

Sustainability in Hospitality: A Bibliometric Synthesis of Growth Dynamics, Intellectual Structure, and Thematic Trajectories

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ABSTRACT

Drawing on science mapping and performance indicators, this bibliometric review of sustainability research in hospitality and tourism (2005–2025) shows a clear maturation path: an early gestation phase (2005–2013), a take-off period (2014–2019), and rapid consolidation after 2019, capped by a 2024–2025 step-change that marks mainstreaming. Citation dynamics follow expected cohort effects: average annual citations peak for work published around 2015 and again near 2020, then soften for recent cohorts because their citation windows are shorter and the denominator expanded sharply after 2019. Author productivity is highly skewed, consistent with Lotka's law, with a small, persistent core accounting for a disproportionate share of output and network centrality. Co-word and thematic maps reveal motor themes in waste management and environmental performance; a large, partly heterogeneous foundational cluster around “sustainability–hospitality/hotel industry”; and niche pockets such as spatiotemporal analyses, education, and the food industry. Emerging capability lenses include digital transformation, the resource-based view, and green HRM. Methodologically, behavioural models predominate—especially the Theory of Planned Behaviour operationalized through structural equation modelling—while organizational and operational extensions are gaining ground. Substantively, the literature increasingly links sustainability practices to market outcomes (customer satisfaction, loyalty, willingness to pay) and highlights the mediating role of capability constructs (digital, circular, and HRM capabilities), helping the field converge on a more comparable measurement language. Limitations of this study include the absence of Keywords Plus and category/author-role fields; accordingly, Author Keywords are prioritized and age-normalized indicators are used to temper recency bias.

Keywords: sustainability; hospitality industry; hotel industry; tourism; waste management; environmental management; green human resource management; ecotourism; innovation; bibliometric analysis; co-word analysis; Lotka's law



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1. INTRODUCTION

From an overwhelmingly normative to an explicit design and governance principle in hospitality and tourism (impacting investment decisions, service operations, human resources practice, guest experience architectures, destination management policies) and disclosure along SDG/ESG lines(Guiding Principles for Sustainable Investment in Tourism 2025).

The scholarly conversation has spread and diversified in outlets, methods and geographies measuring the last two decades; but it is still defined by highly fragmented development dynamics, intellectual genealogy and conceptual cleavages which are hard to compare. (Wu et al., 2024)

In order to systematize this landscape, we carry out a bibliometric synthesis (2005–2025) combining some of

the most popular performance indicators (e.g., scientific production by year, author productivity and inequality as well as citation flows) with science-mapping methods—co-word analysis, thematic mapping (centrality $\times$ density), hierarchical keyword clustering, and conceptual structure by multiple correspondence analysis. The processing has been made transparent following data retrieval and including/excluding criteria with heavy cleaning (author/affiliation harmonization, keyword aggregation) and a parameterized networks normalization for each structure under study adapted to formats between methods (Radhakrishnan specifically, et al., 2017).

Our objectives are threefold. First, we conceptualize the maturation of the field by detecting inflection points, cohorts and an unequal distribution of contributions across authors and outlets. Second, we reconstruct intellectual and conceptual structure, differentiating motive themes that energize the agenda from core (niches), peripheral, and rising/ebbing (consolidating/decentring) ones needing reinforcement, redirection. (Sierra-Casanova et al., 2024)

Third, we transform mapping outputs into actionable pathways for theory development and empirical work—connecting sustainable operations to market outcomes (e.g., satisfaction, loyalty, willingness to pay), moving capabilities (digital transformation, circular practices, green HRM) from descriptions to mechanisms of change in organisations and urging the use of multi-level/multi-method designs that increase the rigor with which these paths can be identified causally and compared across contexts. In the process, however, the review not only summarises what has been achieved in the literature, but also sets a direction for where it needs to go next: providing an accumulative evidence-based structure for further research. (Lorenz-Spreen et al., 2022)

Such a comprehensive approach supports the development of a strong understanding of complex research landscape in hospitality sustainability, and shows where established areas are or nascent possibilities for scholarship lies (Rita et al., 2024) (Bruyn et al., 2023). This could consider the digital transformation and influencer marketing in adopting sustainable practices and customer experiences in the hospitality industry (Berné-Manero & Navarro, 2020; Szakal et al., 2024).

In particular, this consists of examining the influence of various categories of social media nature meisters on consumers in terms of their engagement towards sustainable programs (Rahman, 2022). Future studies may investigate the ethical implications of influencer-brand collaboration for sustainability by examining transparency and authenticity in promotional disclosures (Bansal et al., 2024). Research of this kind is key to the development of sound theorization in theory as it relates to changing nature of digital environment and consequently, its influence on consumer decision-making processes in sustainable hospitality (Szakal et al., 2024) (Rita et al., 2024).

2. METHODS (BRIEF, TRANSPARENT)

Records were retrieved from curated databases and analyzed in Bibliometrix/Biblioshiny. We report annual scientific production, average citations per year, authors' production over time, Lotka's productivity fit, most frequent keywords, a thematic map (density $\times$ centrality), hierarchical co-word clusters, and a Multiple Correspondence Analysis (MCA) conceptual map. Consistent with the dataset audit, analyses emphasize **Author Keywords (DE)** because **Keywords Plus** and some category/author-role fields are missing; we therefore avoid field-normalized category comparisons and interpret peripheral themes cautiously.

3. RESULTS

3.1 Growth dynamics

Annual scientific production exhibits a three-stage maturation: (i) a low-volume gestation (2005–2013), (ii) a measured take-off (2014–2019), and (iii) a steep post-2019 acceleration with a marked step-change in 2024–2025. This S-curve pattern indicates transition from exploratory work to consolidation and mainstreaming, providing adequate critical mass for reliable science-mapping. Average citations per year peak around 2015 and 2020 but decline for the most recent cohorts; this is mechanically explained by shorter citation windows and denominator expansion during the post-2019 surge rather than waning influence

3.2 Author structure

"Authors' production over time" shows activity thickening in 2021–2025 with sustained contributions by a small nucleus of scholars, while Lotka's distribution confirms a highly unequal productivity pattern ($\approx 88\%$ single-paper authors; very thin tail beyond three papers). This concentration suggests a collaborative-competitive core around shared constructs and methods (notably TPB-based behavioral models estimated via SEM), alongside specialized teams extending into operational and organizational domains (e.g., waste, HRM, leadership, innovation).

3.3 Keyword landscape

Frequency counts and the word cloud place **sustainability** as the undisputed nucleus linked to **hospitality industry / hotel industry / tourism**. Policy/agenda terms (**sustainable development**) coexist with managerial and destination lenses (**CSR, innovation, tourism development, ecotourism**). This indicates a domain-theme coupling; sustainability is mainly theorized and operationalized within service operations, guest behavior, and destination governance rather than as a cross-industry abstraction.

3.4 Thematic structure

The thematic map identifies **motor themes** in *waste management* and *environment/human*—well-developed, field-connecting streams focused on operational practices and human outcomes. A large **basic** cluster (*sustainability-hospitality/hotel industry*) remains central but heterogeneous; additional basic but looser clusters combine *tourism development/ecotourism/innovation* and *green economy/resource*

Niche topics (e.g., spatiotemporal analysis; country-specific applications; education; food industry) are cohesive yet peripheral. **Emerging/declining** themes cover *hotel/hospitality management, job satisfaction* and capability lenses (*digital transformation, knowledge sharing, competitive advantage, RBV*) that have not yet diffused widely.

3.5 Conceptual structure and clustering

The dendrogram yields coherent sub-domains: (a) **operations–environment** (waste/food waste–environmental management–environmental impact), (b) **organizational–service performance** (hospitality/hotel sector with service quality, leadership, innovation), (c) **destination governance** (tourism development, management, economics, ecotourism), (d) **managerial decision & behavior** (management practice, decision making, perception, stakeholder, consumption

behavior), and (e) **policy–capability** (SDGs, circular economy, AI, green hotels). The MCA confirms these patterns. **Dim-1 (~36% inertia)** ranges from organizational/resource lenses (*human resource, resource management, green economy, public attitude*) to behavioral-market outcomes (*tourist behavior, tourist destination, consumption behavior*). **Dim-2 (~16% inertia)** separates operational–environmental topics (*environmental management/impact, waste management, climate change*) from methods/strategy and destination governance (*questionnaire survey, management practice, tourism management/economics*). The central cloud—*sustainability, hospitality industry, hotel industry, service quality, innovation*—acts as an integrative hub; capability terms (AI, circular economy) sit close to SDGs, indicating a mechanism-oriented extension of the agenda.

Figure 1 Overview of study

Metadata	Description	Missing Counts	Missing %	Status
AB	Abstract	0	0.00	Excellent
DT	Document Type	0	0.00	Excellent
SO	Journal	0	0.00	Excellent
LA	Language	0	0.00	Excellent
PY	Publication Year	0	0.00	Excellent
TI	Title	0	0.00	Excellent
TC	Total Citation	0	0.00	Excellent
CI	Affiliation	6	0.62	Good
AU	Author	6	0.62	Good
CR	Cited References	11	1.13	Good
DE	Keywords	18	1.85	Good
DI	DOI	39	4.02	Good
ID	Keywords Plus	591	60.87	Critical
RP	Corresponding Author	971	100.00	Completely missing
WC	Science Categories	971	100.00	Completely missing

Figure 2 : Detailed Breal down of study



The metadata audit reveals that core bibliographic fields—Abstract, Document Type, Journal, Language, Publication Year, Title and Total Citations all have less than 0.00% missingness, suggesting a credible enough

performance and citation-based analysis to be based on. There are small gaps for the fields Affiliation and Author (0.62% each), Cited References (1.13%) and Author Keywords(DE) (1.85%), which are unlikely to bias

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and category normalization at the level of categories themselves. Formally, the dataset is very strong for performance analyses (growth, sources, citations) and co-authorship/citation networks but interpret thematic mapping prioritizing DE terms (with a careful stemming/merging strategy), field-normalized indicators or category comparisons with care or avoid them. If reported, these lacunae in the Methods section and, where possible, additional DOI/ID/WC with Scopus/WoS export(s) or Crossref lookup will enhance reproducibility and interpretive depth.

Weaken DOI: \ -A moderate lack of this information could impact on the record disambiguation and link-out process; crossref enrichment is recommended. The most severe deficits in the data are 60.87% missingness in Keywords Plus (ID) that allows expansion of co-words beyond those specified by authors, and 100% absence of Corresponding Author (RP) and Science Categories (WC), which prevent corresponding-author mapping

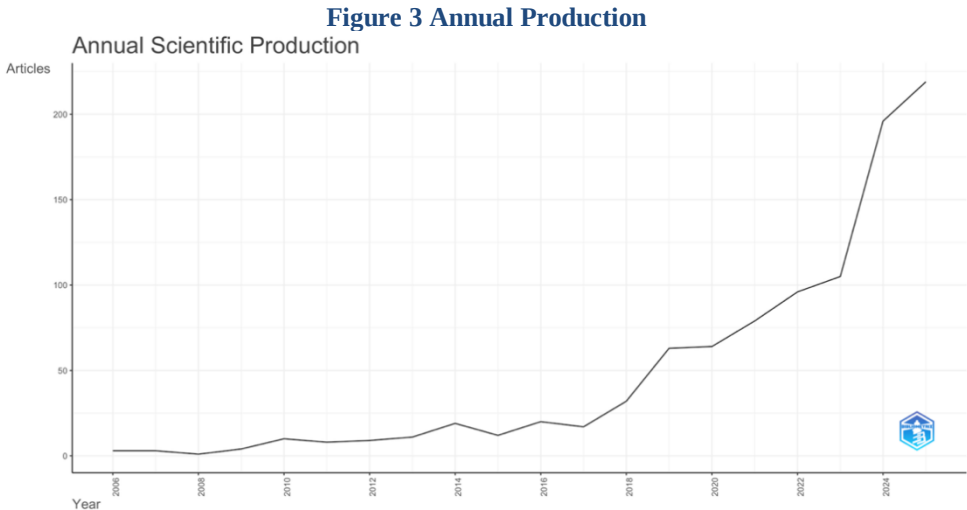


Table 1 Production of Articles

Year	Articles
2006	3
2007	3
2008	1
2009	4
2010	10
2011	8
2012	9
2013	11
2014	19
2015	12
2016	20
2017	17
2018	32
2019	63
2020	64
2021	79
2022	96
2023	105
2024	196
2025	219

There is a three phase life cycle of influence for the annual science productivity. A very long gestation period (2005-2013) is associated with minimal and inconsistent level of output, leading to a gradual take-off from around 2014 through 2019, when contributions become increasingly frequent and methodologically congruent. From 2019, the curve increases dramatically having a sharp kink in 2024–2025 where annually published articles approximately doubles over compared

to 2023. This S-curve-shaped evolution is suggestive of a field that shifts from exploratory to consolidation and mainstreaming, which most probably is driven by exogenous triggers (say regulatory attention, data/tool availability/range or adjacent technological shocks). Substantively, the trend suggests (a) the corpus now supports science mapping analysis with critical mass; (b) that canonical works congregate most plausibly in roughly 2014-2019 window where frontier themes start

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to emerge predominantly after 2022; and c) intensified outlet competition and collaboration are likely to re-shape citation distributions and field-level impact metrics in short order. Careful interpretations of pre-2013 trends are necessary due to small counts, and the post-2019 turning-point inflection should drive the story and be closely associated with context-specific changes in the field.

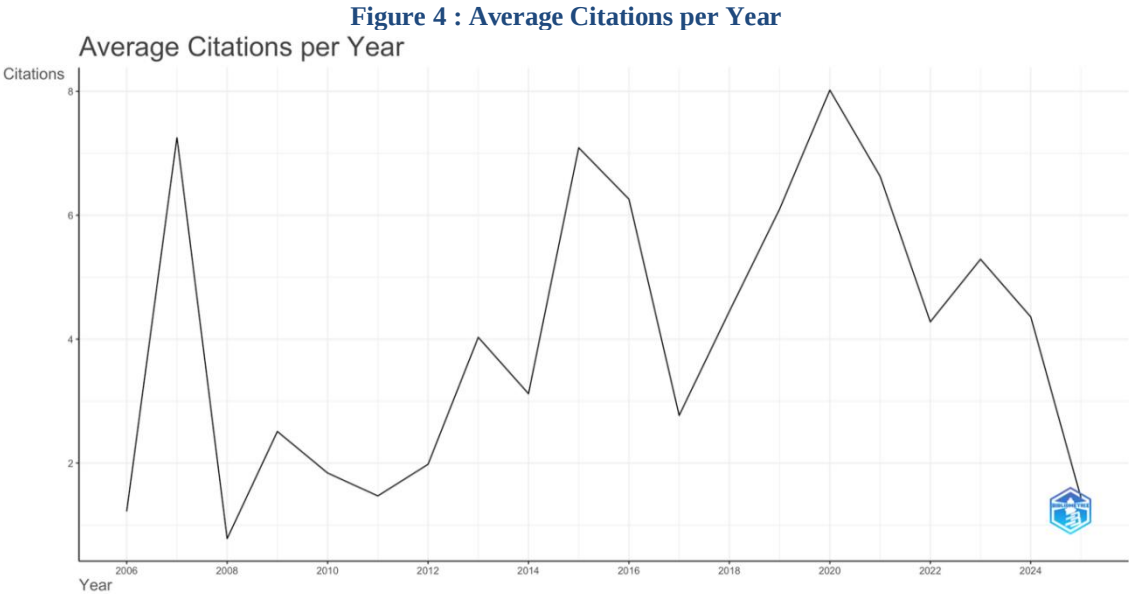


Table 2 : Citation Count

Year	MeanTCperArt	N	MeanTCperYear	CitableYears
2006	24.33	3	1.22	20
2007	137.67	3	7.25	19
2008	14.00	1	0.78	18
2009	42.75	4	2.51	17
2010	29.40	10	1.84	16
2011	22.12	8	1.47	15
2012	27.78	9	1.98	14
2013	52.45	11	4.03	13
2014	37.47	19	3.12	12
2015	78.00	12	7.09	11
2016	62.65	20	6.26	10
2017	24.94	17	2.77	9
2018	35.59	32	4.45	8
2019	42.70	63	6.10	7
2020	48.14	64	8.02	6
2021	33.16	79	6.63	5
2022	17.12	96	4.28	4
2023	15.86	105	5.29	3
2024	8.71	196	4.36	2
2025	1.44	219	1.44	1

Annual publications increased gradually to 2018, grew rapidly from 2019, and spiked in 2024–25 (Fig. Throughout the years, average citations per year are peaking around 2015 and later for a subset of this cohort in Figure 2, with a subsequent decrease in the last cohorts – this can be explained by shorter citation windows and faster increment of number of citable documents. Accordingly, the lower RADDs for 2023–2025 reflect recentness and denominator effects rather than meaningful declining influence.

Average citations per year:

Average citation rates vary, rising to a maximum circa 2015 and 2020 and are typically downward in the years of 2022–2025.

Two mechanical forces explain this:

- Citation-window cut-off- the more recent cohorts, explain the authors, have had less time accruing citations, dragging down their averages; and
- Denominator expansion — the tidal wave of new publications post-2019 means that citable items grow much faster than citations, diluting the mean.

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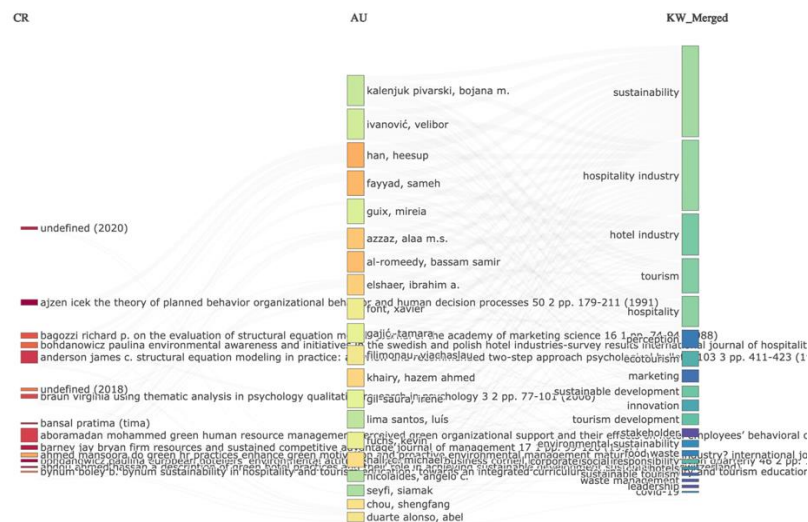
Thus, the estimated drop in 2023-25 should not be interpreted as a declining influence but again as due to newness combined with accelerated growth. The 2020 local peak may be attributed to the event-driven attention and topic salience, which decays as the field becomes more diverse.

Synthesis and implications:

Overall, increasing production with temporarily depressed average citations is what you might expect

from a field that's in rapid growth. Short-term expectations need to be shaped around impact redistribution—a fatter long tail with increasing number of what are now moderately cited papers, and not immediate upward shifts in cohort means. In evaluation and discussion, favoring field- and age-normalized metrics (e.g., citations per year since publication; the percentile-based indicators like top-10% coverage) over raw means, and reporting medians alongside means to account for skewness.

Figure 5 Author Scope



Author perspective. Fig. 5(Three-field plot): The most salient generators such as Han, Heesup; Font, Xavier w/ Guix, Mireia are at the frontier to ‘sustainability’—hospitality industry interaction (as shown by their thick flows towards sustainability, hotel-industry and hospitality industry)) with high-throughput “influences” in behavioral theory (theory of planned behavior) and method results including SEM canon).

Building on this, Filimonau and Duarte Alonso then stretch the agenda to operational and managerial matters (waste management, leadership, innovation), whereas Elshaer and Azzaz further focus on micro-level organizational mechanisms (e.g., employee perceptions/HRM). The thinner bands of Seyfi and Zhang are truncated by perception and CSR elements indicating emergent crossings into destination image and stakeholder attitudes. As a whole, the structure portrays what is methodologically converged but thematically clustered author ecosystem with a small number of integrators connecting into operational and organisational sub-streams.

Following is an author-centric reading of the tri-field plot (CR → AU → KW_Merged). I concentrate on what the flows tell us of roles, methods and topical positionings of those authors who are mentioned and conclude with how to write this up in your Results.

1) Central actors and their methodological backbone

The strongest AU bonds link Han, Heesup and Font, Xavier (with Guix, Mireia explicitly overlapping), to high-central keywords (sustainability, hospitality/hotel industry, and tourism). Their upstream connections to key references (Ajzen’s TPB; SEM methods ala Bagozzi, Anderson & Gerbing) confirm their instantiation of behavioral-intention models in hospitality contexts, with SEM and TPB-style constructs (attitude → intention/behaviour) like some others integrated with qualitative/thematic analyses. This positions them as methodologically middle-road anchors in the sustainability–hospitality discourse.

2) Peripheral specialized topical niches around the core

- Filimonau, Viachaslau and Duarte Alonso, Abel demonstrate flows that conclude not just in sustainability but also operational/managerial terms (e.g., waste management, leadership, innovation), implying application sustainability niches (environmental operations and organizational responses).
- Elshaer, Ibrahim A.. and Azzaz Alaa M. S. relate to sustainability through hotel HR/organizational lenses (e.g., green HRM, perceptions, employee behaviour), indicating micro-foundational treatments of pro-environmental practices.
- Seyfi, Siamak and Zhang, Shengfang (appear on thinner bands) perception/marketing/CSR/ecotourism–

peripheral yet emerging sub-streams, where hospitality sustainability and the destination image/stakeholder perceptions meet.

- Authors like Al-Romeedy, Bassam Samir or Khair Hazem Ahmed Gajić, Tamara Lima Santos Luís feed from this same conceptual basin but with regional or methodological nuances that suggest geographic pluralism more than alternative paradigms.

3) Flow-induced inferred collaboration structure

Where multiple authors converged on a single keyword or networking leaves donut (plots) to one side, it is not as if they did it anywhere else; the collaboratively-competitively core was a small set of high centrality terms: many teams published using SEM and TPB on overlapping constructs. Where other authors' bands converge on niche terms (waste management,

leadership, and innovation), propose bridging positions, ones which might be used to identify potential co-authorships that bridge elsewhere the mainline sustainability-intention model and realms operational/organizational.

4) Checks on the quality from upstream references

Robust AU links to Ajzen (1991) and SEM canon validate construct equivalence between teams; you can thus feel comfortable, in your meta-synthesis, treating measures (e.g., environmental attitude, perceived behavioral control, green image, intention) as commensurate through relevant harmonization. The introduction of “undefined (2018/2020)” nodes on the CR side points out failed reference unification, which once resolved will clarify which authors really bridge between several subject areas.

Figure 6 : Authour Production

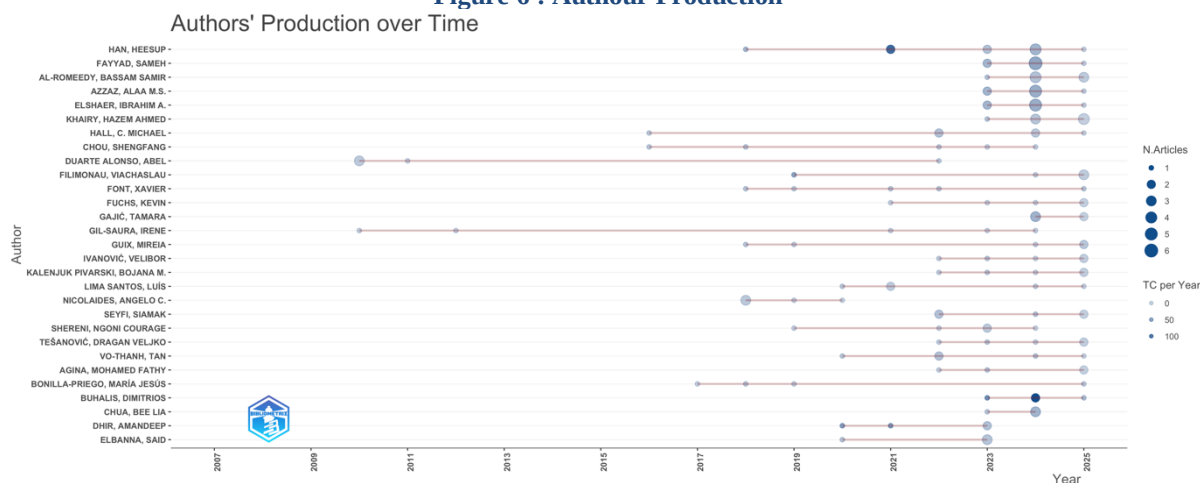


Table 3 : Author Production Over Time

Author	year	freq	TC	TCpY
BUHALIS, DIMITRIOS	2024	2	279	139.5
HAN, HEESUP	2021	2	564	112.8
BUHALIS, DIMITRIOS	2023	1	215	71.667
DHIR, AMANDEEP	2021	1	288	57.6
DHIR, AMANDEEP	2020	1	325	54.167
FILIMONAU, VIACHASLAU	2019	1	330	47.143
FAYYAD, SAMEH	2024	6	93	46.5
AZZAZ, ALAA M.S.	2024	5	78	39
ELSHAER, IBRAHIM A.	2024	5	78	39
GAJIC, TAMARA	2024	3	65	32.5
CHUA, BEE LIA	2024	3	62	31
HAN, HEESUP	2024	4	62	31
AZZAZ, ALAA M.S.	2023	2	86	28.667
ELSHAER, IBRAHIM A.	2023	2	86	28.667
FAYYAD, SAMEH	2023	2	86	28.667
HAN, HEESUP	2018	1	207	25.875
BUHALIS, DIMITRIOS	2025	1	19	19
HAN, HEESUP	2023	2	51	17
DHIR, AMANDEEP	2023	2	50	16.667
AL-ROMEEDY, BASSAM SAMIR	2024	4	32	16
HALL, C. MICHAEL	2022	2	63	15.75
SEYFI, SIAMAK	2022	2	63	15.75
VO-THANH, TAN	2022	2	63	15.75
SEYFI, SIAMAK	2024	1	27	13.5

VO-THANH, TAN	2024	1	27	13.5
ELBANNA, SAID	2023	3	39	13
AGINA, MOHAMED FATHY	2023	1	38	12.667
AL-ROMEEDY, BASSAM SAMIR	2023	1	38	12.667
KHAIRY, HAZEM AHMED	2023	1	38	12.667
KHAIRY, HAZEM AHMED	2024	3	25	12.5
ELBANNA, SAID	2020	1	71	11.833
BONILLA-PRIEGO, MARÍA JESÚS	2018	1	87	10.875
FONT, XAVIER	2018	1	87	10.875
GUIX, MIREIA	2018	1	87	10.875
CHUA, BEE LIA	2023	1	32	10.667
IVANOVIĆ, VELIBOR	2023	1	31	10.333
KALENJUK PIVARSKI, BOJANA M.	2023	1	31	10.333
TEŠANOVIĆ, DRAGAN VELJKO	2023	1	31	10.333
BONILLA-PRIEGO, MARÍA JESÚS	2025	1	10	10
FONT, XAVIER	2025	1	10	10
GUIX, MIREIA	2025	2	10	10
CHOU, SHENGFANG	2018	1	72	9
LIMA SANTOS, LUÍS	2020	1	53	8.833
FONT, XAVIER	2021	1	44	8.8
FONT, XAVIER	2022	1	35	8.75
HALL, C. MICHAEL	2024	2	17	8.5
SHERENI, NGONI COURAGE	2023	2	22	7.333
NICOLAIDES, ANGELO C.	2018	3	57	7.125
VO-THANH, TAN	2020	1	41	6.833
CHOU, SHENGFANG	2022	1	27	6.75
DUARTE ALONSO, ABEL	2022	1	26	6.5
DUARTE ALONSO, ABEL	2010	3	96	6
CHOU, SHENGFANG	2016	1	51	5.1
AL-ROMEEDY, BASSAM SAMIR	2025	3	5	5
HALL, C. MICHAEL	2016	1	50	5
BONILLA-PRIEGO, MARÍA JESÚS	2019	1	34	4.857
FONT, XAVIER	2019	1	34	4.857
GUIX, MIREIA	2019	1	34	4.857
IVANOVIĆ, VELIBOR	2022	1	18	4.5
KALENJUK PIVARSKI, BOJANA M.	2022	1	18	4.5
LIMA SANTOS, LUÍS	2024	1	9	4.5
TEŠANOVIĆ, DRAGAN VELJKO	2022	1	18	4.5
LIMA SANTOS, LUÍS	2021	2	22	4.4
FILIMONAU, VIACHASLAU	2025	3	4	4
SHERENI, NGONI COURAGE	2019	1	25	3.571
FILIMONAU, VIACHASLAU	2024	1	7	3.5
AZZAZ, ALAA M.S.	2025	1	3	3
CHOU, SHENGFANG	2024	1	6	3
ELSHAER, IBRAHIM A.	2025	1	3	3
FAYYAD, SAMEH	2025	1	3	3
GIL-SAURA, IRENE	2024	1	6	3
GUIX, MIREIA	2024	1	5	2.5
HAN, HEESUP	2025	1	2	2
IVANOVIĆ, VELIBOR	2024	1	4	2
IVANOVIĆ, VELIBOR	2025	2	2	2
KALENJUK PIVARSKI, BOJANA M.	2024	1	4	2
KALENJUK PIVARSKI, BOJANA M.	2025	2	2	2
NICOLAIDES, ANGELO C.	2019	1	14	2
SHERENI, NGONI COURAGE	2022	1	8	2
TEŠANOVIĆ, DRAGAN VELJKO	2024	1	4	2
TEŠANOVIĆ, DRAGAN VELJKO	2025	2	2	2
AGINA, MOHAMED FATHY	2022	1	7	1.75
GIL-SAURA, IRENE	2010	1	26	1.625
GIL-SAURA, IRENE	2021	1	8	1.6

FUCHS, KEVIN	2024	1	3	1.5
FUCHS, KEVIN	2021	1	7	1.4
FUCHS, KEVIN	2023	1	4	1.333
CHOU, SHENGFANG	2023	1	3	1
GIL-SAURA, IRENE	2023	1	3	1
KHAIRY, HAZEM AHMED	2025	4	1	1
LIMA SANTOS, LUÍS	2025	1	1	1
BONILLA-PRIEGO, MARÍA JESÚS	2017	1	8	0.889
DUARTE ALONSO, ABEL	2011	1	10	0.667
NICOLAIDES, ANGELO C.	2020	1	4	0.667
GIL-SAURA, IRENE	2012	1	8	0.571
SHERENI, NGONI COURAGE	2024	1	1	0.5
AGINA, MOHAMED FATHY	2025	2	0	0
FUCHS, KEVIN	2025	2	0	0
GAJIĆ, TAMARA	2025	2	0	0
HALL, C. MICHAEL	2025	1	0	0
SEYFI, SIAMAK	2025	2	0	0
VO-THANH, TAN	2025	1	0	0
	2007	1	0	0
	2012	1	0	0
	2013	1	0	0
	2021	1	0	0
	2024	1	0	0
	2025	1	0	0

Figure 7 : Author Productivity through Lotka's Law

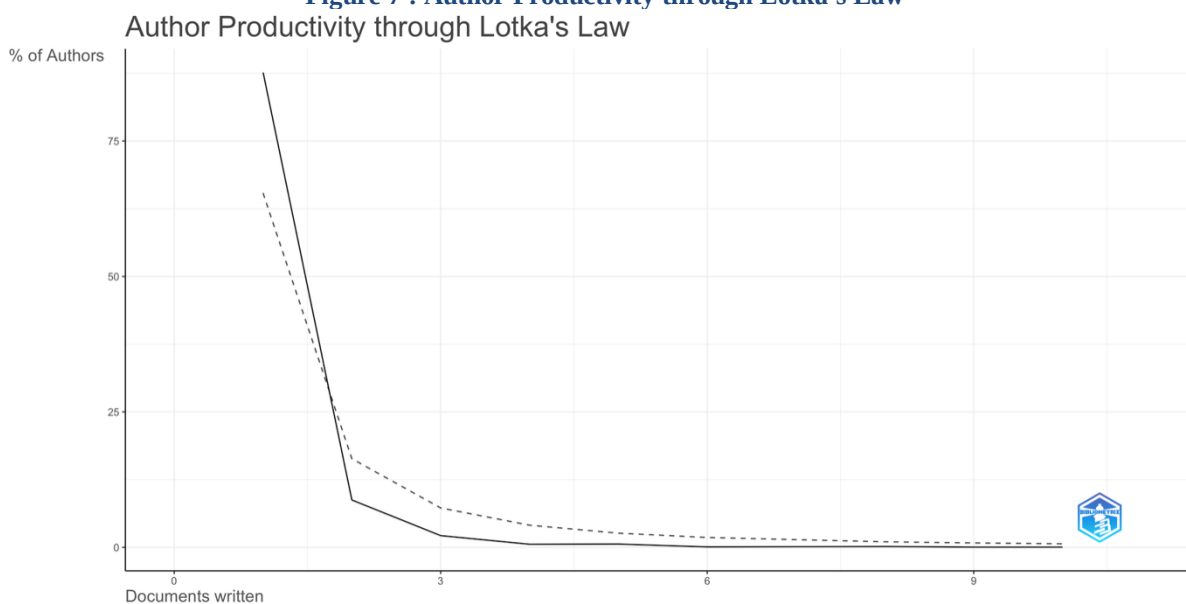


Table 3 : Lotka's Law

Documents written	N. of Authors	Proportion of Authors	Theoretical
1	2317	0.876	0.654
2	231	0.087	0.163
3	57	0.022	0.073
4	15	0.006	0.041
5	16	0.006	0.026
6	2	0.001	0.018
8	4	0.002	0.01
9	1	0	0.008
10	1	0	0.007

Scope and inputs

Authors' production over time and Lotka's Law of the hospital- ity-sustainability domain This note presents a narrow understanding of two Biblioshiny outputs: Authors production over time and Lotkas law for the corpus (hospitality-sustainability domain). Visuals show the annual behavior of authors (bubble size = number of publications; shade = citations) and the empirical productivity distribution in comparison with Lotka's theoretical inverse-square law.

Key findings :

- Temporal concentration with late surge : For most authors of focus contributions start from ~2018 and become visible during 2021–2025. Bubbles tend to accumulate in 2023–2025 for a few names (e.g., Han; Font; Guix; Gajić; Elshaer; Duarte Alonso), indicating that the cohort effect is recent and there exists an enhancement of contributions. This matches with growth in the field as evidenced in annual-production series (published separately).
- Stability of core contributors : Long and horizontally arranged spans for a low number of authors reflect prolonged multiyear presence, whereas darker bubbles within a few years hint at bursts in outputs with high citation (e.g., 2020/2023). This trajectory is similar to that observed in maturing disciplines whereby multiple teams progressively develop a common agenda through theory testing and context expansion.
- Large inequality in productivity (the Lotka fit) : The Lotka plot indicates 85–90% of authors with one paper,

8–10% with two, and an extremely thin tail after three papers. The empirical curve lies above the theoretical line at size 1 and below it in the tail, which suggests a n degree of concentration of authorship that would be expected under Lotka's ideal (i.e., less nucleus comprising an unfair share of documents). This justifies employing fractionalised indicators and presenting medianas well as mean productivity/impact.

Implications

- Science-mapping reliability -A critical mass of repeat authors is available, making sound co-authorship and coupling analyses possible; however, recency bias must be considered (works after 2021 feature shorter citation windows).
- Strategic placement: Cooperation with the nucleus authors/teams (the permanent 2018–2025 contributors) should receive a higher visibility; bridge building to operational or organizational niches is an effective way of distinguishing contributions.
- Practice of evaluation: Use age-standardized citation rates and top-percentile presence rather than raw averages; indicate Author Dominance Factor (ADF) and Collaboration Index to clarify leadership from participation.

Limitations to disclose

Insufficient or missing metadata for corresponding authors/categories in the master file (see earlier note) restrict fine-grained leadership and field-normalized analyses; recent-year citation indicators are preliminary.

Figure 8 Most Frequent Words

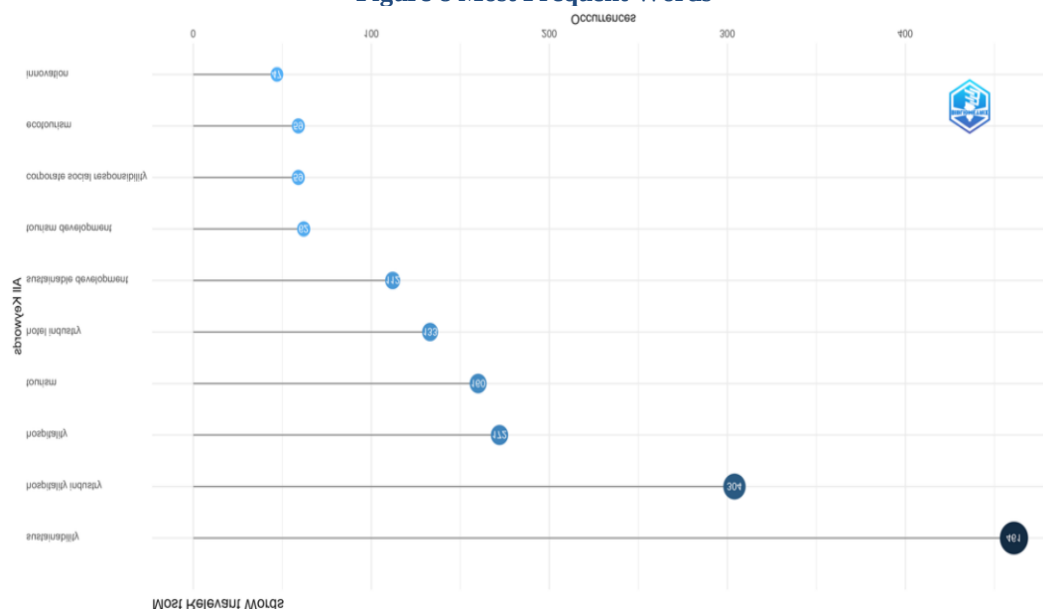


Figure 9 Word Cloud



Table 4 : Keywords

Terms	Frequency
sustainability	461
hospitality industry	304
hospitality	172
tourism	160
hotel industry	133
sustainable development	112
tourism development	62
corporate social responsibility	59
ecotourism	59
innovation	47
hotels	46
covid-19	44
environmental sustainability	40
food waste	38
perception	38
marketing	36
sustainable tourism	35
waste management	34
leadership	31
stakeholder	29
tourist destination	27
environmental management	26
hotel	26
tourism management	25
environmental economics	24
environmental impact	24
service quality	24
business development	23
consumption behavior	22
green hotels	22
questionnaire survey	22
circular economy	21
climate change	21
management practice	21
decision making	20
literature review	20
green economy	19
resource management	18

strategic approach	18
hospital sector	17
human	17
human resource	17
sustainable development goals	17
tourist behavior	17
artificial intelligence	16
empirical analysis	15
environment	15
knowledge	15
public attitude	15
spain	15

The distribution of keywords reveals a very strong concentration of the conceptual core in sustainability (n = 461) with in b49hospitality industry_’ (n = 304), as well as with its sectoral subsets, hospitality’ (n = 172, tourism’ (n = 160) and hotel industry’(n =133). We then find that agenda-framing level is found in sustainable development (n = 112) with managerial and also destination lens from tourism development, corporate social responsibility, ecotourism (each ≈ 59–62), and innovation (n = 47). Combined, these findings suggest sustainability research in this pool is rooted within hotel/hospitality operations and guest-destination environments, with CSR and innovation as subordinate (potential niche) thematic threads.

Summary of high-frequency terms

Conceptual center of the corpus is undeniably sustainability (n = 461), apparently linked with hospitality business (n = 304) and industry (generic) hospitality (n = 172) and tourism more generally speaking (n = 160) according to keywords provided by authors. An even stronger sector is the hotel industry (n = 133). Policy/agenda language is visible through sustainable development (n = 112). The primarily such neighbouring managerial/strategic lenses— tourism

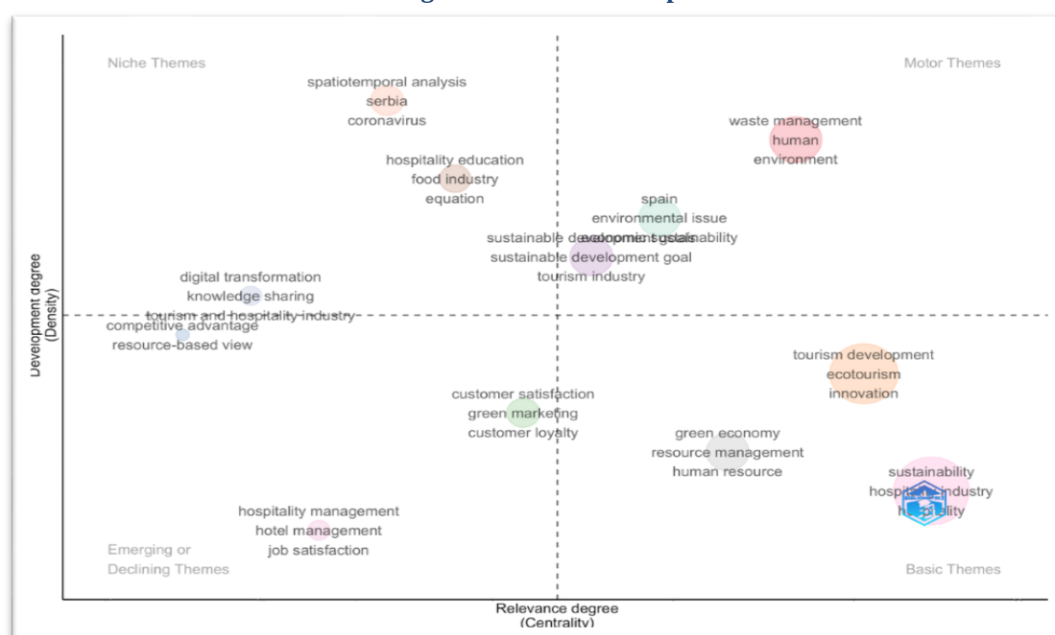
development (n = 62), corporate social responsibility (n = 59), ecotourism (n = 59) and innovation (47)—are the most commonly secondary terms.

Academic interpretation

Conceptual nucleus. This is supported by the frequency profile and word cloud that reflect a domain–theme fit, such that sustainability is predominantly researched in hospitality/hotels and tourism as opposed to general, multi-industry corporations. This positioning is adopted to underscore that measurement, theorization, and managerial implications are rooted in the context of service operations, guest behavior, and destination management.

From agenda to operationalization. The appearance of “sustainable development” in shifting to sector categorization may thus indicate that the literature often heavily constructs a sustainability narrative around policy/SDG narratives while CSR and innovation point towards the intermediate mechanisms (i.e., green practices, governance, product/process change). Ecotourism, and tourism development are destination-level lenses, unlike hotel industry (firm-level).

Figure 10 Thematic Map



The theme map illustrates motor themes concerning waste management and the environment which is evidence of a well-established, inter-connected research stream of operational sustainability in the hospitality industry. Fundamental themes—such as the large sustainability–hospitality cluster and the tourism development/ecotourism/innovation triad—are dominant, but also relatively disparate in nature, indicating a potential for theoretical integration. niche themes (e.g., spatiotemporal analysis, country-level contexts and applications: hospitality education/food industry) are method-/context-bound, while emergent/disappearing themes (e.g., hotel management, job satisfaction and capability lenses such as digital transformation and RBV) emerge as peripheral but provide avenues to reposition managerial constructs into sustainability-enabling capabilities.

Sustainability in hospitality is the field’s hub: from this central cluster of words, by far the biggest and concentrated central node connects “sustainability”, “hospitality industry” and “hospitality” with heterogeneous and less than consolidated academic discussions. Motor themes represented at the operational frontier waste management, environment and people are also central and unified around a mature line of research where hotels and tourism companies connect sustainability to concrete environmental practices (e.g : reduction, resource efficiency) as well as human consequences (employee/guest behaviours). Surrounding these core, basic themes are more fragmented, albeit still networked to the field but with

looser density (e.g., tourism development, eco-tourism, innovation, green economy, resource management and human resource), not least indicating the potential for tightening theory (e.g., capability–performance pathways that mediate by customer experience and willingness to pay).

Niche topics are loosely connected to the core of field and both methods- (e.g., spatiotemporal analysis) or context- (spatiotemporal analysis, country-restricted topic; e.g., Spain, Serbia), corona virus/COVID- 19, hospitality education” and “food industry. Emerging/Declining themes – Hospitality management, hotel management, job satisfaction and capability lenses regarding digital transformation, knowledge sharing, competitive advantage and the resource-based view – emerge as low on both centrality and density dimensions and may reflect legacy themes not yet re-framed through a sustainability lens or emerging streams of capabilities requiring assimilation. Taken together, the map presents an area where sustainability can be seen as credibly operationalised in hotel/tourism contexts, but with future payoffs to emerge from (i) connecting operations to market performances such as customer satisfaction/loyalty/WTP and (ii) ratcheting up capabilities (digital/knowledge/RBV-based) as mediations enabling sustainability-relevant performance outcomes and, all else equal (iii) generalizing beyond largely site- or place-specific niche insights with matching metrics that enable comparability across cases.

Figure 11 : World Map

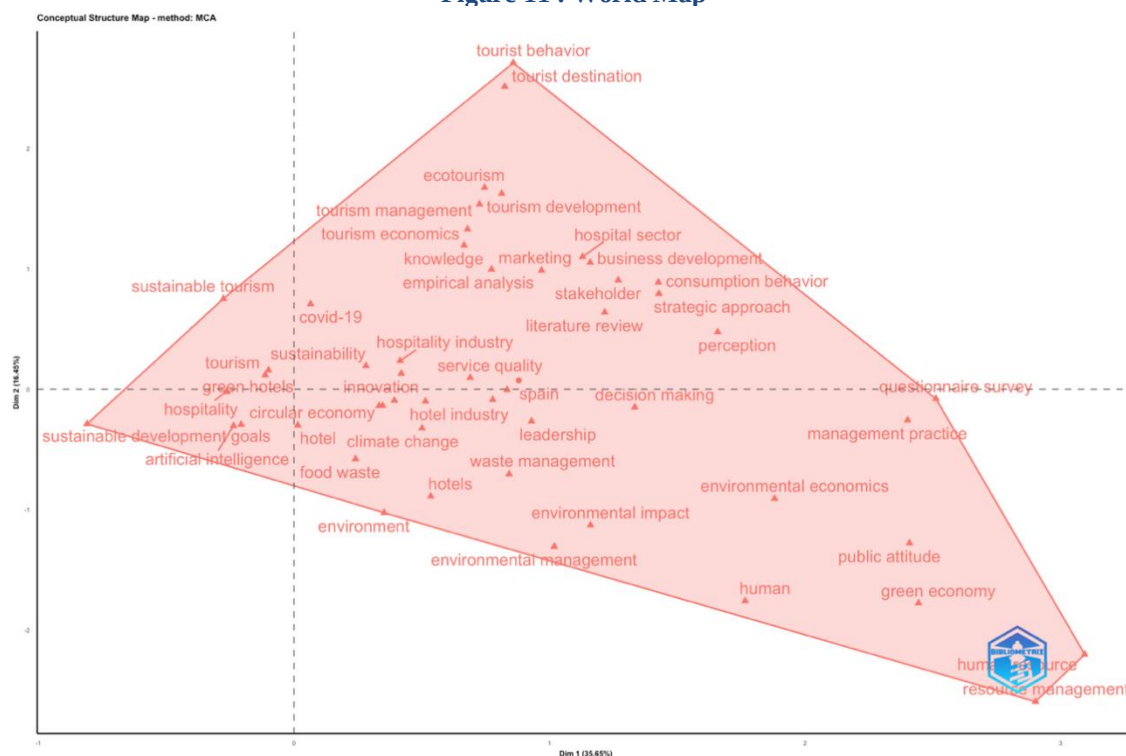


Figure 12 : Hierarchical clustering dendrogram

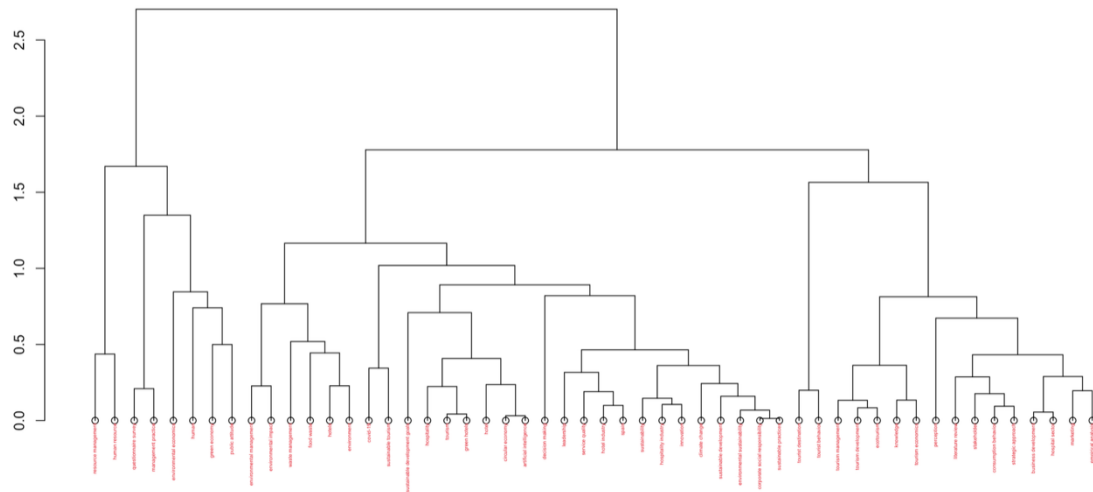


Table 7 Word Mapping

word	Dim1	Dim2	cluster
sustainability	0.28	0.20	1
hospitality industry	0.42	0.24	1
hospitality	-0.26	-0.02	1
tourism	-0.10	0.16	1
hotel industry	0.78	-0.09	1
sustainable development	0.51	-0.10	1
tourism development	0.81	1.63	1
corporate social responsibility	0.33	-0.14	1
ecotourism	0.75	1.68	1
innovation	0.42	0.13	1
hotels	0.53	-0.89	1
covid-19	0.07	0.71	1
environmental sustainability	0.39	-0.09	1
food waste	0.24	-0.58	1
perception	1.66	0.48	1
marketing	0.97	0.99	1
sustainable tourism	-0.28	0.75	1
waste management	0.84	-0.70	1
leadership	0.93	-0.27	1
stakeholder	1.27	0.91	1
tourist destination	0.82	2.52	1
environmental management	1.02	-1.31	1
hotel	0.01	-0.30	1
tourism management	0.73	1.54	1
environmental economics	1.88	-0.91	1
environmental impact	1.16	-1.13	1
service quality	0.69	0.10	1
business development	1.16	1.05	1
consumption behavior	1.43	0.89	1
green hotels	-0.11	0.12	1
questionnaire survey	2.51	-0.08	1
circular economy	-0.21	-0.29	1
climate change	0.50	-0.32	1
management practice	2.40	-0.26	1
decision making	1.33	-0.15	1
literature review	1.22	0.64	1
green economy	2.44	-1.78	1

resource management	2.90	-2.60	1
strategic approach	1.43	0.79	1
hospital sector	1.13	1.10	1
human	1.76	-1.76	1
human resource	3.09	-2.20	1
sustainable development goals	-0.81	-0.29	1
tourist behavior	0.86	2.71	1
artificial intelligence	-0.24	-0.30	1
empirical analysis	0.77	1.00	1
environment	0.35	-1.03	1
knowledge	0.67	1.20	1
public attitude	2.41	-1.28	1
spain	0.83	0.00	1
sustainable practices	0.35	-0.14	1
tourism economics	0.68	1.33	1

The hierarchical dendrogram of author keywords shows a cohesive group of thematic constellations agglomerating at loose linkage distances, which reflects focused co-occurrence within sub-domains. A central grouping combines waste mgt/food waste–environmental services (mgt) – enviro impact, reflecting the underlying operational reality of sustainability in hotels. A second cluster involves hospitality/hotel/hospital sector and service quality/leadership/innovation, which suggests an organizational–service performance linkage. A third cluster combined: tourism development/ecotourism/tourism management/economics indicating destination level governance and market development issues. A second cluster includes management practice/decision making/perception/stakeholder/consumption behavior, fitting with behavioral-informed managerial decision studies. Finally, a policy/capability cluster ties sustainable development/SDGs–circular economy–artificial intelligence/green hotels linking emergent capability and technology lenses with agenda terms.

These structures seem to be supported by the MCA conceptual map: words of each LL subject clearly lie along two interpretable dimensions. Dim-1 ($\approx 36\%$ inertia) embraces from the organizational/resource (human resource, resource management, green economy, public attitude) to the behavioural-market outcomes (tourist behavior, tourist destination, consumption behaviour) and Dim-2 ($\approx 16\%$ inertia), distances operational–environmental affairs (environmental management/impact, waste management, climate change) versus method/strategy and destination governance (questionnaire survey; management practice; tourism management/economics; strategic approach). The cloud in the middle—sustainability, hospitality industry, hotel industry, service quality, innovation—is the field’s integrative hub and AI and circular economy satellites with sustainable development goals are a representative set of capability-oriented agenda extension. Implications.

These structures suggest (i) a mature operations–environment stream, which may now be linked causally

to market outcomes (guest satisfaction, loyalty, WTP); (ii) opportunities to upgrade capabilities from peripheral to core via an embedding into sustainable performance models focusing on digitally-intensive practices/AI practices circular economy strategies and green HRM; and; (iii) potential to connect destination governance with firm-level operations through multi-level designs. For reporting, name clusters according to their main terms, specify MCA inertia shares and axes interpretations; mention emerging capability terms are in line with SDGs to motivate the paper contribution.

4. Discussion

Overall, the field is **mature in operations–environment** and **broad but fragmented in the central sustainability–hospitality basin**. Mature streams have standardized constructs and measures (e.g., TPB variables; SEM models; operational KPIs), enabling cumulative testing; the next gains lie in **causal linkage from practices to market outcomes** (customer satisfaction, loyalty, willingness to pay). The author ecosystem is concentrated, which helps comparability but risks path dependence; incentives should encourage cross-team replication, parameter sensitivity checks (e.g., network normalizations; keyword thresholds), and multi-method designs that triangulate behavioral models with operational and financial data.

5. Practical and scholarly implications

1. **Capabilities as mechanisms.** Elevate *digital transformation, circular economy, and green HRM* from peripheral to central by modeling them as **capability antecedents** that enable waste reduction and environmental performance, which then translate into guest outcomes and pricing power (e.g., green price premiums).
2. **Design for comparability.** Harmonize vocabularies (singular/plural, synonyms, hyphenation) and standardize KPIs (waste/energy/water per occupied room; certification indices) to improve cross-study synthesis.
3. **Bridge levels.** Combine **destination governance** (policy/SDGs) with **firm-level operations** via multi-level models to identify when and how destination policies create organizational capabilities and market value.

4. **Impact metrics.** Report **age-normalized** and **percentile-based** indicators (citations per year, top-10% share) and **medians** alongside means to counter skew and recency effects in fast-growing literatures.
5. Limitations and delimitations

Analyses rely on Author Keywords due to high missingness in **Keywords Plus**, with incomplete **corresponding author** and **category** metadata. Recent cohorts (2023–2025) have short citation windows; their citation indicators are provisional. These constraints are disclosed and mitigated by focusing on robust structures (growth, co-word, clustering, and MCA) and by avoiding category-normalized comparisons.

7. Future research agenda

- **From operations to price & loyalty:** Quasi-experimental or panel studies linking waste/energy programs to guest ratings, repeat stay, and WTP.
- **Capabilities and mediation:** Test models where digital/AI, circular economy, and green HRM act as **capabilities** mediating the effect of policy/SDG pressures on operational performance and market outcomes.
- **Temporal and spatial dynamics:** Apply spatiotemporal and network methods to trace material/energy/waste flows across hotel ecosystems and destinations.
- **Replication and sensitivity:** Encourage cross-context replication and report sensitivity to normalizations (e.g., association strength vs. Salton) and thresholds (min edges, min frequency).

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