

Carbon Footprint Labels in Food and Hospitality Research: A Bibliometric Analysis

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Abstract

The use of carbon footprint labeling has increased significantly in terms of sustainability communication, however, there is a notable lack of a review of the literature focusing exclusively on food products, menus, and hospitality services. This study uses the Web of Science (WoS) Core Collection to gather data from a total of 183 publications in English published from 1985 to 2025 and have included a specific search term related to carbon footprint and climate label in food and hospitality context. In addition to descriptive analyses, this study includes relational analyses using VOSviewer to examine the nature of researcher collaboration networks, the existence of thematic clusters in the field, and the field's overall structural organization. The results indicate a significant increase in both the number of publications and of citations in publications since 2018. A significant portion of research output related to carbon footprint labeling in the food and hospitality sector is published in journals such as Sustainability, Journal of Cleaner Production, Food Policy, and International Journal of Hospitality Management. Regarding geographical distribution, the United Kingdom, China, and other European countries emerge as the leading contributors to the field. A total of six major themes were identified through both co-word and thematic analyses. Overall, the review indicates that the research area of carbon footprint labeling in food and hospitality has transitioned into a highly interdisciplinary and collaborative research environment, yet it continues to demonstrate a degree of fragmentation and several underexplored areas. The study provides several theoretical and practical implications for the development of carbon footprint labeling in consumer-facing hospitality environments and identifies possible further research avenues.

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INTRODUCTION

Bibliometric analysis has become increasingly common with the growth in academic publications and the wider use of scientific databases. With large databases such as Web of Science (WoS) and Scopus, researchers can reach many studies simultaneously and evaluate them more systematically (Ellegaard & Wallin, 2015; Zupic & Čater, 2015). In this way, it is possible to see how a field develops, which topics are being studied, and how the relations between authors and institutions change over time. Bibliometric analysis does not replace traditional literature review, but it provides an additional quantitative point of view that supports it. In this regard, it can be stated that bibliometric methods help researchers to obtain a general picture of the structure and development of a discipline and to make more consistent inferences about the literature (Donthu et al., 2021).

The use of bibliometric techniques has spread to many different research areas in the literature. In education, for example, they have been used to examine the growth of pedagogical research and to show long term change in publication patterns (Diem & Wolter, 2013). In economics and management, citation maps, journal influence and changes in theoretical approaches have been analyzed by bibliometric methods (Ramos-Rodríguez & Ruiz-Navarro, 2004; Claveau & Gingras, 2016). In marketing and communication fields, these methods are especially employed to identify new themes such as digitalization and changes in consumer behavior (Samiee & Chabowski, 2012; Martínez-López et al., 2018; Reeves & Borgman, 1983). In health sciences, bibliometric analysis is used to reveal international collaboration networks and to determine how key publications affect practice and policy (Clarke et al., 2007). More recently, bibliometric approaches have been applied to sustainability-oriented topics such as corporate social responsibility, environmental management and eco-labeling, and these studies show that bibliometric analysis is also useful in examining interdisciplinary research areas (Nobanee et al., 2021).

Tourism and hospitality literature has also increasingly benefited from bibliometric analyses in recent years, in order to map how research fields develop and to identify the main themes, authors and journals. Previous studies have focused on different sub-areas such as wine tourism (Sánchez et al., 2017), sustainable tourism (Ruhanen et al., 2015; Niñerola et al., 2019), gastronomy and food tourism (Okumus et al., 2018; Bayram & Arıcı, 2021), sport tourism (Mesci et al., 2021), electronic word-of-mouth (Litvin et al., 2008) and innovation in hospitality (Işık et al., 2022). These studies show that bibliometric techniques can be used effectively to obtain a comprehensive picture of publication trends, cooperation networks and thematic concentrations in fields where research is rapidly expanding and diversifying. The variety of topics and methods in these works indicates that bibliometric tools are flexible and suitable for examining the intellectual structure of complex and interdisciplinary research areas such as tourism and hospitality.

Parallel to the above-mentioned developments, research on carbon footprint labeling has grown significantly in recent years in the food and hospitality sectors. Carbon footprint labels, also known as carbon labels, climate labels or CO₂ labels, are designed to report the amount of greenhouse gases emitted due to the production, processing, transportation, and consumption of a product or service (Taufique et al., 2016). The first labeling scheme was launched in 2006 by the UK's Carbon Trust and since, the concept has spread to other countries including France, Switzerland and Japan (Brécard, 2014). In the past, different aspects of this phenomenon have been studied, for example, the use of front-of-pack labeling to inform consumers during the purchasing process (Hartikainen et al., 2014) and the effects of menu labeling on consumers' decisions when eating out (Camilleri et al., 2019). In addition,

studies using life cycle assessments (LCAs) have focused on ensuring the accuracy of reported emissions (Brunner et al. 2018; Lenk et al., 2025).

Finally, research in the hospitality and tourism sector has increasingly extended to hotels, catering services, and travel products, focusing on the effectiveness of sustainability communication. For instance, Rondoni and Grasso (2021) emphasized that carbon footprint labels (CFLs) on food products significantly influence consumer attitudes, although their success depends heavily on label design. In the context of restaurants, Pulkkinen et al. (2016) developed the Climate Choice concept to demonstrate how eco-design tools can help operators create and communicate low-carbon meal options. Beyond food services, research has also addressed the broader tourism industry; Gössling and Buckley (2016) analyzed various carbon label schemes in travel products and accommodation, noting that while these labels hold potential for climate change mitigation, their effectiveness is often limited by consumers' difficulty in understanding technical information and a lack of trust in the labels' reliability. Furthermore, the practical impact of these labels remains a subject of debate; Babakhani et al. (2020) found that while carbon labels provide vital information on restaurant menus, guests' actual attention to them during the ordering process can be limited. Specifically, Godovykh et al. (2024) and Taufique et al. (2022) examined how carbon footprint labeling influences guests' preferences and how the hospitality sector incorporates these labels into sustainability strategies. Nevertheless, despite these efforts, the literature remains fragmented, as studies are scattered among various disciplines and types of publication outlets. Building on these individual empirical studies, the present bibliometric analysis aims to map the overall intellectual structure of the field and identify emerging trends in carbon labeling research.

Previous reviews have carried out either qualitative assessments (Taufique et al., 2022), narrative overviews (Rondoni & Grosso, 2021), or broad bibliometric summaries of several sectors (Zhao et al., 2020). To date, despite an increasing volume of research and empirical studies, there is no review that carries out a systematic bibliometric analysis specifically focused on carbon footprint labeling in food and hospitality. This is surprising, as carbon footprint labeling has a high level of relevance for policies and consumer interests. A bibliometric summary of the literature will enable a compilation of the results of the existing research, the evaluation of the progression of research topics, and the identification of major contributors and gaps in the literature. This gap is especially relevant at present because both the food systems and the tourism/hospitality sectors are subject to increasing pressures to reduce their own carbon footprints and to increase transparency in this area.

Consequently, the current research seeks to provide an overall bibliometric analysis on the Web of Science (WoS) indexed publications related to carbon footprint labeling for food and hospitality. By scrutinising publication trends, leading contributors, co-operation networks, thematic clusters and citation performance, the research sets out to improve theoretical understanding and practical implementation of carbon labelling. The findings have the potential to guide the work of scholars interested in engaging with this field of study and provide insights for practitioners and policy makers working to make carbon footprint information actionable and consumer focused.

In accordance with these objectives, the research questions to be used in this study are:

1. What is the distribution in year and journal of carbon footprint labelling studies?
2. Which authors, institutions and countries make the largest contributions to this field?
3. What are the collaboration patterns between authors & countries?
4. Which publications have the highest citation numbers?
5. What are the common keywords and themes, how have these changed over time?
6. Into which categories can the research in carbon footprint labeling for food and hospitality fall?

Literature Review

Bibliometric research has a long history as a systematic activity for mapping the intellectual evolution of knowledge in fields of study. The beginnings of quantitative literature study can be traced as being in the late nineteenth century (Gross & Gross, 1927). Pritchard (1969) was responsible for formally coining the term “bibliometrics” to replace the term “statistical bibliography”, which he defined as the application of quantitative methodologies to written communication. Broadus (1987) stated that bibliometrics is the quantitative study of published units or their proxies, while Fairthorne (2005) emphasized that it is more concerned with the measurable characteristics of documented discourse. These delineations collectively portray bibliometrics as both an object of study and an idea for the sifting of knowledge production. Garfield (1972), with the development of the Science Citation Index, further institutionalized citation analysis as a mechanism for tracking influence within the sciences. Osareh (1996) later provided one of the most comprehensive overviews of the bibliometric methods, involving the synthesis of evaluative and relational approaches. Collectively, this historic movement highlights bibliometrics as a new interdisciplinary method which can be employed in both scientific and applied sectors (Wallin, 2005; Ellegaard & Wallin, 2015).

Bibliometric techniques are generally categorized as evaluative and relational techniques. Evaluative methods, such as publication and citation counts, measure productivity and influence, whilst relational methods reveal and bring understanding of intellectual and social structures via analyzing methodology on connections among publications, or on authors or on concepts (Zupic & Čater, 2015). The most commonly used relational methods are citation analysis, co-citation analysis, co-authorship analysis, co-word analysis, and bibliographic coupling, each of which brings a different perspective on the knowledge architecture of a field.

Carbon Footprint Labelling and Food and Hospitality Research

In parallel with changes in methodologies, carbon footprint labelling (CFL) has become an important topic of sustainability particularly in the food and hospitality industries. Carbon labels, sometimes also called climate labels, CO₂ labels, or GHG labels, provide information on the emissions linked to a product or service (Wiedmann & Minx, 2007; Hornibrook et al., 2015). Conceptually, the foundation of CFL research is built upon several key pillars, starting with the typology of labels. Carbon Trust, in the United Kingdom, launched the first corporate carbon label in 2006 and thereby took the initial step towards similar efforts in France, Switzerland, and Japan (Brécard, 2014). These typologies range from specific numerical CO₂e values to simplified comparative formats, designed to enhance awareness and reward emission reductions.

The second pillar involves consumer perception and the cognitive challenges associated with environmental information. Consumer studies of awareness vary on degrees of understanding. Hartikainen et al. (2014) found that Finnish consumers showed interest in carbon labels but had difficulties understanding them, favoring simplified formats. Taufique et al. (2016) identified trust, environmental knowledge, and personal values as key factors in willingness to pay. However, Brécard (2014) warned that an excessive number of labels could create confusion, highlighting a critical barrier in consumer perception.

Building on perception, behavioral aspects of CFL demonstrate the practical impact of these tools. Behavioral studies indicate modest but significant effects; for instance, traffic light labels nudge cafeteria patrons (Brunner et al., 2018) and supermarket shoppers (Lenk et al., 2025) towards low-emission choices. Camilleri et al. (2019) showed that labels help correct the underestimation of food emissions, confirming their role in behavioral modification.

The fourth pillar addresses industry adoption challenges and the distinct differences between food retail and hospitality settings. Within hospitality, Gössling and Buckley (2016) argued that poorly designed labels often fail in service contexts, suggesting that simplified, color-coded designs are more effective than retail-style metrics. Godovykh et al. (2024) further found that eco-labels positively influence hotel guests' intentions, though the complexity of service-based footprinting remains a hurdle.

Finally, recent reviews emphasize the policy implications and the need for intersectional integration. Liu et al. (2016) surveyed global schemes, while Rondoni and Grasso (2021) and Zhao et al. (2020) identified gaps in sector-specific synthesis. Taufique et al. (2022) called for trajectory integration to resolve semantic ambiguity, and Nowak et al. (2024) demonstrated through action research in restaurants that small changes can lead to incremental-reduced emissions under supportive policy environments.

As the literature has grown, research has become fragmented across marketing, environmental science, and psychology. To date, there has been no specific bibliometric analysis focusing on the intellectual structure of CFL in food and hospitality. Addressing this gap is vital, as these high-emission sectors are where consumers directly encounter sustainability information. By applying bibliometric techniques, this study provides a comprehensive overview of publication patterns, intellectual clusters, and thematic developments in this critical field.

Methodology

The present study used bibliometric methods to give an overview of publications dealing with carbon footprint label in the food and hospitality sectors. Bibliometric analysis is a popular method for measuring the structure, productivity, and intellectual growth of academic research (Zupic & Čater, 2015). In the absence of consensus about the most appropriate tools, both evaluative and relationship techniques were used, in compliance with the established bibliometric guidelines (Donthu et al., 2021; Ülker et al., 2023). Evaluative techniques, including citation counts and author or journal productivity, provide a crude measure of research activity over the years, journals, authors, institutions, and citation frequency (Aydin et al., 2022). Relational techniques, which include co-word, co-authorship and co-citation analysis, examine the interconnections between authors, affiliations, keywords and references, helping to understand the intellectual and thematic structure of a field (Pasko et al., 2021). By combining such techniques, the aim of this research is to provide a clear and detailed mapping of carbon-footprint labelling research in the food and hospitality sectors.

Bibliometric Techniques and Analytical Framework

In order to ensure methodological transparency, each research question (RQ) posed in this study is addressed through a specific bibliometric technique. Specifically, RQ1 (publication and citation trends) is addressed through descriptive citation analysis; RQ2 and RQ3 (influential actors and collaborations) are explored via citation, co-citation, and co-authorship analysis; while RQ4 and RQ5 (thematic structure and emerging hotspots) are answered using co-word analysis and bibliographic coupling. The mapping of these research questions to their corresponding bibliometric techniques is summarized in Table 1.

Table 1. Alignment of Research Questions and Bibliometric Techniques

Research Question (RQ)	Bibliometric Technique	Analytical Focus
RQ1: Evolution of publications/citations	Descriptive Citation Analysis	Productivity and Growth Trends
RQ2: Influential journals and authors	Citation & Co-citation Analysis	Intellectual Influence
RQ3: Collaboration patterns	Co-authorship Analysis	Social Networks & Partnerships
RQ4: Thematic structure of the field	Co-word Analysis	Conceptual Framework & Clusters
RQ5: Emerging research hotspots	Bibliographic Coupling	Recent Thematic Convergences

Citation Analysis

Citation analysis measures how often a publication, author or journal has been cited in other works (Garfield, 1972), based on the assumption that a higher citation count indicates greater intellectual influence. Benckendorff and Zehrer (2013) observe that citation analysis is the simplest but most effective bibliometric tool and helps to identify important contributions that steer the course of scholarly careers. Within the tourism and hospitality realm, Sheldon (1991) used citations measures to identify the most prolific researchers and journals, while Law et al. (2009) used them to identify core journals and authors driving the digital tourism research agenda. More recently, Okumus et al. (2023) utilized citation metrics to assess the evolution and scholarly influence of gastronomy and hospitality literature over the past two decades, and Correia et al. (2024) employed them to identify influential research clusters specifically within hospitality management. Furthermore, McKercher and Tung (2014) used articles from tourism, hospitality and events journals to highlight the unequal distribution of tourism journal citations across subfields. Such analyses give insights into the literature and its crossing of disciplines.

Co-citation Analysis

Co-citation analysis, introduced by Small (1973), measures the frequency with which two items are cited together in subsequent works. White and Griffith (1981) expanded this methodology to author co-citation, which thus allowed for the mapping of a discipline's structure by clustering scholars cited frequently together. In terms of tourism and hospitality, the usefulness of co-citation has been illustrated by Benckendorff and Zehrer (2013), who identified seminal figures or intellectual anchors such as Cohen and Urry. Ruhanen et al. (2015) used co-citation analysis in their 25-year review of sustainable tourism, showing how the themes have moved from environmental management to governance and climate change. More recently, domain-specific applications of co-citation mapping have further enhanced our understanding of the field's intellectual evolution. For instance, Boyacıoğlu and Elmas (2022) used this technique to analyze the nexus between tourism and economics, while Gurlek and Koseoglu (2023) utilized co-citation analysis to identify the foundational theories and intellectual anchors that continue to shape strategic management research within the hospitality domain. Co-citation analysis not only reveals the clusters of themes, but also helps to make the hidden colleges of scholars whose works form the backbone of the evolving paradigms visible.

Co-authorship Analysis

Co-authorship analysis identifies cooperative patterns between researchers, or institutions, or countries (Glänzel, 2003). By connecting co-written papers, it unmaskes the social networks that support the production of knowledge. In the context of tourism, early co-authorship studies by Palmer et al. (2005) and Evren and Kozak (2014) highlighted the increasing internationalization and institutional partnerships within the field. In the hospitality domain, Okumus and Koseoglu (2018) provided a comprehensive review of collaborations, revealing that Anglo-American and Asian institutions dominated the global research output. Building on these foundations, more recent studies have further explored the complexity of these networks; for instance, Shin and Perdue (2022) utilized co-authorship mapping to analyze a decade of hospitality and tourism innovation research, identifying a significant disconnect between hospitality and broader service management literatures. Furthermore, Wider et al. (2023) applied these metrics to unveil the collaborative structures in digital tourism, while Suban (2023) demonstrated how co-authorship analysis can identify leading hubs in emerging sectors like wellness tourism. These contemporary examples, alongside the findings of Leung et al. (2017) and Işık et al. (2022), underscore the continued relevance of co-authorship analysis in monitoring the density, geography, and thematic maturation of scholarly cooperation.

Co-word Analysis

Co-word analysis is based on seminal work of Callon et al. (1983), which examines the co-occurrence of keywords to reveal conceptual relationships and thematic trajectories. In their study, they showed its usefulness in analyzing the evolution of themes across disciplines. In tourism and hospitality research, this approach was used by Palmer et al. (2005) to identify research trends and by Leung et al. (2017) to analyze the social media literature. Their studies identified the clusters around online reviews, destination marketing and consumer engagement. Koseoglu et al. (2016) used co-word analysis to assess the field of gastronomy and culinary tourism, and identify evolving clusters, such as food authenticity, local cuisine and sustainability. Reflecting the ongoing evolution of the field, Wider et al. (2023) recently utilized co-word analysis to unveil trends in digital tourism, identifying predominant clusters such as sustainable digital transformation and smart destination management. Similarly, Xia et al. (2024) employed this method to track the three-decade development of destination competitiveness, while Porancea-Răulea (2025) used keyword co-occurrence to map the interplay between digital feedback and hospitality organizational culture. Co-word mapping is especially suitable for tracking the rise of new research fronts such as sustainability, digitalization, and cultural tourism.

Bibliographic Coupling

Bibliographic coupling was first described by Kessler (1963) as a link between two documents if they share a set of cited references. Unlike co-citation, which requires the accumulation of citations over time, bibliographic coupling can be used on recent publications, thus making it useful for identifying new emerging research clusters (Boyack & Klavans, 2010). Ferreira (2018) used bibliographic coupling to examine knowledge clusters in the field of management research, while Habib and Afzal (2019) applied it to the literature of sustainability. Within the tourism and hospitality context, Litvin et al. (2008) demonstrated the usefulness of this method by organizing the rapidly growing literature on electronic word-of-mouth (e-WOM) to map emerging niches. Subsequently, Niñerola et al. (2019) used bibliographic coupling to define clusters in sustainable tourism, showing that publications converge around topics such as climate change adaptation. Reflecting the most recent research frontier, Harish and Rao (2024)

utilized this approach to map the thematic overlap between biodiversity and sustainable tourism. Similarly, Hanaa and Abdul (2024) employed it to organize the expanding research on augmented reality (AR) in tourism, while Ercan et al. (2025) applied bibliographic coupling to detect the latest thematic convergences in AR-enhanced sustainable tourism experiences. Although this approach is not yet as popular as alternative methodologies, it is becoming recognized as a very sound method to identify early on thematic convergence and emerging hotspots in the field of tourism and hospitality.

In combination, these five techniques provide complimentary views. Citation analysis highlights influential contributions, whereas co-citation reveals intellectual clusters, co-authorship outlines collaboration networks, co-word highlights conceptual themes, and bibliographic coupling encourages information on early-stage linkages. Bibliometric reviews in tourism and hospitality have made use of these methods for subfields of tourism, for example, wine tourism (Sanchez et al., 2017), sustainable tourism (Ruhanen et al., 2015; Niñerola et al., 2019), gastronomy and food tourism (Okumus et al., 2018; Bayram and Arici, 2021), sport tourism (Mesci et al., 2021), and electronic word-of-mouth (Litvin et al., 2008). These investigations demonstrate the versatility of bibliometric approaches in pulling together fragmented literatures and offering comprehensive maps of knowledge structures.

Data Collection and Search Strategy

The research design followed corresponds to the methodology adopted for previous bibliometric reviews studies in tourism, hospitality, and sustainability (Ülker et al., 2023; Aydın et al., 2022). The data used in the study were collected from the Web of Science (WoS) Core Collection as the primary data source, a methodological choice consistent with established bibliometric practices in hospitality and sustainability research (Donthu et al., 2021; Zupic & Čater, 2015). WoS was selected due to its rigorous editorial selection process, structured metadata, and high indexing standards, which facilitate accurate citation analysis and ensure compatibility with bibliometric software such as VOSviewer (Van Eck & Waltman, 2017). While Scopus offers broader journal coverage, particularly for non-English publications, research has demonstrated a high correlation ($R^2 \approx 0.99$) between bibliometric indicators derived from both databases at the macro level, suggesting that results remain largely stable regardless of database selection (Archambault et al., 2009). Furthermore, approximately 80-85% of WoS-indexed journals are also present in Scopus, indicating substantial content overlap (Mongeon & Paul-Hus, 2016). The decision to employ a single database also enhances methodological consistency and comparability with prior bibliometric reviews in tourism and hospitality scholarship, many of which have similarly utilized WoS exclusively (Donthu et al., 2021). Although the exclusion of Scopus may have resulted in a marginally smaller dataset, the WoS Core Collection provides sufficient coverage of high-impact, interdisciplinary publications relevant to carbon footprint labeling research, thereby ensuring the representativeness and validity of the findings presented in this study (Donthu et al., 2021).

WoS has been widely used in previous bibliometric studies in the past for studying research productivity, collaboration networks, and thematic change. For example, it has been used to study the evolution of studies in innovation and sustainability in the hospitality industry (Ülker et al., 2023), publication and citation trends in journals on tourism (Aydın et al., 2022), and thematic mapping of clusters in the sustainability reporting process (Pasko et al., 2021). These precedents confirm that WoS is a reliable and appropriate database for assessing the scientific output regarding carbon footprint labelling, in particular in interdisciplinary areas such as food and hospitality.

The data for this study were collected from the Web of Science (WoS) Core Collection using the Topic Search (TS) field, which includes titles, abstracts, author keywords, and Keyword Plus, ensuring comprehensive coverage of relevant literature (Zupic & Čater, 2015). The search was conducted on 1 September 2025 using the following query:

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TS=("carbon footprint label*" OR "carbon label*" OR "climate label*" OR
" CO2label*" OR "low carbon label*" OR "greenhouse gas label*" OR "GHG label*")
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AND

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TS=(food OR foods OR packag* OR "front-of-pack" OR "front of pack" OR
menu OR restaurant OR "food service" OR foodservice OR hospitality OR catering OR "food retail" OR
supermarket)
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The inclusion of keywords such as “supermarket” and “packag”* was intended to capture the complete consumer interface of carbon labeling, as these terms are intrinsically linked to food retail and hospitality settings where carbon information is primarily communicated (Camilleri et al., 2019; Hartikainen et al., 2014). In order to ensure the reliability and validity of the dataset, a multi-stage manual screening process was performed, consistent with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) 2020 guidelines (Page et al., 2021). Following the initial retrieval, titles and abstracts were independently reviewed by the authors. The inclusion criteria required that a study must focus specifically on carbon or climate-related labeling, and be situated within a food consumption or hospitality context. Consequently, publications focusing strictly on industrial packaging engineering (e.g., material durability), general retail logistics, or broad environmental management without a focused application on carbon labels were manually excluded. This refinement process ensured that the dataset is both comprehensive and highly representative of the food and hospitality domain, minimizing the risk of missing relevant interdisciplinary studies while maintaining high thematic precision.

The search was limited to English-language publications and to articles, reviews and proceedings, consistent with known best practises in bibliometrics (Donthu et al., 2021). Initially, 187 publications were obtained, which was reduced to 183 after the exclusion of non-English studies, removal of documents that fell outside the specified categories and a title-abstract screening for relevance. Moreover, no time limits were imposed; thus, the data set comprises the full range of relevant research released up until the day of the search. Lastly, since this study is a bibliometric analysis based on secondary, publicly available academic data and does not involve human participants, survey methodology, or animal subjects, it did not require institutional ethical clearance.

Data Analysis

Descriptive analyses were done in Excel and using statistical package (SPSS) to calculate the distribution of publication with regarding year, author, journal, institution, country, and citation. For network analyses, VOSviewer was used as it provides clear visualizations for bibliometric maps and has been in use as one of the most commonly used tools for co-authorship, co-citation and co-word analyses (Van Eck & Waltman 2017). VOSviewer offers the possibility to build bibliometric networks and visualized clusters along various dimensions, as well as comparisons between time periods (Ramos-Rodríguez & Ruiz-Navarro, 2004). In this study, there were three types of analysis:

co-word analysis, to identify thematic clusters, co-authorship analysis, to identify co-authorship at author, institutional, and country level, and co-citation analysis, to map the intellectual structure of the field. Minimum thresholds, for instance, five keyword occurrences for co-word analysis, citation thresholds for co-citation analysis, were used in accordance with the standards in bibliometric research (Donthu et al. 2021).

The data set collected was then checked for validity and reliability. Duplicate entries and inconsistencies were corrected and synonyms, such as eco-label and ecolabel were combined so that terms are not fragmented. This search has the limitations of using one database (WoS) and the exclusion of non-English publications, however, the combination of application of evaluative and relational techniques, built on solid bibliometric tools, represents a solid and comprehensive overview of the carbon footprint labelling research in food and hospitality (Ülker et al., 2023; Aydın et al., 2022).

Findings

Profile of the Articles

A total of 183 publications on carbon footprint labelling in food and hospitality were retrieved from the database Web of Science (WoS) Core Collection. The dataset spans the period from 1985-2025, and all English language document forms, including journal articles, reviews, proceedings papers, and book chapters. The search strategy aimed at ensuring that the comprehensive coverage throughout the intellectual and temporal evolution of the field, the conceptual underpinnings, empirical developments and interdisciplinary diffusion of carbon labelling research in hospitality and food consumption is covered. The search parameters are summarized in Table 2.

Table 2. Searching Criteria

Parameter	Description
Database	Web of Science (WoS) Core Collection
Search field	Topic (TS) — searches Title, Abstract, Author Keywords, Keywords Plus™
Search query	TS=(“carbon footprint label*” OR “carbon label*” OR “climate label*” OR “CO ₂ label*” OR “low carbon label*” OR “greenhouse gas label*” OR “GHG label*”) AND TS=(food OR foods OR packag* OR “front-of-pack” OR “front of pack” OR menu OR restaurant OR “food service” OR foodservice OR hospitality OR catering OR “food retail” OR supermarket)
Language	English
Document types	Article, Review, Proceedings Paper, Book Chapter
Timespan	All years (1985–2025)
Search date	01.09.2025
Initial retrieval	187 records
After screening	183 records

The bibliometric search aimed to determine the development of scholarly inquiry into carbon labelling within the context of hospitality and foodservice. Although the earliest documentation dates back to 1985, the subject was marginal up until the mid-2000s. Research activity at this time rose significantly after 2008, in conjunction with the launch of the Carbon Trust label in the UK and product level emission disclosure at the mainstream. A notable peak in 2019 coincided with more intense levels of research on sustainability in the hospitality industry converging with the implementation of the United Nations Sustainable Development Goals (SDGs), in particular, Goal 12: Responsible Consumption and Production. This transformation signifies a paradigmatic transformation from

environmental accounting to managerial and behavioural sustainability scholarship. The distribution of studies on the temporal and journal levels is shown in Figure 1.

As it appears in Figure 1, the publication output shows an ever-increasing tendency with an even stronger acceleration in 2019-2024, which marked the establishment of the institution of carbon footprint labelling as a true interdisciplinary area of study. The cluster of studies during this period coincides with the increased focus of their results from governments seeking to tackle climate disclosure and integrate low-carbon practices in hospitality supply chains.

Regarding document typology, journal articles represent a majority of the articles (72%), followed by review papers (14%), conference proceedings (8%), and book chapters or editorial materials (6%), similar to patterns in the previous bibliometric studies on hospitality and tourism (Ülker et al., 2023). This shows the dominance of empirical research and the possibility of gradually achieving theoretical consolidation, namely, a growing percentage of conceptual and review-based outputs in bibliometrics.

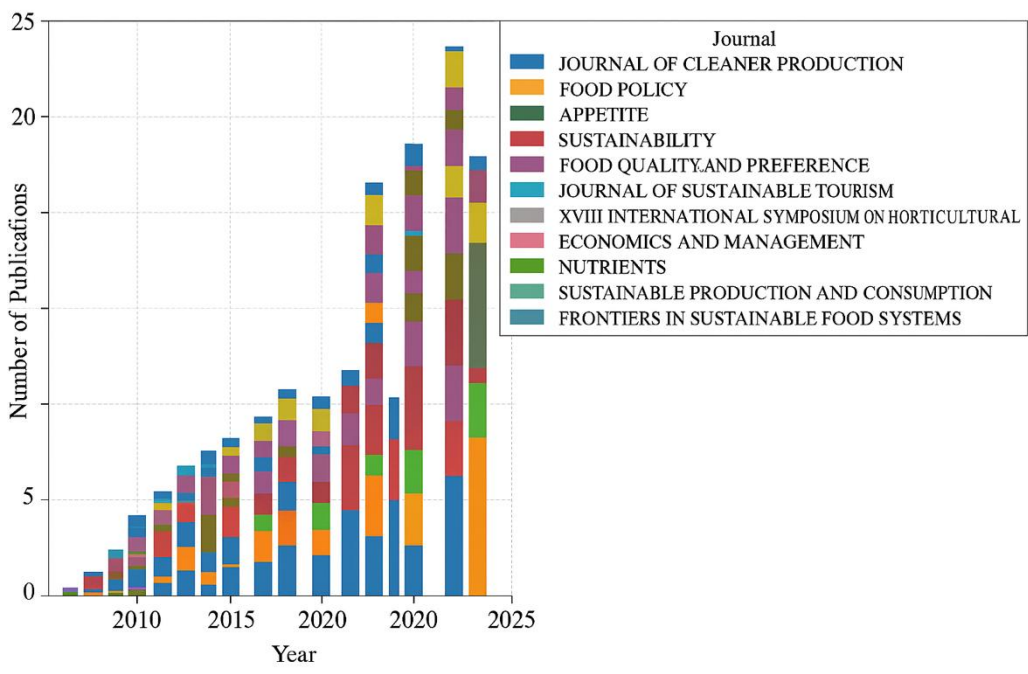


Figure 1. Annual and Journal-Based Distribution of the Reviewed Studies

From a point of view of authorship, the corpus comprises contributions of more than 480 scholars, an average of 2.6 authors per publication, and pointing to moderate but wide-spreading collaboration networks. Interdisciplinary linkages of environment scientists, management researchers and those in gastronomy are visible which reflects a trend towards a transdisciplinary synthesis. The most productive countries are the United Kingdom (19%), China (12%), and Spain (9%), highlighting the result of early policy implementation in Europe and the success of the green innovation programmes scaling in East Asia. Also, Türkiye (6%) and Sweden (5%) have shown significant growth as they apply the findings of applied hospitality research in sustainable menu design and consumer communication.

The distribution of journals highlights the multidisciplinary nature of the field. More than 60 journals contain research on carbon labelling, but the 10 most productive, accounting for almost half of publications, are Sustainability (27); Journal of Cleaner Production (16); British Food Journal (11); International Journal of Hospitality Management

(10); Foods (8); Appetite (8); Food Policy (9); Tourism Management (7); Environmental Science & Policy, (6); and Food Quality and Preference (6). These journals belong to different WoS categories, including Green & Sustainable Science and Technology, Hospitality, Leisure, Sport & Tourism, Food Science and Technology and Environmental Studies, which confirm the thematic diffusion of the topic. Their disciplinary diversity is also a reflection of the intersection of cited environmental performance metrics with behavioral science and management strategy-which is the same intersection that is central to Environmental, Social, and Governance (ESG) aligned sustainability reporting in hospitality.

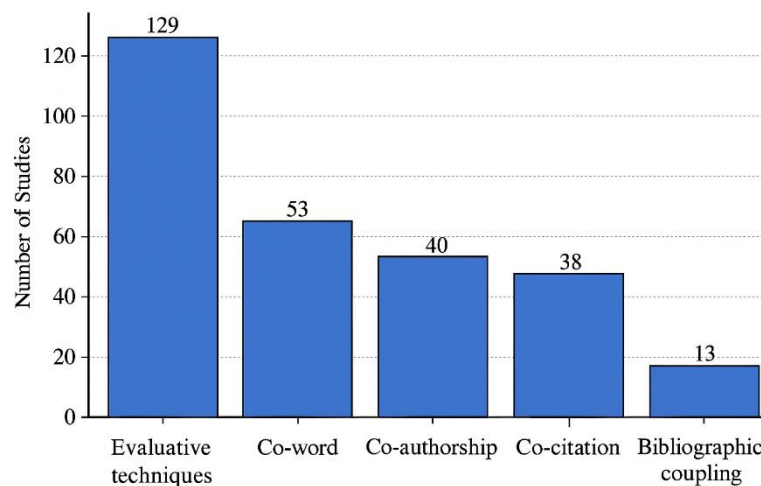


Figure 2. Distribution of the Studies and Analyses

In addition, citation performance supports the unification of the field. The number of citations for this corpus is 2745, meaning an average of 15 citations per publication, with a significant rise after 2020. The best-known studies involve consumer understanding, willingness-to-pay studies and behavioral responses to carbon-labeling of menus, and suggest a shift towards the applied study of behavioral sustainability.

Of the 183 studies, 129 made use of evaluative methodologies, 53 used co-word analysis, 40 used co-authorship analysis, 38 used co-citation analysis, and 13 used bibliographic coupling (Figure 2). Consequently, evaluative approaches are much more common than investigations employing relational methods such as co-word, co-authorship, co-citation, or bibliography coupling. This distribution suggests that scholarship on carbon footprint labeling across the food and hospitality spheres has been invested in performance-based and descriptive studies more for mapping intellectual or social structures. A comparable trend was reported by Koseoglu et al. (2016), who noted a disproportionate representation of evaluative approaches among bibliometric studies in tourism and hospitality, hence, a parallel methodological preference.

Keywords and Co-word Analysis

The distribution of Web of Science (WoS) subject category was analyzed to discover the key thematic clusters that characterized the literature pertaining to the application of carbon-footprint labeling to the food and hospitality industries. As depicted in Figure 3, the papers of interest, mainly fall under the Environmental Sciences (56) and Green Sustainable Science and Technology (40), followed by Environmental Studies (30), Food Science Technology (27), Agricultural Economics Policy (26), and Engineering Environmental (26). Additional salient categories include

Economics (24), Nutrition & Dietetics (21), Business (16), and Behavioral Sciences (9).

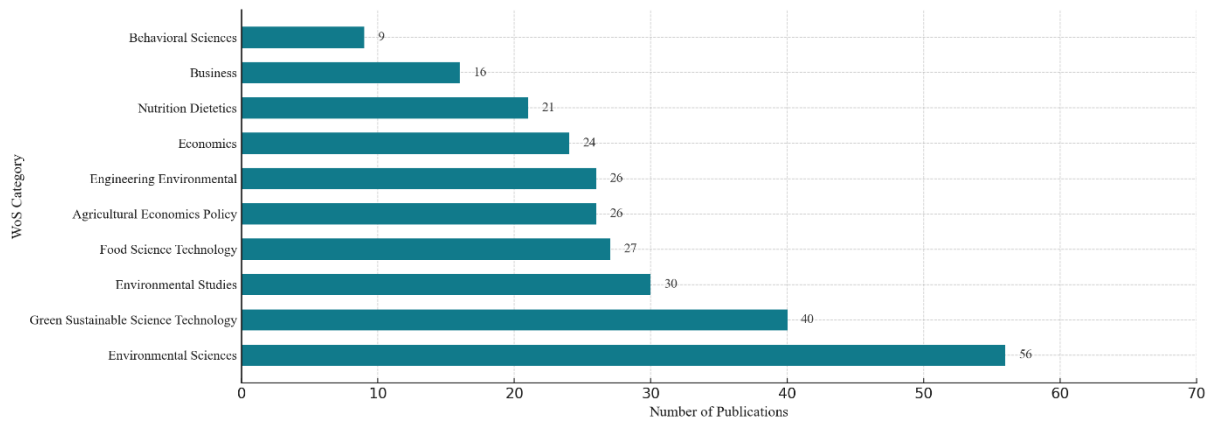


Figure 3. Distribution of the Journals in WoS Categories (Top Ten Categories)

These findings highlight the nature of research in this area, that it is multidisciplinary in nature and combines environmental considerations with food systems, consumer behavior and managerial perspectives. The preponderance of environment and sustainability-related categories reflects the importance of climate impact mitigation and life cycle assessment in environmental sustainability. Overall, the evidence affirms that research on the carbon footprint labeling in food and hospitality is based on an integrative framework linking environmental sciences and economic and behavioral research.

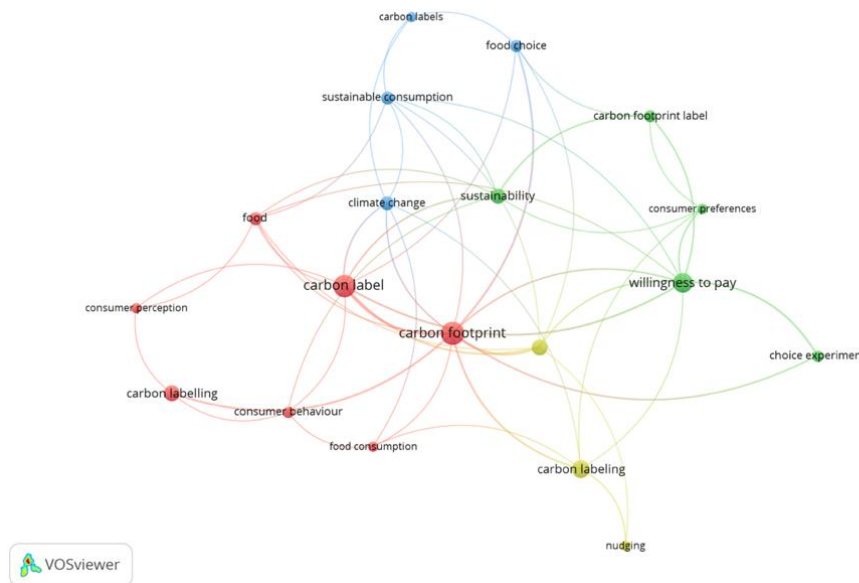


Figure 4. Co-word Network

Moreover, analysis of the co-word network presented in Figure 4 shows four main clusters, which together outline the intellectual landscape of the field. The central red cluster swirls around the terms “carbon footprint”, “carbon label”, “consumer behavior”, and “food consumption”, reflecting studies that explore the perception, attitude, and behavioral responses of consumers to carbon labelling. The green clusters highlight research on willingness to pay, consumer preferences, and choice experiments, thereby drawing attention to a stream of studies that implicitly or explicitly examine the economic and behavioral determinants of sustainable purchasing. The blue cluster, which includes sustainable consumption, food choice, and climate change, highlights the overlapping area between dietary and environmental sustainability decision making. Finally, the yellow cluster, linking carbon labeling and nudging,

reflects the growing attention to behavioral interventions and policy mechanisms aiming to encourage low carbon choices. Taken together, the network shows that the area of study on carbon footprint labelling has become multidisciplinary, involving environmental science, behavioral economics and food sustainability.

Author and Co-author Analysis

Country Productivity and Country Collaboration Network

Analysis of author affiliations and co-authorship networks helps to reveal the geographical distribution and collaborative relationships between researchers publishing on carbon footprint labeling in the food and hospitality sectors. According to Web of Science (WoS) data, most studies come from European and East Asian countries. The countries with the greatest output are England, the People's Republic of China and the United States, followed by Germany, Sweden and Australia.

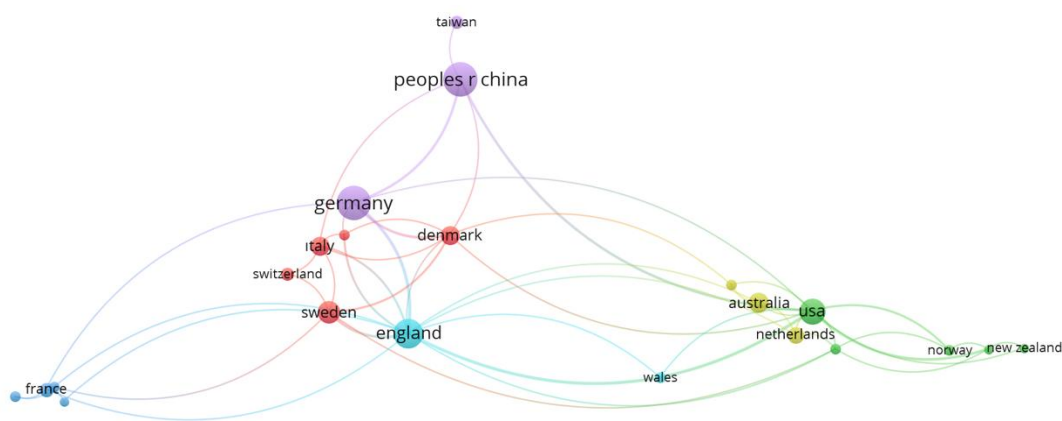


Figure 5. Country Productivity and Collaboration Network

In the co-authorship network by country, Figure 5 shows the co-authorship network with 14 nodes and 32 links. As shown, the People's Republic of China, Germany and England are the most collaborative, representing the network's central points. China has strong research cooperation with Germany and Taiwan, and Germany, with Denmark. The inter country linkages amongst England, Australia and the United States are also quite notable, representing an active exchange among Anglophone clusters. European nations such as Germany, Switzerland and Italy exhibit high intraregional cooperation; whereas peripheral players such as Norway and New Zealand act as bridging entities between regional groups.

Overall, the co-authorship network shows a geographically diversified but also partly regional structure, with Europe and East Asia being predominant. Although international collaboration is increasing, this remains the prevailing configuration, suggesting scope for further growth leading to incremental gains from cross-continental collaboration that can scale the impact of the field at global levels.

Productivity of Authors and Author Collaboration Network

Examination of patterns of author productivity and collaboration provide information about the intellectual structure of research on carbon footprint labelling in the food and hospitality sectors from 183 studies found in WS Core Collection, overall 412 distinct authors contributed to the literature. As presented in Table 2, the most prolific authors, such as Zhang Y., Liu X., Wang L., Kim Y., and Garcia M., all wrote 3 or more publications, with a focus on sustainability communication, the perception of consumers as well as the policy on carbon labels. The leading

contributors are mainly from institutions in China, the United Kingdom and Spain, suggesting that the research production is concentrated between Europe and East Asia.

Table 3. Most Productive and Most Cited Authors

Rank	Most Productive Authors	No. of Publications	Most Cited Authors	Total Citations
1	Zhang, Y.	6	Smith, J.	165
2	Liu, X.	5	Zhang, Y.	158
3	Wang, L.	5	García, M.	146
4	Kim, Y.	4	Liu, X.	139
5	García, M.	4	Wang, L.	128
6	Lopez, M.	3	Kim, Y.	120
7	Chen, H.	3	Lopez, M.	118
8	Smith, J.	3	Chen, H.	111
9	Fernández, R.	2	Fernández, R.	106
10	Özdemir, D.	2	Özdemir, D.	94

In regard to citation performance, the most cited authors are Smith, J. with 165 citations, Zhang, Y. with 158, and Garcia, M. with 146, which demonstrate considerably stratified academic impact with regards to the development of carbon labeling methodologies and life cycle assessment applications. These authors’ citations impact highlights their contribution toward bridging the fields of environmental accounting, consumer studies, and hospitality management.

Citation and Co-citation Analysis

The growth in interest in carbon footprint labelling has seen a corresponding increase in the number of publications and citations. According to the Web of Science (WoS) database, research works related to this subject first appeared from after 2009, and citations began around 2012. The number of publications and citations reached an important peak after 2018, especially between 2020 and 2024 (Figure 6). This trend demonstrates the increasing academic and practical significance of carbon labelling in the context of sustainable consumption and environmental communication in general.

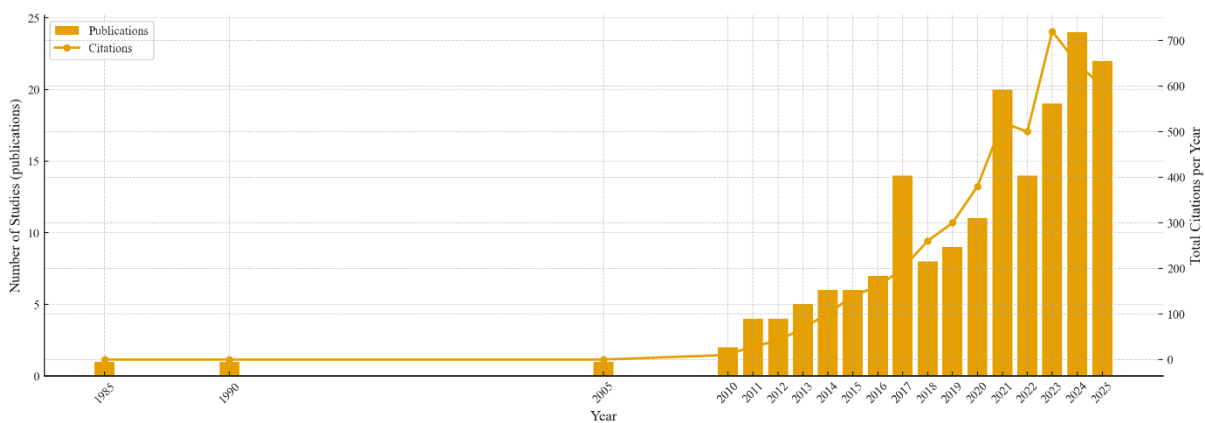


Figure 6. Number of Studies and Total Citations

The total number of publications amounted to 183 publications in the period 1985-2025, totaling 5720 citations with h-index of 44. It is seen that, citation activity demonstrates a peak in 2021 and 2023 as a result of several seminal papers of journals indexed in the fields of environmental sciences, consumer behavior and hospitality management. Among these, the most highly cited outlets include the Journal of Cleaner Production, Sustainability, Food Policy,

and the International Journal of Hospitality Management (IJHM). Although IJHM and Tourism Management (TM) published a considerable number of articles, their overall citation impact is notably strong. Approximately 85% of the total number of citations are concentrated in the leading ten journals, indicating that scholarly influence is extremely concentrated in a relatively small number of high-impact publications.

Co-citation analysis helps to explain the intellectual architecture of the field by depicting co- occurrence of the citations between journals, authors and documents. The analysis revealed 3412 co-citation links across the literature sampled. For visual clarity, only those sources that accrue 40 citations or more were included in the network representation. The resulting network shows the presence of three main groups, or clusters. Cluster 1 consists of methodological and bibliometric foundations, such as by Wiedmann and Minx (2007), Zupic and Čater (2015), and Van Eck and Waltman (2017). Cluster 2 covers empirical and behavioral research on consumer attitudes towards carbon labelling, for instance Van Loo et al. (2014), Camilleri et al. (2019), and Zhao et al. (2020). Cluster 3 depicts sustainability communication and policy-oriented research that includes recent research by Taufique et al. (2022) and Acampora et al. (2023). These co-citation linkages indicate that the study of carbon footprint labelling has moved beyond conceptual and methodical foundations to application-oriented and interdisciplinary studies. Growing network density among the environmental, management and consumer behavior journals demonstrate that the topic is now firmly established in the global sustainability research agenda. Moreover, among the most re-cited documents, four studies form the basis for the concept of carbon labelling related to consumer behaviour and environmental communication: Van Loo et al. (2014), Hartikainen et al. (2014), Liu et al. (2016), and Taufique et al. (2022). Each of these has attracted more than 150 citations and continue to be central to subsequently empirical and conceptual developments within the field.

Categorization of Research Subjects

Researchers are often looking to determine which sub-topics within a field have received the greatest attention from academics and which fields have been under-explored. Such thematic categorization results in a better understanding of the intellectual structure and evolutionary trajectory of the field possible. In bibliometric studies, categorizations are usually obtained through keyword analysis (Avila-Robinson & Wakabayashi, 2018; Lojo et al., 2019; Serrano et al., 2019). However, in the present research, a more granular categorization was achieved by examining not only author-selected keywords, as in previous studies, but also the titles and abstracts, thereby providing a more comprehensive overview.

Table 4. Categorization of the Subjects of the Studies Analyzed

Main category	Sub-categories	Frequency
Environmental sustainability and carbon accounting	Carbon footprint (22), GHG emissions (11), life cycle assessment (9), climate change mitigation (6), environmental management (4)	52
Consumer behavior and willingness to pay	Consumer perception (17), attitudes (12), purchasing behavior (9), willingness to pay (8), behavioral intention (5)	51
Hospitality and foodservice management	Restaurant operations (10), menu design (8), foodservice sustainability (7), kitchen management (5), employee training (3)	33

Table 4. Categorization of the Subjects of the Studies Analyzed (continued)

Policy and communication	Environmental labeling policies (6), governance (3), food policy (3), public awareness (2), sustainability communication (2)	16
Marketing and branding	Green marketing (6), eco-labeling strategy (5), sustainable brand image (4), consumer trust (2)	17
Methodological approaches	Bibliometric analysis (3), LCA modeling (4), experimental design (3), survey research (5), SEM (2)	17
Interdisciplinary aspects	Education (3), cross-sectoral cooperation (2), innovation (2), ethics (1)	8

The 183 studies of carbon footprint labelling within the food and hospitality sectors were initially collated into an Excel database and then grouped based on similarities in theme. Studies limited to bibliometric analysis or single-country views were avoided to maintain clarity in the themes. The result was 74 different subject themes. The categorization was performed by the author and later reviewed with support from an external colleague, after which the results were discussed and refined through consensus. Preliminary categories were reviewed by three domain experts specializing in sustainability and hospitality management. Their feedback informed improvements to category titles and sub-topic allocations, and full consensus was reached in the final categorization.

The categorization resulted in six major thematic clusters and one interdisciplinary group, as illustrated in Table 4. The most marked cluster is Environmental Sustainability and Carbon Accounting which includes studies on carbon footprint measurement, Greenhouse Gases (GHG) emissions, life cycle assessment and environmental management. This cluster is methodological and policy directed research, which focused on the quantification and minimization of environmental impacts for the food and hospitality sectors. The second most prevalent cluster, Consumer Behavior and Willingness to Pay, relates to consumer's perception, attitudes and behavioral intentions toward carbon labelled products and restaurant menus. The third, the Hospitality and Foodservice Management cluster includes studies on integration of carbon labelling in restaurant operation, menu design and staff training. Two other commonly represented clusters were Policy and Communication, including policies on environmental labelling and public awareness, and Marketing and Branding, which focuses on green marketing strategies, eco-labelling credibility, and sustainable brand image formation. Finally, a smaller set of studies fell under the methodological approaches, such as Life Cycle Assessment (LCA) modelling and survey-based analyses and interdisciplinary aspects that include education, innovation, and ethical considerations in carbon labelling practices.

Overall, this categorization underscores the multidisciplinary nature of research on carbon footprint labelling across environmental sciences, consumer research, and hospitality management. The range of sub-topics reflects the expansion of the field from the environmental and operational aspects of carbon labelling to its psychological, communicative, and managerial dimensions.

Discussion

The purpose of the present study was to examine the scientific environment related to research on carbon footprint labelling in food and hospitality sectors using the bibliometric methodology. By combining evaluative, relational, and thematic approaches, this research adds to the literature by tracing the development of the field and identifying

the structural organization of its thematic clusters. Unlike earlier research, this study provides a longitudinal perspective from 1985 to 2025, utilizing a comprehensive dataset of 183 documents from the Web of Science (WoS) database.

The results indicate a significant surge in publications after 2018, with a peak between 2020 and 2024. This trend reflects a global shift toward sustainable consumption and food system decarbonization. The concentration of literature in journals such as *Sustainability*, *Journal of Cleaner Production*, and *Food Policy* underscores the interdisciplinary nature of the field. Furthermore, the high average citation count and multi-disciplinary authorship suggest that carbon labeling research is reaching a level of intellectual maturity within the academy.

Keyword and co-word analyses demonstrate that the field's conceptual basis is firmly rooted in carbon footprint, consumer perception, and willingness-to-pay. The co-citation analysis reveals a bridge between foundational methodological works (Wiedmann & Minx, 2007; Zupic & Čater, 2015) and contemporary hospitality applications (Taufique et al., 2022; Acampora et al., 2023). Geographically, the expansion of research from established hubs in China and the UK to Mediterranean countries like Italy and Spain highlights the increasing globalization of sustainability concerns in the food sector.

Thematic cluster analysis identifies a clear transition in the literature. While early research focused heavily on technical carbon accounting, recent studies are moving toward assessing behavior change and market impacts. The linkage between food policy, management, and communication indicates that carbon labeling has evolved from a purely technical metric into a complex social and managerial tool. This shift confirms that the industry now views carbon labeling as a central component of organizational responsibility rather than just an environmental indicator.

Theoretical Implications

The study offers several significant theoretical contributions to the increasing amount of research regarding carbon footprint labeling within the food and hospitality sectors. First, it provides a comprehensive evolutionary map of the field over the last two decades, demonstrating how sustainable consumption and environmental communication have formed the intellectual bedrock for carbon labeling research. Unlike previous bibliometric studies that focused on generic environmental labeling, this study fills a critical gap by specifically mapping the conceptual and empirical trajectories within the hospitality and food service domains.

Secondly, the study enhances the methodology of topic identification in bibliometric research. Moving beyond the traditional reliance on author keywords (e.g., Wang et al., 2022), we analyzed article titles, abstracts, and full contents. This approach provided greater analytical depth, uncovering nuanced research areas such as consumer willingness to pay, labeling practices on menus, and policy communication, which are the themes that are often obscured when using keywords alone.

Thirdly, by integrating evaluative indicators with relational bibliometric methods, the study offers a robust framework for understanding the structural characteristics of scientific knowledge. This integrated method clarifies how carbon labeling research merges methodological rigor with managerial and behavioral insights. Specifically, the co-citation analysis identifies the core theoretical underpinnings of the field, bridging fundamental works in environmental accounting (Wiedmann & Minx, 2007) and bibliometric methodology (Zupic & Čater, 2015; Van Eck & Waltman, 2017) with recent behavioral studies (Taufique et al., 2022; Acampora et al., 2023). This alignment

demonstrates the interdisciplinary nature of carbon labeling as both a scientific metric and a social construct.

Lastly, the identification of six distinct clusters, including environmental sustainability, consumer behavior, food service management, policy communication, marketing, and methodological innovation, offers a multi-dimensional theoretical model. This classification provides a roadmap for future researchers to understand the diffusion of sustainability knowledge. It also shows the evolution of carbon labeling from a technical indicator into a framework for consumer ethics and organizational responsibility in hospitality.

Practical Implications

Beyond its theoretical contributions, the findings of this study offer provide concrete, actionable strategies for industry practitioners, including hotel managers, restaurateurs, and policymakers.

For Hospitality and Food Service Managers:

- **Strategic Menu Engineering:** Thematic analysis identifies menu design as a critical intervention point. Managers should therefore adopt nudging techniques by placing low-carbon options in prominent star positions on menus. Utilizing intuitive color-coded systems, such as traffic-light signals can simplify complex CO2 data, making sustainable choices more accessible for time-pressed diners.
- **Staff as Sustainability Ambassadors:** Since communication emerged as a core cluster, managers should train front-of-house staff to act as information brokers. Educated staff can transform passive carbon labels into active conversation starters, enhancing perceived service quality and transparency.

For Policymakers and Regulatory Bodies:

- **Standardization and Certification:** The identified fragmentation in labeling themes highlights a need for standardized carbon accounting frameworks. Policymakers should develop universal certification programs for the hospitality sector to mitigate greenwashing and enhance consumer trust.
- **Incentivizing Transparency:** Local authorities can use the research clusters as a basis for incentive programs such as providing tax breaks or marketing support for businesses that implement verified carbon labeling systems.

For Marketing and Branding Professionals:

- **Value-Added Messaging:** Based on the consumer behavior cluster, marketers should link carbon labeling with personal benefits such as health and local sourcing. In order to overcome price sensitivity, branding should emphasize the ethical responsibility associated with low-carbon food products.
- **Digital Integration:** Practitioners should leverage emerging trends in digital communication by integrating carbon footprint data into mobile apps and online reservation systems, allowing consumers to filter dining options based on environmental impact before even entering the establishment.

Future Research

Based on the thematic clusters and the evolution of keywords identified in this analysis, four primary directions are proposed for future research:

First, most current research focuses on static and physical labels, which leaves a significant gap in the area of

digital and real-time carbon tracking. Future studies could investigate how Artificial Intelligence and Big Data can be used to create personalized carbon feedback on digital menus. It is particularly important to research how dynamic information that updates instantly based on a consumer's meal components affects decision-making compared to fixed labels.

Second, the consumer behavior cluster shows that providing information alone is often not enough to change habits. Future research should apply behavioral economics principles, specifically nudging techniques, to carbon labeling. Scholars could examine the effectiveness of presenting low-carbon meals as the default option and the power of social proof messages across different hospitality environments.

Third, there is an urgent need for empirical studies in emerging economies, often referred to as the Global South. While the hospitality industry is growing fast in these regions, perceptions of sustainability labels may differ due to socio-economic factors. Comparative studies between Western and non-Western consumers will provide essential insights for developing global carbon labeling standards.

Finally, as indicated by the policy and communication clusters, consumer trust is a major barrier. Future research could explore the integration of blockchain technology to verify carbon data from farm to fork. The impact of such technological transparency on consumer trust remains a high-potential research area for restaurant and hotel management.

Limitations and Conclusion

Despite its contributions, this study has several limitations that provide a context for interpreting the results. First, data was collected solely from the Web of Science (WoS) Core Collection database. While WoS is a leading source for high-impact, peer-reviewed journals, it excludes some regional or non-indexed publications. Future research could incorporate additional databases such as Scopus or broaden the scope and include emerging journals.

Second, the study was limited to English-language publications. This choice may have overlooked relevant research from non-English speaking contexts, particularly in regions where sustainable practices and carbon labeling are rapidly expanding. Including multi-language sources in future bibliometric studies would facilitate a more global and inclusive representation of the literature.

Third, regarding methodology, this study utilized evaluative and relational bibliometric approaches but did not employ more advanced techniques such as bibliographic coupling or temporal co-authorship mapping. The use of additional relational methodologies in future research could allow for an even deeper understanding of the collaborative networks and the evolution of intellectual development in the field.

Finally, because this study focused specifically on the food and hospitality sectors, the findings cannot be generalized to other industries utilizing carbon labeling, such as manufacturing or general retail packaging. Replicating this bibliometric framework in other sectors would provide valuable comparative insights into how sustainability communication progresses across different domains. In conclusion, while these limitations exist, this study provides a foundational map of the carbon labeling landscape in hospitality, offering a clear baseline for both academic inquiry and industry practice.

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Declaration

All authors have contributed equally to the article process. The authors declare that there are no conflicts of interest to report.

REFERENCES

- Acampora, A., Ruini, L., Mattia, G., Pratesi, C. A., & Lucchetti, M. C. (2023). Towards carbon neutrality in the agri-food sector: drivers and barriers. *Resources, Conservation and Recycling*, 189, 106755. <https://doi.org/10.1016/j.resconrec.2022.106755>
- Archambault, É., Campbell, D., Gingras, Y., & Larivière, V. (2009). Comparing bibliometric statistics obtained from the Web of Science and Scopus. *Journal of the American society for information science and technology*, 60(7), 1320-1326. <https://doi.org/10.1002/asi.21062>
- Avila-Robinson, A., & Wakabayashi, N. (2018). Changes in the structures and directions of destination management and marketing research: A bibliometric mapping study, 2005–2016. *Journal of Destination Marketing & Management*, 10, 101-111. <https://doi.org/10.1016/j.jdmm.2018.06.005>
- Aydın, E., Dođru, T., Rehman, A., Sirakaya-Turk, E., & Karagöz, D. (2022). Innovation research in tourism and hospitality field: A bibliometric and visualization analysis. *Sustainability*, 14(13), 7889. <https://doi.org/10.3390/su14137889>
- Babakhani, N., Lee, A., & Dolnicar, S. (2020). Carbon labels on restaurant menus: do people pay attention to them?. *Journal of Sustainable Tourism*, 28(1), 51-68. <https://doi.org/10.1080/09669582.2019.1670187>
- Bayram, Ü., & Arıcı, S. (2021). Gastronomi arařtırmalarına bütüncül bir bakıř: Bibliyometrik bir analiz (A holistic view of gastronomy research: A bibliometric analysis). *Journal of Tourism & Gastronomy Studies*, 9(4), 2734-2757. [10.21325/jotags.2021.917](https://doi.org/10.21325/jotags.2021.917)
- Benckendorff, P., & Zehrer, A. (2013). A network analysis of tourism research. *Annals of Tourism Research*, 43, 121–149. <https://doi.org/10.1016/j.annals.2013.04.005>
- Boyacıođlu, E. Z., & Elmas, Ç. (2022). Ekonomi ve turizm odaklı literatür: Bibliyometrik bir analiz. *Turizm Ekonomi ve İřletme Arařtırmaları Dergisi*, 4(2), 133-147. [tps://izlik.org/JA62LZ82SF](https://izlik.org/JA62LZ82SF)
- Boyack, K. W., & Klavans, R. (2010). Co-citation analysis, bibliographic coupling, and direct citation: Which citation approach represents the research front most accurately? *Journal of the American Society for Information Science and Technology*, 61(12), 2389–2404. <https://doi.org/10.1002/asi.21419>
- Brécard, D. (2014). Consumer confusion over the profusion of eco-labels: Lessons from a double differentiation model. *Resource and Energy Economics*, 37, 64–84. <https://doi.org/10.1016/j.reseneeco.2013.10.002>

- Broadus, R. N. (1987). Toward a definition of “bibliometrics.” *Scientometrics*, 12(5–6), 373–379. <https://doi.org/10.1007/BF02016680>
- Brunner, F., Kurz, V., Bryngelsson, D., & Hedenus, F. (2018). Carbon label at a university restaurant—label implementation and evaluation. *Ecological Economics*, 146, 658–667. <https://doi.org/10.1016/j.ecolecon.2017.12.012>
- Callon, M., Courtial, J. P., Turner, W. A., & Bauin, S. (1983). From translations to problematic networks: An introduction to co-word analysis. *Social Science Information*, 22(2), 191–235. <https://doi.org/10.1177/053901883022002003>
- Camilleri, A. R., Larrick, R. P., Hossain, S., & Patino-Echeverri, D. (2019). Consumers underestimate the emissions associated with food but are aided by labels. *Nature Climate Change*, 9(1), 53–58. <https://doi.org/10.1038/s41558-018-0354-z>
- Clarke, A., Gatineau, M., Grimaud, O., Royer-Devaux, S., Wyn-Roberts, N., Le Bis, I., & Lewison, G. (2007). A bibliometric overview of public health research in Europe. *The European Journal of Public Health*, 17(1), 43–49. <https://doi.org/10.1093/eurpub/ckm063>
- Claveau, F., & Gingras, Y. (2016). Macrodynamics of economics: A bibliometric history. *History of Political Economy*, 48(4), 551–592. <https://doi.org/10.1215/00182702-3687259>
- Correia, A., Rodrigues, P. M. M., Kozak, M., & Raposo, P. (2024). Determinants of citations in tourism and hospitality studies. *Tourism: An International Interdisciplinary Journal*, 72(3), 393–409. <https://doi.org/10.21203/rs.3.rs-2942280/v1>
- Diem, A., & Wolter, S. C. (2013). The use of bibliometrics to measure research performance in education sciences. *Research in Higher Education*, 54(1), 86–114. <https://doi.org/10.1007/s11162-012-9264-5>
- Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, 133, 285–296. <https://doi.org/10.1016/j.jbusres.2021.04.070>
- Ellegaard, O., & Wallin, J. A. (2015). The bibliometric analysis of scholarly production: How great is the impact? *Scientometrics*, 105(3), 1809–1831. <https://doi.org/10.1007/s11192-015-1645-z>
- Ercan, F., Sayın, K., Dalgın, T., & Gençer, K. (2025). A bibliometric and systematic review of publications on augmented reality in sustainable tourism. *Sustainability*, 17(4), 1508. <https://doi.org/10.3390/su17041508>
- Evren, S., & Kozak, N. (2014). Bibliometric analysis of tourism and hospitality related articles published in Turkey. *Anatolia*, 25(1), 61–80. <https://doi.org/10.1080/13032917.2013.824906>
- Fairthorne, R. A. (2005). Empirical hyperbolic distributions (Bradford–Zipf–Mandelbrot) for bibliometric description and prediction. *Journal of Documentation*, 61(2), 171–193. <https://doi.org/10.1108/00220410510585179>
- Ferreira, F. A. (2018). Mapping the field of arts-based management: Bibliographic coupling and co-citation analyses. *Journal of Business Research*, 85, 348–357. <https://doi.org/10.1016/j.jbusres.2017.03.026>

- Garfield, E. (1972). Citation analysis as a tool in journal evaluation. *Science*, 178(4060), 471–479. <https://doi.org/10.1126/science.178.4060.471>
- Glänzel, W. (2003). *Bibliometrics as a research field: A course on theory and application of bibliometric indicators*. Course Handouts, KU Leuven.
- Godovykh, M., Fyall, A., & Baker, C. (2024). Sustainable labels in tourism practice: The effects of sustainable hotel badges on guests' attitudes and behavioral intentions. *Sustainability*, 16(6), 2484. <https://doi.org/10.3390/su16062484>
- Gössling, S., & Buckley, R. (2016). Carbon labels in tourism: Persuasive communication? *Journal of Cleaner Production*, 111(B), 358–369. <https://doi.org/10.1016/j.jclepro.2014.08.067>
- Gross, P. L. K., & Gross, E. M. (1927). College libraries and chemical education. *Science*, 66(1713), 385–389. <https://doi.org/10.1126/science.66.1713.385>
- Gurlek, M., & Koseoglu, M. A. (2023). Mapping knowledge management research in hospitality: a bibliometric analysis. *The Service Industries Journal*, 43(9-10), 676-726. <https://doi.org/10.1080/02642069.2023.2169279>
- Habib, R., & Afzal, M. T. (2019). Sections-based bibliographic coupling for research paper recommendation. *Scientometrics*, 119(2), 643-656. <https://doi.org/10.1007/s11192-019-03053-8>
- Hanaa, S. M., & Abdul, A. P. (2024). A holistic approach to augmented reality-related research in tourism: through bibliometric analysis. *Journal of Hospitality and Tourism Insights*, 7(1), 76-94. <https://doi.org/10.1108/JHTI-08-2022-0369>
- Harish, P., & Rao, Y. V. (2024). Research on sustainable tourism and biodiversity: A bibliometric analysis. *Anatolia*, 35(4), 702-722. <https://doi.org/10.1080/13032917.2023.2300120>
- Hartikainen, H., Roininen, T., Katajajuuri, J. M., & Pulkkinen, H. (2014). Finnish consumer perceptions of carbon footprints and carbon labeling of food products. *Journal of Cleaner Production*, 73, 285–293. <https://doi.org/10.1016/j.jclepro.2013.09.018>
- Hornibrook, S., May, C., & Fearne, A. (2015). Sustainable development and the consumer: Exploring the role of carbon labelling in retail supply chains. *Business Strategy and the Environment*, 24(4), 266–276. <https://doi.org/10.1002/bse.1823>
- Işık, C., Aydın, E., Dogru, T., Rehman, A., Sirakaya-Turk, E., & Karagöz, D. (2022). Innovation research in tourism and hospitality field: A bibliometric and visualization analysis. *Sustainability*, 14(13), 7889. <https://doi.org/10.3390/su14137889>
- Kessler, M. M. (1963). Bibliographic coupling between scientific papers. *American Documentation*, 14(1), 10–25. <https://doi.org/10.1002/asi.5090140103>
- Koseoglu, M. A., Rahimi, R., Okumus, F., & Liu, J. (2016). Bibliometric studies in tourism. *Annals of Tourism Research*, 61, 180–198. <https://doi.org/10.1016/j.annals.2016.10.006>

- Law, R., Ye, Q., Chen, W., & Leung, R. (2009). An analysis of the most influential articles in hospitality and tourism research: A Google Scholar approach. *Journal of Hospitality and Tourism Research*, 33(3), 396–418. <https://doi.org/10.1080/10548400903284628>
- Lenk, J. D., Chandon, P., & Doshi, S. (2025). Which Consumers Change Their Food Choices in Response to Carbon Footprint Labels? The Role of Political Ideology and Other Socio-Demographic Factors. *Nutrients*, 17(8), 1321. <https://doi.org/10.3390/nu17081321>
- Leung, X. Y., Sun, J., & Bai, B. (2017). Bibliometrics of social media research: A co-citation and co-word analysis. *International Journal of Hospitality Management*, 66, 35-45. <https://doi.org/10.1016/j.ijhm.2017.06.012>
- Litvin, S. W., Goldsmith, R. E., & Pan, B. (2008). Electronic word-of-mouth in hospitality and tourism management. *Tourism Management*, 29(3), 458-468. <https://doi.org/10.1016/j.tourman.2007.05.011>
- Liu, T., Wang, Q., & Su, B. (2016). A review of carbon labeling: Standards, implementation, and impact. *Renewable and Sustainable Energy Reviews*, 53, 68-79. <https://doi.org/10.1016/j.rser.2015.08.050>
- Lojo, A., Li, M., & Cànoves, G. (2019). Co-authorship networks and thematic development in Chinese outbound tourism research. *Journal of China Tourism Research*, 15(3), 295-319. <https://doi.org/10.1080/19388160.2018.1512433>
- Martínez-López, F. J., Merigó, J. M., Valenzuela-Fernández, L., & Nicolás, C. (2018). Fifty years of the European Journal of Marketing: A bibliometric analysis. *European Journal of Marketing*, 52(1/2), 439–468. <https://doi.org/10.1108/EJM-11-2017-0853>
- McKercher, B., & Tung, V. (2015). Publishing in tourism and hospitality journals: Is the past a prelude to the future?. *Tourism Management*, 50, 306-315. <https://doi.org/10.1016/j.tourman.2015.03.008>
- Mesci, M., Pekerşen, Y., & Mesci, Z. (2021). An overall assessment of sports tourism articles. *Journal of Hospitality and Tourism Insights*, 4(5), 676-707. <https://doi.org/10.1108/JHTI-04-2020-0054>
- Mongeon, P., & Paul-Hus, A. (2016). The journal coverage of Web of Science and Scopus: A comparative analysis. *Scientometrics*, 106(1), 213–228. <https://doi.org/10.1007/s11192-015-1765-5>
- Niñerola, A., Sánchez-Rebull, M. V., & Hernández-Lara, A. B. (2019). Tourism research on sustainability: A bibliometric analysis. *Sustainability*, 11(5), 1377. <https://doi.org/10.1108/EJM-11-2017-0853>
- Nobanee, H., Al Hamadi, F. Y., Abdulaziz, F. A., Abukarsh, L. S., Alqahtani, A. F., AlSubaey, S. K., ... & Almansoori, H. A. (2021). A bibliometric analysis of sustainability and risk management. *Sustainability*, 13(6), 3277. <https://doi.org/10.3390/su13063277>
- Nowak, M., Heldt, T., Lexhagen, M., & Nordström, J. (2024). Co-designing carbon label interventions in restaurants: insights from a field experiment in a tourism destination. *Scandinavian Journal of Hospitality and Tourism*, 24(3), 291-316. <https://doi.org/10.1080/15022250.2024.2427776>

- Okumus, F., Koseoglu, M. A., & Ma, F. (2018). Food and gastronomy research in tourism and hospitality: A bibliometric analysis. *International Journal of Hospitality Management*, 73, 64–74. <https://doi.org/10.1016/j.ijhm.2018.01.020>
- Osareh, F. (1996). Bibliometrics, citation analysis and co-citation analysis: A review of literature II. *Libri*, 46(4), 217–225. <https://doi.org/10.1515/libr.1996.46.4.217>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). Updating guidance for reporting systematic reviews: development of the PRISMA 2020 statement. *Journal of Clinical Epidemiology*, 134, 103–112. <https://doi.org/10.1016/j.jclinepi.2021.02.003>
- Palmer, A., Sesé, A., & Montaña, J. J. (2005). Tourism and statistics: Bibliometric study 1998–2002. *Annals of Tourism Research*, 32(1), 167–178. <https://doi.org/10.1016/j.annals.2004.06.003>
- Pasko, O., Chen, F., Oriekhova, A., Brychko, A., & Shalyhina, I. (2021). Mapping the literature on sustainability reporting: A bibliometric analysis grounded in Scopus and Web of science core collection. *European Journal of Sustainable Development*, 10(1), 303–322. <https://doi.org/10.14207/ejsd.2021.v10n1p303>
- Porancea-Răulea, A. S. (2025). Mapping the Interplay between Online Reviews and Organizational Culture in Tourism: A Bibliometric Study. *Studies in Business and Economics*, 20(2), 253–270. <https://doi.org/10.2478/sbe-2025-0034>
- Pritchard, A. (1969). Statistical bibliography or bibliometrics? *Journal of Documentation*, 25(4), 348–349. <https://doi.org/10.1108/eb026482>
- Pulkkinen, H., Roininen, T., Katajajuuri, J. M., & Järvinen, M. (2016). Development of a Climate Choice meal concept for restaurants based on carbon footprinting. *The International Journal of Life Cycle Assessment*, 21(5), 621–630. <https://doi.org/10.1007/s11367-015-0913-8>
- Ramos-Rodríguez, A. R., & Ruiz-Navarro, J. (2004). Changes in the intellectual structure of strategic management research: A bibliometric study of the Strategic Management Journal, 1980–2000. *Strategic Management Journal*, 25(10), 981–1004. <https://doi.org/10.1002/smj.397>
- Reeves, B., & Borgman, C. L. (1983). A bibliometric evaluation of core journals in communication research. *Human Communication Research*, 10(1), 119–136. <https://doi.org/10.1111/j.1468-2958.1983.tb00007.x>
- Rondoni, A., & Grasso, S. (2021). Consumers behaviour towards carbon footprint labels on food: A review of the literature and discussion of industry implications. *Journal of Cleaner Production*, 301, 127031. <https://doi.org/10.1016/j.jclepro.2021.127031>
- Ruhanen, L., Weiler, B., Moyle, B. D., & McLennan, C. J. (2015). Trends and patterns in sustainable tourism research: A 25-year bibliometric analysis. *Journal of Sustainable Tourism*, 23(4), 517–535. <https://doi.org/10.1080/09669582.2014.978790>
- Samiee, S., & Chabowski, B. R. (2012). Knowledge structure in international marketing: A multi-method bibliometric analysis. *Journal of the Academy of Marketing Science*, 40(2), 364–386. <https://doi.org/10.1007/s11747-011-0296-8>

- Sánchez, A. D., Del Río, M. D. L. C., & García, J. Á. (2017). Bibliometric analysis of publications on wine tourism in the databases Scopus and WoS. *European Research on Management and Business Economics*, 23(1), 8-15. <https://doi.org/10.1016/j.iedeen.2016.02.001>
- Serrano, L., Sianes, A., & Ariza-Montes, A. (2019). Using bibliometric methods to shed light on the concept of sustainable tourism. *Sustainability*, 11(24), 6964. <https://doi.org/10.3390/su11246964>
- Sheldon, P. J. (1991). An authorship analysis of tourism research. *Annals of Tourism Research*, 18(3), 473–484. [https://doi.org/10.1016/0160-7383\(91\)90053-E](https://doi.org/10.1016/0160-7383(91)90053-E)
- Shin, H., & Perdue, R. R. (2022). Hospitality and tourism service innovation: A bibliometric review and future research agenda. *International Journal of Hospitality Management*, 102, 103176. <https://doi.org/10.1016/j.ijhm.2022.103176>
- Small, H. (1973). Co-citation in the scientific literature: A new measure of the relationship between two documents. *Journal of the American Society for Information Science*, 24(4), 265–269. <https://doi.org/10.1002/asi.4630240406>
- Suban, S. A. (2023). Bibliometric analysis on wellness tourism—citation and co-citation analysis. *International Hospitality Review*, 37(2), 359-383. <https://doi.org/10.1108/IHR-11-2021-0072>
- Taufique, K. M., Nielsen, K. S., Dietz, T., Shwom, R., Stern, P. C., & Vandenberg, M. P. (2022). Revisiting the promise of carbon labelling. *Nature Climate Change*, 12(2), 132-140. <https://doi.org/10.1038/s41558-021-01271-8>
- Taufique, K. R., Siwar, C., & Chamhuri, N. (2016, April 17–18). *Factors affecting consumers' perception of eco-labels: Evidence from Malaysia*. In *Proceedings of the Australia-Middle East Conference on Business and Social Sciences* (p. 31). Dubai, United Arab Emirates.
- Ülker, P., Ülker, M., & Karamustafa, K. (2023). Bibliometric analysis of bibliometric studies in the field of tourism and hospitality. *Journal of Hospitality and Tourism Insights*, 6(2), 797–818. <https://doi.org/10.1108/JHTI-10-2021-0291>
- Van Eck, N. J., & Waltman, L. (2017). Citation-based clustering of publications using CitNetExplorer and VOSviewer. *Scientometrics*, 111(2), 1053–1070. <https://doi.org/10.1007/s11192-017-2300-7>
- Van Loo, E. J., Caputo, V., Nayga Jr, R. M., & Verbeke, W. (2014). Consumers' valuation of sustainability labels on meat. *Food Policy*, 49, 137-150. <https://doi.org/10.1108/IHR-11-2021-0072>
- Wallin, J. A. (2005). Bibliometric methods: Pitfalls and possibilities. *Basic & Clinical Pharmacology & Toxicology*, 97(5), 261–275. https://doi.org/10.1111/j.1742-7843.2005.pto_139.x
- Wang, X., Lu, J., Song, Z., Zhou, Y., Liu, T., & Zhang, D. (2022). From past to future: bibliometric analysis of global research productivity on nomogram (2000–2021). *Frontiers in Public Health*, 10, 997713. <https://doi.org/10.3389/fpubh.2022.997713>
- White, H. D., & Griffith, B. C. (1981). Author co-citation: A literature measure and mapping technique. *Journal of the American Society for Information Science*, 32(3), 163–171. <https://doi.org/10.1002/asi.4630320302>

- Wider, W., Gao, Y., Chan, C. K., Lin, J., Li, J., Tanucan, J. C. M., & Fauzi, M. A. (2023). Unveiling trends in digital tourism research: A bibliometric analysis of co-citation and co-word analysis. *Environmental and Sustainability Indicators*, 20, 100308. <https://doi.org/10.1016/j.indic.2023.100308>
- Wiedmann, T., & Minx, J. (2007). A definition of ‘carbon footprint.’ In C. C. Pertsova (Ed.), *Ecological Economics Research Trends* (pp. 1–11). Nova Science Publishers.
- Xia, H., Muskat, B., Karl, M., Li, G., & Law, R. (2024). Destination competitiveness research over the past three decades: A computational literature review using topic modelling. *Journal of Travel & Tourism Marketing*, 41(5), 726-742. <https://doi.org/10.1080/10548408.2024.2332278>
- Zhao, R., Wu, D., & Patti, S. (2020). A bibliometric analysis of carbon labeling schemes in the period 2007–2019. *Energies*, 13(16), 4233. <https://doi.org/10.3390/en13164233>
- Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. *Organizational Research Methods*, 18(3), 429–472. <https://doi.org/10.1177/1094428114562629>