

Scientific collaboration and thematic analysis of the tourism industry in the context of COVID-19: a bibliometric approach

Tourism industry

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Abstract

Purpose – The main purpose of this research paper is to generate a holistic bibliometric study of the tourism industry and COVID-19 fields, to further investigate the current interests and trends emerging from scientific collaboration and thematic analysis and to identify research gaps that indicate future research directions.

Design/methodology/approach – This study conducts several analyses, which include the co-authorship and social network analysis, co-citation and keyword co-occurrence knowledge structures. The authors generate a knowledge map of the leading articles and link them with previous literature to elucidate the debates and consensus in research on COVID-19 and tourism.

Findings – Research interests concentrate in the USA, China, Europe and the Oceania areas, so more cross-continental collaborations are expected among them and with other regions. Popular topics are tourism sustainable transformation, crisis management and multidisciplinary fields like tourism, hospitality, information technology and environmental sciences. This paper also identifies underexplored topics for future investigation on the social, environmental, cultural and governance dimensions of sustainable tourism.

Research limitations/implications – This paper contributes to guiding tourism researchers in identifying and finding publication references and future collaborations. Moreover, the investigation of knowledge structures could be beneficial for scholars hoping to broaden the current understanding of this field and discover potential for future tourism research, especially in the global pandemic and other severe health crises.

Originality/value – This study enriches the existing literature in the fields of tourism and the pandemic and highlights current interests and research trends exploring scientific collaboration, thematic analysis and knowledge mapping.

Keywords COVID-19, Tourism industry, Scientific collaboration, Social network analysis, Thematic analysis, Knowledge map, Sustainable transformation, Research potentials

Paper type Research paper



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1. Introduction

Ever since the outbreak of the COVID-19, global tourism has suffered major losses. The main subsectors, hotels and airlines have seen a year-to-date reduction in bookings and reservations of 33% and 88%, respectively, due to mandatory social distancing, outgoing and travel restrictions (The World Tourism Organization, 2021). Thanks to widespread vaccination and digital communication, a recent spring-back of international travelers occurred in 2021. Notwithstanding this, it is predicted that global tourism cannot recover to the pre-COVID level until 2024 (The World Tourism Organization, 2022). In face of this situation, many countries and regions are making consistent efforts in pandemic control, prevention and business reconstruction.

This phenomenon has attracted the interest of academics, emerging articles in the field of tourism-related diseases management (Chen *et al.*, 2020), business survival strategies (Colmekcioglu *et al.*, 2022; Lau, 2020) and urban recovery studies (Ntounis *et al.*, 2022). The global pandemic has stressed tourism resilience and the need to rethink a more sustainable approach for the whole industry (Brouder, 2020). Recent studies have been focused on the need of consistent development of tourism subsectors, especially the most affected by the pandemic crisis, like hospitality and transportation (Gössling, 2020). Academics are interested in offering alternatives for a successful transformation of the tourism industry from a classic volume-driven model to a more sustainable one, which embraces the fulfillment of tourist expectations, the development of the tourism industry and local communities and the resolution of social concerns related to tourism (Cheer, 2020; Elkhwesky *et al.*, 2022; Higgins-Desbiolles, 2020; Sigala, 2020; Yang and Wong, 2021).

The polyhedral nature of this topic explains the continued growth of studies that address one or multiple of its dimensions, and the urgent need to construct a comprehensive knowledge map regarding the tourism survival and expectations to re-boom the industry under the lens of crisis, as well as shed light on future research possibilities in this field. Bibliometric reviews have been conducted to revise this emerging and growing literature and summarize the main reflections and analyses on COVID-19 and tourism, but they are quite limited, in both, number and scope. First, none of these studies has developed a broad social network analysis, incorporating relevant metrics to determine the scientific collaboration structure and performance in the field. Second, the few previous bibliometric studies have mainly focused on industry-based subfields, like digital tourism and tourism city development (Akhtar *et al.*, 2021; Casado-Aranda *et al.*, 2021). In these respects, more studies elucidating the scientific collaboration structure and performance are needed, as well as the knowledge and thematic structure of the field from a broad and holistic perspective rather than from specific tourism subfields.

The main objective of the present study can be stated as twofold. First, it aims to explore tourism development in the context of COVID-19 via social network analysis focusing on the scientific collaboration and relationship among countries, journals and authors. Second, this study seeks to develop a holistic thematic analysis, which would also embrace the construction of the knowledge map and thematic relationships. We contribute to establishing a comprehensive knowledge network structure via bibliometric analysis, to further explore academic collaborative relationships, intellectual structure, knowledge domains and emerging research topics, in relation to tourism and COVID-19.

2. Literature review

2.1 Academic background of tourism and COVID-19

The pervasive sweep of the global pandemic has provoked the rethinking and change of the tourism industry, including different spheres related mostly to tourists, destinations and

tourism-related subsectors (Jamal and Budke, 2020). This section presents the main themes addressed by previous tourism research in the COVID-19 crisis, considering these different fields. Regarding tourists and destinations, one of the key themes refers to new preferences of tourists when choosing tourism destinations. Previous researchers found out that there existed the tendency of traveling preferences to less crowded areas, domestic and coastal regions, with higher sanitation and privacy standards arising from virus avoidance considerations (Jeon and Yang, 2021). However, some scholars pointed out (Wen *et al.*, 2021), as the global pandemic came into a stabilization thanks to the widespread of the vaccine, people would shift their concerns back to the fulfillment of tourism experiences, coming back to more traditional determinants of destination choice. Positive destination image, mainly based on a sense of security and privacy, has been considered essential to relieve the tourists' negative sentiments and win back their tourism confidence during and after the pandemic (Song *et al.*, 2022; Yang and Wong, 2021). Some practical actions were also proposed in establishing active emotional communications between destinations and customers to enhance their revisit intentions and foster local tourism recovery (Balakrishnan and Sambasivan, 2022).

In terms of tourism subsectors, those with the largest damage such as hospitality and transportation (UNWTO, 2021), also gained attention from worldwide researchers (Colmekcioglu *et al.*, 2022; Ntounis *et al.*, 2022). From the perspective of the hospitality issues, the pandemic damages are related to the worsening of working atmosphere, employee job insecurity and turnover (Colmekcioglu *et al.*, 2022). In this context, many researchers advocated that, corporate social responsibility and governmental supports could provide a positive and equal organizational climate (Han *et al.*, 2020; Zhang *et al.*, 2021). Additionally, legalized employment contract and more opportunities should be accommodated, out of the labor rights protections and stimulation of employee safety behaviors (Baum *et al.*, 2020). Another popular issue is related to the utilization of new technologies, especially in hotel sectors, as improving tourism service qualities and reducing social anxiety and the risk of human exposure to COVID-19 (Ghosh and Bhattacharya, 2022; Lau, 2020). These technologies could also be potential in creating responsible behaviors from both tourism and hospitality entities in resource management, environmental protection and customer satisfaction (Elkhwesky *et al.*, 2022).

From the viewpoint of transportation, the huge reduction in international tourist numbers and reduced carbon footprint, especially in the air transportation, might provide an opportunity for ongoing sustainable development (Lu *et al.*, 2022). Someone (Wieckowski, 2021) proposed that a sustainable post-pandemic future should be considered, under a green transport model with low energy density and consequent pollution. Someone (Gössling, 2020) advocated effective control over booking and seat vacancy to reduce reluctant waste in energy consumption and risk of cross-infection. The debate between mass tourism and environmental vulnerability and a rethinking about tourism sustainable transformation, was aroused in the research agenda (Gössling and Higham, 2021; Song *et al.*, 2022). Some researchers (Higgins-Desbiolles, 2020; Sigala, 2020) related both spheres of sustainability, the social and the environmental and proposed that a sustainable future should take "sociocultural issues" such as discriminative tourist experiences, social equality and deteriorating working conditions of a vulnerable workforce into consideration, so as to achieve benefits and welfare for all the tourism stakeholders (Cheer, 2020; Santos Roldán *et al.*, 2020).

Overall speaking, multiple fields addressed by previous tourism research in the context of COVID-19 mostly focused on tourists, destinations and tourism subsectors. The main discussed themes have been related to new tourists' preferences, destination image, social

issues and sustainable tourism (He *et al.*, 2022). However, interactions between the different spheres and themes have not been sufficiently explored. Social network, thematic analysis and knowledge mapping will serve to identify common concerns, scientific cooperation and the knowledge structure among the tourism related fields and topics of interest.

2.2 Bibliometric studies on tourism and COVID-19

A review of previous studies reveals only a few bibliometric studies on tourism and pandemic-relevant topics. All of them develop thematic analysis with different purposes, scopes and techniques. Those with the broadest scope consider the whole industry, analyzing previous tourism research in the context of COVID-19. Some scholars (Ferjančić Hodak, 2020) focused on investigating the productivity of tourism and pandemic publications to determine future paths in a sustainable perspective. Some researchers (Utkarsh and Sigala, 2021) applied content analysis regarding the tourism and hospitality areas and proposed a complete scenario of the tourism development in the post-pandemic era toward a sustainable and collaborative future. However, despite the broad scope of these studies, they mostly perform limited bibliometric analysis, being the case that none of these studies has analyzed scientific collaborations and social network analysis to determine collaborative structures among regions. In addition, none of the previous thematic analyses provides the construction of knowledge map, which would contribute to the better comprehension of the main themes and spheres in this research topic, and the potential interrelations between them.

There have been only a few reviews combining thematic analysis, and the study of scientific collaborations, and they have been focused on specific tourism-based subfields, hence neglecting the use of a broader scope on the whole tourism industry. A bibliometric study of digital tourism was conducted by previous scholars (Akhtar *et al.*, 2021), who proposed that under the global stress caused by the pandemic, technological innovation, especially digitalization in tourism development, acted as a possible solution for rescuing the tourism economy and releasing mass tourism. Some investigators (Casado-Aranda *et al.*, 2021) also generated bibliometric analyses in a different tourism subfield, in finding thematic connections and emerging trends for urban destination development, and discovering considerable current and post-pandemic potential for investigating smart tourism, sustainable and social industrial growth. Therefore, scientific collaborations were explored only on specific and few tourism subfields, which suggests the need to broaden this approach developing a holistic and broad analysis on the tourism industry as a whole in the context of the pandemic.

Moreover, scientific collaboration studies could be extended, through social network analysis metrics, which have been widely used in bibliometric analyses (Koseoglu *et al.*, 2018), and from which a better understanding of the academic and knowledge structure can be achieved (Espasandin-Bustelo *et al.*, 2020). These analyses are beneficial in identifying knowledge domains, areas and discovering new research niches through the combination of valuable information and viewpoints from the academic networks. They thus may trigger information sharing among scholars navigating novel theories, concepts and multidisciplinary fields (Song *et al.*, 2022). From the revision, it is concluded the need of a broader and more holistic bibliometric research in this field, including both, thematic and scientific collaboration analysis, to better understand the academic structure of the research on COVID-19 and tourism, as well as to gain greater comprehension of its knowledge dissemination.

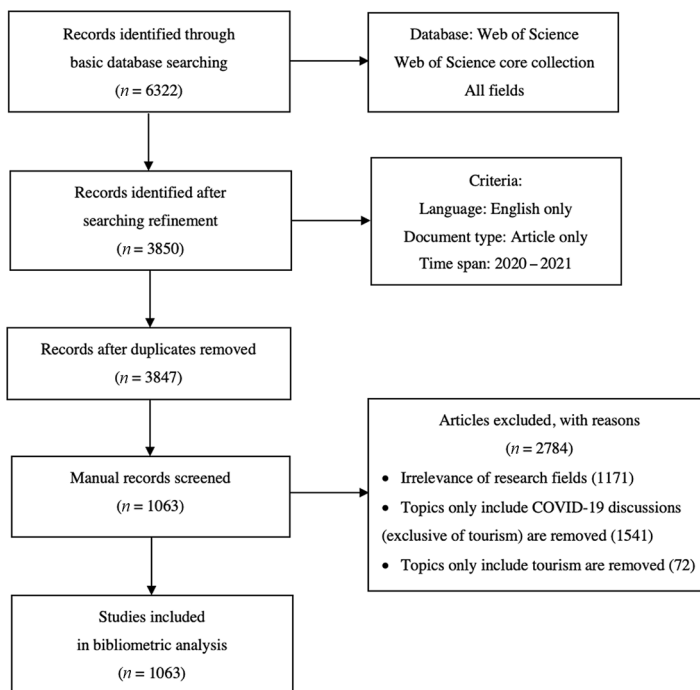
3. Methodology

3.1 Data collection

In *Figure 1*, we exhibit a preferred reporting items for systematic reviews and meta-analyses (PRISMA) diagram (Moher *et al.*, 2009), over a total collection and refinement period of November 23, 2020, to September 6, 2021. The first step was to select a suitable database for scientific data collection. We chose the Web of Science Core Collection due to its extensiveness and academic recognition, as well as being compatible with mapping visualizations in the bibliometric analytical process (Garrigos-Simon *et al.*, 2019). In the next stage, we defined relevant keywords as: “COVID-19” (with its synonyms – “pandemic,” “coronavirus”) + “tourism” (with the synonym – “travel”) to be applied into the Web of Science database, both in the title and abstract parts. Moreover, we adopted a “*” wildcard in search strings to include related words like “tourist,” “traveling” or different COVID-19-related expressions (Utkarsh and Sigala, 2021). This resulted in an optimized search string: (covid* OR pandemic* OR “coronavirus”) AND (touris* or travel*), filtered to include English – only articles, in the period 2020–2021.

3.2 Data exclusion

We used Mendeley to remove duplicates and manually excluded irrelevant articles based on the following criteria. Articles of irrelevant research fields such as air quality, energy consumption, disease treatment and care in Ebola and SARS were excluded. Topics related to the COVID-19 virus (COVID-19 transmission, detection, clinical symptoms, treatment and



Source: Elaborated by the authors

Figure 1. PRISMA flow diagram: literature filtering process of the research

prevention measures like social distancing, non-pharmaceutical preventions, etc.) were removed. We excluded tourism related articles without any discussion of the pandemic. Using these selection criteria, a total number of 1,063 articles were finally targeted for our bibliometric research, with the inclusion of relevant industries like tourism and leisure, hospitality, accommodation, transportation and different fields like tourists, tourism destinations, companies and local communities among others.

3.3 Bibliometric analyses

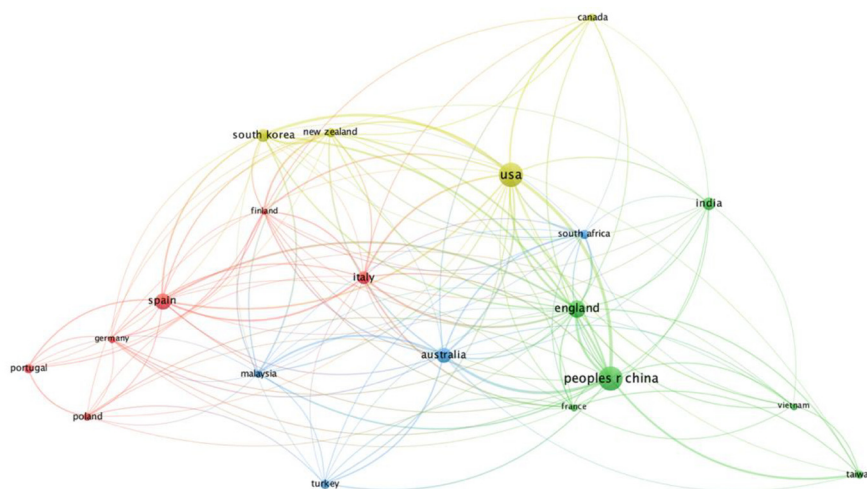
The VOSviewer program is frequently used to construct social networks and graphical mappings and to present scientific correlations of specific fields, involving subject domains, global academic contributions, etc. (Mulet-Forteza *et al.*, 2019). We first explored the scientific collaboration in the field, that addressed the main scientific performances and collaborations worldwide among countries, journals and authors. In this regard, we carried out country-dimension co-authorship network analysis to identify scientific collaborations between countries and regions, journal-based co-citation analysis to analyze the disciplinary characteristics of frequently cited journals and author dimension co-authorship analysis to determine the specific collaboration among scholars (Van Eck and Waltman, 2020). Second, we conducted a thematic analysis through keyword co-occurrence analysis and created visualizations for the co-occurring term frequencies in different articles (Van Eck and Waltman, 2020). We included some relevant social network analysis metrics (centrality and density) and calculated them by using Ucinet 6 both in co-authorship and keyword co-occurrence networks to gain a better and more solid understanding of the scientific collaboration as well as the thematic structure of the field. Finally, we constructed a knowledge map by analyzing the most cited articles and linking their main ideas with the existing literature to elucidate consensuses and debates over COVID-19 and tourism discussions.

4. Findings and discussion

4.1 Scientific collaboration

4.1.1 Country dimension co-authorship analysis. A country dimension co-authorship map is presented in Figure 2. The minimum number of publications for each country was refined to be twenty, with twenty items meeting the thresholds within one hundred countries and regions. Among the four clusters, the USA (yellow) and China (green) were the two largest items with largest total strength links (133 and 131 correspondingly), which implies their leading positions in collaborating with other countries and regions. Other sizeable nodes like England (green), Spain (red), Australia (blue) and South Korea (yellow), are highly ranked among the most productive countries in Table 1 (third to sixth). Australia (blue) and New Zealand (yellow) have the second and third highest numbers of total citations (1,089, 1,047), behind England (1382). Overall, international interests and connections in tourism and COVID-19 research increased, especially in the USA, China, Europe and the Oceania areas.

Geographically based international participation among European countries can be demonstrated in the red cluster in the map. "Germany," "Poland," "Spain," and "Portugal" exhibit shorter distances, thus indicating closer scientific connections between them probably based on geographical similarities. There are also thicker lines of main nodes in all clusters – "South Korea" and "New Zealand," "China" with the "USA," "Australia" and "England," which may indicate close cross-continental partnerships between these most prolific countries. In general, all 20 nodes in the map are relatively scattered, showing the absence of strong knowledge sharing and collaboration in general terms among countries (Jamal and Budke, 2020). In the face of severe global health crises, it appears that little



Source: Elaborated by the authors

Figure 2.
Country dimension
co-authorship map

Country	Publications	Total citations	Total link strength
USA	181	1,020	133
China	181	990	131
England	103	1,382	95
Spain	92	408	53
Australia	86	1,089	80
South Korea	67	375	73
India	63	174	18
Italy	60	369	58
New Zealand	42	1,047	70
Portugal	40	82	15

Source: Elaborated by the authors

Table 1.
Top 20 most
productive countries
(according to total
publications)

academic effort has been done in the case of developing countries and regions (Novelli *et al.*, 2018). It thus drives the rethinking to the establishment of more solid and broad networking and communications among not only the identified leading countries but also collaborations that involve some vulnerable regions.

4.1.2 *Source co-citation analysis.* The cited source co-citation network is presented in Figure 3, with the minimum number of each co-cited sources refined to 250; thus, 15 items meet the requirements. In Figure 3 and Table 2, the biggest node, *Tourism Management* (red), enjoys the highest co-citations (2,475), indicating that the main academic concerns in the field are concentrated on tourism management, policy and planning topics as impacted by COVID-19. The top journals – *Tourism Management*, *Journal of Travel Research*, *Journal of Sustainable*

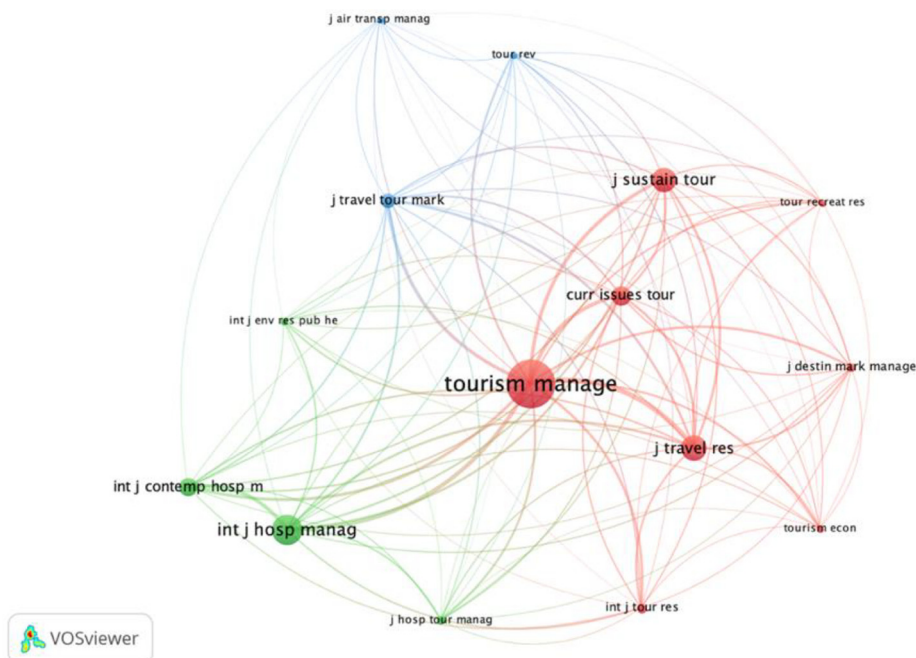


Figure 3.
Cited source co-
citation map

Source: Elaborated by the authors

Tourism and Current Issues in Tourism in the red cluster and *International Journal of Hospitality Management* (the biggest node in the green cluster) apparently have closer relations due to the thicker link strength lines between them. This indicates that their main concerns and collaborations lie in the tourism and hospitality fields, among which tourism management, marketing, tourist behavior and sustainable development fields have drawn the major interest.

Similarly, there are three clusters separately distributed in the map. Eight journals (red) focus on the tourism and travel fields – tourism management, planning, policies, sustainable issues, etc. Four nodes (green) range from the studies of hospitality management to marketing, environmental sciences and public health. There are three items in the blue cluster, concentrating in tourism marketing, technology and air transportation issues. We can conclude that the journal co-citation analysis reveals that researchers hold conjoint interests in dispersed disciplinaries and themes (Niñerola *et al.*, 2019), as far as relevant connections are detected among journals that belong to different disciplines.

4.1.3 Author dimension co-authorship analysis. We conducted social network analysis through the calculation of centrality and density indicators. Table 3 shows the degree of centrality of the top eight most-cited authors from the co-authorship network displayed in Figure 4. These metrics identify the critical positions, strength of collaborations and corresponding influences of some of the most influential authors in the social network (Koseoglu *et al.*, 2018). We observe that Hall C. Michael, Gössling Stefan and Scott Daniel, the most cited authors with 800, 782 and 765 citations, respectively, also possess the leading positions according to the scores of degree centrality and eigenvector centrality. These results indicate their prominent position in terms of scientific collaboration, but also their

Most co-cited journals	Disciplines	Co-citations	Total link strength
1 <i>Tourism Management</i>	Tourism management, planning and policy	2,475	36,925
2 <i>International Journal of Hospitality Management</i>	Hospitality HR, marketing, business, economics, management, information technology, legislation	1,376	8,858
3 <i>Journal of Travel Research</i>	Travel and tourism behavior, management and development	1,120	20,719
4 <i>Journal of Sustainable Tourism</i>	Tourism and sustainable development	1,058	13,491
5 <i>Current Issues in Tourism</i>	Tourism inquiry, method and practice	853	14,629
6 <i>International Journal of Contemporary Hospitality Management</i>	Hospitality strategic management, marketing, finance and HR management	796	12,277
7 <i>Journal of Travel and Tourism Marketing</i>	Tourism management, business, government policies, new technologies	585	11,333
8 <i>International Journal of Tourism Research</i>	Tourism, leisure and hospitality business, management and accounting, environmental science, social sciences	362	7,122
9 <i>Journal of Destination Marketing and Management</i>	Tourism destination marketing, management, policy, planning, economic, geographical and historical contexts	318	6,802
10 <i>Journal of Hospitality and Tourism Management</i>	Tourism and travel management, leisure and recreation studies, event management	291	5,339
11 <i>Journal of Air Transport Management</i>	Air transport policy, regulation and law, strategy, operations, marketing, economics and finance, sustainability	277	1,702
12 <i>Tourism Review</i>	Tourism and subsectors business, management, strategies, marketing, policy, planning and development, information, technology, sustainability, culture, HR, crisis management	271	4,774
13 <i>Tourism Economics</i>	Business, tourism, social interests, sustainability, recreation resources	269	4,396
14 <i>International Journal of Environmental Research and Public Health</i>	Environmental sciences and engineering, public health, environmental health, occupational hygiene, health economic, global health	268	3,907
15 <i>Tourism Recreation Research</i>	Tourism, leisure and hospitality cultural Studies, geography, planning and development, management, monitoring, policy and law	266	3,886

551

Table 2.
Top 15 highly co-cited source
(according to total co-citations)

Source: Elaborated by the authors

influential role, prestigious and status within the scientific network (Isfandyari-Moghaddam *et al.*, 2021). Betweenness centrality ranks Baum Tom in the first position – demonstrating that he represents a channel between several authors, increasing his power and decreasing his dependence on others (Koseoglu *et al.*, 2018). The degree of density was also calculated for the clusters in the co-authorship map, indicating that the cluster including authors such as Gössling Stefan, Hall C. Michael and Scott Daniel, holds the largest score (density = 4.8), which would prove the tighter collaborations among these authors, especially the leading ones (Koseoglu *et al.*, 2018).

Table 3.
Degree centrality of
authors with most
citations

		Degree centrality		Betweenness centrality		Eigenvector centrality
1	Hall C. Michael	41	Baum Tom	157.667	Hall C. Michael	0.817
2	Gössling Stefan	23	Hall C. Michael	124.533	Gössling Stefan	0.377
3	Scott Daniel	22	Song Haiyan	102	Scott Daniel	0.341
4	Baum Tom	21	Zenker Sebastian	67.833	Baum Tom	0.169
5	Wen Jun	21	Wen Jun	10.167	Sigala Marianna	0.114
6	Sigala Marianna	11	Sigala Marianna	5.5	Wen Jun	0.094
7	Zenker Sebastian	10	Scott Daniel	2.033	Zenker Sebastian	0.051
8	Song Haiyan	2	Gössling Stefan	2.033	Song Haiyan	0.002

Source: Elaborated by the authors

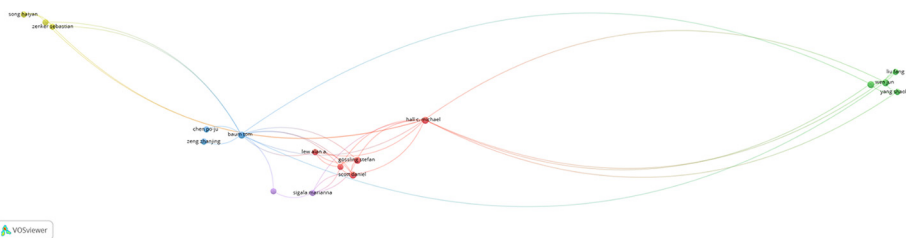


Figure 4.
Author dimension co-
authorship map

Source: Elaborated by the authors

4.2 Thematic analyses

4.2.1 Keyword co-occurrence analysis. We also constructed the keyword co-occurrence map (Figure 5) and analyzed the centrality degree (Table 4) of the top 29 keywords with the most co-occurrences to further identify the prominent positions of main keywords and their influences upon each other (Muritala et al., 2020). Twenty-nine items meet the threshold after defining the minimum occurrences of each keyword to be ten. “COVID-19” becomes the biggest node in the network both in occurrences and total link strength. Terms like “tourism,” “crisis management,” “risk perceptions” and “hospitality industry” also show higher total occurrences. The biggest term “COVID-19” is closely connected with terms like “tourism,” “crisis management,” “risk perceptions,” “hospitality industry” and “hotel industry,” as can be seen from the thick line connections between them. This may also indicate current interests of hot topics in tourism-related subsectors and areas.

According to the total number of occurrences and all the three-centrality metrics, tourism, hospitality industry, hotel industry and tourists (with keywords like risk perceptions, tourism demand, travel intentions, travel behavior, customer satisfaction, etc.) become dominant tourism related entities within the area of tourism and COVID-19. Crisis management and risk perceptions also prove to be central and influential according to their high ranks in all three centrality measures (Muritala et al., 2020). We find less influenced topics and fields like destination (destination image), sustainable tourism (sustainable

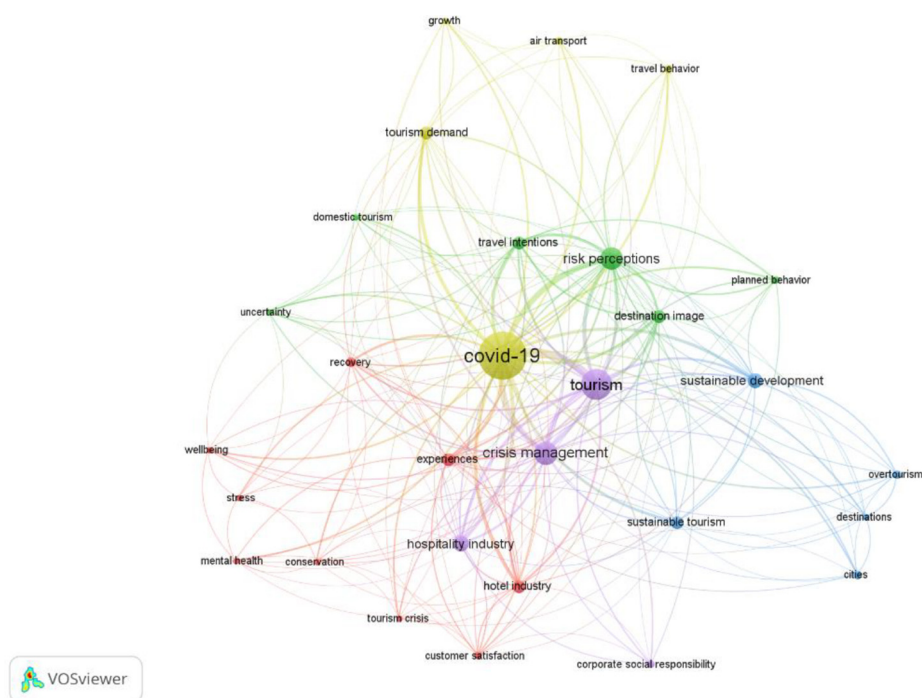


Figure 5.
Keywords co-occurrence map

Source: Elaborated by the authors

development), overtourism, air transport, corporate social responsibility, etc., with relative low influences and ties of connections with main nodes from the map, due to their smaller values of betweenness and eigenvector centrality (Isfandyari-Moghaddam *et al.*, 2021). These topics may be highlighted as underexplored areas and future research would be necessary to investigate in breadth and depth. Finally, we calculated the degree of density of different clusters from the keyword co-occurrence map. It appears that nodes in the cluster that includes – tourism, hospitality industry, crisis management and corporate social responsibility – hold closer connections with each other (density = 20.1677), compared with nodes in other clusters (Isfandyari-Moghaddam *et al.*, 2021).

4.2.2 Most cited articles and previous literature linking. The most cited articles with high number of citations are listed in Table 5. Here, “Pandemics, tourism and global change: a rapid assessment of COVID-19” (Gössling *et al.*, 2020) has the highest scientific impact. It compared the impact of previous global diseases crises and COVID-19 and questioned the volume-oriented tourism model. The second most-cited reference – “Tourism and COVID-19: impacts and implications for advancing and resetting industry and research” (Sigala, 2020) also focused on the discussion of the transformational opportunity provided by COVID-19, toward a more sustainable and collaborative tourism future. Seen from both keyword domains in Figure 5 and the top five most cited articles, we can conclude that current trending topics concentrate on the “crisis management,” “sustainable tourism,” “resilience” and “social justice” aspects.

Table 4.
Degree centrality of
keywords with most
occurrences

	Occurrences	Degree centrality	Betweenness centrality	Eigenvector centrality	
1	covid-19	742	covid-19	covid-19	0.882
2	tourism	283	tourism	tourism	0.385
3	crisis management	153	crisis management	risk perceptions	0.172
4	risk perceptions	146	risk perceptions	crisis management	0.154
5	hospitality industry	67	hospitality industry	hospitality industry	0.065
6	sustainable development	61	experiences	hotel industry	0.047
7	tourism demand	48	travel intentions	hospitality industry	0.047
8	destination image	47	destination image	sustainable development	0.046
9	hotel industry	47	hotel industry	destination image	0.045
10	experiences	46	tourism demand	travel intentions	0.045
11	sustainable tourism	43	sustainable development	sustainable development	0.043
12	travel intentions	41	sustainable tourism	sustainable tourism	0.029
13	recovery	25	recovery	tourism demand	0.024
14	travel behavior	21	planned behavior	customer satisfaction	0.017
15	cities	17	customer satisfaction	uncertainty	0.016
16	overtourism	17	overtourism	conservation	0.012
17	customer satisfaction	16	uncertainty	mental health	0.012
18	planned behavior	16	travel behavior	planned behavior	0.012
19	air transport	14	cities	well-being	0.011
20	corporate social responsibility	13	well-being	travel behavior	0.011
21	growth	12	corporate social responsibility	stress	0.011
22	mental health	12	growth	air transport	0.011
23	uncertainty	12	destinations	tourism crisis	0.01
24	conservation	11	mental health	corporate social responsibility	0.01
25	domestic tourism	11	air transport	destinations	0.01
26	well-being	11	domestic tourism	domestic tourism	0.009
27	destinations	10	tourism crisis	growth	0.007
28	stress	10	conservation	cities	0.007
29	tourism crisis	10	stress	overtourism	0.007

Source: Elaborated by the authors

Rank	Titles	Keywords	Citations
1	Pandemics, tourism and global change: a rapid assessment of COVID-19 (Gössling <i>et al.</i> , 2020)	Global change, COVID-19, pandemic, crisis, travel restrictions, tourism demand, resilience	607
2	Tourism and COVID-19: impacts and implications for advancing and resetting industry and research (Sigala, 2020)	Tourism, COVID-19, impacts, recovery, resilience, crisis	187
3	Pandemics, transformations and tourism: be careful what you wish for (Hall <i>et al.</i> , 2020)	COVID-19, crisis management, disaster management, disaster recovery, pandemic impact, pandemic response, resilience, sustainable tourism, third-order change, tourism policy	158
4	Socialising tourism for social and ecological justice after COVID-19 (Higgins-Desbiolles, 2020)	COVID-19, responsible tourism, critical tourism, social tourism, social justice, public good tourism, cruiseship industry	140
5	The coronavirus pandemic – a critical discussion of a tourism research agenda (Zenker and Kock, 2020)	Crises, disasters, coronavirus, COVID-19, pandemic research agenda	112
6	COVID-19: potential effects on Chinese citizens' lifestyle and travel (Wen <i>et al.</i> , 2021)	COVID-19, lifestyle, travel behavior, post-disaster, collectivist orientation, China	109
7	From high-touch to high-tech: COVID-19 drives robotics adoption (Zeng <i>et al.</i> , 2020)	COVID-19, lifestyle, travel behavior, post-disaster, collectivist orientation, China	91
8	Hospitality, tourism, human rights and the impact of COVID-19 (Baum and Hai, 2020)	Tourism, human rights, hospitality, COVID-19, pandemic	84
9	Social costs of tourism during the COVID-19 pandemic (Qiu <i>et al.</i> , 2020)	Tourism impact; pandemic crisis; social cost; willingness to pay; contingent valuation method	83
10	Reset redux: possible evolutionary pathways towards the transformation of tourism in a COVID-19 world (Brouder, 2020)	COVID-19, evolutionary economic geography, path dependence, pathways, reset, tourism, transformation	74

Source: Elaborated by the authors

Table 5.
Top ten most cited articles and author keywords

Based on the findings of the most cited articles, we constructed a knowledge map (Figure 6) of the most discussed themes and linked them with the existing literature to further identify current concerns and research potentials in the discussions of tourism and COVID-19. We accumulated basic ideas from the findings of the keyword co-occurrence map and defined main tourism-related entities to be included in the construction of the knowledge map. These entities were also paid special attention by previous scholars, involving tourists (Jeon and Yang, 2021), destinations (Yang and Wong, 2021), hospitality (Han *et al.*, 2020) and transportation (Gössling, 2020). These general entities were combined with more specific topics as customer satisfaction, experience, mental health, well-being, overtourism issues, etc., which appeared in the keyword co-occurrence map, and were also emphasized in previous research (Cheer, 2020; Gössling and Higham, 2021; Santos Roldán *et al.*, 2020).

Sustainable tourism development has been not only emphasized as important research potentials by previous scholars (Gössling and Higham, 2021; Utkarsh and Sigala, 2021), but

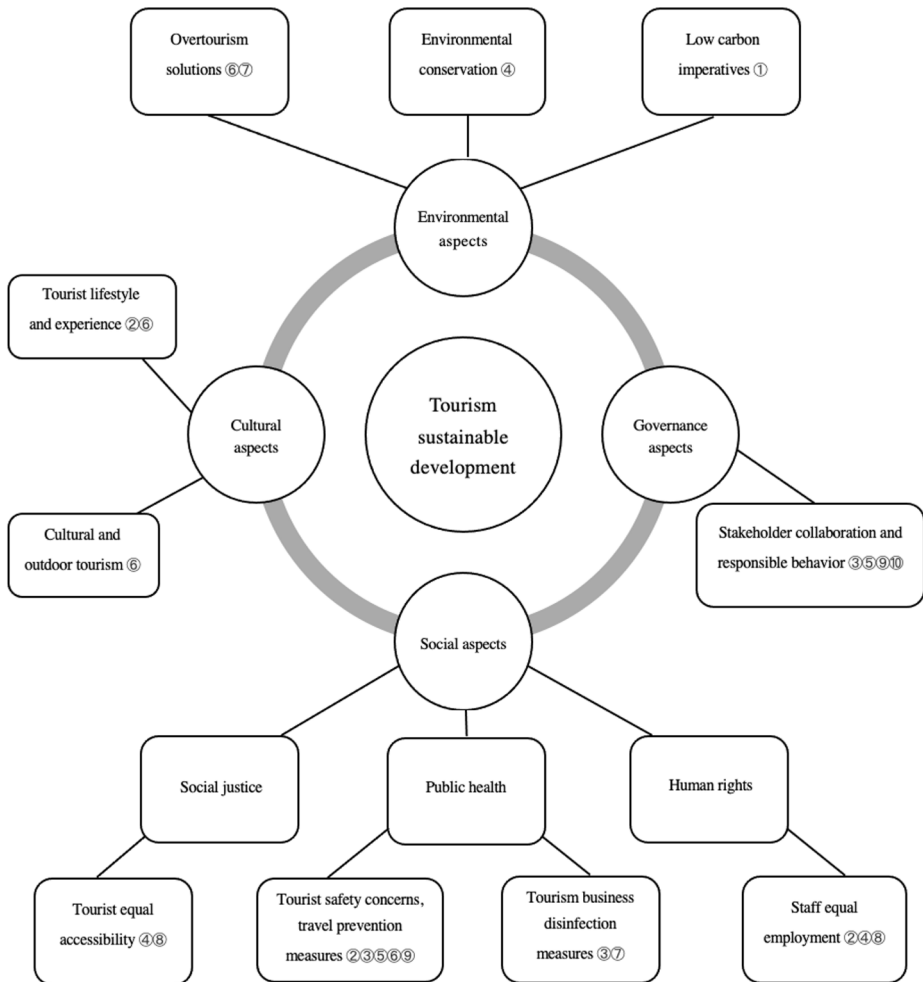


Figure 6. Knowledge mapping of the top ten most cited articles

Source: Elaborated by the authors

it also appears in all the most influential articles, referring as sustainable tourism and transformations (Brouder, 2020; Gössling *et al.*, 2020; Hall *et al.*, 2020; Higgins-Desbiolles, 2020; Sigala, 2020) or as sustainability and sustainable development in tourism (Baum and Hai, 2020; Qiu *et al.*, 2020; Wen *et al.*, 2021; Zeng *et al.*, 2020; Zenker and Kock, 2020). This topic is consequently considered as one of the key elements faced by different tourism related entities in the future tourism growths and decision-makings. Thus, it occupies the center of the knowledge map. We also identified the main sub-themes addressed by the top ten most cited articles and categorized them according to their nature into four dimensions. For the categorization process, we considered the categories already used by previous scholars (Utkarsh and Sigala, 2021), who already identified the social, cultural and environmental categories. We also added the governance dimension, studied by the authors

from the most cited articles (Qiu *et al.*, 2020; Zenker and Kock, 2020). The numbers illustrated in the knowledge map represent the article in which the sub-themes appear according to the rank of *Table 5* on the most cited papers.

4.2.2.1 Social dimension. Social concerns over public health management were firstly paid great attention (Hall *et al.*, 2020; Zeng *et al.*, 2020). Top-cited articles provided a general protocol to the fact that crisis management practices were carried out and exemplified country by country, including social distancing, traveling restrictions, preventative behaviors like tourism avoidance, disinfection and sanitation approaches (Zeng *et al.*, 2020). In the implementation stage, previous research pointed out that crisis management was found to be more effectively coordinated by some specific tourism entities like hospitality practitioners (Lau, 2020). However, it was also highlighted the absence of proactive and coordinated strategies and planning at the regional or country level.

In addition, job insecurity (Sigala, 2020), unequal exploitation, discrimination of vulnerable groups exposed during the pandemic (Higgins-Desbiolles, 2020), appeared in the most cited papers, leading to a rethinking of human rights. Possible solutions which could be found from previous studies should be implemented to better prepare for future emergencies, like the improvement of hospitality employee protection, the corporate support for guaranteeing staff rights, legalized contract and soft training (Baum *et al.*, 2020; Zhang *et al.*, 2021). The last social issue is related to the fulfillment of equal tourist access to local touristic sites, activities and enjoyments, regardless of restrictions and discriminations out of racial or gender bias (Baum and Hai, 2020; Utkarsh and Sigala, 2021). Previous researchers (Yang and Wong, 2021) investigated tourist uncomfortable experiences and pointed out the negative significances it brought to them (deterioration of tourist well-being and increased anxious sentiments). New thoughts upon how to improve tourist experiences and sense of participation, as compared to merely regaining tourist access might be an additional problem to be considered (Yang *et al.*, 2021).

4.2.2.2 Environmental dimension. Previous researchers gave full attention to a series of environmental issues that experienced some changes as a consequence of the pandemic (Gössling and Higham, 2021), as overtourism (Wen *et al.*, 2021; Zeng *et al.*, 2020), environment deterioration (Higgins-Desbiolles, 2020) and climate change (Gössling *et al.*, 2020). The pandemic gave the opportunity to rethink on these issues and propose some adaptations. As a result of the decreasing tourism traffic imposed by the pandemic, on the one hand, environmental protection was given full attention, as far as the conservation of natural environments emerged as a trending topic, in line with the pursuit of a long-term tourism sustainable development and ecological justice (Higgins-Desbiolles, 2020). On the other hand, to solve the overtourism problem, especially in famous tourism destinations and cities, it was advisable to adopt modern high technologies to facilitate the tourism volume management (Wen *et al.*, 2021) and supervision over current tourism assets of cultural heritages and natural sites (Zeng *et al.*, 2020). Another important issue lied in the promotion of low carbon imperatives, incentivized by the mitigation of global climate change in the face of consistent reduction of global travel demands brought by the pandemic (Gössling, 2020). In this regard, research was focused on a reconsideration toward a sustainable air transportation management with an effective control over both energy consumption and optimized sales for the seats.

4.2.2.3 Cultural dimension. Some top cited articles stressed cultural dimensions, like the changes of tourist lifestyles and preferences – toward less-crowded, nature-based areas to reconnect themselves with the nature and avoidance of the COVID-19 (Wen *et al.*, 2021). This could be explained by the fear to unseen risks like the pandemic and priority to the general well-being, especially emphasized by the collectivism culture of Asian countries. Therefore,

on the one hand, it could be advised that cultural-sensitive tourists – especially health-sensitive in this sense, might benefit from some niche tourism and outdoor recreation, which would be helpful in the restoration of tourists' mental health, tiredness from daily work and pursuit of novel experiences. On the other hand, future investigations might also shed light on other geographic locations and regions (Jeon and Yang, 2021), to identify if cultural sensitivity could also be differentiated and if this factor would influence tourist intentions in the face of a global health emergency.

4.2.2.4 Governance dimension. In general, a reconsideration of the volume-driven tourism model toward a more sustainable development approach have been proposed (Brouder, 2020; Gössling *et al.*, 2020; Hall *et al.*, 2020; Higgins-Desbiolles, 2020; Zenker and Kock, 2020). This idea is connected with the governance transformation of the business structures, by taking both the innovative supply and demand management from all the stakeholders into consideration (Qiu *et al.*, 2020; Zenker and Kock, 2020). The rapid development of global modern technologies might even accelerate the solutions for issues, like resource management (Zeng *et al.*, 2020), disinfection and service improvement (Elkhwesky *et al.*, 2022) and fulfillment of tourism experiences (Yang *et al.*, 2021). Nevertheless, a real tourism sustainable transformation needs the responsible behaviors and willingness to the changes from all the entities, especially local communities and tourism businesses, endowed already with the high benefits from previous large tourism volumes (Hall *et al.*, 2020).

5. Conclusions, implications, limitations and future research

5.1 Conclusions

As the pandemic spread, tourism and COVID-19 research greatly increased. In this paper, we conduct both scientific collaboration and thematic analyses using a bibliometric approach to better understand the intellectual base and complement previous literature by providing analysis of knowledge structure in this area. Through the comprehensive review of 1,063 academic articles in Web of Science from 2020 to 2021, our findings demonstrate that global academic interest and connections in tourism and COVID-19 increased strongly especially in the USA, China and European countries. Also, the results of this paper provide a global view of multidisciplinary research focusing on the tourism, hospitality, information technology, marketing and environmental sciences fields. Adopting a bibliometric approach enables us to better understand the scientific collaborative relationships among authors, research ideas and trends, guiding tourism researchers in identifying and finding future collaborations and relevant sources and references.

Moreover, knowledge trends and patterns are identified through keyword co-occurrence analysis and the construction of a knowledge map, which help us to sketch future research lines, and contribute to a greater comprehension of the intellectual structure of the field. Our findings confirm the place of sustainable tourism development in the center of the knowledge map, appearing in all the most influential articles. Although it is not a novel topic (Niñerola *et al.*, 2019), there still remains a need to investigate it further, especially in the context of public health crisis. The main value of our research is its contribution in the identification of new venues for future research to advance in tourism transformation facing this kind of crisis, by integrating social, environmental, cultural and governance dimensions of sustainable tourism. Several key issues involving low carbon imperatives, overtourism solutions, stakeholder collaborations, tourist experiences, social justice, human rights and health issues, are also emphasized as relevant aspects to contribute to sustainable tourism which deserve future reconsideration.

5.2 Academic implications

This article has provided relevant contributions for academics in tourism related studies. As the pandemic spread, global attention was paid to rethink how to tackle the issue and its impacts on the whole tourism industry (Elkhwesky *et al.*, 2022; Ntounis *et al.*, 2022). Our findings have revealed some realistic problems induced by the pandemic, like tourist discriminative experiences, unequal hospitality employment, overtourism, balance over stakeholder well-being and economic profits (Colmekcioglu *et al.*, 2022; Song *et al.*, 2022). This research contributes to a better comprehension of knowledge sharing in leading countries and regions and provides guidance to researchers in establishing future collaboration. More research dedication can be addressed in establishing a solid and in-breadth communication and networking among not only the identified leading countries but also those more vulnerable developing regions.

We also found the most co-cited sources, which not only reveal the main avenues of knowledge dissemination of top-tier publications upon tourism, the pandemic and multidisciplinary fields, but also offers implications for scholars to find the relevant journals for their papers (Pelit and Katircioglu, 2022). The proposed construction of the integrated knowledge map contributes to improving the comprehension of tourism research by linking four different dimensions and drawing reflections in various realistic issues (Colmekcioglu *et al.*, 2022) as the counterbalance over tourism staff rights and the utilization of modern technologies (Lu *et al.*, 2022); equal communication and interaction among different entities within the tourism system (Balakrishnan and Sambasivan, 2022; Jamal and Budke, 2020); and practical solutions in the realization of sustainable tourism governance and responsible behaviors (Elkhwesky *et al.*, 2022; Hall *et al.*, 2020).

5.3 Practical implications

From a practical perspective, managers and practitioners in different sectors of the tourism industry may need to consider the proposed aspects in the social dimension to enhance equality and efficiency in employee management so as to better understand and adapt to the dynamics of the industry to uncertainties. Moreover, based on the perspective of governance dimension, all stakeholders of the tourism industry, as tourist boards and convention and visitors' bureaus, may consider promoting tourism destinations with empathy strategy (Xie *et al.*, 2021) and tourist reconnections and trust (Song *et al.*, 2022), aiming to arouse tourists' emotional attachment and confidence to traveling again (Balakrishnan and Sambasivan, 2022; He *et al.*, 2022). Finally, upon the proposed knowledge map, one of the key necessities is to take local resilience and sustainable transformation into consideration. It is advisable that positive policy changes could be realized to fulfill this agenda, particularly in the efforts of implementing a multi-stakeholder regulatory strategy (Abdi *et al.*, 2022) to create both internal resilience and external defense to unforeseen global health disasters (Ntounis *et al.*, 2022).

5.4 Limitations and future research

Despite the contributions drawn from the research, several limitations should be noted. First, our single database might be extended to others, such as Scopus and ScienceDirect to increase scope of scientific materials. In the analytical dimension, scholar and institutional co-authorships could be supplemented by future knowledge creation and project designs (Pelit and Katircioglu, 2022). In the light of the recency and limited duration of our work on the topic, a longer up-to-the-minute data tracking might be organized, as a resource for researchers to follow the time-based thematic evolution through overlay visualization. The last perspective lies in the invariability of keyword co-occurrences. In addition to analysis of top cited articles, we could extend the research into text-mining aspects, including the discussion of titles and abstracts, which would result in a more holistic study overall.

For future researchers, we provide some directions based on the constructed knowledge map from the perspectives of social, environmental, cultural and governance dimensions under the main theme of sustainable tourism development. In terms of social dimension, future research can study the implementation strategies over public health crisis management and how these crisis management practices may impact on social concerns in tourism industry. There is the need to explore the resolution of employment problems in various tourism sectors during the crisis and post-crisis era and prevent their reappearance. Future research may investigate the counterbalance over tourism staff rights and employment problems in the tourism industry to proactively tackle them in similar crisis. Finally, researchers may study how tourist experiences and sense of participation can be improved by promoting equal communication and interaction among different entities within the tourism system.

In the environmental dimension, we could also find some research potentials in terms of the environmental protection and resource utilization perspectives. Specifically, future research may focus on the role of technology and its impact on issues as tourism volume management and environmental conservation, analyzing the key factors that contribute to the control of overtourism and environmental deterioration. Scholars can also ask how regulatory apparatus can promote technology and innovation to help environmental conservation. Finally, more research work can address the issue of efficient energy consumption to promote the low carbon imperatives, considering which incentives and conditions would be necessary for the transformation toward a green energy model in distinctive tourism sectors so as to achieve the sustainable development of the industry.

In terms of cultural and governance dimension, reflections are demanded in studying the impact of cultural and governance aspects during crisis in tourism industry. Some questions can be raised for future research as: What are the factors that may contribute to a good cultural-sensitive guidance in tourism industry? How cultural sensitivity related factors may influence tourists' restoration both physically and mentally in the public health crisis? What are the key elements in planning and implementing a multi-stakeholder regulatory strategy to achieve the sustainable governance? How to effectively promote responsible behaviors from different entities in tourism industry? How can tourism entities in a proactive and collaborative way design and incorporate protocols and strategies for confronting any public health crisis?

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