance	Social
Local	Social	Economy	Industry	Performance	Industry
Natural	Community	System	Research	Ethical	Financial
Management	Economic	Model	Sustainability	Development	Governance
Based	Destination	Economic	Economic	Innovation	Companies
Tourists	Industry	Environmental	Sector	Authors	Hospitality
Economic	Local	Tourism	Environmental	Statement	Research
Conservation	Based	Circular	Model	Technology	Impact
Environmental	Analysis	Water	Management	Market	Relationship
Activities	Tourists	Design	Social	Journal	Management
Analysis	Findings	Energy	Practices	Complexity	Sustainable
Resources	Management	Environment	Resources	Conflict	Market

In the ESG dimension, Topic 1 focuses on research, performance, sustainability, and environmental factors, while Topic 2 explores social sustainability, governance, and firms' involvement. These topics reveal the interrelation of environmental, social, and economic aspects in the evolving landscape of tourism. ESG topics display a pronounced evaluative and institutional vocabulary, incorporating terms such as "performance," "governance," "firms," "financial," and "ethical." This indicates that ESG research in tourism is strongly embedded within accountability, reporting, and market-oriented contexts, complementing CE's operational focus and SUS's normative orientation.

Taken together, the topic modeling results suggest a layered sustainability structure in

tourism research: sustainability articulates overarching developmental objectives, circular economy translates these into operational resource strategies, and ESG embeds them within governance and performance evaluation mechanisms. This layered configuration empirically supports the conceptual progression outlined in the literature review.

This suggests a need to connect CE process indicators with ESG reporting standards. This interpretation aligns with quality management scholarship that conceptualizes sustainability as a measurable performance domain supported by structured improvement cycles. Bibliometric evidence indicates that continuous improvement systems contribute to sustainable performance by embedding incremental operational changes within

performance measurement systems and strategic management processes (Sesar, 2024). From this perspective, sustainability

transitions require not only conceptual alignment but also systematic, organization-wide improvement mechanisms.

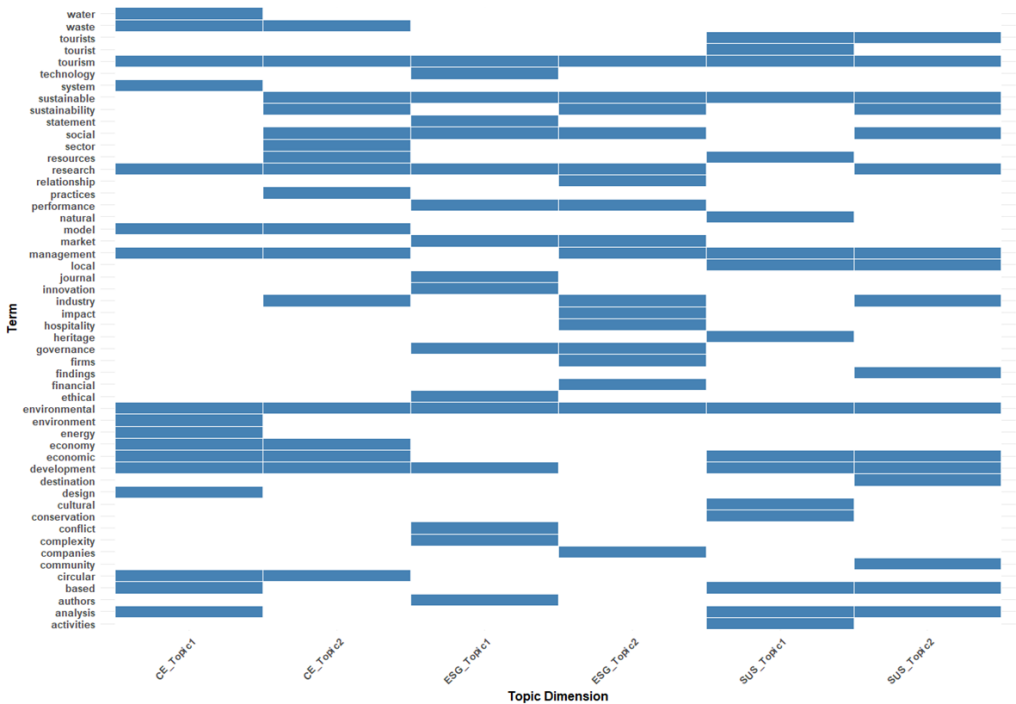


Figure 4. Topics modeling results for the CE, ESG, and SUS dimensions in tourism

5. Theoretical implications

A significant contribution of this study is the development of a conceptual progression that positions sustainability as the normative foundation, circular economy as the operational mechanism, and ESG as the essential toolset for quantifying progress. Unlike existing studies that often examine these concepts in parallel, this paper offers an integrated analytical framework that explicitly links environmental efficiency, social responsibility, and governance within tourism systems.

The bibliometric analysis indicates a growing scholarly interest in SUS, CE, and ESG within tourism research, reflecting an overarching emphasis on the sustainable development of the sector. SUS-related studies dominate the literature, underscoring

the well-established role of sustainability in tourism and its strong alignment with global frameworks such as the Sustainable Development Goals (SDGs). Although CE and ESG are associated with a comparatively smaller volume of publications, their increasing presence highlights a rising recognition of circular resource use, waste management, and governance-related metrics as complementary mechanisms for advancing and assessing sustainability performance in tourism.

The thematic network analysis further demonstrates that each dimension contributes a distinct theoretical perspective. SUS-oriented research places strong emphasis on sustainable development and ecotourism, highlighting conceptual commitments to responsible tourism practices and ecological conservation. CE research complements this

perspective by focusing on sustainable development and waste management, with particular attention to reducing tourism's environmental footprint through circular resource flows. ESG-related studies broaden the analytical scope by integrating sustainability with governance, air quality, and investment considerations, reflecting an expanded theoretical understanding of environmental accountability and financial responsibility.

Topic modeling results further deepen this theoretical understanding. From the SUS perspective, dominant terms such as "sustainable," "development," and "tourism research" emphasize a strong commitment to long-term sustainability and the conceptual foundations of sustainable tourism development. Words such as "performance," "impact," and "analysis" suggest a growing theoretical interest in assessing the effectiveness of sustainability initiatives. From the CE perspective, recurring terms such as "circular," "waste," and "development" indicate a strong focus on applying circular economy principles in tourism, particularly through structured systems for waste management and resource efficiency. In the ESG dimension, keywords related to "social," "cultural," "community," and "local" highlight social impacts and community engagement, while terms associated with "environment," "environmental management," and "natural resources" stress ecological responsibility. Governance-related concepts such as "ethical" and "financial" further underscore the theoretical importance of institutional and regulatory frameworks in ensuring sustainable tourism aligned with ESG criteria. The recurrence of shared concepts, most notably "sustainable development", across SUS, CE, and ESG highlights a strong theoretical interconnection among these dimensions. This overlap suggests that tourism sustainability is increasingly conceptualized through integrated lenses of sustainability, circularity, and governance,

reinforcing the need for multidimensional theoretical frameworks.

From a quality management standpoint, these findings suggest that the SUS-CE-ESG nexus may be interpreted as a structured performance system rather than as three independent conceptual streams. Sustainability provides the value-driven quality objectives; circular economy introduces process-oriented redesign and operational efficiency mechanisms; ESG embeds measurement, accountability, and reporting logics. This layered structure mirrors classical quality cycles—planning (normative orientation), execution (operational transformation), and control (performance evaluation)—thereby positioning sustainability governance in tourism within a continuous improvement paradigm.

Moreover, the empirical clustering identified through bibliometric and topic modeling analyses indicates that the literature is progressively moving toward performance-oriented integration, even if explicit theoretical consolidation remains limited. This reveals an emerging theoretical trajectory in which sustainability transitions in tourism are increasingly conceptualized as measurable, systemically organized governance architectures rather than loosely connected ethical discourses.

6. Practical implications

From a practical standpoint, the findings indicate that SUS, CE, and ESG offer complementary pathways for operationalizing sustainable tourism. SUS provides the normative foundation for tourism development by emphasizing ecological conservation, responsible tourism practices, and long-term viability. CE translates these sustainability objectives into concrete operational strategies, particularly through waste reduction, resource efficiency, and circular production and consumption models within tourism systems. ESG further

strengthens implementation by introducing governance structures, ethical standards, and investment-related metrics that enable organizations and destinations to monitor sustainability performance in a more systematic and measurable manner.

The prominence of research-related terms across all three dimensions highlights the importance of empirical evidence in informing tourism policy, destination management, and industry practices. The integration of structured analytical and data-driven approaches supports evidence-based decision-making and enhances the capacity of tourism stakeholders to design, implement, and evaluate sustainability-oriented interventions.

This work aligns with and extends existing literature by offering methodological insights into how SUS, CE, and ESG intersect in tourism research. For instance, the findings resonate with Purwaningsih et al. (2024), who emphasize the role of IT in enhancing collaboration among tourism stakeholders, suggesting practical opportunities for co-developing sustainable tourism services. Moreover, the application of machine learning techniques demonstrates how innovative analytical tools can reveal overlooked complementarities among sustainability dimensions, thereby supporting more informed managerial and policy decisions.

From a managerial perspective, this integration enables tourism organizations and destinations to design sustainability management systems that explicitly link operational circular initiatives with ESG-based performance dashboards. Such alignment supports benchmarking, internal audits, strategic alignment with regulatory requirements, and continuous improvement cycles. In this respect, the SUS-CE-ESG structure can serve as a blueprint for developing quality-oriented sustainability management systems within tourism enterprises, destination management organizations, and policy frameworks.

7. Further research

The findings open several structured directions for future research. Although SUS, CE, and ESG are increasingly present in tourism scholarship, they remain predominantly examined in parallel rather than within integrated analytical and performance-based frameworks. Future research should therefore prioritize the development of conceptual and empirical models that explicitly connect sustainability objectives with circular operational mechanisms and ESG-based evaluation systems, enabling a more coherent understanding of sustainability performance in tourism contexts.

In line with calls for value-based and ethics-oriented tourism development (Fuchs, 2023), further investigation is needed to explore how normative sustainability commitments can be translated into operational redesign and measurable governance practices. This need becomes particularly relevant in light of post-pandemic structural gaps in hospitality and tourism systems (Ciarlante et al., 2024), where resilience, social responsibility, and environmental accountability require stronger integration.

Additionally, deeper inquiry into the financial and governance dimensions of sustainability transitions is warranted. Building on discussions of green finance and circular investment mechanisms in tourism (Fu et al., 2024), future studies could examine how ESG disclosure requirements, regulatory frameworks, and sustainable finance instruments shape the institutionalization of CE practices within tourism organizations and destinations.

Methodologically, longitudinal, comparative, and mixed-method approaches would provide richer insight into how SUS, CE, and ESG interact across different spatial scales, tourism segments, and governance settings. Such designs could help identify contextual moderators that influence the success or

limitations of integrated sustainability architectures.

Finally, future research could advance this field by developing integrated sustainability performance scorecards that operationally connect CE process indicators with ESG reporting standards. Insights from continuous improvement research suggest that such integration should be supported by structured performance measurement systems and iterative improvement cycles to ensure long-term sustainability outcomes (Sesar, 2024). Embedding CE indicators within ESG reporting frameworks through continuous monitoring mechanisms may strengthen accountability, comparability, and strategic alignment across tourism organizations and destinations.

Comparative analyses across destinations, hospitality segments, and governance models could determine how such integrated quality architectures influence strategic alignment, investment decisions, performance monitoring, and long-term competitiveness in tourism systems.

8. Concluding remarks

It is important to acknowledge a data-related limitation of this study, as the analysis relied exclusively on the Scopus database. While incorporating additional databases could potentially expand the corpus, the consistent use of a single standardized source ensures comparability, coherence in indexing standards, and methodological consistency across the bibliometric and topic modeling analyses.

Despite this limitation, the study offers a structured and innovative analytical approach to examining tourism-related research across the interconnected dimensions of sustainability (SUS), circular economy (CE), and environmental, social, and governance (ESG) factors. By combining bibliometric mapping with probabilistic topic modeling,

the research identifies dominant thematic orientations, structural overlaps, and conceptual divergences, thereby illuminating the evolving architecture of sustainability-oriented tourism scholarship.

More importantly, the findings extend beyond descriptive mapping by demonstrating how these three dimensions can be interpreted as a layered and integrated performance framework. Sustainability articulates normative developmental objectives, circular economy operationalizes resource and process transformation mechanisms, and ESG embeds measurement, accountability, and governance logics. Through this structured interpretation, the study repositions sustainability in tourism not merely as an ethical commitment, but as a measurable, governable, and continuously improvable quality domain.

In doing so, the research contributes to advancing the conceptual integration of SUS, CE, and ESG within tourism systems and provides a foundation for future work aimed at developing coherent performance architectures capable of guiding strategic planning, operational redesign, and evaluative control in sustainable tourism development.

Acknowledgment: This work emerged from a joint international collaboration supported by the European Union's research and education programmes. It was funded by the Horizon Europe research and innovation programme under the project ClearClimate—Engaging approaches and services for meaningful climate actions (Grant Agreement No. 101131220), and by the Erasmus+ Alliances for Education and Enterprises programme under the project ESG4PMChange—The ESG Imperative for the Project Management World: Alliance for Developing and Empowering Changemakers (Grant Agreement No. 101187376). Furthermore, the research was supported by COST Action CA23157: European Network for Multiple-View Life Cycle Sustainability Assessment (MultiViewLCSA), supported by COST (European Cooperation in Science and Technology).

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Appendix

The word clouds for the CE, ESG, and SUS dimensions of Tourism-related publications, are depicted in this Appendix (Figure A1).



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