


Review

How to Monitor the Transition to Sustainable Food Services and Lodging Accommodation Activities: A Bibliometric Approach

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Abstract: The transition to sustainable food systems is one of the main challenges facing national and international action plans. It is estimated that food services and lodging accommodation activities are under pressure in terms of resource consumption and waste generation, and several tools are required to monitor their ecological transition. The present research adopts a semi-systematic and critical review of the current trends in the food service and lodging accommodation industries on a global scale and investigates the real current environmental indicators adopted internationally that can help to assess ecological transition. This research tries to answer the subsequent questions: (i) how has the ecological transition in the food service industry been monitored? and (ii) how has the ecological transition in the lodging accommodation industry been monitored? Our study reviews 66 peer-reviewed articles and conference proceedings included in Web of Science between 2015 and 2021. The results were analyzed according to content analysis and co-word analysis. Additionally, we provide a multidimensional measurement dashboard of empirical and theoretical indicators and distinguish between air, water, energy, waste, health, and economic scopes. In light of the co-word analysis, five research clusters were identified in the literature: “food cluster”, “water cluster”, “consumers cluster”, “corporate cluster”, and “energy cluster”. Overall, it emerges that food, water, and energy are the most impacted natural resources in tourism, and users and managers are the stakeholders who must be involved in active monitoring.

Keywords: ecological transition; tourism; environmental indicators; circular economy; sustainability; monitoring framework; food services; hotels; hospitality



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1. Introduction

Ecological transition, defined as an implementation of the sustainable development concept, aims at ensuring resilience soon after economic crises and ecological disasters [1] and represents one of the main challenges of national and international action plans [2,3]. Among others, its main pillars are represented by sustainability and efficient waste management paradigms, the development of renewable energy sources, and more sustainable agriculture [4,5]. Therefore, to achieve the 17 sustainable development goals (SDGs) enacted by the United States [6], several proper strategies and policies have been promoted on a global scale. At the European level, on the one hand, the circular economy action plan is based on depicting production and consumption systems which rely on recycling, re-use, and repairing and remanufacturing products, as well as on green consumption patterns [7]. On the other hand, there is a need to put the ‘farm to fork’ practice into effect, which aims at ensuring fair, healthy, and environmental-friendly food systems. The concept of the circular economy has a high impact at the international level due to its ambition to redefine a sense of a resource’s value. Even though companies and public authorities have the most powerful role in accelerating the transition from the linear to the circular economy, customer preferences are key to making this change [8].

Moreover, shifting production from one based on primary resources to one based on recycling resources generates the premise of applying a sustainable economic model that could change the world into a better place for future generations. However, many questions arise when putting into practice the circular economy model. The most well-known issues are circular economy rebound [9] and the high costs of implementing barriers like technological costs, market readiness, institutional resistance, or cultural aspects [10]. Also, even though the circular economy is based on the four 'R's (i.e., reduce, reuse, recycle, and recover), research shows that most companies focus their activity on recycling and neglect the other three pillars of circularity [11]. Another critique of the circular economy is that it represents just a concept that is hard to transform into an economic reality [12].

Theoretically, ecological transition is possible and affordable to achieve [13] but it is still difficult to evaluate and monitor. Therefore, to assess Member States' progress towards ecological transitions, several indicators have been implemented at the European level, such as production and consumption indicators, waste management indicators, secondary raw materials indicators, and competitiveness and innovation indicators [14,15], in addition to environmental performance indicators [16].

The present paper investigates ecological transition within different sub-sectors of so-called hospitality management, considering an expected revival in tourism activity after the recovery from the COVID-19 pandemic [17]. The authors explore the food services and food and beverage activities within restaurants, fast-food chains, takeaways, catering, bars, and pubs on the one side, and lodging accommodation activities, from luxury hotels to campgrounds, on the other. The hospitality industry, encompassing establishments such as canteens, elderly care hospitals, hotels, schools, restaurants, and universities [18], represents one of the major incomes and sources of labor in Europe, as well as one of the most impactful sectors on the economy, environment, and society [19]. Besides, food services and lodging accommodation activities are under pressure in terms of resource consumption and waste generation, requiring a conversion towards circular economic systems focused on savings and recovering resources. Hotels and restaurants must be considered resource-intensive activities considering that their processes are orientated toward space conditioning (i.e., heating and cooling systems, ventilation, air conditioning), lighting, hot water, and electricity use, as well as cooking activities and washing activities, among others. However, although resource and waste management represent a topical and current concern, little research has been conducted on the environmental impacts of tourism, and additional investigations must be addressed to enhance environmental sustainability.

Several authors have considered these burdens in the field of transportation, analyzing aviation [20], train [21,22], or cruise ship [23] impacts, whereas increasing environmental loads should be refocused toward energy consumption (i.e., heating, air conditioning, and lighting) and greenhouse gases emissions [24], as well as to waste (and food waste) management [25]. Since the eruption of the COVID-19 pandemic, pollution and ecological burdens have significantly decreased by 30% on a global scale, highlighting the need to find and understand the unsustainable drivers and gradually switch them towards investment opportunities [17]. At present, the environmental and economic performance of food services and lodging accommodations are included in eco-effective strategies promoted at the EU level [26,27]. Still, the monitoring and measurement of specific policies need to be implemented either at the local or global level, representing a challenge toward ecological transition [28]. Monitoring represents a challenge to reaching sustainable development and economic growth. In light of the uncommon measurement and monitoring tools used in the hospitality industry, it seems essential to develop shared, common, and homogeneous systems to reach such targets, filling in empirical and theoretical gaps, which highlight the lack of harmonized indicators for measuring ecological transition.

In light of these premises, the present research carries out a semi-systematic literature review on the environmental indicators adopted by international realities to assess the sustainable transition of food services and lodging accommodation activities. Besides, by

answering to two research questions (Section 2), the authors have provided a multidimensional measurement dashboard of empirical and theoretical indicators, which distinguishes between air, water, energy, waste, health, and economic scope (Section 3). The main purpose of this research is to identify the current state and the future prospects of sustainability in the food service and the lodging accommodation industries. Although several authors and practitioners have experienced, explored, and tested circular economy and sustainability strategies in the hospitality industry, a comprehensive and critical review on this topic still needs to be conducted. Hence, the present research contributes to the empirical studies dealing with sustainable tourism and environmental best practices in the hospitality sector, providing theoretical and managerial recommendations for supporting either academics or practitioners.

2. Theoretical Background and Research Questions Development

Tourism and hospitality activities have been the preferred subject of several research studies from environmental, social, or economic perspectives. Ecological transition, based on the sustainable development concept, encompasses transversal and multidimensional areas, covering not only environmental and green issues but revising the entire concept of work and enterprise and opening modern and innovative paths for boosting competitiveness while ensuring environmental protection [1–3].

In recent years, with the exception of the pandemic period, there has been an increase in the number of tourists. International tourism has continued to sustain global economic development [29]. Latest international statistics have estimated that more than 1.5 billion international tourist arrivals were recorded before the pandemic, representing a substantial investment opportunity for communities all around the world. In Europe, over 740 million tourists have been registered, accounting for more than 50% of the total tourists in the global market [30]. According to Eurostat, more than one in ten EU enterprises, excluding the financial sector, was based on tourism in 2019 [12]. However, considering that tourism represents a holistic industry and encompasses several businesses endowed with divergent characteristics and management operations, the present research focuses especially on food services and accommodation lodging activity. Food services, defined as the operations related to preparing, transporting, or selling foods in restaurants, cafeterias, or catering services [31,32], play an important social and economic role in modern societies [25]. In western Europe, food services revenue rose to EUR 427 billion, while in eastern Europe, it rose to over EUR 45 billion before the outbreak of the pandemic. The United Kingdom and France have the most developed markets for food services, whereas France and Italy are ranked first in the number of food service companies. France accounts for 161,466 restaurants and mobile food service activities, with 155,875 for Italy [33]. Still, several major issues in this area are under-researched, such as their related environmental externalities and issues, such as food waste or packaging waste, which represent an increasing share on a global scale. It is estimated that food services amount to 12% of global food waste [34]. Hence, the first research question (RQ) is proposed to investigate the ecological transition in the food service industry as follows:

RQ1: How has the ecological transition in the food service industry been monitored?

On the other hand, accommodation lodging activities that include hotels, motels, resorts, and bed and breakfast units, are supposed to constitute the most energy-intensive buildings due to their multi-usage functions, such as food and beverage production and consumption, recreation, and hygiene procedures [35]. Overall, over 73.2% of worldwide CO₂ emissions are derived from energy consumption, of which 24.2% come from industrial use (e.g., iron and steel production, food and tobacco production, and chemical and petrochemical production) and over 17.5% come from energy use in buildings [36]. It emerges that approximately 6.6% of CO₂ emissions are generated by commercial buildings, such as restaurants or hotels, to produce electricity for lighting, appliances, and heating. The amount of energy consumed in non-residential buildings amounts to over 700 million tons of the equivalent oil (Mtoe), with approximately 233 Mtoe needed for space heating,

116 Mtoe needed for lighting and 86 Mtoe needed for water heating. Besides, over 232 Mtoe is spent on other end-uses, such as IT equipment [37]. Among others, several strategies and action plans have been addressed to enhance energy and waste management [38], promoting guests' awareness of sustainable behaviors [39]. It is estimated that hotels produce more than 289,000 t of waste each year, of which approximately 80 t comes from food waste. More specifically, an amount of approximately 0.8–1.2 kg of waste per guest daily, which doubles on checkout days, has been assessed. Hotels and restaurants generate over 160–200 kg of CO₂/m². In terms of waste composition, it is estimated that about 44% comes from organic matter, 16% from glass, 13% from plastic, 11% from paper, and 9% from cardboard, whereas only 7% comes from unsorted waste [40,41]. Therefore, the second research question investigates the monitoring of the ecological transition in the lodging accommodation industry as follows:

RQ2. How has the ecological transition in the lodging accommodation industry been monitored?

The circular economy is presented as a possible solution to actual economic challenges, such as the increasing global demand for natural resources, delays in supply chains, climate change, and industrial pollution effects. In this context, the circular economy can also be considered a potential solution for the hospitality industry, known to be a consumer of resources [42]. However, the impact of the circularity concept in the hospitality industry is still new and under-researched. Moreover, few studies have been written in the field of circular economics for tourism. According to da Silva et al. [43], most of the studies in these areas began to be written and published in 2019, with most of them being focused primarily on a theoretical approach. Despite the desire of the stakeholders in the hospitality sector to focus more on sustainability and resource waste, the COVID-19 pandemic proved that the principles of circular economics and the signs of progress with the adoption of its rules are extremely sensitive to unpredicted events. An eloquent example is the increased use of plastic packages in the hospitality sector. On the one hand, due to the prevention rules applied for preventing the spread of COVID-19, and especially the distancing rules, the restaurants developed delivery services to continue their activity and to assure food security conditions. Customers preferred to order food at home to meet the travel conditions of the pandemic [44]. In this context, increasing numbers of home orders led to increasing use of plastic packaging. However, the desire of the customers to reduce single-use packaging plastics has not disappeared yet. According to Kitz et al. [45], in Canada, there is an increasing desire in consumers to use biodegradable single-use packaging.

The circular economy concept endorses either policy aimed at diminishing environmental burdens or those elaborating strategies oriented toward fostering economic growth, which is often difficult to define [14]. Environmental and sustainable strategies are usually part of a circular economy-monitoring framework [46]. This includes ten indicators used to capture the main features of a circular economy in a synthetic and suggestive way [15], as follows: (a) production and consumption (four indicators); (b) waste management (two indicators); (c) secondary raw materials (two indicators); and (d) competitiveness and innovation (two indicators). In addition, environmental performance indicators should be taken into account, measuring the environmental impacts related to climate change, consumption of natural resources, and waste generation [16]. Environmental performance indicators are used for comparing performance over time, communicating results in a transparent way, and supporting national and international policy for monitoring goals [47]. These are related to air, water, or land emissions, as well as resource consumption. Among other sustainability and environmental indicators, environmental footprint (i.e., water and carbon footprint), being an assessment based on inventories such as material flow analysis or environmental tools and life-cycle assessment [48–50], has emerged as a popular concept. Therefore, several studies have been devoted to the assessment of energy, carbon, and water consumption [51].

3. Research Methodology

3.1. Research Strategy and Review Criteria

Different approaches could be adopted to conduct a literature review, such as systematic, semi-systematic, and integrative reviews [52], each having unique characteristics and research strategies. Among them, the present research paper applies a semi-systematic method, being orientated toward providing an overview of the research area and tracking its development over time, contributing to the state of contextualized knowledge. In accordance with Wong et al. [53] and McColl-Kennedy et al. [54], the semi-systematic approach offers a comprehensive understanding of complex and transversal areas (e.g., environmental sciences, social sciences, and business and management), covering broad topics and different types of studies, contributing, at the same time, to detecting themes, theoretical perspectives, or common threads of research [55].

To perform a clear and replicable strategy, achieving a double purpose of methodological objectivity and efficacy of this review itself [56–58], there are four different steps as follows: (a) defining the background of the analysis and identification of the review criteria (i.e., inclusion and exclusion criteria); (b) selecting suitable research strings and creating a preliminary global database; (c) in-depth screening of selected items and improvement of the opening database; and (d) data synthesis and data analysis through co-word and content analysis. Such an approach is the so-called SALSA (search, appraisal, synthesis, and analysis) framework [59]. Considering the theoretical background of the environmental indicators mentioned, this research paper reviews academic articles based on ecological transition indicators by answering the identified research questions. Ecological transition is investigated under the so-called “environmental approach”, which is considered a concept-oriented term that encompasses pollution control, cleaner production, green chemistry, eco-design, life-cycle assessment, waste minimization, zero waste, and social welfare [60].

As discussed by Snyder [52], the research questions have been formulated to investigate broader topics, which have been conceptualized differently and analyzed within transversal disciplines. Such research queries aim at mapping the theoretical and practical approaches related to the food service and lodging accommodation industries, exploring the collective evidence in diverse research areas. To pursue reliability and dependability, the present research explores academic peer-reviewed journals and conference proceedings written in English, whereas it does not include book chapters. Regarding the publication timeline, articles published between 2015 and 2021 have been considered from the SDG and the circular economy action plan developed and implemented starting from 2015, whereas, under the geographical perspective, either global or European experiences have been taken into account. Figure 1 illustrates the research strategy according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) model.

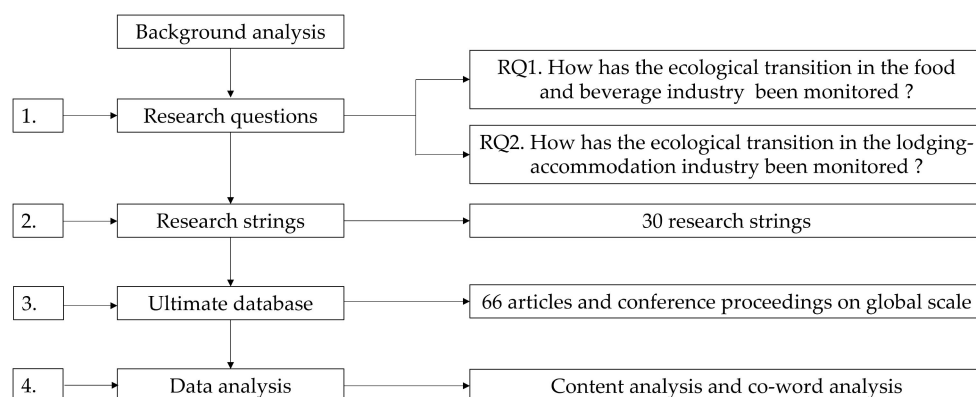


Figure 1. Research strategy overview. Source: Personal elaboration by the authors.

3.2. Data Collection and Research Strings

Data collection began with a TITLE-ABS-KEY query and was conducted using Web of Science (WoS), which represents a collector of standardized, reputable, and high-quality research. Web of Science is one of the world's leading databases and is increasingly used for academic papers [61], being the leading scientific citation search and analytical information platform [62]. The authors have considered all the indexes included in the WOS database and used them for export selection using the integrated function on the platform, integrated with the VOS viewer software, from 2015 to 2021. The research considers a timespan from 2015–2021 since the SDGs [6], as well as the circular economy action plan [2], were implemented in 2015 by the United Nations and the European Union, respectively. Although the main purpose of the research is to focus on monitoring the overall ecological transition of food services and lodging accommodation activities as a starting point for future research, the authors have tried to identify the possible strategies that could be adopted soon after the COVID-19 pandemic, highlighting the implications of these in Section 5.4.

Considering the research questions, designed to address and investigate food services and lodging accommodation activities as well as environmental indicators (also defined as circular indicators or sustainability indicators), the present research has identified several keywords to cover as many relevant aspects as possible.

Regarding RQ1, the subsequent (truncated) keyword combinations have been selected: “indicator” or “index” or “monitoring” AND “environment” AND “restaurant”, or “fast food” or “takeaway” or “catering” or “pub”, for an amount of 15 research strings. Regarding RQ2 the subsequent combinations were investigated: “indicator” or “index” or “monitoring” AND “environment” AND “hotel” or “motel”, “resort” or “bed and breakfast” or “spa”, for an amount of 15 research strings. Overall, 30 research strings were investigated within titles, abstracts, and keywords. Figure 2 illustrates the research string strategy.

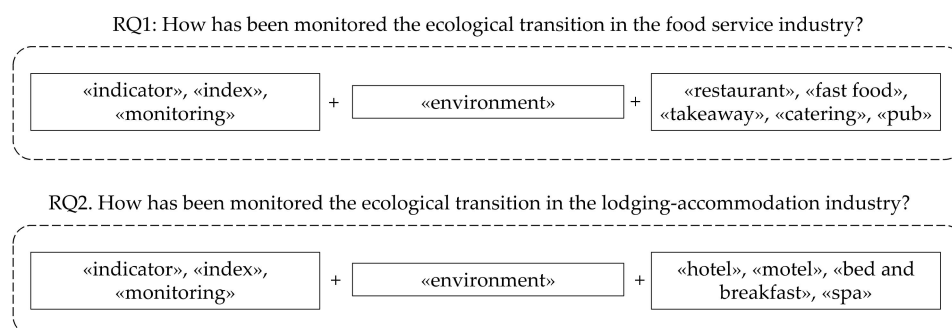


Figure 2. Research Strings. Source: Personal Elaboration by the Authors.

Research strings helped to create a preliminary database, which included the article authors' name, title, publishing journal, year of publication, geographical area, paper type, and DOI (digital object identifier). Then, a further in-depth selection of the most relevant studies was conducted to avoid duplication. Collected data were catalogued in Microsoft Excel sheets.

3.3. Data Synthesis and Data Analysis

The collected data were synthesized according to a co-word analysis [63]. Such an approach investigates the co-occurrences of keywords and also identifies the relationship and interactions between different research topics [64], highlighting research trends, as well as the most influential authors in the field of environmental transition in tourism. It provides a systematic overview of research evolution, creating suggestive maps of keywords and textual data [65] and represents a rigorous method for investigating huge amounts of data [66,67]. Furthermore, using the VOSviewer software, clusters of keywords used in the metadata of the different articles were identified. VOSviewer is an open-source

software and was successfully applied to co-word analysis [68,69] to investigate the links between research topics and to identify the most relevant publishing journals. It was developed by Leiden University.

In addition, to integrate the meta-analysis and better evaluate and interpret the results, a content analysis was carried out. This helped to identify “not-so-obvious” perspectives, creating potentially groundbreaking perspectives for either academics or practitioners, playing a critical role in creating new theories [37]. Furthermore, it has previously been successfully applied in tourism and hospitality research [70,71], guaranteeing its suitability for pursuing the aims and scope of the present research. Considering that environmental performance indicators are essential for comparing hotel and restaurant performances over time and communicating transparent and comparable results, selected indicators from the content analysis were synthesized into a dashboard, which distinguished between the scopes of the indicators, as follows: (a) air scope, including the indicators which monitor the activities affecting climate change and causing risks to human health; (b) water scope, including indicators which evaluate human impact on freshwater systems, either from single products or entire processes; (c) energy scope, including indicators which assess the use of energy, energy performance, and resource consumption rates; (d) waste scope, including indicators which measure waste generation from a economic, environmental, or social perspective; (e) health scope, including indicators which monitor the impact of unhealthy or unsafe foods on human health, as well as suitable human conditions on an employee’s well-being; and (f) economic scope, including indicators which monitor economic performance and service quality [47,48,50,58].

4. Results

4.1. Publishing Journals, Geographical Areas, and Research Timeline

To better contextualize the selected papers ($n = 56$) and conference proceedings ($n = 10$), Table 1 includes the publishing journals, geographical areas, and timelines investigated and also highlights those journals and countries that account for two or more contributions. The limited number of the selected papers represents this topical yet still under-researched (in the literature) niche subject. Considering the high heterogeneity of the hospitality sector, the present research took into sole consideration the food service and lodging accommodation industries to obtain as accurate results as possible. Although the dataset is composed of 66 papers, such results are in line with other scientific research papers in the tourism and hospitality field [72,73].

It has emerged that the vast majority of the selected contributions were published on Sustainability (9 articles) and in both the Journal of Hospitality Management (4 articles) and the International Journal of Environmental Research and Public Health (2 articles). Indeed, among others, such journals aim at publishing research which provides solutions toward tackling climate change, pursuing sustainable development, and guaranteeing either economic growth or environmental protection. The selection by geographical area shows the majority of authors have explored environmental and social indicators in the United States (14 articles), followed by China (10 articles) and then Brazil (13 articles), whereas in the European Union, only several manuscripts have investigated Poland, The Czech Republic, Italy, Portugal, and Romania. In terms of the timeline of publication, the highest number of contributions were published in 2019 (15 articles).

To comprehend the main research trends, we searched for the most cited articles in the WoS database. The most cited contribution (38 citations) identified possible opportunities to enhance restaurants’ competitiveness through online reviews, based on the competitive index and dissimilarity index [73]. The second most cited contribution (37 citations) dates back to 2015 and investigates fast-food consumption on healthy diets and obesity reduction through the body mass index z-score [74]. The same number of citations was achieved by Charlebois et al. [75], in which food service procurement, kitchen practices, cost management, menu design, and technical literacy in the field of food waste minimization through “performance indicators” was investigated. Therefore, using these preliminary

insights, a transversal and holistic concept of “ecological transition” has emerged, which encompasses managerial strategies, human health, food safety, and food security toward the wider aim of sustainable development.

Table 1. Contributions per publishing journal. (a) Geographical areas and (b) timeline (c).

a. Publishing Journal	N.
Sustainability	9
Journal of Hospitality Management	4
International Journal of Environmental Research and Public Health	3
Anatolia	2
International Journal of Contemporary Hospitality Management	2
International Journal of Culture Tourism and Hospitality Research	2
Journal of Hospitality and Tourism Management	2
b. Geographical Areas	N.
United States	14
Brazil	4
Poland	3
Russia	3
Australia	2
Canada	2
Czech Republic	2
Italy	2
Portugal	2
Romania	2
Taiwan	2
Turkey	2
c. Timeline	N.
2015	6
2016	3
2017	9
2018	10
2019	15
2020	13
2021	10

Source: Personal elaboration by the authors.

4.2. VOSviewer Analysis Results

According to the VOSviewer analysis, which investigated the co-occurrences of keywords and interactions between research topics within article titles and abstracts, a total of five clusters emerged and are depicted in Figure 3. In the first cluster, defined as the “food cluster” and identified in red in Figure 4, 17 keywords were found for a total of 568 links and 84 co-occurrences. The most relevant keywords are represented by “fast food”, “body mass index”, “obesity”, “home”, and “restaurant”, whereas specific countries have emerged, such as “Canada” and “U.S.A.”. In the second cluster, defined as the “water cluster” and represented in green in Figure 4, 14 keywords were found for a total of 73 co-occurrences. Such a cluster highlights research topics related to “climate”, “recreational water”, “pools”, and “water use”, focusing on water consumption in health resorts. In the third cluster, the so-called “consumers cluster”, illustrated in blue in Figure 4, 12 keywords were found for 51 co-occurrences. This reveals connections and links between words such as “consumer”, “government”, “market”, and “hospitality”. The fourth cluster, defined as the “corporate cluster” and represented in yellow in Figure 4, is composed of 11 keywords and reveals 48 co-occurrences. Among other factors, this cluster focuses on keywords like “companies”, “hotels”, “tasks”, “work”, and “work environment”, revealing a novel attitude toward ecological transition in the field of corporate social responsibility, customer satisfaction, and employee wellbeing. In the last cluster, which we have called the “energy cluster”, repre-

sented in violet in Figure 3, 9 keywords were found for 38 co-occurrences. Its keywords are related to “energy”, “investment”, “natural environment”, and “sustainable development”, highlighting a focus on energy transition towards sustainability. Furthermore, among its keywords, it presented the country “China”. Table A1 illustrates the five clusters and their items.

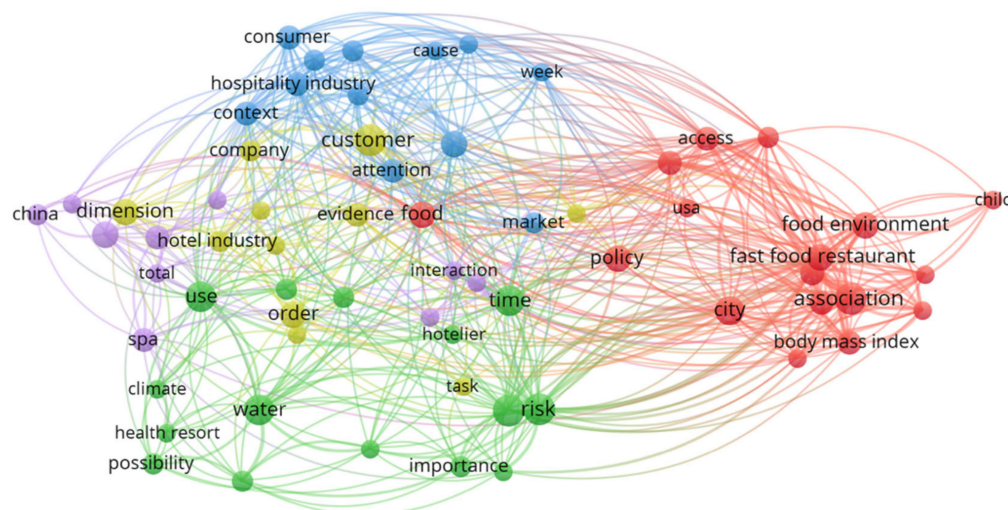


Figure 3. VOSviewer results based on text data. Source: personal elaboration by the authors.

TOURISM ACTIVITIES		
SCOPE		Food Services
	Air	Hamerman et al. 2017, Greer et al. 2020, Sofuoglu et al. 2015, Bufquin et al. 2017, Lepkowska-White et al. 2019, Fernández-Gómez et al. 2020, Zikirya et al. 2021, Harun et al. 2018
	Water	Hamerman et al. 2017, Sofuoglu et al. 2015, Bufquin et al. 2017, Lepkowska-White et al. 2019, Fernández-Gómez et al. 2020, Zikirya et al. 2021
	Energy	Hamerman et al. 2017, Sofuoglu et al. 2015, Stuchlikova and Botlikova 2020, Flessas et al. 2015, Khachatryan and Klicheva 2019, Bufquin et al. 2017, Lepkowska-White et al. 2019, Fernández-Gómez et al. 2020, Zikirya et al. 2021
	Waste	Fortin and Yazbeck 2015, Li et al. 2018, Rizk et al. 2017, Sofuoglu et al. 2015
	Health	Charlebois et al. 2015, Asirvatham et al. 2019, Bai et al. 2019, Wang et al. 2021, Stuchlikova and Botlikova 2020, Flessas et al. 2015, Khachatryan and Klicheva 2019, Denisova et al. 2020, Bufquin et al. 2017, Lepkowska-White et al. 2019, Harun et al. 2018
	Economic	Denisova et al. 2020, Bufquin et al. 2017, Chou et al. 2016
		Lodging-Accommodation Activities
		Wickramasingh 2019, Blengini and Heo 2020, Alipour et al. 2019, Omune et al. 2020, Zemke and Chen 2017, Saura et al. 2018
		Wickramasingh 2019, Blengini and Heo 2020, Szatten and Więclaw 2021, Milik et al. 2018, Bonotto 2017, Bonotto et al. 2017, Tirodimos et al. 2018
		Wickramasingh 2019, Blengini and Heo 2020, Alipour et al. 2019, Campos et al. 2022, Bagheri et al. 2020, Lau et al. 2021, Yuan and Luo 2019, Wang et al. 2021, Liang et al. 2021, Tirodimos et al. 2018, Zemke et al. 2017
		Dang et al. 2018, Tirodimos et al. 2018, Omune et al. 2020
		Szatten and Więclaw 2021, Milik et al. 2018, Bonotto 2017, Bonotto et al. 2017, Omune et al. 2020, Zemke et al. 2017, Saura et al. 2018, Bacik et al. 2019
		Weerathunga et al. 2016, Grecu et al. 2019, Alipour et al. 2019, Tirodimos et al. 2018,

Figure 4. Multidimensional monitoring dashboard by selected indicators [75–115]. Source: personal elaboration by the authors.

5. Discussion

5.1. Monitoring the Ecological Transition of Food Services (RQ1)

Regarding RQ1, a total of 11 contributions were each been identified within the “food cluster” and the “corporate cluster”, with only 9 contributions for the “customer cluster”.

In the “food cluster”, several authors have investigated the sustainability of fast foods through the analysis of childhood body mass index [76] or adolescent weight gain [77]. Wang et al. [78] have adopted the healthy eating index to measure diet quality and to estimate how specific food commodities align with the key recommendations of the dietary guidelines for Americans for healthy and nutritional diets. In addition, Li et al. [79] have explored the healthfulness of restaurants through the adoption of the Nutrition Environment Measures Survey-Restaurant, which represents an agent-based model, examining family dining patterns, individual and community sociodemographic characteristics, restaurant location, size, and food healthfulness. These authors focused on studying the food habits of school and university students, highlighting a correlation between fast-food influence on a child’s body mass index and the geographical distance from school [76]. Food waste has been largely explored by different authors as a second pillar of the “food cluster”. Considering that food waste is one of the most topical challenges from a social, environmental, and economic perspective [28], Hamerman et al. [80] have identified the service of offering to wrap leftovers as a positive indicator of restaurants’ quality and environmental sustainability, considering it useful for reducing food waste and increasing future home consumption. In addition, Charlebois et al. [75] have highlighted the amount of food waste as an index of food service quality and economic performance. In the field of food waste disposal, Rizk et al. [81] have explored the environmental and public health consequences of organic waste treatment, monitoring the physical-chemical parameters of the composting process of food waste toward sustainable organic composting production. Lastly, as suggested by Greer et al. [82], successful indicators (i.e., key performance indicators) for measuring circular food services could be identified in the reduction and reporting of food waste. The third pillar of the “food cluster” was identified as indoor air quality during cooking and frying activities [83]. Among others, it seems essential to measure the CO₂ pollution, and volatile organic compound concentrations generated during deep-frying, which could cause negative health effects for chefs and consumers.

As regards the “corporate cluster”, Stuchlikova and Botlikova [84] have identified transportation, climate change, waste management, water management and wastewater management as the most used indicators for calculating environmental impact analysis. However, as highlighted by several authors [85–87], additional financial and non-financial measures, as well as layout performance indicators, should be considered for food service sustainability. As proposed by Flessas et al. [85], two main indicators should be included: productivity and work-in-process. Productivity value shows the degree of human and natural resources used, whereas work-in-progress represents the proportion in which the inventory has been stored throughout the production process due to inefficiencies in the system. Furthermore, human-centered indicators for ecological transition processes include the number of work-related accidents and customer satisfaction. Similar results have been depicted by Bufquin et al. [88]. Regarding the improvement of food service warmth, competence, and competitiveness in global markets, the authors investigated customer satisfaction, changes in restaurant sales, and employee turnover rates, highlighting the interconnection between social responsibility and human development. Further, as suggested by Chou et al. [89], the ecological transition of food services should be explored in the light of five major indicators: sustainable service innovation, food service technology, organizational learning, adoption of innovation, and organizational environment. Among the social media marketing indicators, which show the success of small and medium enterprises [90], the authors highlighted the importance of evaluating performance indicators, such as likes, shares, and followers, as well as the restaurant’s social media index.

Lastly, the “customer cluster” encompasses variables such as environmental and health perceptions [91], vitality [92], and corporate social responsibility [93] toward food services’ economic, social, and environmental transitions. Considering that consumer review websites and consumer perception of sustainable practices have increased in importance in recent years, Fernandez-Gamez et al. [91] investigated the relationship between health and environmental conditions and a restaurant’s corporate reputation at the country level through the use of the healthiest country index. Furthermore, regarding the measurement of the quality of urban life and the environment, Zikirya et al. [92] estimated the vitality of urban takeaways through building footprints, whereas Dang et al. [94] explored customers’ perceptions, attitudes, and practices towards experienced secondhand smoke in restaurants, stressing the need to enhance the monitoring system of smokers. In the field of fast-food competitiveness, Harun et al. [93] have estimated that young generations are greatly involved in fast-food restaurants’ responsible behavior and their concern for the environment. Therefore, economic development and purchasing behavior strategies should be grounded in environmental indicator measurement.

5.2. Monitoring the Ecological Transition of Lodging accommodation Activities (RQ2)

Regarding RQ2, all five clusters (i.e., food, water, customer, corporate, and energy) emerged as important. The largest number of contributions was identified in the “corporate cluster” (11 contributions), followed by the “energy cluster” (10 contributions), the “water cluster” (8 contributions), the “customer cluster” (4 contributions) and the “food cluster” (2 contributions). Such a variety of topics is possible because lodging accommodation activities are highly energy-intensive and cover multi-usage functions, from food and beverage consumption to recreation, resort, and hygiene procedures [35].

The “corporate cluster” encompasses the analysis of hotels’ environmental orientation through composite indicators [95], as well as the investigation of their sustainability performance [96] or economic and financial performance through macroeconomic indicators [97,98]. Some authors address employees’ environmental behavior and perception of their hotels’ sustainability practices [99], whereas others link environmental and economic performance to a holistic perspective [100]. From an environmental perspective, several indicators were depicted: environmental records, environment policy, environment management systems, involvement in relevant projects/programs, and receipt of environmental awards and certifications. Furthermore, some authors [99] have applied the global sustainable tourism council hotel criteria indicators, as well as the indicators of sustainable development for tourism destinations and the European Union’s sustainability framework for nearly zero-energy hotels. An additional contribution, as suggested by Weerathunga et al. [96], regards the development of a sustainable performance evaluation index, which encompasses either economic, social, government, or environmental sustainability. Regarding the environmental aspect, the authors assessed and evaluated the methods and processes adopted to reuse and recycle effluents and waste, as well as the awards and the certifications in recognition of environmentally friendly operations, as already proposed by Wickramasingh [95].

In the “energy cluster”, Bagheri et al. [101] estimated that the hotel’s energy dimension represents the most impactful dimension among all others, with the most significant indicators related to the supply and efficient use of energy, as well as the use of renewable energies. Further, Lau et al. [102] assessed chiller-power usage, highlighting the need to enhance energy control in deluxe waterfront hotels. Among the possible solutions to reduce the energy consumption of existing hotel buildings, some authors [103,104] discussed the importance of energy-saving retrofitting, including the application of photovoltaic panels and energy-efficient LED lights [105]. The indicators dedicated to estimating energy consumption include, for example, self-sufficiency ratio, energy production diversification, per-capita energy production, energy intensity, energy consumption, electricity consumption, and energy industry investment. The use of clean energy and solar power still represents a challenge for measuring the environmental sustainability of hotels [106].

In terms of the “water cluster”, this dimension has been investigated in the fields of water quality, water savings, and water security. Milik et al. [107] investigated the physical and chemical parameters of fountains in health resorts, highlighting a need to introduce supervision over the quality of drinking water. Similar research was conducted by Bonotto [108], measuring alpha-emitting radionuclides, temperature, pH, Eh, electrical conductivity, dissolved gases, and major constituents in water, whereas other authors have investigated bacteria such as *Legionella* [109] or fecal water contamination [110]. As to water savings, Omune et al. [111] explored water conservation practices, paying attention to taps that are open unnecessarily.

The “customer cluster” includes research studies which explore the relationship between online comments and reviews and hotels’ environmental management [112,113]. Among others, tourists evaluate garbage or fumes that harm and pollute nature, solar panels, self-sufficiency zones, sustainable maintenance policies, noise pollution, traditional foods, and sustainable energy. Furthermore, tourists seem to have a positive sentiment towards hotel ecosystems, paying attention to the surrounding environment, the abundance of nature and plants, and the pure air in the facilities. Such indicators could enhance either environmental or economic performance [114].

The “food cluster” includes research studies related to a hotel’s readiness to offer local cuisines [115] and food-waste management practice [111]. Among other factors, it seems that serving local food could reduce food production costs, increase food profit margin, improve the attractiveness of menus, and make menu prices cheaper.

Overall, the five clusters highlight an evident link between specific subjects in the literature, with food, water, customer, corporate, and energy clusters able to monitor the transition to sustainable food services and lodging accommodation activities. Although the number of the selected articles is limited to 66 scientific contributions, it emerged that these studies are homogeneously focused on a few (but relevant) topics, which is in line with other research in the tourism and hospitality field concerning food services and lodging accommodation activities [116].

5.3. Theoretical and Managerial Implications

Figure 4 summarizes the selected indicators and provides a multidimensional measurement dashboard of empirical and theoretical tools useful for boosting decision-making processes and strategies in the hospitality industry. In the light of Eurostat [15], which provides a list of indicators used to monitor the progress towards the circular economy and ecological transition, Figure 4 distinguishes between air, water, energy, waste, health, and economic scopes [47,48,50,58]. Table A2 provides details related to the multidimensional monitoring dashboard.

Regarding food services, several articles have investigated the scope of air and energy, as well as health, highlighting the nexus between food safety, service quality, and economic performance. However, waste (and food waste) still requires further research, considering the low number of contributions exploring this issue. The same trends are detected in lodging accommodation-industry research, which appears marginally interested in waste management. Although restaurants and hotels have the potential to quantify food waste and packaging waste, which are mainly produced in the final consumption stage and especially outdoors, several authors have not addressed their efforts towards this issue, instead focusing on air emissions related to energy consumption or water pollution, yet neglecting all the hidden costs associated with waste generation, from cradle to grave. This means that the circular economy approach, which highlights the need to reuse or recycle waste and avoid unnecessary withdrawals of virgin raw materials from nature, has not yet been fully implemented. Several strategies can be adopted to convert waste (food and non-food) into secondary raw materials, useful both in terms of closed-loop-recycling and open-loop-recycling. As a consequence, tourism operators must be encouraged by authorities to measure waste since alternative pathways could be walked, such as (a) waste reduction through awareness-raising practices and improvements in customer behavior

and (b) energy recovery or compost practices. Both alternatives would help improve environmental performance and reduce the burden on the environment.

Our research confirms a lack of harmonized indicators for measuring ecological transition, as well as a lack of data. In light of the uncommon measurement and monitoring tools used in the hospitality industry, public authorities should suggest practices, together with a set of indicators to monitor the environmental transition, with also a set of homogeneous and standardized measurement methodologies, which could boost comparability and replicability among food services and lodging accommodation activities. Although the European Union, through the Commission Delegated Decision (EU) 2019/1597 on common methodologies and minimum quality requirements for the homogeneous assessment of food waste quantities and composition [117], has suggested suitable tools to measure food waste, hotels and restaurants have not yet considered the importance of measurement and monitoring practices. Whether public authorities should make measurement mandatory rather than leave it voluntary practice remains a fundamental question. Nevertheless, the need for the development of a life-cycle inventory database, as well as the need for measurement programming, replicability, and comparability, remains a fixed point.

5.4. The Ecological Transition after the COVID-19 Pandemic

It has been proved that circular economy principles are sensitive to unpredictable events, such as the COVID-19 pandemic. Since the eruption of COVID-19, pollution and ecological burdens have decreased by 30% [17], which means that several economic activities, such as tourism, must switch from linear to circular practices through suitable investment opportunities. Although no selected articles in the present review deal with the COVID-19 issue, meaning that no authors have monitored ecological transition during the pandemic, the authors have identified some possible strategies to rebuild tourism soon after the pandemic. Hotels and restaurants have adopted new strategies in terms of hygiene protocols, and several units have proceeded to renovate their businesses during the stoppage of their activities due to the pandemic, increasing their attractiveness to customers. The COVID-19 pandemic has offered the food service and lodging accommodation industries an opportunity to more authentically practice corporate social responsibility, focusing their awareness on environmental and social challenges [118,119].

In light of the sudden business revival soon after the pandemic, the adoption of integrated management systems, which take care of environmental, social, health and economic issues, has emerged. Integration based on industrial symbiosis and circular economy paradigms could represent an essential step to switch from linear to circular activities, boosting the interactions between suppliers, companies, and customers. Besides, considering the nexus between economic growth and environmental protection, activities in food service and lodging accommodation could benefit from the adoption of environmental strategies since this could lead to cost reductions while increasing efficiency and clients' trust. Monitoring ecological transition requires quantitative and qualitative data; on one hand, indicators are essential to gain as much knowledge as possible and compare data over time, and on the other hand, companies should engage in sustainable practices to enhance consumers' loyalty, stakeholders' interest to invest, and local-supplier networking, considering such variables as key factors to boost competitiveness (and sustainability) in the hospitality sector.

6. Conclusions

The ecological transition in the hospitality sector remains one of the main challenges towards sustainable development. The traditional way to do business, which involves a lack of sustainable practices, is beginning to be no longer acceptable by the decision makers and public authorities. As a consequence, representatives from the field should reconsider their "way of doing business". The present research, through a semi-systematic literature review of 66 peer-reviewed articles and conference proceedings included in Web of Science between 2015 and 2021, brings new details about the monitoring activities of the

transition to sustainable food services and lodging accommodation activities. Overall, the current review has identified five intervention clusters, namely (a) “food cluster”, (b) “water cluster”, (c) “consumers cluster”, (d) “corporate cluster”, and (e) “energy cluster”. Each cluster refers to different areas of intervention and specific indicators, either of sustainability or circularity, in order to identify strategies for pursuing the SDGs and ecological transition. One of the conclusions of the study is that the natural resources that are most impacted within the tourism sector are food, water, and energy, and the main stakeholders to be actively monitored are the users (or consumers) and the managers. Besides, companies and consumers should develop a positive attitude toward the implementation of economic and environmentally friendly-blended performance, whereas researchers should investigate each stage of the supply chain, from raw material supply to consumer behavior. Although the selected papers represent a small sample for inference, such scientific research still provides useful quantitative data for understanding the main sustainability trends in the food service and lodging accommodation industries.

As regards the limitations of the present research, one refers to the small number of peer-reviewed articles and proceedings that were investigated, explained by restricting the approach of the research to the food service industry and the lodging accommodation industries. Another limitation was the language criteria for inclusion. The present research contains only articles and proceedings published in English that are included in the WOS database while excluding books. To enlarge the research base, the authors intend to expand this research to other databases, like Scopus and Elsevier and also to include books and book chapters. Lastly, our research has a timespan between 2015–2021 and does not make a distinction between articles published before or during the COVID-19 pandemic, owing to the main purpose of the paper as being focused on monitoring the overall ecological transition of food services and lodging accommodation activities, setting a starting point for future research.

Future research directions will broaden the time span of the current study, as well as the research strings selected for screening, providing a comparative analysis among geographical areas and distinguishing between before, during, and after the COVID-19 pandemic. If it is true that an ecological transition ensures resilience soon after economic crises and natural disasters, a future extension of the present research based on the use of either quantitative or quantitative indicators, will confirm this assumption.

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Appendix A

Table A1. VOSviewer clusters, items, links and occurrences.

“Food Cluster” (17 Items)			
Items	Links	Total Link Strength	Occurrences
Access	32	43	5
Association	26	58	9
Body Mass Index	20	36	5
Canada	29	37	4
Child	8	11	3
City	26	36	7
Cycle	17	22	3
Fast Food	17	26	3
Fast Food Restaurant	26	41	6
Food	30	37	6
Food Environment	23	39	6
Home	31	44	5
Obesity	23	38	5
Policy	22	24	6
Population	24	40	5
Resident	16	19	3
U.S.	16	17	3
“Water Cluster” (15 Items)			
Items	Links	Total Link Strength	Occurrences
Climate	10	11	3
Health Resort	9	10	3
Hotelier	9	10	3
Implementation	17	17	4
Pool	14	18	3
Possibility	10	13	4
Recreational Water	12	17	3
Requirement	17	18	4
Risk	30	46	9
Time	29	37	8
Type	34	44	9
Use	28	34	8
Water	24	35	8
Water sample	14	20	4
“Customer cluster” (12 Items)			
Items	Links	Total Link Strength	Occurrences
Attention	27	33	5
Cause	19	23	3
Consumer	21	30	5
Context	26	38	5
Food waste	21	26	4
Government	26	32	4
Hospitality Industry	25	35	5
Interest	20	24	4
Market	15	15	4
Patron	19	24	3
Restaurant Industry	24	30	6
Week	25	27	3

Table A1. *Cont.*

“Corporate Cluster” (11 Items)			
Items	Links	Total Link Strength	Occurrences
Company	14	16	3
Culture	11	11	3
Customer	30	44	9
Customer Satisfaction	8	10	3
Dimension	22	28	6
Evidence	17	18	5
Hotel Industry	14	18	4
Order	15	19	6
Task	7	7	3
Work	17	18	3
Work Environment	10	11	3
“Energy Cluster” (10 Items)			
Items	Links	Total Link Strength	Occurrences
China	7	8	4
Energy	16	19	6
Interaction	19	20	3
Investment	12	12	3
Lack	11	11	3
Natural Environment	10	11	3
Spa	14	16	5
Star Hotel	11	12	3
Sustainable	12	13	5
Development	13	14	3
Total			

Appendix B

Table A2. Multidimensional monitoring dashboard using selected indicators.

RQ	Cluster	Selected Indicator	Scope	Reference
1	Food	Body Mass Index	Health	[76]
1	Food	Weight Gain Rate	Health	[77]
1	Food	Healthy Eating Index	Health	[78]
1	Food	Nutrition Environment Measures	Health	[79]
1	Food	Leftovers Rate	Waste	[80]
1	Food	Food Waste Rate	Waste	[75]
1	Food	Organic Waste Treatment	Air, Water, Energy	[81]
1	Food	Food Waste Reduction	Waste	[82]
1	Food	Indoor Air Quality	Air	[83]
1	Corporate	Environmental Impacts Indicators	Air, Water, Energy, Waste	[84]
1	Corporate	Productivity, Human Centered Indicators	Energy, Health	[85–87]
1	Corporate	Employees Turnover Rates	Health, Economic	[88]
1	Corporate	Sustainable Service Innovation	Air, Water, Energy	[89]
1	Corporate	Restaurant Social Media Index	Economic	[90]
1	Customer	Healthiest Country Index	Air, Water, Energy, Health	[91]
1	Customer	Urban Vitality/Building Footprints	Air, Water, Energy	[92]
1	Customer	Secondhand Smoke Rate	Air, Health	[94]
1	Customer	Fast Food Responsible Behavior	Air, Water, Energy	[93]

Table A2. Cont.

RQ	Cluster	Selected Indicator	Scope	Reference
2	Corporate	Waste Reuse/Recycling Rates	Waste	[95]
2	Corporate	Sustainability Performance Indicator	Air, Water, Energy	[96]
2	Corporate	Economic Performance	Economic	[97]
2	Corporate	Financial Performance	Economic	[98]
2	Corporate	GST Council Hotel Criteria Indicators	Air, Water, Energy	[99]
2	Corporate	Environmental/Economic Performances	Air, Energy, Economic	[100]
2	Energy	Energy Use/Renewable Energy Use	Energy	[101]
2	Energy	Chiller Power Use Rate	Energy	[102]
2	Energy	Building Energy Savings Retrofitting	Energy	[103–105]
2	Energy	Clean Energy/Solar Power Ratio	Energy	[106]
2	Water	Water Physical and Chemical Parameters	Water, Health	[107]
2	Water	Water Physical and Chemical Parameters	Water, Health	[108]
2	Water	Water Physical and Chemical Parameters	Water, Health	[109]
2	Water	Water Physical and Chemical Parameters	Water, Health	[110]
2	Water	Water Savings Rate	Water, Energy, Economic	[111]
2	Customer	Garbage Rate, Fumes Rate	Air, Waste, Health	[112]
2	Customer	Sustainable Maintenance, Energy Rate	Air, Energy, Health	[113]
2	Customer	Hotel Ecosystems Rate	Air, Health	[114]
2	Food	Local Cuisine Rate	Health	[115]
2	Food	Food Waste Rate	Waste	[111]

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