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Defining the Balearic Islands' Tourism Data Space: An Approach to Functional and Data Requirements

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Abstract: The definition of a tourism data space (TDS) in the Balearic Islands is a complex process that involves identifying the types of questions to be addressed, including analytical tools, and determining the type of information to be incorporated. This study delves into the functional requirements of a Balearic Islands' TDS based on the study of scientific research carried out in the field of tourism in the Balearic Islands and drawing comparisons with international scientific research in the field of tourism information. Utilizing a bibliometric analysis of the scientific literature, this study identifies the scientific requirements that should be met for the development of a robust, rigorous, and efficient TDS. The goal is to support excellent scientific research in tourism and facilitate the transfer of research results to the productive sector to maintain and improve the competitiveness of the Balearic Islands as a tourist destination. The results of the analysis provide a structured framework for the construction of the Balearic Islands' TDS, outlining objectives, methods to be implemented, and information to be considered.

Keywords: data space; data tourism; tourism data space; Balearic Islands; Mallorca; Menorca; Ibiza; Formentera; smart tourism; sustainability; bibliometric

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Citation: Ordóñez-Martínez, D.; Seguí-Pons, J.M.; Ruiz-Pérez, M. Defining the Balearic Islands' Tourism Data Space: An Approach to Functional and Data Requirements. *Data* **2024**, *9*, 41. https://doi.org/10.3390/data9030041

Academic Editor: Han Woo Park

Received: 16 January 2024
Revised: 12 February 2024
Accepted: 27 February 2024
Published: 29 February 2024

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1. Introduction

Tourism is a fundamental pillar of the economy in the Balearic Islands, a region that has established itself as one of Europe's most popular tourist destinations. Tourism represents a significant portion of the islands' gross domestic product (GDP) (41%, according to Exceltur, 2022 [1]). It is responsible for a high percentage of employment in the region (41.6% in 2019, according to Exceltur, 2022 [1]). In 2022, the Balearic Islands attracted 16,475,559 tourists [2] thanks to its geographical characteristics (favorable climate and beautiful beaches), rich culture, varied gastronomy and leisure offer, and high-quality hotel offer. However, this tourism success does not come without risks or challenges. One of the most significant challenges is mass tourism and its impact on the environment, its impact on local infrastructure, and the socio-economic disruption it generates for the resident population [3,4]. The substantial influx of tourists, especially in the summer, puts pressure on natural resources, such as water and beaches, and can lead to the saturation of services and public spaces [5]. Moreover, the concentration of tourism in certain areas gives rise to notable territorial and social imbalances [6,7]. Likewise, climate change poses an additional challenge for the Balearic Islands, potentially altering the climatic conditions that serve as a major attraction for tourists [8]. This is coupled with a growing demand for enhanced sustainability in destinations and the tourism offering. A more critical concern arises from a socio-economic point of view, with the absolute economic dependence on tourism making the region particularly vulnerable to global crises, such as pandemics or economic downturns, as evidenced in the past [9–11]. Furthermore, the continuous increase in tourism demand in an island environment with limited resources poses another significant challenge. Additionally, the evolving dynamics of the global

tourism market, where digitalization plays a pivotal role [12], present further complexities. The introduction of digital solutions and the democratization of information through mobile devices, coupled with increased destination connectivity, have placed substantial pressure on many destinations. Navigating this challenge requires adept management to ensure competitiveness, as in the case of the Balearic Islands.

In this context, having relevant and up-to-date digital tourism information is crucial to effectively addressing these challenges. A comprehensive analysis of tourism data can help better understand tourism dynamics, including travel patterns [13–15], tourist preferences [16–18] and behavior [19,20], the carrying capacity of infrastructure and natural resources [21–23], analysis of trends in demand [24–26], the real impact of tourism on the territory and the resident population [27], etc. The availability of tourism information is instrumental in optimizing the distribution of visitors throughout the year and across different areas of the islands to facilitate the development of sustainable tourism strategies that strike a balance between economic needs, the preservation of the environment, and the well-being of the local community, among many other advantages. By leveraging tourism data, the Balearic Islands can anticipate changes and make decisions based on evidence and knowledge, rather than on sensations and perceptions. This is essential to adapt to emerging trends, such as the rise of digital tourism or changes in travelers' preferences due to factors like climate change, global crises, etc.

Within this framework, the construction of a tourism data space emerges as an essential strategic tool for both public and private sector managers and for the academic community, which plays a crucial role in supporting decision-making in the field of tourism by enhancing understanding of the tourism phenomenon and its dynamics through scientific research and innovation.

A tourism data space is a digital infrastructure that generates a framework of trust under clear governance to share data securely and reliably with desired entities. The basic principle of a tourism data space is the voluntary sharing of data between entities that are part of an ecosystem to generate new value [28]. This new value can take the form of a new service or product, a cost reduction, or the development of new business models. The data shared in a data space can, if the parties so decide, be reused and contribute to generating new benefits for the territory. In this sense, data spaces generated by public and private entities can be used to collect, store, process, and analyze a wide variety of tourism-related data [29,30]. This concept focuses on integrating and leveraging data from multiple sources to gain a deeper and more comprehensive understanding of the tourism sector. In a tourism data space, data are collected from various sources, such as tourist surveys [31], online booking systems [32], active listening through social media [33], sensors and Internet of Things (IoT) devices at tourism sites [34], and government statistics, among many other sources. This information can range from the demographics and travel patterns of tourists to details about accommodations, tourist attractions, transportation, and the environmental and economic conditions of a tourism destination. Once collected, connectors can be used to access the entity's databases securely and in an accessible manner. The data collected are processed and analyzed using technological tools, such as artificial intelligence, machine learning, etc. This plays a pivotal role in the unveiling of patterns, the identification of trends, and the extraction of valuable insights that would not be evident without detailed analysis.

Upon reviewing the scientific literature on tourism, it becomes possible to discern the types of information used, the methods applied, and their purposes. For instance, numerous studies on tourist spending patterns or accommodation preferences indicate a substantial availability of data on tourist consumption behavior [35,36]. Many tourism studies often rely on data collected through surveys, reservation systems, and tourism agency statistics, reflecting a consolidated and reliable data source. On the other hand, the absence or scarcity of scientific studies on certain topics or geographic areas may suggest a lack of available tourist data or relevant information gaps.

This article is founded on a key conceptual and methodological premise within the field of tourism research: the idea that the existence and nature of scientific research in tourism are intrinsically linked to the availability of information. According to this premise, the presence of studies and research on a specific tourism topic and geographic area suggests data availability within that domain. Conversely, the absence of research on a topic may indicate a deficiency in information. From this perspective, the challenge of this study is to detect the available tourist data in the Balearic Islands and specify what other information should be available to enable the development of a robust and efficient tourism data space (TDS), facilitating comprehensive tourism research.

Bibliometric analysis of scientific literature on a subject allows the identification of the main authors, journals, topics, and their relationships [37]. Bibliometrics is a widely used methodology in the scientific field that facilitates the systematic study of the state of the art of a subject. In the realm of tourism, there are many studies on bibliometrics, which offer a comprehensive view of various aspects of tourist activity and the main themes analyzed [38–41].

This article aims to answer the following scientific questions (Q), achieve the following objectives (O), and make the following contributions (C):

Q1. Is there any bibliometric study on tourism data spaces? Objective 1: Analyze the state of the art of bibliometric studies in tourism to confirm that references to the development of tourist spaces are scarcely addressed. C1: Evaluation of bibliometric studies in the field of tourism.

Q2. What international tourism research is conducted based on the use of tourist data/information, what themes are considered, what data are used, and what methods are applied? Objective 2: Identify the themes, types of information, and methods used in comprehensive international tourism research. C2: List of themes, information typologies, and analytical methods used in international tourism research.

Q3. What tourism research is conducted in the Balearic Islands, what themes are covered, what type of information is used, and what methods are applied? Objective 3: Assess the tourism research in relation to the Balearic Islands, identify themes, types of information used, and methods applied. C3: List of tourism themes considered by the scientific literature in the Balearic Islands, methods applied in Balearic tourism research, and types of information considered.

Q4. In terms of constructing a tourism data space in the Balearic Islands, what themes should be implemented so that such a TDS would facilitate comprehensive international research? Objective 4: Identify the research priorities in Balearic tourism, complementary to the existing ones, to incorporate into a tourism data space that supports comprehensive tourism research. C4: Research lines to incorporate into a Balearic tourism data space. Implications and future directions.

The article is structured into four sections. Section 2 presents the methodology applied in the study based on the use of bibliometric analysis tools. Section 3 is an analysis of the state of the art, examining bibliometric studies conducted in the field of tourism research. Section 4 presents the results, divided into three subsections: the first presents the results of the bibliometric analysis of scientific literature based on the use of tourist data/information, identifying the information and methods used; the second evaluates tourism research in the Balearic Islands and extracts the type of information and methods applied; and the last subsection is a discussion, identifying information needs for constructing a tourism data space in the Balearic Islands. Finally, Section 5 includes a conclusion that also assesses the implications and future directions in the tourism context for creating a tourism data space.

2. Methodology

The basic assumption of the applied methodology is based on the principle that keywords in the scientific literature are direct indicators of the topics of focus and, by extension, of the types of data used in the research. In general, keywords are selected by authors and editors to accurately reflect the central themes of their research. They, therefore,

provide a direct and condensed view of the issues addressed. Analysis of keywords over time can reveal emerging trends in tourism research, showing how interests and areas of focus in the field are evolving. Suppose a keyword is prominent in the literature. In that case, it suggests that sufficient data are available to support research in that area, as well as the evolution of the concept according to historical context and time and the adaptation of research accordingly.

This study adopted a stratified bibliometric approach, articulated in three levels of analysis, to comprehensively explore the existing literature in the field of tourism data/information with a particular focus on the Balearic Islands.

Firstly, a bibliometric meta-analysis was implemented to assess the current landscape of bibliometric studies in the field of tourism. This level aimed to identify and analyze the prevalence and focus of existing research on using tourism data and information. The main goal was to assess the state of the art of bibliometric research in tourism, specifically those studying tourism data/information.

Secondly, a detailed bibliometric analysis of the scientific literature focusing on analyzing and managing data and information in tourism was carried out. This level aimed to discern the current research context in this domain, examining the themes of the information analyzed and the predominant analytical methods.

Thirdly, the study focused on a specific bibliographical review of tourism research in the Balearic Islands, including all its islands: Mallorca, Menorca, Ibiza, and Formentera. The purpose was to analyze the type of tourism information used in previous studies and review the applied methodologies. This analysis allowed us to detect the scientific areas addressed and the data sets used in the Balearic context.

The bibliometric study was complemented by a thorough review of the selected scientific articles, identifying their application areas, methodologies, and the data/information used in their development.

Based on the results obtained, areas of tourism research were identified that have not yet been explored in the Balearic Islands, probably due to a lack of data in this area, which would require tourism data for their development.

The bibliometric information (bibliographic references) was extracted through the Web of Science [42] by applying various queries specifically constructed to answer each of the questions posed.

The methodology was developed in three phases:

- Collection of scientific references.

Firstly, to analyze the state of the art, other bibliometric studies carried out in the field of bibliometric analysis in tourism were evaluated. For this purpose, we used Query (1), obtaining a total of 785 references.

The query used was as follows:

(1) TS = (“tourism” OR “tourist”) AND TS = (“Bibliometric”)

Secondly, although it would have been interesting to evaluate the international scientific production in the field of the construction of tourism data spaces, such an approach has not been feasible because it has been found that there are no scientific references in this field. For this reason, it was considered convenient to focus the work on the search for references about the production and use of scientific data/information and tourism. In this approach, we applied the search Query (2). In this case, a total of 939 references were obtained.

(2) TI = (“tourism” OR “tourists”) and TI = (“data” or “information”) and Article (Document Types) and (2000 to 2023) (Publication Years) and Web of Science Core Collection (Database) and Business Economics or Social Sciences Other Topics or Environmental Sciences Ecology or Computer Science or Information Science Library Science or Geography or Mathematics or Science Technology Other Topics (Research Areas)

Thirdly, for the specific analysis of tourism research in the Balearic Islands, a search was carried out to retrieve information on the islands and tourism as presented in Query (3). Thus, a total of 442 references were retrieved.

(3) TS = ("MALLORCA" or "Minorca" or "Eivissa" or "Ibiza" or "Formentera" or "Balearic" or "Balearic Islands") and TS = ("Tourism" or "Touristic")

It is important to note that the WOS was consulted on 15 November 2023.

- Bibliometric Analysis

Two computer tools were used for the bibliometric analysis:

- Biblioshiny 4.1: Used for initial descriptive analysis, co-citation mapping of authors and journals, and identifying major trends and themes [43].
- VOSviewer: Used for visualizing keywords, co-authorship, and citation networks, providing a graphical representation of the relationships and patterns between studies [44]. This program was specifically used for generating keyword co-citation graphs and clustering. The first step involves collecting bibliometric data from the Web of Science. This data includes information about publications, authors, citations, and keywords. VOSviewer analyzes the publications' titles, abstracts, and keyword lists to identify the most relevant keywords. The software applies natural language processing techniques to process and normalize the text data. VOSviewer calculates the strength of the co-citation relationships between pairs of keywords for keyword co-citation analysis. The co-citation strength between two keywords is determined by the number of publications in which both keywords appear. Using the co-citation strengths, a network is constructed where nodes represent keywords and edges define the co-citation relationships. The thickness of an edge typically reflects its co-citation strength. VOSviewer uses a clustering technique based on modularity optimization. Clusters of keywords are identified so that keywords within a cluster have stronger co-citation links with each other than with keywords in different clusters. The modularity Q is given by Formula (1):

$$Q = \frac{1}{2m} \sum_{ij} \left[A_{ij} - \frac{k_i\, k_j}{2m} \right] \& \, (c_i, c_j) \tag{1}$$

where A_{ij} is the weight of the edge between nodes i and j; k_i and k_j are the sum of the weights of the edges attached to nodes i and j; m is the sum of all edge weights in the network; and δ is the Kronecker delta function, which is 1 if i and j are in the same cluster and 0 otherwise.

The network was visualized using a distance-based mapping technique. The layout of the network was determined in such a way that the distance between two keywords reflected the relatedness of the keywords, with closely related keywords positioned near each other. The resulting visualization and clusters were analyzed to identify patterns, trends, and thematic concentrations in the scientific literature.

This methodology allowed us to visually explore the structure and evolution of scientific fields, identify key themes, and detect emerging trends. The clusters in the keyword co-citation networks often correspond to different research topics or thematic areas within the field.

- Interpretation and Synthesis of Results

The information generated identified citations, the most frequent topics, and emerging research areas.

3. State of the Art: Bibliometrics of Tourism

The WOS search for "bibliometrics and tourism" resulted in a total of 785 citations. There is a growing interest in the development of bibliometric analysis related to tourism. The total number of papers published in this field has grown exponentially over the

last decade (Appendix A, Figure A1). This increase in the number of papers is probably related to the interest in this theme and the existence of new automated tools for bibliometric analysis.

The scientific journals that have published the most articles are *Sustainability* (78 articles), *IJ of Contemporary Hospitality Management* (28 articles), and *Tourism Review* (22 articles) (Appendix A, Table A1).

The most cited articles in the field of bibliometric research in tourism (Appendix A Table A2) refer to various themes: tourism in the framework of the circular economy [45]; scientific research networks in the field of tourism [46]; quality of research in tourism according to academic rankings [47]; social media research [48]; innovation in hospitality and tourism [49]; economic impact of tourism [41]; trends and patterns in sustainable tourism [50–52]; tourism and gender [53]; crisis and disaster management [54]; wine tourism [55]; medical tourism [56]; food and gastronomy [57]; adventure tourism [58]; travel and tourism marketing [59]; tourism, leisure, and hospitality [60]; tourism statistics [61]; intangible cultural heritage [62]; geo-tourism [63]; and psychological research [64].

Figure 1 shows a diagram with the main keywords (Keywords Plus) used by the selected scientific articles. The analysis shows the grouping of the keywords into four clusters reflecting the different themes of the publications and addressing different aspects of the tourism experience and its management.

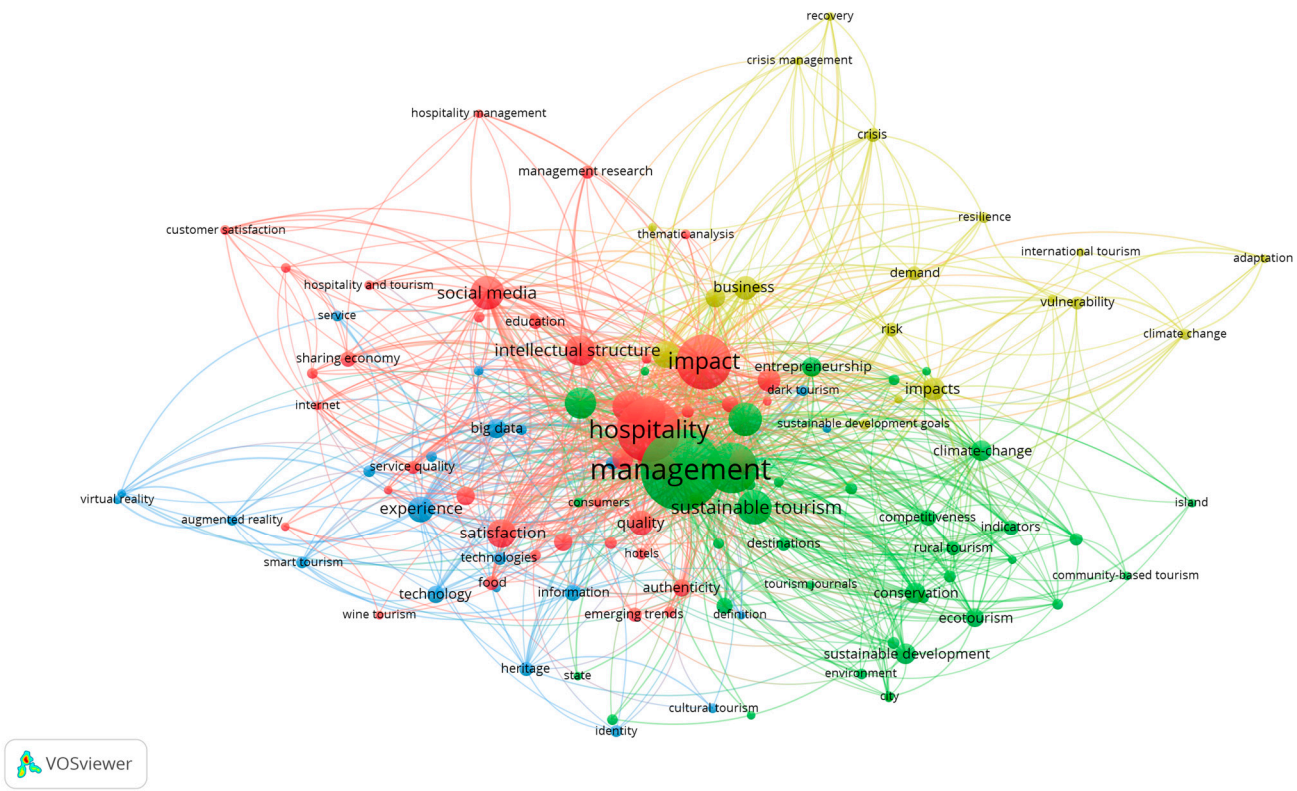

Figure 1. Map of the co-occurrence of keywords in the field of bibliometrics and tourism. (Note: The graphic was created using VOSviewer software version 1.6.20). Each node's size correlates with the frequency of the keyword's appearance, meaning a larger node indicates a more frequent presence in the authors' keywords. The overall spacing between nodes reflects their interrelationship, with closer nodes signifying a stronger connection. The importance of terms is assessed by tallying their occurrences in keywords. The colors show the clusters.

Cluster 1 (red) represents the backbone of the tourism industry with terms such as "management" [65,66], "hospitality" [67,68], "impact" [69], "satisfaction", "social media", "customer satisfaction" [70], and "hotel". These terms suggest that much of the

existing tourism bibliometric research focuses on hospitality management and impact assessment [71].

The presence of "satisfaction" and "customer satisfaction" indicates a strong focus on the customer experience, which is central to the success of any tourism destination or service [70,72]. "Social media" reflects the importance of digital platforms in the promotion and management of the tourism experience [48]. At the same time, "hotel" emphasizes the relevance of research in hospitality as a specific sector within tourism [73].

Cluster 2 (green) focuses on sustainability and responsible tourism with terms such as "sustainability" [72,74], "climate change" [75,76], "conservation" [77], and "ecotourism" [78]. This shows the tourism industry's growing concern for and commitment to environmental preservation and sustainable development. This cluster underlines how tourism must adapt and respond to global environmental challenges while prioritizing conservation.

Cluster 3 (yellow) addresses the dimensions of resilience and crisis management with terms such as "impacts", "vulnerability" [79], "crisis" [80], "COVID" [81], and "recovery". The research here focuses on understanding and mitigating the negative effects of adverse events on tourism. This includes studies on how tourism areas can be vulnerable to shocks of different types and how they can recover from them, which is especially relevant in the context of the COVID-19 pandemic.

Finally, Cluster 4 (blue) is linked to technological innovation in tourism and is the cluster most related to the objectives of this article. It includes the terms "big data" [82,83], "information", "virtual reality" [84], "technologies" [85,86], and "artificial intelligence" [87–90].

Including these terms highlights the ongoing digital transformation in tourism and how technology is reshaping how tourism destinations are managed and enjoyed. Also included in this list are the terms "smart destination" [91,92] and IoT [93], which suggest an interest in how tourism destinations can use technology to improve the tourist experience and destination management. This term is particularly related to the use of technology for the use of tourism information.

The results obtained show how the tourism industry is evolving in response to consumer demands and global challenges. Efficient management and customer satisfaction (Cluster 1) must be balanced with environmental responsibility (Cluster 2) and the ability to manage and recover from crises (Cluster 3). Tourism technology and data (Cluster 4) are enablers along these lines, enabling new forms of engagement and more efficient management of tourism resources. The joint analysis of these clusters reveals a picture of an industry in transformation, seeking to balance growth and customer satisfaction with sustainability and resilience.

Figure 2 shows the thematic evolution of bibliometric articles in tourism. There has been a progressive increase and diversification of the topics subject to bibliometric analysis from 2005 to the present. Within the framework of this study, it should be noted that in the recent period 2021–2022, the thematic category "information science" stands out, in which most of the references specifically related to the use and exploitation of tourism information are grouped.

In terms of bibliometric studies specifically related to tourism data/information, we highlight the following works:

Vidal Carrasco et al. (2023) [85] develop a conceptual framework of architecture and processes based on data analysis for tourism management based on Stone and Woodcock (2014) [86]. In this framework, they identify four components: data sources (tourism information systems, travel agencies, geo-social networks, online reviews, user-generated content, and destination image), data architectures (storage, basis for management, and basis for governance), advanced analytical models (clustering, data mining, deep learning, etc.), and management applications (strategies, management, customer satisfaction, etc.). This approach is also included by Moreno et al. [94].

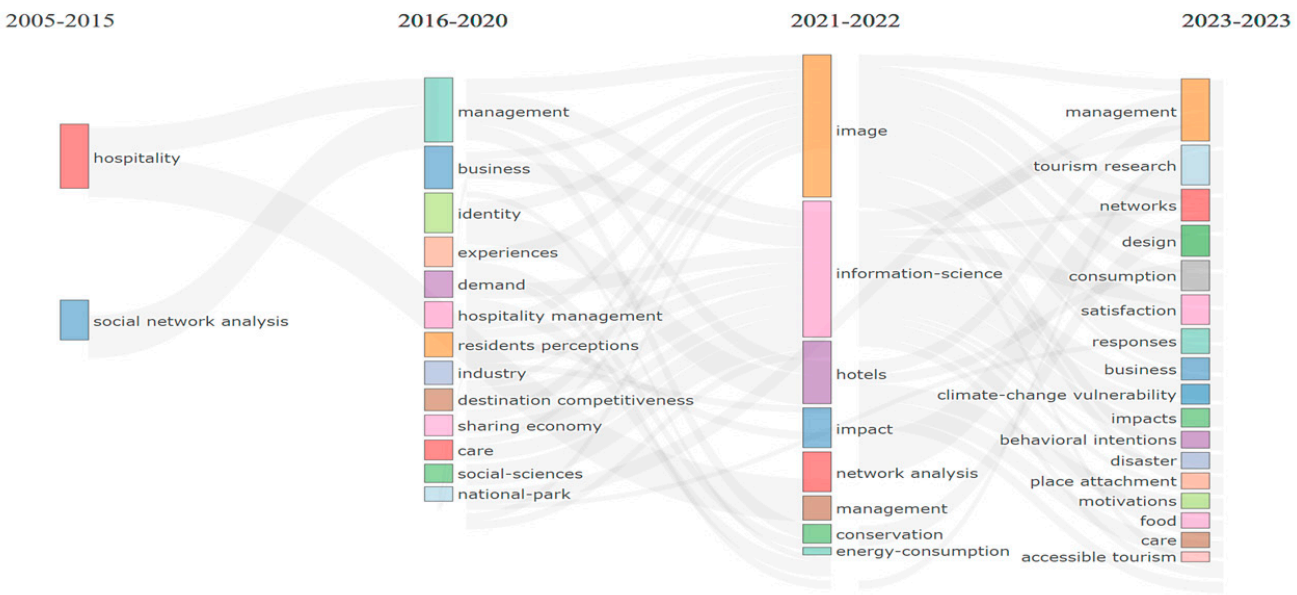

Figure 2. Thematic and temporal evolution of bibliometric keywords in tourism. The figure shows the evolution of the keywords used in bibliometric analysis papers on various topics related to tourism. The columns show the time periods of analysis. The size of the boxes shows the importance of the keywords. The colors are random to distinguish each keyword. There has been a considerable increase in bibliometric studies in recent years. It is notable that tourism data spaces do not appear as featured keywords to date.

Li, Xu, Tang, Wang, and Li (2018) [95] identify different types of data in tourism analytics, which they divide into three main categories: UGC (user-generated) data, including online textual data and online photo data; device data, comprising GPS data, mobile roaming data, Bluetooth data, etc.; and transaction data (by transactions), including data from web searches, website visits, and online bookings, among others. Each type of data carries different information and addresses different tourism issues.

Concerning the detection of analytical methods developed in the analysis of tourism data, see the work of Rahmadia et al. (2021) [96].

Also important is the work of Yuan et al. [86], which, using a bibliometric analysis, analyzes the topics in tourism research in the technological field. This authors point out six areas of work in the framework of information/tourism: interaction of people and organizations, interaction of people and information (destination manager, online experience), technological implementation, interaction of organization and information (marketing), interaction of organization and technology (internet strategy).

The main conclusion of this analysis is that, despite the importance of the subject, there are few bibliometric studies specifically oriented towards the analysis of the uses of tourism data/information. From this perspective, the present study will significantly contribute to this gap, providing a consistent and rigorous approach to the subject.

4. Results and Discussion

The results of the bibliometric study are grouped into three sections. The first section analyzes the research carried out using tourism data/information. The second section analyzes the scientific contributions in the field of the Balearic Islands. Finally, the last section, by way of discussion, evaluates the availability and gaps in terms of available information and analytical tools used in the analysis of tourism data in the Balearic Islands concerning the international panorama and proposes objectives to be covered in terms of data typology and analytical processes to be incorporated in the design of a tourism data space in the Balearic Islands.

4.1. Bibliometric Analysis of Research Focusing on the Analysis of Tourism Data/Information

The temporal analysis of the 948 references obtained from the WOS in the field of "tourism information/data" shows that there has been a notable increase in the number of studies in recent years (Appendix A, Figure A3).

The main scientific journals that concentrate on the publication of articles are the following: *Sustainability* (54), *Tourism Management* (52), *Current Issues in Tourism* (47), *Tourism Economics* (32), and *Journal of Travel Research* (29) (Appendix A, Table A1). This diversity of sources shows the widespread interest in tourism information in all specialized scientific fields.

The most cited articles in this field are presented in Appendix A, Table A3.

Figure 3 shows the co-citation diagram of the keywords used in the analyzed articles in the field of tourism and data/information. From the analysis of the graph, the following groups can be extracted:

- Cluster 1: Innovation and Management in Tourism and Hospitality. This cluster focuses on the dimensions of innovation, management, and evolution in the tourism and hospitality industry. It strongly focuses on how new technologies, such as artificial intelligence and virtual reality, reshape the tourism experience. In addition, it addresses management and performance issues in the context of hospitality, as seen by the inclusion of terms such as "hotel" and "management research". This cluster reflects a combination of technological advances and progressive management practices that define the current direction of the sector. Its keywords are "artificial intelligence", "virtual reality", "hotel", "management", and "performance" [97–99].
- Cluster 2: Sustainability and Social Perceptions in Tourism: This cluster focuses on sustainability issues, social perceptions, and the impact of tourism on communities and the environment. It includes concepts related to conservation, environmental impact, and corporate social responsibility. Terms such as "climate change" and "conservation" underscore the growing concern for sustainability in tourism, while "corporate social responsibility" reflects a focus on the ethical and responsible practices of tourism companies [100,101].
- Cluster 3: Adaptation and Resilience in the Face of Challenges. This cluster addresses adaptation, resilience, and risk management issues in tourism. It focuses on how tourism regions and businesses can adapt to climate change, terrorism, and crises. Terms such as "risk", "crisis management", and "adaptation" indicate a concern to develop effective strategies to cope with and overcome adversity [102–104].
- Cluster 4: Cultural Aspects and Authentic Experiences in Tourism. This cluster focuses on the importance of authenticity, cultural heritage, and unique experiences in tourism. It includes terms related to food tourism, cultural heritage, and the search for authentic experiences. "Food tourism" and "heritage" highlight the growing demand for tourism experiences that reflect local culture and traditions [105,106].
- Cluster 5: Accessibility and Inclusion in Tourism. This cluster addresses accessibility and inclusion in the tourism industry. It focuses on how to make tourism destinations and services accessible to all, including people with disabilities. Terms such as "accessibility" and "inclusive tourism" reflect a growing awareness of the need for more inclusive and accessible tourism [107].
- Cluster 6: Impact of the Pandemic on Tourism. This cluster appears to focus on the significant impact of the COVID-19 pandemic on the tourism industry. It includes terms directly related to the pandemic, such as "coronavirus" and "COVID-19", as well as terms that may be associated with its consequences on tourism, such as "pandemic". This cluster reflects the need to understand and respond to the unique challenges the pandemic has presented to the tourism and hospitality sector [108,109].
- Cluster 7: Transport and Mobility in Tourism. This cluster addresses aspects related to transportation and mobility in tourism. The presence of terms such as "transport" suggests a focus on how transport systems and infrastructures influence the tourism experience and the accessibility of destinations [110].

- Cluster 8: Supply Chain Management in Tourism. This cluster focuses on supply chain management within tourism. Terms such as "supply chain" and "supply chain management" indicate an interest in how efficient and sustainable supply chains can improve and sustain tourism operations [111].
- Cluster 9: Social and Cultural Aspects of Tourism. This cluster includes topics related to the social and cultural aspects of tourism. Terms such as "sociology" and "social sciences" suggest an analysis of tourism from a social and cultural perspective, considering how human interactions and cultural norms influence the tourism experience [112].
- Cluster 10: Hospitality Research and Education. This cluster appears to be related to research and education in the field of hospitality. The inclusion of terms such as "hospitality" indicates a focus on academic production and dissemination of knowledge in this sector [113].

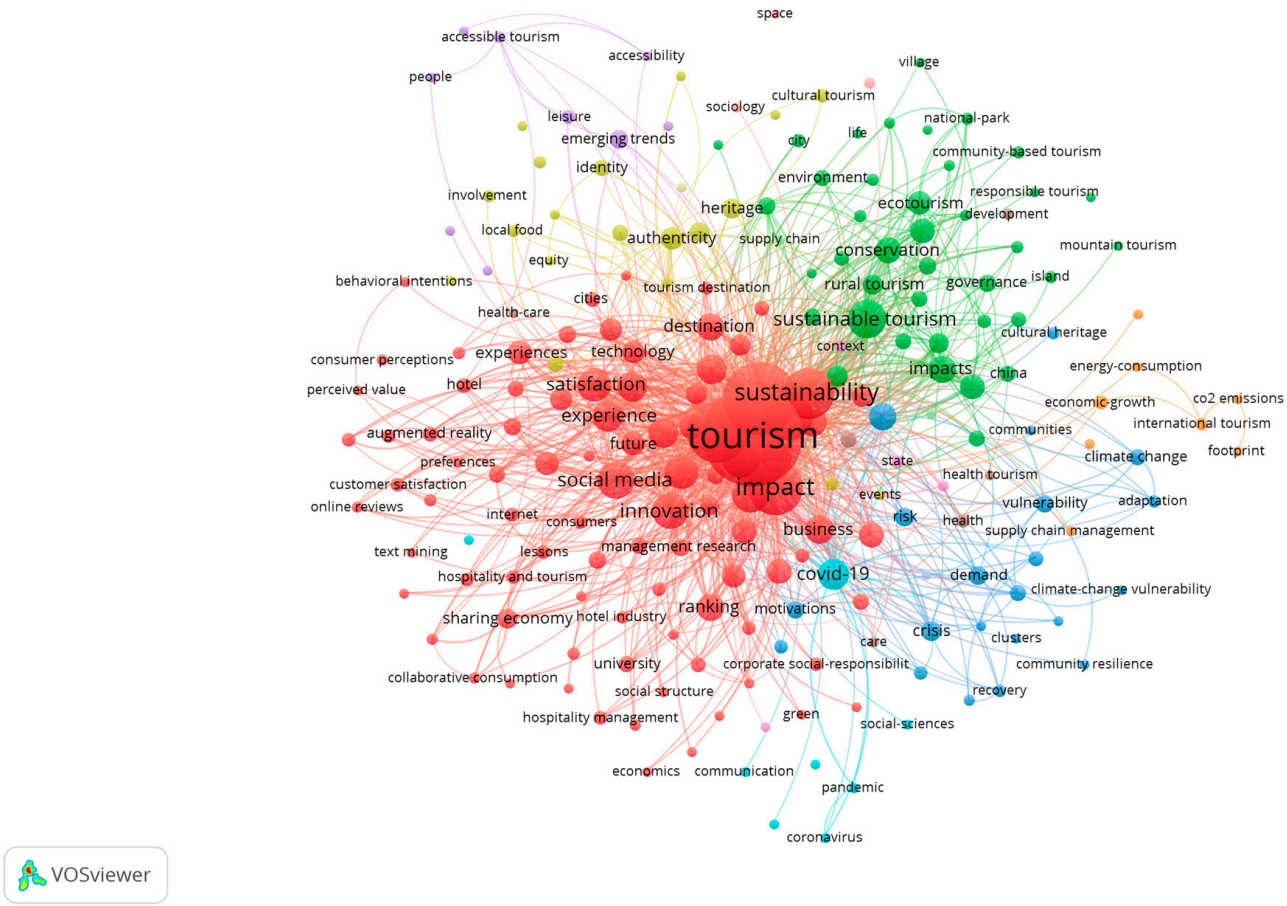

Figure 3. Co-occurrence map of keywords in the research topic of tourism and data/information. Colors show the keyword clusters.

The detailed analysis at the article level for the detailed extraction of their scientific objectives, the methodology used, and the type of information used in the studies are summarized in Figures 4–6. The analysis of the results shows the great diversity in the typology of the information used in tourism research, ranging from digital and social network data to official information from tourism organizations and environmental data. It shows the need to understand travelers' behavior patterns, market trends, environmental impacts and perceptions of destinations, among other issues. The predominance of advanced methods, such as machine learning, artificial intelligence, and geospatial analysis, is evident in terms of analytical tools. These tools allow researchers to handle large volumes of data and extract significant insights into complex and often non-linear patterns in tourism. The scientific

objectives of the papers analyzed are also very diverse, ranging from the analysis of traveler behavior and market demand to environmental sustainability and the socio-economic impact of tourism. This shows that tourism is an economic activity and a complex social, cultural, and environmental phenomenon.

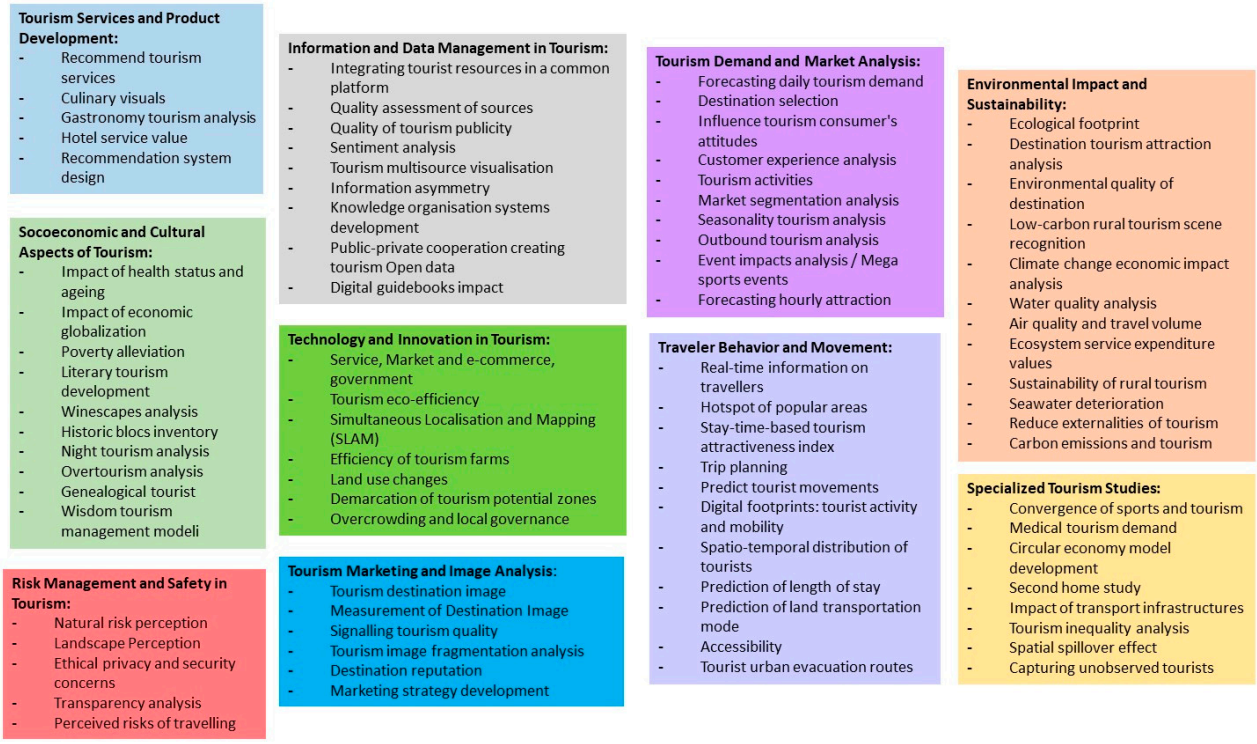

Figure 4. Objectives of the research literature on tourism and data/information.

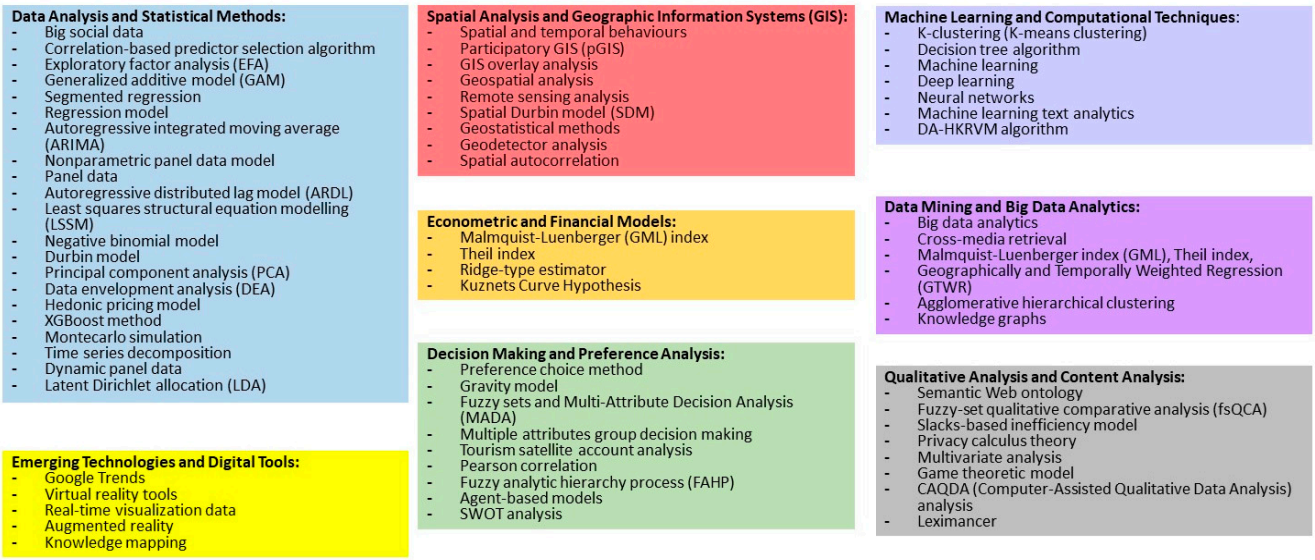

Figure 5. Applied methods of research literature on tourism and data/information.

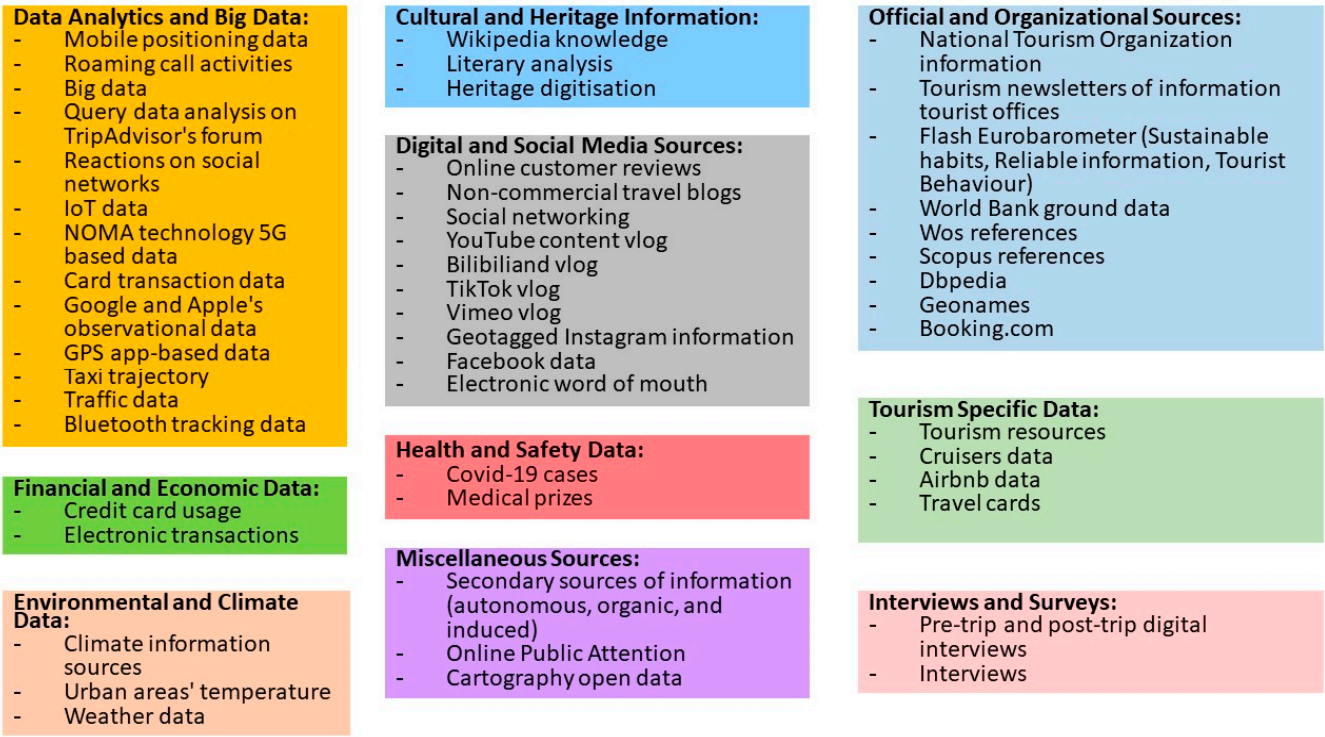

Figure 6. Data sources of research literature on tourism and data/information.

This approach to the use of tourism data to support scientific research shows the high complexity that can be implicit in implementing a TDS so that it can answer all the scientific questions raised by the research carried out. In addition, the TDS will have to be able to apply the various methodologies and techniques proposed and manage the data set to support the research.

In this approach, it is interesting to consider the work of Parra-López and Martínez-González [114]. The study of the lines of tourism research developed in island environments shows the need for these issues to be extensively analyzed in these environments. Although most of the lines of research detected have been included in our study, the singularity of island environments is evident, and the complementarity of both studies is confirmed.

From this perspective, the approach for the efficient implementation of a TDS should be based on an exhaustive evaluation of requirements to simplify its initial approach, as there are many possibilities to evolve and broaden its scope of work progressively.

4.2. Bibliometric Analysis of Tourism Research in the Balearic Islands

The evolution of scientific articles on tourism in the geographical area of the Balearic Islands shows an upward trend over the last decade (Figure A4, Appendix A).

The scientific articles on tourism research in the Balearic Islands with the highest number of citations are shown in Table A4 of Appendix A. Table A5 also shows the main authors that have published in this field.

Regarding their subject matter and use of tourism information, Figure 7 shows the co-citation map of keywords in the Balearic Islands' scientific articles about tourism. The grouping of keywords by subject matter gives rise to the following clusters:

- Cluster 1, focusing on Sustainability and Climate Change, addresses issues such as climate change [115,116], conservation, the environment, sustainable tourism, and vulnerability [117,118]. This focus reflects a growing concern for the environment and the need to promote sustainable tourism practices that minimize environmental impact [5,112–117].

- In Cluster 2, dedicated to Customer Experience and Destination Management, terms such as customer satisfaction, destination image, management and travel are highlighted, underscoring the importance of understanding and improving customer experience and effective destination management [119,120].
- Cluster 3 focuses on Island Tourism and Cultural Aspects, with terms such as Airbnb, the Balearic Islands, coastal tourism, gentrification, and Palma. This cluster suggests a special interest in how tourism influences local culture and the socio-economic structure of islands, with a particular focus on Mallorca [121–124].
- Cluster 4 addresses Pandemic Response and Resilience, including terms related to COVID-19, efficiency, frameworks, resilience, and uncertainty. This approach may reflect developing strategies and frameworks to manage uncertainty and foster tourism recovery during and after the pandemic [9,125,126].
- In Cluster 5, the Economic and Environmental Aspects of Tourism are the focus, with terms such as emissions, externalities, hotels, Mallorca, and tourism demand. This cluster concentrates on how tourism demand and sector practices affect Mallorca's environment and economy [127–129].
- Cluster 6 focuses on the Social and Technological Aspects of Tourism, with terms such as destinations, determinants, innovation, Spain, and technology, highlighting the importance of technological innovation in tourism and the role of social and cultural factors in choosing tourism destinations [130,131].
- Cluster 7, which addresses Perceptions and Psychological Aspects of Tourism, includes terms such as attitudes, Ibiza, perceptions, residents, and support. It suggests focusing on how residents and tourists perceive tourism and its impact on specific destinations, such as Ibiza [132–135].

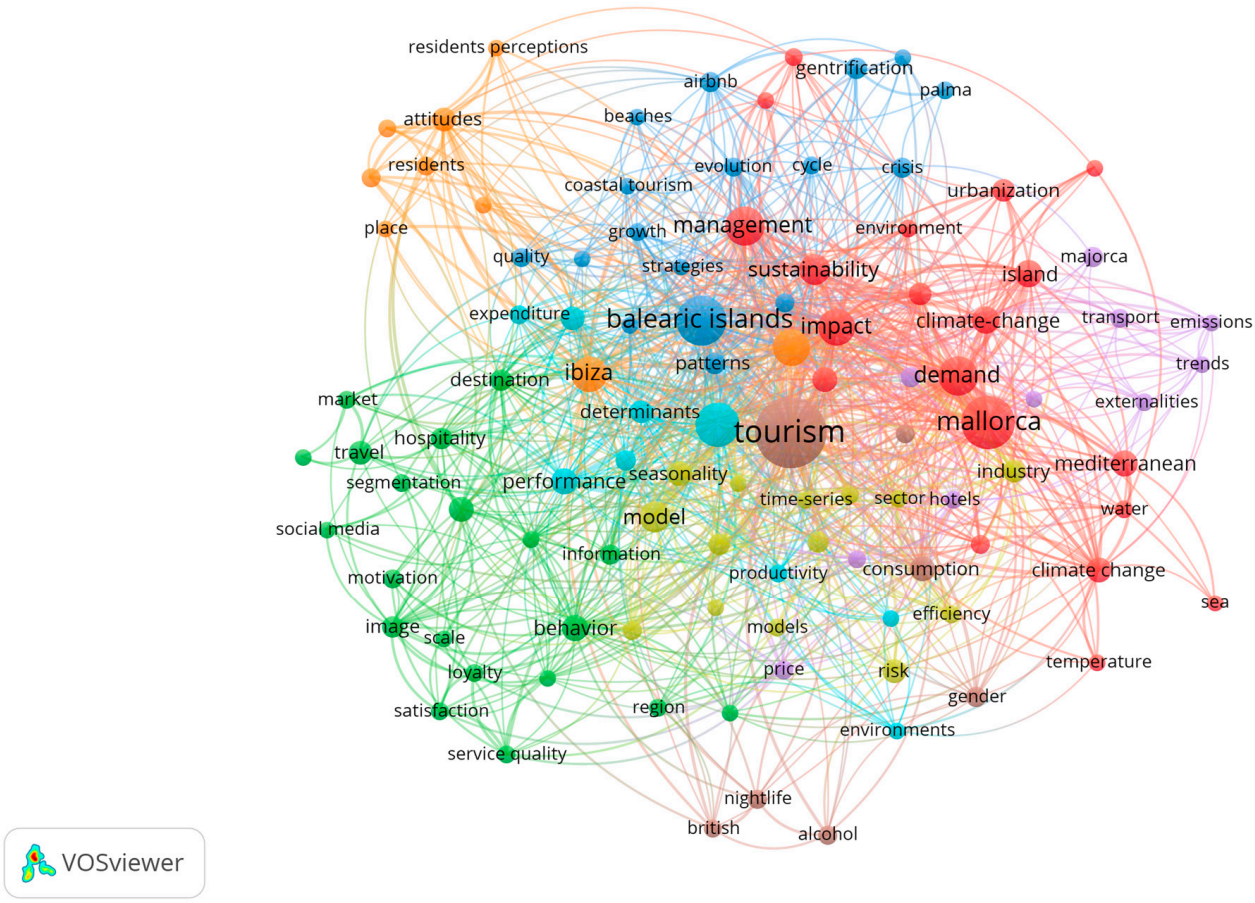

Figure 7. Co-occurrence keywords in the fields of "tourism" and "Balearic Islands". Colors show the keyword clusters.

Finally, Cluster 8 focuses on Alcohol Consumption and Beach Tourism, with terms related to alcohol, British tourists, consumption, tourism, and nightlife. It indicates an interest in analyzing consumption patterns and how they influence the tourist experience in Mallorca [136,137].

The detailed analysis of the scientific articles from the Balearic Islands, identifying their specific topics, provided the results in Table 1.

Table 1. Main topics of the Balearic Islands tourism research.

Environmental and Ecological Impacts of Tourism:

- Water consumption
- Seagrass meadow impacts
- Reuse of greywater
- Economic value of beaches
- Agriculture impacts
- Waste production and impacts
- Climate change impacts
- Natural risks: coastal flooding, extreme precipitation, flood mortality, and droughts
- Impacts on air pollution

Tourism Management and Planning:

- Tourism Education
- Reactivation of hotels post-crisis
- Market analysis and evolution
- Management analysis
- Resident attitudes and perceptions
- Tourism risk management
- Tourism information assessment
- Sustainability analysis
- Seasonality implications in tourism
- Rural tourism market analysis

Economic and Social Impacts of Tourism:

- COVID-19 tourism impact
- Perceived value of the nautical business sector
- Impact of daylight saving time (DST)
- Impact of air transport subsidies
- German tourism analysis
- Housing speculation, digital economy, and spatial readiness
- Personal income and employment
- Transport infrastructure
- Peer-to-peer market impacts
- Multinationals market
- Energy infrastructures, fuel prices, and solar energy at hotels
- Housing crisis
- Over tourism
- Gentrification
- Social and environmental impacts
- De-industrialization
- Senior tourism
- Tourism preferences
- Forecasting arrivals
- Price strategies
- Capital accumulation
- Patterns in beach occupation

Cultural and Innovation Aspects of Tourism:

- Motivation, satisfaction, and competitiveness in cycling
- Wine tourism
- Music as a tourism innovation
- Intangible heritage values
- Landscape value assessment
- Island tourism analysis
- Digital guidebooks impact
- Tourism and innovation activities

Health and Safety in Tourism:

- Housekeepers' issues, stress, and gender analysis
- Balconing
- Road accidents related to tourism
- Drug use
- Sexual crimes

Specific Tourism and Market Niches:

- Impact of Adlib fashion in Ibiza
- Night tourism analysis
- Real estate tourism
- Urban sprawl
- Literary tourism development
- Impact of daylight saving time (DST)

An analysis of the detailed subject matter of the scientific articles on tourism in the Balearic Islands reveals a variety of approaches and key concerns in the sector, which largely coincide with the clusters identified above.

First, there is a significant emphasis on the Environmental and Ecological Impacts of Tourism, addressing issues such as water consumption, impacts on *Posidonia* meadows, greywater reuse, the economic value of beaches, and the effects of tourism on agriculture, waste production, climate change, and natural hazards. These studies reflect a growing concern about understanding and mitigating the negative impact of tourism on the environment and ecosystems.

Secondly, the Tourism Management and Planning group includes topics such as tourism education, post-crisis hotel reactivation, market analysis and evolution, tourism

risk management, and sustainability. This work focuses on improving tourism management and planning to optimize its benefits and reduce its challenges.

The third group, Economic and Social Impacts of Tourism, explores a wide range of issues, from the impact of COVID-19 and the value of the nautical sector to property speculation, employment, the housing crisis, over-tourism, and gentrification. These studies investigate how tourism positively and negatively affects the economy and society.

On the other hand, Cultural Aspects and Innovation in Tourism highlights the importance of culture and innovation in tourism development. Topics such as cycle tourism, wine tourism, music, intangible heritage, and island tourism are addressed, underscoring the relevance of culture and innovation in promoting tourism.

The fifth group, Health and Safety in Tourism, focuses on critical issues such as stress and gender issues in cleaning staff, balconing, traffic accidents, drug use, and sexual offenses. These articles highlight the importance of ensuring health and safety in tourism.

Finally, the Specific Tourism and Niche Markets group focuses on specific niches such as Adlib fashion in Ibiza, nightlife tourism, real estate, and literary tourism. These studies highlight the diversity and specialization within the tourism sector.

With regard to the specific information used in tourism research in the Balearic Islands, Table 2 lists the main items inventoried. The limitation of the data typology in relation to that collected in international scientific research (Figures 4–6) is evident, as is the appearance of topics that had not been collected previously and which show the specificities of Balearic tourism: cycling tourism surveys, *Posidonia* sp. cartography, water consumption, etc.

Table 2. Typology of the information used in tourism studies in the Balearic Islands.

Main Information Sources
Environmental and Natural Resource Data:
Water consumption data
Posidonia sp. cartography (seagrass mapping)
Aquifer water extraction data
Climate data
Accommodation and Pricing Information:
Renovation registers of hotels
Tourism accommodation prices
HomeAway data
Airbnb data
Digital and Social Media Sources:
Social media data
Tourism websites
Surveys and Interview Data:
Questionnaires
Cycling tourism participant survey
Interviews
Technological and Infrastructure Data:
Wi-fi coverage and usage data
Video monitoring data
Visual and Multimedia Data:
Photo and video content

Figure 8 shows a co-authorship analysis of the articles, which allows us to identify the research groups working in this area.

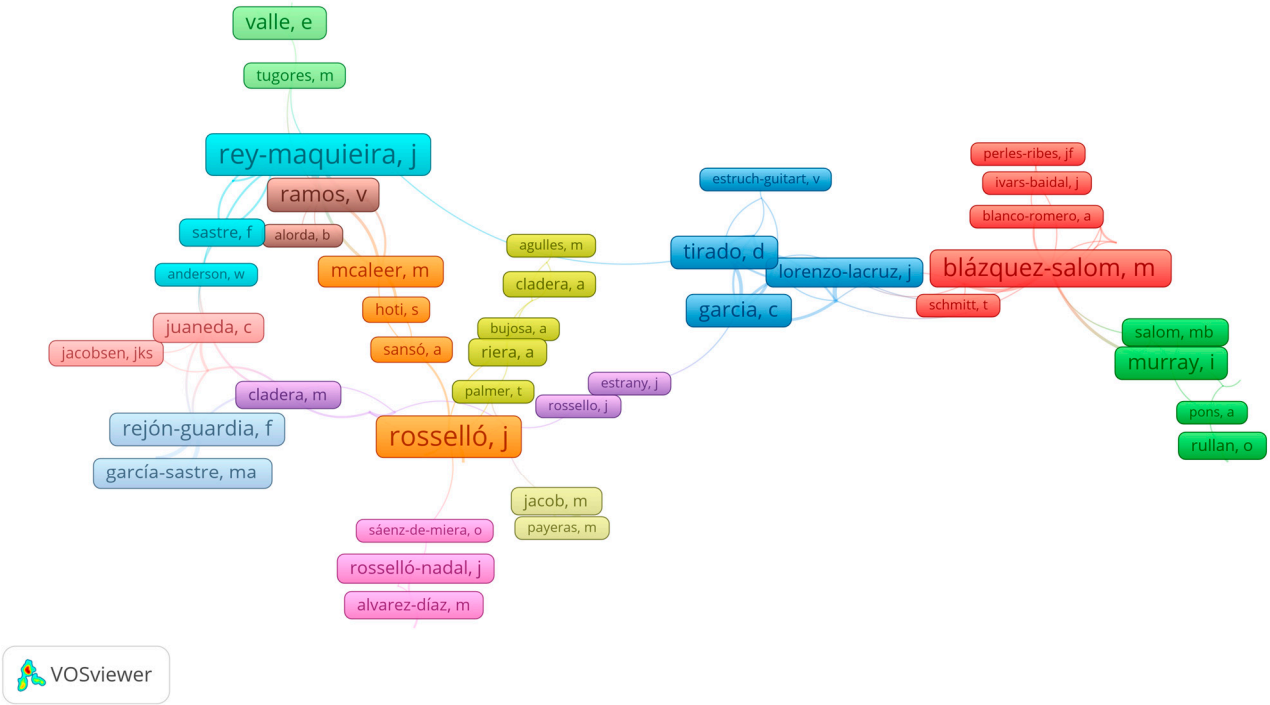

Figure 8. Co-authorship map of researchers in tourism at the Balearic Islands. Colors show the generated clusters.

The authors could be grouped into the next clusters:

- Cluster 1: Innovation and Sustainable Development in Tourism. This includes authors such as Blanco-Romero, A.; Blázquez-Salom, M.; Hof, A.; Ivars-Baidal, J.; and Perles-Ribes, JF. This cluster could focus on innovation and sustainable development in tourism. Authors in this cluster may be working in areas such as sustainable tourism, environmental impacts of tourism, and the development of innovative strategies for tourism management.
- Cluster 2: Economic and Social Aspects of Tourism. Authors such as Rullan, O. and Vives-Miró, S. are part of this cluster. This cluster probably focuses on tourism's economic and social aspects, including studies on the economic impact of tourism, the relationship between tourism and community development, and issues of equity and social justice in tourism.
- Cluster 3: Tourism and Environmental Management. With authors such as Deyà-Tortella, B.; García, C.; Lorenzo-Lacruz, J.; and Tirado, D., this cluster seems to focus on the intersection of tourism and environmental management. Research topics could include natural resource management in tourist areas, tourism and climate change, and eco-tourism practices.
- Cluster 4: Market Studies and Consumer Behavior in Tourism. This cluster, with authors such as Agulles, M.; Cladera, A.; Jordà, G.; and Torres, C., may specialize in market studies and consumer behavior in the context of tourism. The authors may be researching tourism consumption patterns, travelers' preferences, and marketing strategies in tourism.
- Cluster 5: Tourism and Local Economic Development. Authors such as Aguiló, E.; Alegre, J.; Cladera, M.; and Sard, M. are part of this group. This cluster may focus on the relationship between tourism and local economic development, exploring how tourism can be a tool for economic growth and how it impacts local economies.
- Cluster 6: Tourism, Culture, and Heritage. Including authors such as Anderson, W.; Arbulú, I.; Lozano, J.; and Rey-Maquieira, J., this cluster could be focused on

the relationship between tourism, culture, and heritage. Authors in this cluster may explore how tourism affects and is affected by cultural heritage and local traditions.

- Cluster 7: Tourism and Destination Management. This cluster, with authors such as Bakhat, M.; Hoti, S.; Rosselló, J.; and Saenz-de-Miera, O., seems to focus on tourism destination management. Research topics could include destination planning and management, the sustainability of tourism destinations, and the development of destination marketing strategies.
- Cluster 8: Tourism and Community Aspects. With authors such as Alorda, B.; Bartolomé, A.; Leoni, V.; and Ramos, V., this cluster may be focused on tourism and its community aspects. The authors could be investigating the impact of tourism on local communities, community-based tourism, and how communities can benefit from tourism.

Tourism research in the Balearic Islands highlights that although research is extensive in terms of topics and approaches, its fields of study are limited in relation to international tourism research. There is no evidence of a wide availability of tourism data and particularly not abundant research based on the extensive use of big data and artificial intelligence tools, as shown by international research patterns.

4.3. Discussion and Proposal of the Thematic Framework of the TDS

The design of a TDS in a tourist destination must respond to the management and research of this environment. From this perspective, the diagnosis of the scientific research on tourism carried out in the Balearic Islands lays the foundations for the basic requirements in terms of the tourism information necessary to incorporate in a Balearic TDS and, in turn, provides indications of the available tourism information that has underpinned the recorded research activity.

However, constructing a TDS must go beyond covering current research needs by providing advanced analytical tools and rigorous and updated information on the tourism phenomenon in all its dimensions. The private sector is missing as a key player as a generator and provider of tourism data of great relevance to ensure the good management of the destination and its competitiveness.

Therefore, to build a TDS that facilitates integrated tourism research in the Balearic Islands, it is important to conduct a comparative analysis between international tourism research lines based on data and information and the specific lines of research in the Balearic Islands. This will reveal the information required to be able to broaden the scope of the study.

The comparative analysis of the international tourism research areas carried out in the Balearic Islands shows significant coincidences (Figures 4–6 and Table 2). It can be seen that both areas coincide in their focus on the environmental and ecological impacts of tourism, including aspects such as water consumption; the effects of climate change; and the preservation of natural ecosystems, such as *Posidonia* meadows. This overlap is particularly relevant for the Balearic Islands, given their rich biodiversity and dependence on coastal tourism. Furthermore, tourism management and planning also feature prominently in both areas, reflecting a common concern for the long-term sustainability of tourism, especially in contexts such as post-crisis recovery and risk management. Research in both contexts also addresses tourism's economic and social impacts, including aspects such as the impact of the COVID-19 pandemic, gentrification, and changes in the labor market and economic structure due to tourism. These studies are crucial to understanding how tourism shapes local societies and economies, especially in a prominent tourist destination such as the Balearic Islands.

However, there is significant potential for research in the Balearic Islands to expand and align more closely with global research trends. One area with potential for development is analyzing traveler behavior and movement, especially using appropriate data and advanced technologies for tracking and prediction. This would enhance the understanding of tourism behavior and inform more effective management and marketing strategies. In

terms of innovation and technology, the Balearic Islands could deepen studies on tourism eco-efficiency and the implementation of emerging technologies, such as big data analytics and digitalization, to remain competitive in a technology-driven tourism sector. Tourism marketing and image analysis also present an opportunity for the Balearic Islands to strengthen its position in the global market by developing more sophisticated and data-driven marketing strategies. This could improve the perception of the destination and attract more diverse and lucrative market segments.

On this basis, designing a Balearic TDS that includes sources of information that have not been considered will significantly improve research activity and the tools for management and decision support in the field of tourism.

Based on the interpretation of the results obtained, the main scientific requirements of the Balearic TDS to support the research would be as follows (Table 3).

Table 3. Scientific requirements of a Balearic Islands TDS.

Objectives of the TDS	Description
In-depth understanding of tourist Behavior	The Balearic Islands, being a popular tourist destination, offer a rich terrain to study various tourism dynamics. A data space would allow researchers to analyze patterns in tourist behavior, travel preferences, and spending trends, providing a deeper understanding of what attracts visitors and how they interact with the destination.
Environmental and social impact monitoring	The Balearic Islands face challenges related to sustainable tourism. A data space would facilitate monitoring tourism's impact on the environment and local communities. It is crucial to develop strategies that balance tourism growth with conservation and the local community's well-being.
Innovation and development of tourism products	Researchers can use the data to identify gaps in the tourism market and opportunities for developing new tourism products. This includes creating customized tourism experiences, developing niche tourism, and improving existing attractions.
Crisis response and emergency planning	Collecting and analyzing data in real time is crucial for crisis management. In situations such as natural disasters or health crises, a robust data space can help investigators better understand how to react effectively and plan recovery strategies.
Forecasting and modeling future trends	Researchers could use the data to predict future trends in tourism, which is vital for long-term planning. This includes anticipating changes in traveler preferences, the impacts of climate change on tourism, and the development of sustainable tourism policies.
Cross-sectoral collaboration	A data space enables collaboration between different sectors, such as tourism, public administration, academia, and the private sector. This fosters a more integrated and multidisciplinary approach to addressing tourism challenges.
Enhancing the tourist experience	The data collected can be used to analyze and improve the overall tourist experience. This includes optimizing tourist routes, improving hospitality services, and personalizing experiences based on visitor preferences and behavior.
Tourism education and training	A well-structured data space can serve as an educational resource for institutions offering tourism and hospitality studies. Students and academics could use this data to conduct research, develop case studies, and better understand the dynamics of the tourism market.

Table 3. *Cont.*

Objectives of the TDS	Description
Local economic development	By better understanding tourists' needs and behaviors, researchers can help local businesses adapt and thrive. This can include identifying opportunities for small businesses and local entrepreneurship, contributing to the region's economic development.
Resource and capacity management	Data on tourism flows and infrastructure use patterns can help in efficient resource management and capacity planning. This is vital to avoid overexploitation of resources and to ensure that tourism infrastructure are sustainable and efficient.
Integration of advanced technologies	Researchers can explore the integration of emerging technologies, such as artificial intelligence, big data, and the Internet of Things (IoT), in the tourism sector. This could lead to innovations in how data are collected, analyzed, and used to improve tourism.
Improving brand image and marketing	More effective marketing strategies can be developed with a detailed data analysis to promote the Balearic Islands as a tourist destination. This includes identifying niche markets, personalizing campaigns, and improving the brand image of the destination.
Developing new data-driven business models	Data can have great potential, and data spaces generate the infrastructure and clear governance framework to ensure its sharing under the premise of trust and security. Access to data from all actors in the tourism value chain is essential for generating new business models.

5. Conclusions

This article aims to advance the development of a tourism data space for the Balearic Islands (TDSBI). The approach adopted centers on identifying its functional requirements, which are essential for addressing scientific questions in the realm of tourism raised by international scientific research. From this perspective, firstly, through a stratified bibliometric analysis of references from the Web of Science, international scientific tourism research that makes use of tourism data/information was evaluated; secondly, scientific tourism research in the Balearic Islands was analyzed, and based on this analysis, a thematic guide of research areas already covered and others that should be incorporated into the scope of the TDSBI was proposed, assisting with techniques to be implemented and types of data to be included.

The analysis of the state of the art of bibliometric studies confirmed the lack of references in the domain of tourism data spaces and the scarcity of studies specifically related to the production and use of tourism data. Scientific output is concentrated in various areas, such as the analysis of tourism management, customer satisfaction, environmental impacts and responsibility, and the capacity to manage and recover from crises. However, as highlighted, technology and tourism data is a subject that has received less attention.

The bibliometric analysis of the scientific literature on international tourism data/information provided information in three fields: areas of study covered, analytical techniques applied, and types of data sources used.

In terms of areas of study, a wide range of research lines are identified in Figure 4. With regard to the data analysis techniques used, the main ones are presented in Figure 5. In relation to the data sources used in the studies, they are summarized in Figure 6.

With regard to tourism research carried out in the Balearic Islands, we highlight the main lines of work in Table 1. It should be noted that the information available in the Balearic Islands is noteworthy for its reliance on general tourism data, but there is also an emergence of specific themes tailored to the requirements of island studies. Examples

include surveys on cycling tourism, mapping of aquatic ecosystems, high-precision tracking of water consumption, and the use of other highly specific sources of information.

Based on this broad framework encompassing approaches, objectives, methods, and typologies of international tourism information and those specific to the Balearic Islands, a set of scientific requirements were formulated for the development of a TDSBI, as shown in Table 3.

The conclusion drawn is that the scientific objectives of the TDS should focus on improving various aspects of tourism by gaining insights into tourist behavior and innovation in tourism products. They should monitor and mitigate the environmental and social impacts of tourism as well as respond effectively to crises and plan for emergencies. They should predict and model future trends as well as foster collaboration between different sectors. In addition, they will promote the enhancement of the overall tourist experience, including fostering education and training initiatives for human capital in the field of tourism. They will contribute to local economic development driven by the efficient management of resources and capacities, integrating advanced technologies to optimize processes and services. Additionally, they will emphasize the improvement of brand image and marketing as well as the development of new data-driven business models, which will allow for greater adaptability and sustainability in the tourism sector.

The work carried out has some limitations, especially related to its focus. Firstly, it is based on the hypothesis that scientific research in tourism is mainly oriented towards areas where tourism information is available and that the absence of research may indicate a lack of data. This reasoning is logical and well-founded. It is based on the understanding that research needs data to analyze, interpret, and generate new knowledge. Without available or sufficient data, opportunities for meaningful research would be limited. However, there are important considerations to bear in mind, namely, that tourism research may be influenced by factors such as funding, political interests, or fashionable trends, which do not necessarily reflect the availability of data. Furthermore, it might be assumed that data availability is synonymous with usefulness and quality. However, data may exist but may not be accessible or meet the necessary quality standards required for research purposes. It should also be recognized that research sometimes aims to explore new and emerging areas where data availability is limited or is in the process of being collected, representing a potential limitation to this assumption.

Secondly, it is crucial to acknowledge that keywords may not capture the methodological aspects of the articles analyzed. They are often general and broad, potentially overlooking unconventional research areas. In addition, keywords may change over time as the field evolves, so it is important to consider how terminology may influence the interpretation of trends and data.

To avoid such limitations, the study has relied on a detailed analysis of the scientific articles from which specific information was independently extracted in relation to their subject matter, methods, and the type of data used.

The research underscores the critical role of data in comprehending tourist behaviors, which can significantly influence tourism operators to tailor experiences that align more closely with traveler preferences, thereby enhancing satisfaction and loyalty. The study also brings to the forefront the environmental and social impacts of tourism. These insights offer a pathway for businesses to adopt more sustainable practices, aligning with the broader objectives of responsible tourism.

Implications and Future Directions in the Tourism Context from Findings

The exploration of this study highlights the significant impact of comprehensive data collection and analysis in enhancing the tourism sector, particularly focusing on the Balearic Islands. Through the lens of bibliometric analysis, we've unveiled pivotal themes, methodologies, and existing research voids, advocating for the establishment of a robust and efficient Tourism Data Space (TDS). This section delves into the consequences

of our findings and sets forth prospective pathways for the evolution of TDS within the tourism domain.

The inception of a TDS promises to revolutionize decision-making processes for both the public and private sectors in tourism, facilitating access to a broad spectrum of data ranging from tourist behaviors to metrics on environmental sustainability. This initiative is poised to bridge research gaps, especially in realms concerning sustainable practices and the digital evolution of tourism, steering the industry towards more sustainable and conscientious development paradigms. Moreover, the insights derived from a comprehensive TDS are expected to spur innovation, paving the way for novel services, products, and business models that would amplify the allure and competitive edge of the Balearic Islands as a premier tourist destination.

The genesis of a tourism data space requires the consideration of several future trajectories to effectively buttress tourism research and management:

- **Data integration and interoperability** involves creating a framework that facilitates the seamless integration and interoperability of diverse data sources across the tourism ecosystem's myriad systems and platforms.
- **Privacy and data governance** necessitates establishing rigorous governance structures and privacy protocols to ethically and responsibly manage data sharing and utilization.
- **Advanced analytics and AI** advocates for the inclusion of sophisticated analytics, artificial intelligence, and machine learning tools to dissect data, forecast trends, and extract actionable insights to inform strategic decision-making.
- **User-centric design** emphasizes the importance of developing the TDS with the end-user in mind, ensuring it is accessible, intuitive, and tailored to meet the needs of researchers, policymakers, and industry stakeholders.
- **Sustainability metrics** underscores the need to prioritize the collection and analysis of data related to sustainability metrics to endorse eco-friendly and sustainable tourism practices.
- **Crisis management and resilience** highlights the incorporation of tools and datasets that bolster the tourism sector's crisis management capabilities and resilience to global adversities, such as pandemics and economic downturns.
- **Digital tourism trends** focuses on staying abreast of and adapting to digital trends, such as virtual reality experiences and digital nomadism, to maintain the destination's competitiveness and appeal to new tourist demographics.

Looking towards the future, our findings suggest several avenues for innovation in tourism products. There is a promising potential for integrating advanced technologies, such as AI and IoT, to create more personalized tourist experiences, opening new business opportunities. Additionally, the study underscores the need for enhanced strategies in crisis management and emergency planning. We advocate for the development of predictive models to anticipate tourism trends and potential crises, enabling businesses and authorities to respond more effectively.

Furthermore, our research highlights the importance of cross-sector collaboration based on the use of tourism data spaces, which will incorporate data and methods to improve decision-making processes in the tourism sector. This involves not only governmental and academic institutions but also the tourism industry at large. Such collaboration can lead to economic development, fueled by the efficient management of resources and capacities. Integrating advanced technologies can optimize processes and services, contributing significantly to regional, national, and European economic growth.

Author Contributions: Conceptualization, D.O.-M. and M.R.-P.; Methodology, D.O.-M. and M.R.-P.; Software, D.O.-M. and M.R.-P.; Validation, D.O.-M. and M.R.-P.; Formal analysis, D.O.-M.; Investigation, D.O.-M.; Resources, D.O.-M.; Data curation, D.O.-M.; Writing—original draft, D.O.-M.; Writing—review & editing, D.O.-M. and M.R.-P.; Visualization, D.O.-M. and M.R.-P.; Supervision, J.M.S.-P. and M.R.-P.; Project administration, J.M.S.-P.; Funding acquisition, J.M.S.-P. All authors have read and agreed to the published version of the manuscript.

Funding: This paper has been funded in the framework of the project FU0642. Fons UIB: Mobilitat sostenible. OIMO-2023-645/541A.

Data Availability Statement: No new data were created or analyzed in this study. Data sharing is not applicable to this article.

Conflicts of Interest: Author Dolores Ordóñez-Martínez was employed by the company Anysolution, S.L. The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Appendix A

Appendix A.1 Tourism Bibliometric Analysis

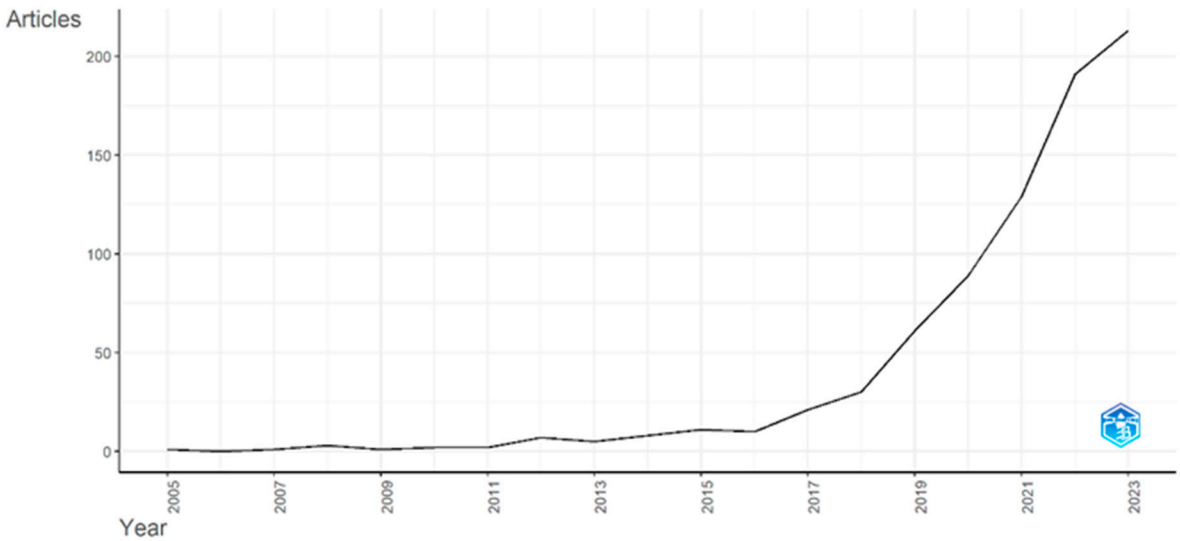

Figure A1. Evolution of the number of bibliometric studies in the field of tourism.

Table A1. Scientific journals ordered by the number of articles published about the bibliometric analysis of tourism.

Sources	Articles
SUSTAINABILITY	78
INTERNATIONAL JOURNAL OF CONTEMPORARY HOSPITALITY MANAGEMENT	28
TOURISM REVIEW	22
INTERNATIONAL JOURNAL OF HOSPITALITY MANAGEMENT	19
JOURNAL OF HOSPITALITY & TOURISM RESEARCH	12
ANATOLIA-INTERNATIONAL JOURNAL OF TOURISM AND HOSPITALITY RESEARCH	11
JOURNAL OF CLEANER PRODUCTION	11
JOURNAL OF HOSPITALITY AND TOURISM INSIGHTS	11
SAGE OPEN	11
TOURISM MANAGEMENT PERSPECTIVES	11
ANNALS OF TOURISM RESEARCH	10
EUROPEAN JOURNAL OF TOURISM RESEARCH	10
PASOS-TOURISM AND CULTURAL HERITAGE MAGAZINE	10
LAND	9
INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH	8
JOURNAL OF BUSINESS RESEARCH	8
JOURNAL OF HOSPITALITY AND TOURISM MANAGEMENT	8
ROSA DOS VENTOS-TOURISM AND HOSPITALITY	8
ADVANCES IN HOSPITALITY AND TOURISM RESEARCH-AHTR	7
CURRENT ISSUES IN TOURISM	7
JOURNAL OF QUALITY ASSURANCE IN HOSPITALITY & TOURISM	7
ASIA PACIFIC JOURNAL OF TOURISM RESEARCH	6
ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH	6
HELIYON	6
JOURNAL OF CHINA TOURISM RESEARCH	6

Table A2. Most cited articles in tourism bibliometric studies.

Author, Year, Journal	DOI	Total Citations	TC per Year	Normalized TC
D'AMATO D, 2017, *J CLEAN PROD*	10.1016/j.jclepro.2017.09.053	471	67.29	9.18
BENCKENDORFF P, 2013, *ANN TOURIS RES*	10.1016/j.annals.2013.04.005	309	28.09	4.89
HALL CM, 2011, *TOURISM MANAGE*	10.1016/j.tourman.2010.07.001	302	23.23	1.76
KOSEOGLU MA, 2016, *ANN TOURIS RES*	10.1016/j.annals.2016.10.006	260	32.50	3.67
LEUNG XY, 2017, *INT J HOSP MANAG*	10.1016/j.ijhm.2017.06.012	241	34.43	4.69
OMERZEL DG, 2016, *INT J CONTEMP HOSP MANAG*	10.1108/IJCHM-10-2014-0510	233	29.13	3.29
COMMERCE, 2019, *ECONOMIC TOUR*	10.1177/1354816618793762	217	43.40	6.90
RUHANEN L, 2015, *J SUSTAIN TOUR*	10.1080/09669582.2014.978790	213	23.67	4.11
FIGUEROA-DOMECQ C, 2015, *ANN TOURIS RES*	10.1016/j.annals.2015.02.001	210	23.33	4.05
PIZZI S, 2020, *J CLEAN PROD*	10.1016/j.jclepro.2020.124033	185	46.25	9.09
JIANG Y, 2019, *CURR ISSUES TOUR*	10.1080/13683500.2017.1408574	166	33.20	5.28
NINEROLA A, 2019, *SUSTAINABILITY*	10.3390/su11051377	137	27.40	4.36
DURAN SANCHEZ A, 2017, *EUR RES MANAG BUSECON*	10.1016/j.iedeen.2016.02.001	136	19.43	2.65
DE LA HOZ-CORREA A, 2018, *TOURISM MANAGE*	10.1016/j.tourman.2017.10.001	127	21.17	4.07
OKUMUS B, 2018, *INT J HOSP MANAG*	10.1016/j.ijhm.2018.01.020	120	20.00	3.84
DONTHU N, 2021, *J BUS RES*	10.1016/j.jbusres.2021.07.015	117	39.00	7.51
DUCK ML, 2016, *RURAL SOCIAL*	10.1111/soru.12058	113	14.13	1.60
CHENG M, 2018, *J HOSP TOUR RES*	10.1177/1096348016640588	98	16.33	3.14
MULET-FORTEZA C, 2019, *J BUS RES*	10.1016/j.jbusres.2018.12.002	87	17.40	2.77
MULET-FORTEZA C, 2018, *J TRAVEL TOUR MARK*	10.1080/10548408.2018.1487368	87	14.50	2.79
DELLA CORTE V, 2019, *SUSTAINABILITY*	10.3390/su11216114	85	17.00	2.70
PALMER AL, 2005, *ANN TOURIS RES*	10.1016/j.annals.2004.06.003	85	4.47	1.00
SU X, 2019, *SAGE OPEN*	10.1177/2158244019840119	84	16.80	2.67
HERRERA-FRANCO G, 2020, *GEOSCIENCES*	10.3390/geosciences10100379	83	20.75	4.08
BARRIOS M, 2008, *SCIENTOMETRICS*	10.1007/s11192-007-1952-0	81	5.06	2.83

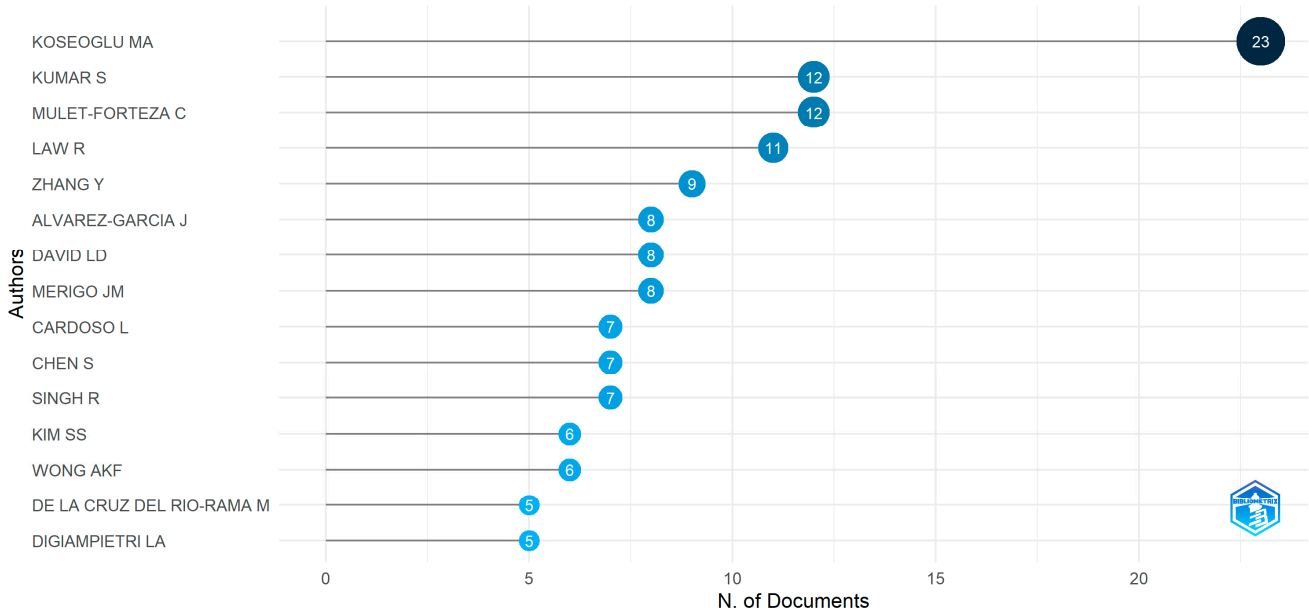

Figure A2. Most relevant authors in the bibliometric analysis of tourism.

Appendix A.2 Bibliometric Analysis of Tourism Research in Relation to Tourism Data

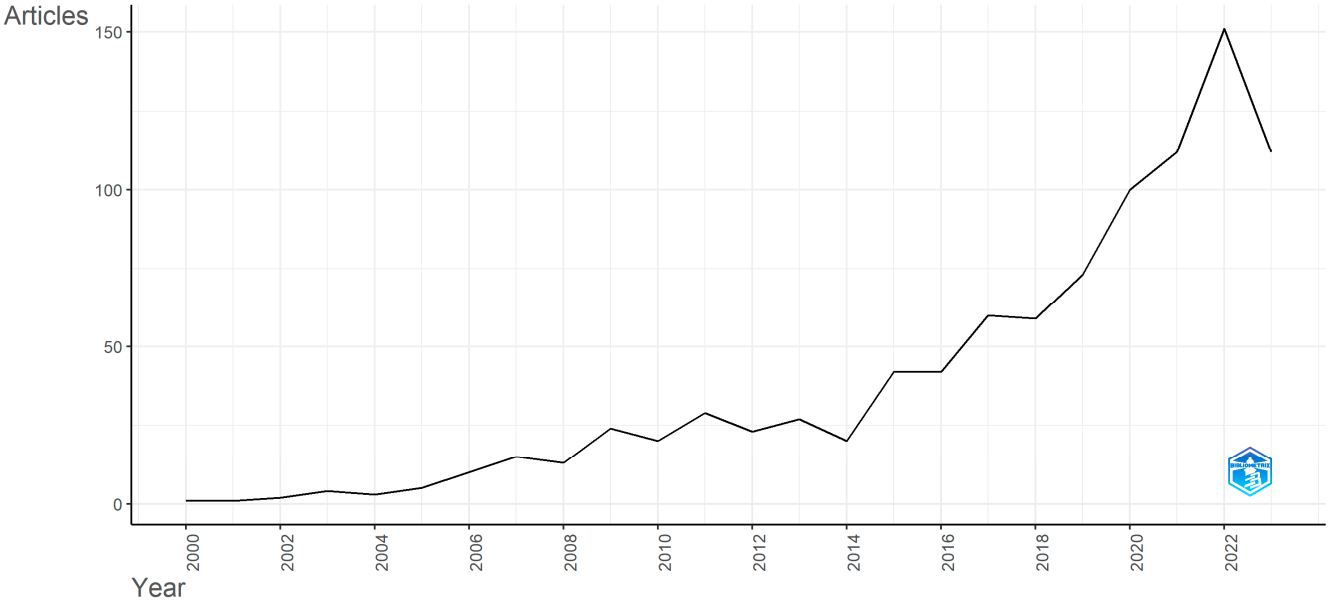

Figure A3. Evolution of the number of scientific articles focusing on the use of tourism data/information.

Table A3. Most cited articles in the field of tourism information.

Author, Year, Journal	DOI	Total Citations	TC per Year	Normalized TC
GOOSSENS G, 2000, *ANN TOURIS RES*	10.1016/S0160-7383(99)00067-5	413	17.21	1.00
LAW R, 2014, *INT J CONTEMP HOSP MANAG*	10.1108/IJCHM-08-2013-0367	369	36.90	6.48
XIANG Z, 2015, *J RETAIL CONSUM SERV*	10.1016/j.jretconser.2014.08.005	333	37.00	9.74
DE FREITAS CR, 2003, *INT J BIOMETEOROL*	10.1007/s00484-003-0177-z	283	13.48	3.21
YANG X, 2015, *TOURISM MANAGE*	10.1016/j.tourman.2014.07.019	257	28.56	7.52
ALAEI AR, 2019, *J TRAVEL RES*	10.1177/0047287517747753	250	50.00	13.83
EILAT P, 2004, *APPL ECON*	10.1080/000368404000180897	250	12.50	2.14
ZHANG H, 2011, *TOURISM MANAGE*	10.1016/j.tourman.2010.02.007	227	17.46	6.91
BUHALIS D, 2005, *TOUR RECREAT RES*	10.1080/02508281.2005.11081482	214	11.26	3.07
JACOBSEN JKS, 2012, *TOUR MANAG PERSPECT*	10.1016/j.tmp.2011.12.005	214	17.83	5.03
BANGWAYO-SKEETE PF, 2015, *TOURISM MANAGE*	10.1016/j.tourman.2014.07.014	205	22.78	6.00
KIM SE, 2017, *INF MANAGE*	10.1016/j.im.2017.02.009	198	28.29	5.65
MIAH SJ, 2017, *INF MANAGE*	10.1016/j.im.2016.11.011	196	28.00	5.59
AHAS R, 2008, *TOURISM MANAGE*	10.1016/j.tourman.2007.05.014	196	12.25	3.73
LI Y, 2017, *TOURISM MANAGE*	10.1016/j.tourman.2016.03.014	194	27.71	5.53
SEQUEIRA TN, 2008, *APPL ECON*	10.1080/00036840600949520	182	11.38	3.46
GARÍN-MUÑOZ T, 2006, *TOURISM MANAGE*	10.1016/j.tourman.2004.10.002	182	10.11	4.33
LAW R, 2009, *J TRAVEL TOUR MARK*	10.1080/10548400903163160	179	11.93	6.73
MASSIDDA C, 2012, *TOURISM MANAGE*	10.1016/j.tourman.2011.06.017	174	14.50	4.09
FUCHS M, 2014, *J DESTIN MARK MANAG*	10.1016/j.jdmm.2014.08.002	174	17.40	3.06
DEL VECCHIO P, 2018, *INF PROCESS MANAGE*	10.1016/j.ipm.2017.10.006	173	28.83	7.48
CHOU MC, 2013, *ECON MODEL*	10.1016/j.econmod.2013.04.024	168	15.27	6.07
KOCAK E, 2020, *TOUR MANAG PERSPECT*	10.1016/j.tmp.2019.100611	164	41.00	11.09
DARCY S, 2010, *TOURISM MANAGE*	10.1016/j.tourman.2009.08.010	160	11.43	4.00
AHAS R, 2007, *TOURISM MANAGE*	10.1016/j.tourman.2006.05.010	158	9.29	4.28

Appendix A.3 Bibliometric Analysis of Tourism Research in the Balearic Islands

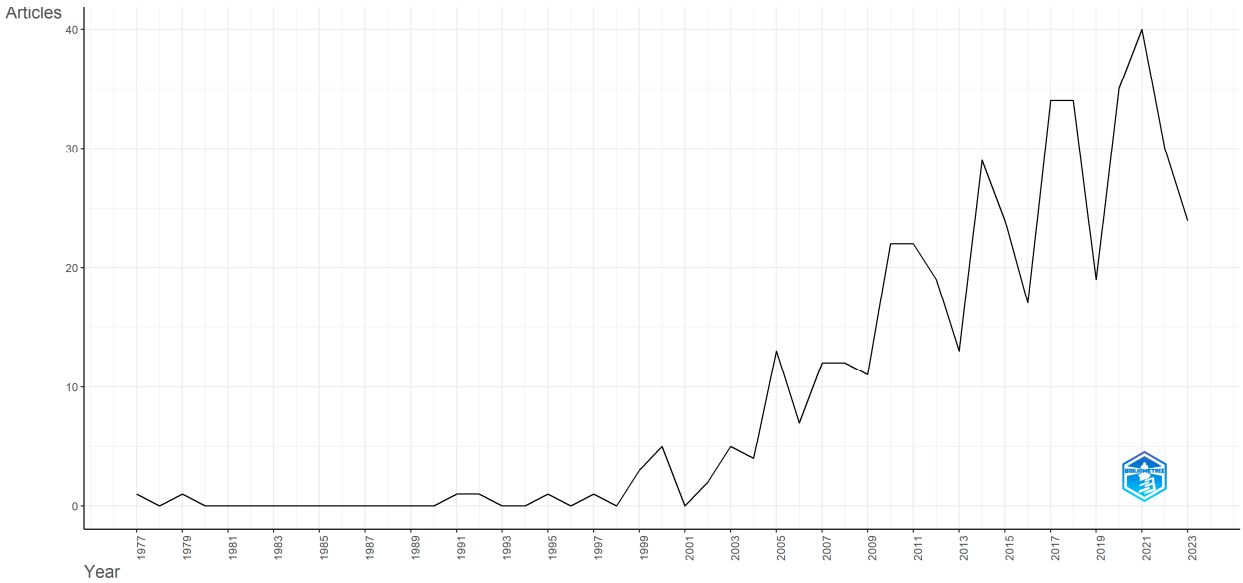

Figure A4. Evolution of scientific research in relation to tourism in the Balearics Islands.

Table A4. Articles by number of citations of scientific research on tourism in the Balearic Islands.

Author, Year, Journal	DOI	Total Citations	TC per Year	Normalized TC
MUNAR AM, 2014, *TOURISM MANAGE*	10.1016/j.tourman.2014.01.012	551	55.10	14.19
ORFILA-SINTES F, 2005, *TOURISM MANAGE*	10.1016/j.tourman.2004.05.005	237	12.47	4.69
AGUILÓ E, 2005, *TOURISM MANAGE*	10.1016/j.tourman.2003.11.004	222	11.68	4.39
PAPATHEODOROU A, 2010, *J TRAVEL RES*	10.1177/0047287509355327	203	14.50	8.12
PÉREZ EA, 2005, *ANN TOURIS RES*	10.1016/j.annals.2004.11.004	185	9.74	3.66
PALMER A, 2006, *TOURISM MANAGE*	10.1016/j.tourman.2005.05.006	177	9.83	5.87
DEYA TORTELLA B, 2011, *J ENVIRON MANAGE*	10.1016/j.jenvman.2011.05.024	144	11.08	5.72
MUNAR AM, 2013, *SCAND J HOSP TOUR*	10.1080/15022250.2013.764511	144	13.09	5.83
COLE S, 2012, *ANN TOURIS RES*	10.1016/j.annals.2012.01.003	135	11.25	3.89
GARIN-MUNOZ T, 2007, *TOURISM MANAGE*	10.1016/j.tourman.2006.09.024	128	7.53	3.60
ROSSELLO-BATLE B, 2010, *ENERGY BUILD*	10.1016/j.enbuild.2009.10.024	125	8.93	5.00
NADAL JR, 2004, *ANN TOURIS RES*	10.1016/j.annals.2004.02.001	125	6.25	3.11
MARTINEZ-ROS E, 2009, *TECHNOVATION*	10.1016/j.technovation.2009.02.004	113	7.53	3.72
ANTONIO DURO J, 2021, *TOUR MANAG PERSPECT*	10.1016/j.tmp.2021.100819	110	36.67	9.17
GUERRIER Y, 2003, *HUM RELAT*	10.1177/00187267035611006	109	5.19	1.42
NAWIJN J, 2012, *J TRAVEL RES*	10.1177/0047287511426482	108	9.00	3.11
KOZAK M, 2002, *ANN TOURIS RES*	10.1016/S0160-7383(01)00072-X	108	4.91	1.04
MARTINEZ-RIBES L, 2007, *SCI MAR*	10.3989/scimar.2007.71n2305	103	6.06	2.89
ARBULU I, 2021, *J DESTIN MARK MANAG*	10.1016/j.jdmm.2021.100568	102	34.00	8.50
GARCIA C, 2003, *GEOGR ANN SER A-PHYS GEOGR*	10.1111/j.0435-3676.2003.00206.x	101	4.81	1.31
KENT M, 2002, *APPL GEOGR*	10.1016/S0143-6228(02)00050-4	99	4.50	0.96
HOF A, 2011, *LAND USE POL*	10.1016/j.landusepol.2011.01.007	99	7.62	3.93
BELLIS MA, 2003, *ADDICTION*	10.1111/j.1360-0443.2003.00554.x	96	4.57	1.25
CLIFT S, 1999, *TOURISM MANAGE*	10.1016/S0261-5177(99)00032-1	95	3.80	2.46

Table A5. Cited authors by number or articles in tourism research on Balearic Islands.

Authors	Articles	Articles Fractionalized
ROSSELLO J	14	6.50
BLAZQUEZ-SALOM M	11	3.81
RAMON-CARDONA J	11	4.50
REY-MAQUIEIRA J	11	3.20
RAMON CARDONA J	9	5.50
GARCIA C	8	2.62
ORFILA-SINTES F	8	3.33
REJON-GUARDIA F	8	2.83
MURRAY I	7	3.17
RAMOS V	7	2.03
VALLE E	7	3.50
ARBULU I	6	1.83
BATLE J	6	3.00
CIRER-COSTA JC	6	5.50
GARAU-VADELL JB	6	2.50
HOF A	6	2.67
MCALEER M	6	1.78
ALEGRE J	5	2.17
ANDREWS H	5	5.00
LOZANO J	5	1.67
ROSSELLO-NADAL J	5	2.00
SAENZ-DE-MIERA O	5	2.50
SEGUI LLINAS M	5	2.17
TIRADO D	5	1.62
AGUILO E	4	2.17

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