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To cite this article: Samuele Marinello, Maria Angela Butturi, Rita Gamberini & Umberto Martini (2023) Indicators for sustainable touristic destinations: a critical review, Journal of Environmental Planning and Management, 66:1, 1-30, DOI: [10.1080/09640568.2021.1978407](https://doi.org/10.1080/09640568.2021.1978407)

To link to this article: <https://doi.org/10.1080/09640568.2021.1978407>



Published online: 21 Oct 2021.



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REVIEW ARTICLE



Indicators for sustainable touristic destinations: a critical review

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(Received 19 March 2021; revised 1 July 2021; final version received 26 August 2021)

Globally, tourism is currently one of the fastest-growing industries, with strong impacts on territories, from an environmental, economic and social point of view. The increase in the number of tourists who flock to destinations requires greater attention to sustainability through tools (indicators) such as strategic destination management support. This paper, through the review of 104 scientific papers, aims to analyze the structure and evolution of the evaluation and monitoring of sustainable tourism through the use of sets of indicators. In particular, the study favors the understanding of the most significant aspects of sustainable tourism that the literature suggests to analyze, evaluating how these vary in relation to the type of destination and the time period of the study. The results contribute to the understanding of the theoretical and operational aspects which, today, are considered representative of the concept of sustainable tourism, improving the sustainable management of territories.

Keywords: sustainable tourism; destination sustainability; indicator; review

1. Introduction

Globally, tourism is currently one of the fastest-growing industries in the world. According to the recent UNWTO study for the year 2019 (UNWTO 2021), international tourism recorded the tenth consecutive year of growth. In 2019, the growth compared to 2018 was + 6% and, compared to 2017, it was + 7%. Europe represents almost 40% of international tourism receipts, followed by Asia and the Pacific with almost one third. It is recognized for its ability to generate an important part of gross domestic product for many economies around the world (in particular, tourism accounts for 48% of GDP in Macao—China). It employs numerous companies, about 80% of which are micro, small and medium sized enterprises (MSMEs). It generates millions of direct and indirect jobs, employing a high proportion of women and young people.

In addition to the economic aspect, tourism has also proved to have strong impacts on the sociocultural and environmental aspects of territories (Lee and Jan 2019; Zhuang, Yao, and Li 2019; Su and Swanson 2017; Su, Hsu, and Swanson 2017; Buckley 2012; Miller *et al.* 2010; Boksberger and Laesser 2007; Hunter and Shaw 2007). Unfortunately, the continuous and constant growth of this sector, as studied by the UNWTO (2019), places destinations and the entire tourism sector in a situation

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where it excessively influences the use of local resources, causing a progressive deterioration of the destinations and compromising their competitiveness and appeal on the market (Torres-Delgado and Saarinen 2014; Torres-Delgado and Palomeque 2014).

From a destination management perspective, solutions with respect to two types of problems are required:

- The development of policies and strategies that aim to balance the economic exploitation of resources and a particular territory and, on the other hand, that formulate concrete hypotheses for the protection and safeguarding of the territory and the well-being of local communities.
- The development of tools and approaches that allow constant monitoring of the territory and guarantee, if and when necessary, the timeliness of corrective action, operating in a sector characterized by a multidimensional nature and multi-stakeholder environment.

For this reason, tourist localities must also include adequate approaches and indicators for the analysis of sustainability parameters in order to control the phenomenon and make coherent decisions among the territorial management tools.

As reported by Budeanu *et al.* (2016), tourism already has a long tradition of initiatives in this sense, becoming one of the first sectors to launch sustainability-related initiatives, including through principles, strategies and action plans. Despite this tradition and great international interest, the actual implementation of sustainability practices within the tourism sector remains sporadic (Estêvão *et al.* 2019).

2. Sustainable tourism

This concept of sustainable tourism, among many definitions, is described by the World Tourism Organization (UNWTO) in this way: “Sustainable tourism development meets the needs of present tourists and host regions while protecting and enhancing opportunities for the future. It is envisaged as leading to management of all resources in such a way that economic, social and aesthetic needs can be fulfilled while maintaining cultural integrity, essential ecological processes, biological diversity and a life support system” (UNEP and WTO 2005). This paradigm has its roots in the wider context of sustainable development. The theme of sustainability rapidly developed and spread over the course of the twentieth century, in support of the preservation of the natural environment intended as a collective, non-reproducible asset. Observing this phenomenon from the point of view of the scarcity of resources (which represents a limiting factor for development and growth), the paradigm of sustainability is well connected to the unsustainable asymmetry described by Thomas Malthus in 1798, which contrasts a geometric progression in the growth of the population with the linear progression of livelihoods (Ulanowicz 2019; Elliott 2005).

Sustainability and development are concepts brought together in a structured way at an international level through the political commitment activated by the UN Conference held in Stockholm in 1972. Officially, the definition of sustainable development is attributed to the document ‘Our Common Future’ (otherwise known as the Brundtland Report), published in 1987 by the UN World Commission on Environment and Development, as well as to the subsequent United Nations Conference on the Environment held in Rio de Janeiro in 1992 (Berno and Bricker 2001). This

partnership favored the development of the eight Millennium Development Goals in 2000 and, in 2015, the 2030 Agenda for Sustainable Development, with its 17 Sustainable Development Goals and 169 specific targets with a time scenario through to 2030 (United Nations General Assembly 2015).

These are the main stages, which constitute the milestones of reference. In fact, there are numerous other policy instruments which have been adopted internationally. A very comprehensive picture of the road map that connects tourism with sustainable development has been presented by Pan *et al.* (2018).

Capitalizing on the corporate philosophy and accounting form of the triple bottom line (TBL) applied to the assessment of corporate performance (Elkington 1998), the combined use of economic, social and environmental bottom lines has also been applied to the concept of sustainability and, therefore, also to sustainable tourism (Stoddard, Pollard, and Evans 2012; IUCN 2006). To add to these three bottom line dimensions, some authors have proposed other additional ones: Pan *et al.* (2018) indicate 'sustainable culture' as the fourth pillar to describe the sustainability of tourism, while Asmelash and Kumar (2019a) consider 'institutional sustainability' as an additional dimension. Furthermore, Agyeiwaah, McKercher, and Suntikul (2017) propose four additional dimensions: 'cultural', 'political', 'management/institutional' and 'technological'.

The evaluation and control of tourism sustainability has favored the development of numerous operational tools and practices, becoming, moreover, one of the main foci of the literature (Lu and Nepal 2009). The need to proceed through constant monitoring is specified by the UNWTO, which considers it one of the preconditions necessary to achieve sustainable tourism as it allows the introduction of preventive or corrective measures (UNWTO 2004).

Schianetz, Kavanagh, and Lockington (2007) provided a complete review of the sustainable instruments. They described the tools and their potential advantages and limitations in supporting sustainability assessments for tourism destinations. These include: environmental impact assessment, Life Cycle Assessment (LCA), environmental auditing, ecological footprint, multi-criteria analysis, adaptive environmental assessment and sustainability indicators.

Among these, sustainability indicators are the most widespread and internationally used tool (Twining-Ward and Butler 2002; UNWTO 2004). The UNWTO (2004, 7–19) summarized the concept of indicators as the "tool for identifying and measuring the results of our actions". Some of the reasons that led to the massive use of this tool are related to the simplicity of formulation and use, its applicability to different spatial levels (from the supranational to the local level), the modularity and flexibility, the possibility of using it for quantitative or qualitative purposes and, finally, its interdisciplinarity.

These characteristics and potential have pushed institutions to develop appropriate sets of indicators to analyze the dimensions of sustainable tourism. Starting from the first commitments of the UNWTO in the 1990s, currently there are numerous sets of indicators for evaluating tourism and tourist destinations, including analyzing their level of sustainability:

- United Nations (UN): 17 Sustainable Development Goals (UN 2015)
- Global Sustainable Tourism Council (GSTC): 105 GSTC Criteria for Destinations (GSTC 2019)
- Global Destination Sustainability Index (GDS-Index): 70 Global Destination Sustainability Index (GDSI 2019)

- UN World Tourism Organization (UNWTO): 41 Statistical framework for sustainable tourism (UNWTO 2016)
- World Economic Forum (WEF): 14 Travel & Tourism Competitiveness Index (WEF 2019)
- European Commission (EC): 67 European tourism indicators for sustainable destination management (EC 2017)

Scientific research has always been very focused on the topic of assessing the sustainability of tourism, providing a very large and rapidly evolving bibliography.

This review article finds its informative foundation in the numerous research articles that study and present sets of indicators to evaluate the tourism sustainability of destinations, as well as in previous reviews that have described this aspect from different points of view. In fact, several studies have analyzed in detail the numerous and elaborate sets of indicators for assessing sustainable tourism.

For example, Guilarte and Quintáns (2019) analyze the 10 papers considered most significant for the reference period of the study between 1999 and 2019 and in particular the use of big data to support sustainable tourism. Kristjánsdóttir, Ólafsdóttir, and Ragnarsdóttir (2018) analyze 48 representative articles from the period 2001–2016, assessing their consistency with the analytical needs in terms of the complexity of the socio-ecological systems of tourist destinations. Finally, Shafiee *et al.* (2019) analyze 40 articles relating to the period 2000–2017, featuring a new model for smart tourism destinations.

3. Material and methods

3.1. Scope of review

Starting from previous review works (e.g. Agyeiwaah, McKercher, and Suntikul 2017, Rasoolimanesh *et al.* 2020), this paper presents a critical review of the available research concerning the set of indicators available in the literature to assess the sustainability of tourist destinations, as well as the identification of the main dimensions that characterize a sustainable tourist destination. In particular, the added value that this work intends to provide is to support in a concrete and operational way the choice of the aspects to be analyzed to properly evaluate the main themes of tourism sustainability of the different destinations. In fact, although there are widely used indicators for all destinations, some have been found to be very widespread for some specific environments (e.g. EN4 indicator for touristic accommodation, EC7 and EC8 indicator for urban areas and EC2 for islands). This research indicates that the assessment of tourism sustainability is always connected to the assessment of environmental aspects and, to a lesser extent, social and economic ones. Other aspects are even less investigated, such as the managerial and governance skills of local actors.

Offering a hint to answer the two problems mentioned above (development of policies and strategies and identification of tools and approaches), this analysis can be useful for local administrations in choosing the main aspects to be analyzed and monitored to assess the level of sustainability of tourist destinations, as well as for local stakeholders to identify possible strategies and best practices to be more ‘ready’ to work in sustainable tourism.

3.2. Literature search, selection and protocol analysis

In order to ensure a complete literature review it is necessary to adopt an accurate approach to collect and analyze the reference bibliographic material. In this paper, a search and analysis protocol has been defined (Table 1).

The research questions that guided the research and analysis of the articles are:

What is the reference benchmark in the existing literature on the sustainability of tourist destinations (Q1)?

What are the characterizing aspects of each study (Q2)?

What are the most common approaches and aspects in assessing the sustainability of tourist destinations (Q3)?

Starting from the research questions that the work intends to answer, Scopus, ScienceDirect, Taylor & Francis and MDPI databases have been used for unrestricted search in journals and years of publication. The only constraints imposed on research are the type of publication (research and review) and the English language.

Two distinct groups of keywords were used, referred to as 'Group A' and 'Group B'. The first identifies the specific topic of this paper (the sustainability), while the latter reflects the study's specialization. The two groups were combined with each other, obtaining a list of six keywords that have been used for research in the two selected databases.

The collected papers were selected through a scalar analysis of the contents: from a preliminary level to an increased deepening of the contents (Figure 1). Starting from the identification phase, the screening eliminated the duplicates and analyzed the abstracts of the works to assess their compliance with the objective of this work. The remaining papers were assessed by applying eligibility criteria (Table 1).

Finally, a full-text assessment was carried out. Only with this last step was the selection completed. Finally, browsing other known references and tracking down references in the selected papers (backward snowballing), other contributions were identified. This process resulted in a total of 104 papers.

In the final paper database, an analysis protocol has been applied to critically analyze the content of the collected material and to describe it in a structured way (Table 1).

The descriptive analysis (F1) provides a general overview of the collected material, enhancing three key aspects that frame the reference bibliography: year of publication, journal and country of the corresponding author. F2 indicates the method used for collecting the papers, while F3 indicates its type. These first groups allow us to answer Q1. F4 and F5 respond to Q2, indicating the type of tourist destination that characterizes the study area and the sustainability aspect analyzed. Finally, F6 specifies the number and type of indicators proposed by each author. Finally, given the multitude of indicators, F7 identifies those that are the main topics covered by the tourism sustainability indicators. The latter two groups respond to Q3.

4. Results and discussion

The discussion on the results aims to answer the identified research questions. To make this paragraph easier to read, each author has been assigned a number, as reported in Table 2.

Table 1. Search protocol for the material collection.

A		Research questions										
B	A1	What is the reference benchmark in the existing literature on the sustainability of tourist destinations (Q1)?										
	A2	What are the characterizing aspects of each study (Q2)?										
	A3	What are the most common approaches and aspects in assessing the sustainability of tourist destinations (Q3)?										
	Database											
	B1	ScienceDirect	&	Group B	ScienceDirect	Scopus	Taylor & Francis	MDPI	Total			
B2	Scopus											
B3	Taylor & Francis											
B4	MDPI											
C	Search criteria											
	C1	Journal	All	Group B	ScienceDirect	Scopus	Taylor & Francis	MDPI	Total			
	C2	Year										
	C3	Article type										
	C4	Date of search										
C5	Language	English										
D	Keywords											
	D1	Group A	Sustainability	Group B	ScienceDirect	Scopus	Taylor & Francis	MDPI	Total			
	D2	Tourism										
	D3	Indicator										
	D4	Assessment										
	D5	Destination										
	D6	Management										
TBL												
Total		43,094	313,773	542,714	47,649	604,349	1,566	1,553,145	131,924	1,764,950	5,300	3,455,319
E	Eligibility criteria											
	E1	Treats the sustainability of the tourist destination										
	E2	Identify / apply tourism sustainability indicators										
F	E3	It describes a practical application										
	Categories for the analysis structure											
	F1	Descriptive analysis										
Year												
Journal												

Table 1. (Continued).

A		Research questions
F2	Country Material collection PD—Protocol-driven IA—Informal approaches SB—Snowball methods	
F3	Type Research paper Review	
F4	Destination type Country Region Island Province/Municipality/local community Accommodations Natural sites Event	
F5	Sustainability dimensions Environmental Economic Social Others (peripherals)	
F6	Sustainable tourism indicators Number Type	
F7	Sustainability themes Themes Themes by type of destination Evolution over time	

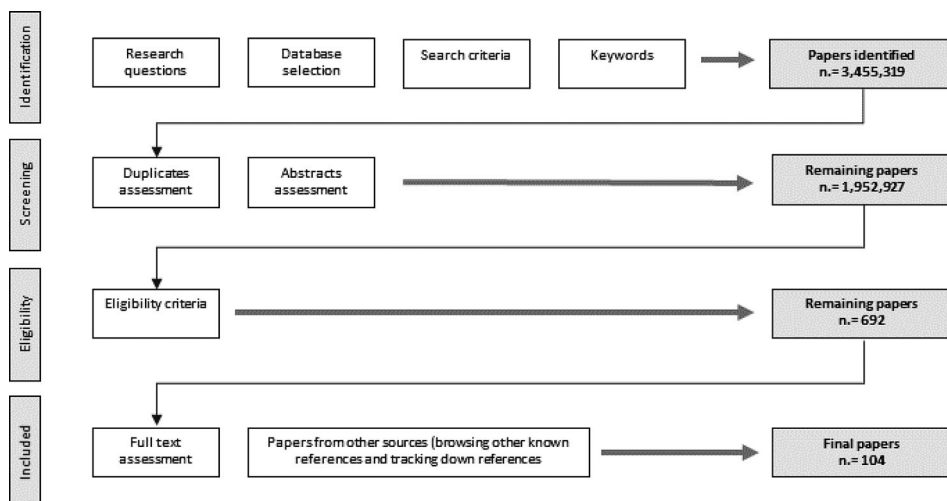


Figure 1. Approach for the material selection.

4.1. Descriptive analysis

The selected articles describe studies that were published during the period 2001–2020, with a strong increase since the year 2017 (Figure 2). The year 2019 was very productive: 25 papers were selected.

The journals that most frequently published papers on descriptive indicators of sustainable tourism were *Tourism Management* with 17 papers and *Sustainability* with 15 papers (Figure 3). Together, they represent over 31% of the articles analyzed. The remaining articles are divided among the other journals equally. The ‘Other’ category includes a large number of journals (over 25) that have published one or two papers each.

The selected studies are concentrated in particular in Europe (50 papers) and Asia (32 papers), which together represent 78% of the papers analyzed. Spain is the most productive country (26 papers), followed by China (12). Italy and Taiwan complete the podium with seven papers each. South America, Australia and Africa are the areas with the fewest publications. A representation of the geographical distribution of the papers is shown in Figure 4.

4.2. Material collection and paper type

As previously described, most of the papers were selected through the ‘protocol-driven’ approach (about 97%), while the rest derive from ‘informal’ approaches and ‘snowball’ methods (2% and 1%, respectively). This is due to the fact that the use of an operating protocol for research has made it possible to select a significant number of articles that are representative of the reference literature.

As for the types of paper, most are research work (about 98%), while 2% are review articles.

4.3. Type of destination

The authors analyzed describe the use of indicators for sustainable tourism with respect to their effectiveness as an evaluation and monitoring tool for tourist

Table 2. Paper identification code.

Code	Authors	Code	Authors
[1]	Aminian 2012	[53]	Lee and Jan 2019
[2]	Arrobas <i>et al.</i> 2020	[54]	Lenzen <i>et al.</i> 2018
[3]	Andersson and Lundberg 2013	[55]	Liu, Zhang, and Fu 2017
[4]	Asmelash and Kumar 2019a	[56]	Liu <i>et al.</i> 2018
[5]	Asmelash and Kumar 2019b	[57]	Liu <i>et al.</i> 2019
[6]	Avelino <i>et al.</i> 2019	[58]	Lozano-Oyola <i>et al.</i> 2012
[7]	Azizi, Biglari, and Joudi 2011	[59]	Lozano-Oyola, Contreras, and Blancas 2019
[8]	Azouz and Galal 2016	[60]	Lozano-Oyola <i>et al.</i> 2019
[9]	Blancas <i>et al.</i> 2010a	[61]	Luo 2018
[10]	Blancas <i>et al.</i> 2010b	[62]	Martin <i>et al.</i> 2019
[11]	Blancas <i>et al.</i> 2011	[63]	Mathew and Sreejesh 2017
[12]	Blancas, Lozano-Oyola, and Gonzalez 2015	[64]	McCool, Moisey, and Nickerson 2001
[13]	Blancas <i>et al.</i> 2016	[65]	McLoughlin, Hanrahan, and Duddy 2020
[14]	Blancas <i>et al.</i> 2018	[66]	Miller 2001
[15]	Boley, McGehee, and Hammett 2017	[67]	Modica <i>et al.</i> 2018
[16]	Boskovic, Vujicic, and Ristic 2019	[68]	Mutana and Mukwada 2017
[17]	Brcsic <i>et al.</i> 2020	[69]	Navarro, Martinez, and Jimenez 2019
[18]	Cadarso and Du Plessis. 2016	[70]	Nesticò and Maselli 2020
[19]	Canteiro, Cordova-Tapia, and Brazeiro 2018	[71]	Ng <i>et al.</i> 2017
[20]	Carrillo and Jorge 2017	[72]	Ocampo <i>et al.</i> 2018
[21]	Castellani and Sala 2010	[73]	Pan <i>et al.</i> 2018
[22]	Castellani and Sala 2012	[74]	Pereira, Ribeiro, and Filimonau 2017
[23]	Cazcarro, Hoekstra, and Choliz 2014	[75]	Perez <i>et al.</i> 2013
[24]	Chavez-Cortes and Maya 2010	[76]	Rasoolimanesh <i>et al.</i> 2020
[25]	Cheng, Su, and Tan 2013	[77]	Rico <i>et al.</i> 2019
[26]	Choi and Sirakaya 2006	[78]	Rio and Nunes 2012
[27]	Cobacho-Tornel 2019	[79]	Roberts and Tribe 2008
[28]	Cronje and Du Plessis 2020	[80]	Rodriguez-Diaz and Pulido-Fernandez <i>et al.</i> 2020
[29]	Cucculelli and Goffi 2016	[81]	Santos and Cincera 2018
[30]	Cvelbar and Dwyer 2013	[82]	Sarmiento and El Hanandeh 2018
[31]	Dolf and Teehan 2015	[83]	Schianetz and Kavanagh 2008
[32]	Estêvão <i>et al.</i> 2019	[84]	Shafieisabet and Haratifard 2020
[33]	Farinha <i>et al.</i> 2019	[85]	Tang 2015
[34]	Fernandez and Rivero 2009	[86]	Tanguay, Rajaonson, and Therrien 2013
[35]	Fernandez <i>et al.</i> 2020	[87]	Torres-Delgado and Palomeque 2012

(Continued)

Table 2. (Continued).

Code	Authors	Code	Authors
[36]	Foroni, Modica, and Zenga 2019	[88]	Torres-Delgado and Palomeque 2014
[37]	Franzoni 2015	[89]	Torres-Delgado and Palomeque 2018
[38]	Garcia-Melon, Gomez-Navarro, and Acuna-Dutra 2012	[90]	Tsaur, Lin, and Lin 2006
[39]	Goffi, Cucculelli, and Masiero 2019	[91]	Tseng <i>et al.</i> 2019
[40]	Gomez-Vega and Picazo-Tadeo 2019	[92]	Tshipala, Coetzee, and Potgieter 2019
[41]	Huang, Ye, and Kao 2015	[93]	Twining-Ward and Butler 2010
[42]	Huang and Coelho 2017	[94]	Vecco and Srakar 2018
[43]	Huiqin and Linchun 2011	[95]	Vidishcheva, Dreizis, and Kopyrin 2019
[44]	Hunter and Shaw 2007	[96]	Wang <i>et al.</i> 2013
[45]	Ivanov, Ivanova, and Iankova 2014	[97]	Wang <i>et al.</i> 2016
[46]	Jurado <i>et al.</i> 2012	[98]	Weber and Taufer 2016
[47]	Kim <i>et al.</i> 2015	[99]	Weng <i>et al.</i> 2019
[48]	Ko 2005	[100]	Xin and Chan 2014
[49]	Kurt Konakoglu <i>et al.</i> 2019	[101]	Zhang, Ji, and Zhang 2015
[50]	Kunasekaran <i>et al.</i> 2017	[102]	Zhang 2017
[51]	Law, DeLacy, and McGrath 2017	[103]	Ziaabadi <i>et al.</i> 2017
[52]	Lee and Hsieh 2016	[104]	Zhang and Zhang 2020

destinations. The destinations covered in the literature may vary according to clearly identifiable administrative territorial areas (e.g. states or regions) or specific territorial areas (e.g. coastal area), or they may represent specific factors of attraction (e.g. accommodation structures, events). Of the 95 papers analyzed, 51% apply to the first classification, 22% to the second and 27% to the third. Overall, the destinations described are very heterogeneous among the studies: a total of 22 possible destination types have been identified. Table 3 presents a description of the types of destination treated by the authors analyzed.

About half of the collected works describe the use of tourism sustainability indicators with respect to well-defined administrative territorial areas. Of these, most provide a broad assessment, represented by the country (19 papers). Twelve papers operate at regional level, one at provincial level and one at municipal level.

Vecco and Srakar (2018) analyze a specific territorial context, represented by conflict and war regions in the Middle East, and develop an index to evaluate the sustainability of the cultural heritage of these regions.

In analyzing specific contexts, in the coastal and marine areas, the islands represent destinations of wide interest (7 overall papers), as do coastal areas (7 papers). Studies dedicated to marine protected areas (1 paper) and to coral reefs (1 paper) follow. Moving toward the hinterland, three studies examined rural areas (Aguilar-Becerra *et al.* (2017) have studied rural communities), 6 studies related to urban areas, 1 to

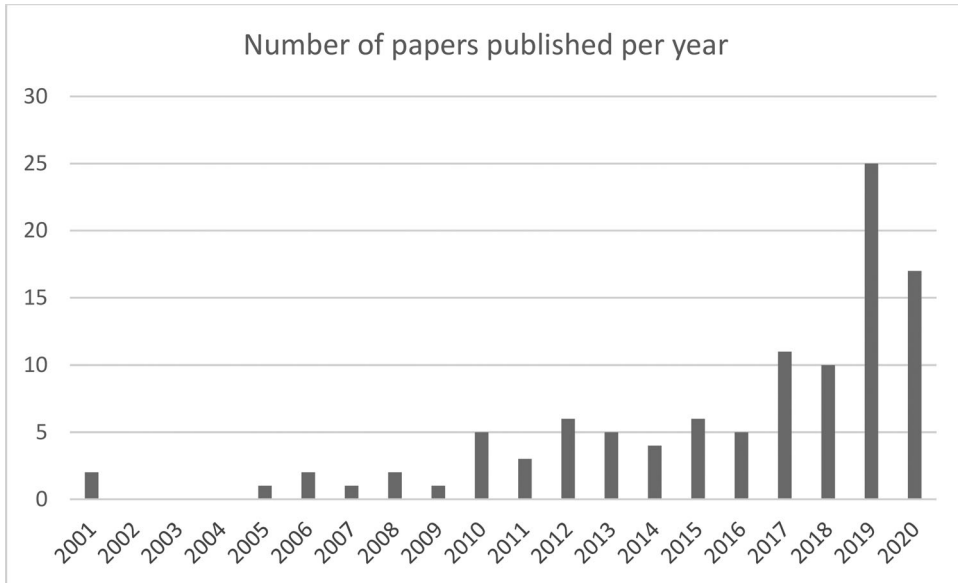


Figure 2. Number of papers per year of publication.

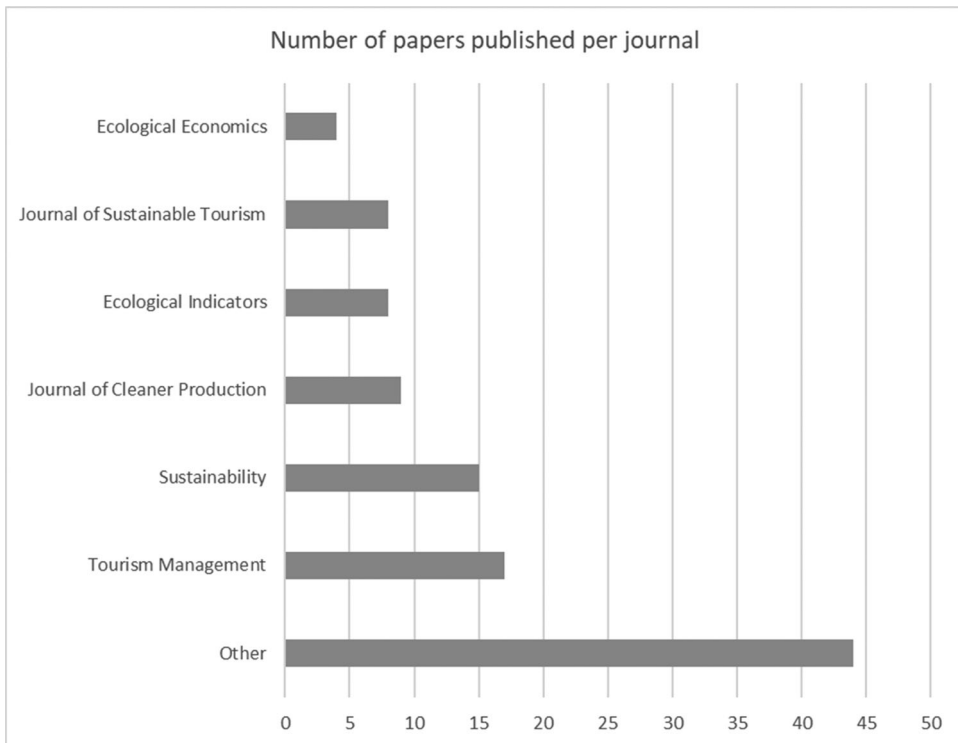


Figure 3. Number of papers per journal of publication.



Figure 4. Number of papers distributed by area of origin of the corresponding author.

natural protected areas and 1 to mountain areas. Finally, four studies dealt with local communities in general.

Representing a mixed environment (naturalistic areas composed of soil and water), wetlands have been analyzed in two studies. Cheng, Su, and Tan (2013) and Lee and Hsieh (2016) studied the indicators for assessing the sustainability of tourism in these specific environments.

Many studies, however, evaluated the use of sustainability indicators with respect to certain attractiveness factors of territories, assessing their applicability and ability to analyze the specificities of each situation. In particular, tourism accommodation and events are two of most studied aspects (7 studies were collected for each category). All the others, with one or two jobs each, are dedicated to deepening specific aspects: cultural heritage sites, tour operators, products, UNESCO world heritage sites, ecotourism sites.

The destination assessment allows some relevant aspects to be outlined; generally, the tendency of the authors is to prefer sets of indicators representative of extended territorial contexts, thus renouncing the possibility of conducting punctual and specific evaluations for more limited areas and with more detailed data. Environments of high natural and biological value are also the subject of various studies, in particular aimed at assessing the environmental dimension of sustainability.

4.4. Sustainability dimensions

As described in the introductory section, the concept of sustainability is commonly represented through three main dimensions that represent the TBL approach: environmental, economic and social. There is no shortage of references in the bibliography that combine these dimensions with other relevant aspects characterizing sustainability that can be analyzed as additional dimensions (often referred to as 'peripheral').

Table 3. Reference touristic destination of each study and number of indicator analyzed by each paper (En: environmental; Ec: economic; S: social; M: managerial; G: governance; I: infrastructure).

Code	Destination	No. of indicators	Dimensions covered	Code	Destination	No. of indicators	Dimensions covered
[1]	Tourism Accommodation	51	En -Ec -S -G	[53]	Region	26	En -Ec -S
[2]	University	9	En -Ec -S	[54]	Event	1	En
[3]	Event	7	En -Ec -S	[55]	Urban area	7	En -S
[4]	Region	53	En -Ec -S -G	[56]	Province	30	En -Ec -S -I
[5]	Region	53	En -Ec -S -G	[57]	Event	21	En -Ec -S
[6]	Marine protected area	12	En -Ec -S	[58]	Region	91	En -Ec -S -G -I
[7]	Urban area	23	En -Ec -S -G -I	[59]	Urban area	38	En -Ec -S -G -I
[8]	Tourism Accommodation	26	En -Ec -S -I	[60]	Urban area	65	En -Ec -S -I
[9]	Coastal area	91	En -Ec -S -I	[61]	Country	17	En -Ec -I
[10]	Coastal area	32	En -Ec -S -I	[62]	Region	1	En -Ec -S
[11]	Rural area	88	En -Ec -S -I	[63]	Local community	70	En -Ec -S -G -I
[12]	Country	89	En -Ec -S -M -I	[64]	Country	26	En -Ec -S -G -I
[13]	Country	85	En -Ec -S -M -I	[65]	County	n.a.	En -Ec -S -G -I
[14]	Coastal area	65	En -Ec -S -M -I	[66]	Local community	16	En -Ec -S -I
[15]	Province	13	En -Ec -S -M -G	[67]	Resort area	67	En -Ec -S
[16]	Country	11	En -Ec -S -I	[68]	Natural Protected Areas	36	En -Ec -S
[17]	Coastal area	33	En -Ec -S	[69]	Country	27	En -Ec -S -I
[18]	Country	1	En	[70]	Island	23	En -Ec -S -I
[19]	Natural Protected Areas	21	En	[71]	Island	50	En -Ec -S -M -G -I
[20]	Country	18	En -Ec -S -I	[72]	Country	39	En -Ec -S -M -G
[21]	Mountain area	19	En -Ec -S -I	[73]	Region	26	En -Ec -S
[22]	Northern Italy macro-region	1	En	[74]	Event	1	En -I
[23]	Country	1	En	[75]	Island	39	En -Ec -S -I
[24]	Country	34	En -Ec -S -G	[76]	Different areas	46	En -Ec -S -G -I
[25]	Wetland area	40	En -I	[77]	Urban area	1	En -I
[26]	Coastal area	50	En -Ec -S -G -I	[78]	Rural area	36	

(Continued)

Table 3. (Continued).

Code	Destination	No. of indicators	Dimensions covered	Code	Destination	No. of indicators	Dimensions covered
[27]	Country	125	En -Ec -S -M -G -I	[79]	Island	54	En -Ec -S -M -G -I En -Ec -S -G
[28]	Different areas	10	En -Ec -S -G	[80]	Global	14	En -Ec -S -I
[29]	UNESCO World Heritage Sites	59	En -Ec -S -M -G -I	[81]	Event	20	En -Ec -S
[30]	Tourism Accommodation	33	En -Ec -S -M	[82]	Coastal area	21	En
[31]	Event	1	En	[83]	Country	26	En -Ec -S -G
[32]	Region	167	En -Ec -S -M -G -I	[84]	Different areas	33	En -Ec -S -G
[33]	Region	65	En -Ec -S -G -I	[85]	Province	20	En -Ec -S
[34]	Country	14	En -Ec -S	[86]	Region	20	En -Ec -S -G -I
[35]	Country	14	En -Ec -S	[87]	Local community	26	En -Ec -S -G -I
[36]	Resort area	67	En -Ec -S	[88]	Local community	26	En -Ec -S -G -I
[37]	Local community	60	En -Ec -S	[89]	Municipality	12	En -Ec -S -G -I
[38]	Natural Protected Areas	13	En -Ec -S -G	[90]	Ecotourism site	47	En -Ec -S -M
[39]	Country	62	En -Ec -S -M -G -I	[91]	Ecotourism site	21	En -Ec -S -G
[40]	Country	14	En -Ec -S	[92]	Natural	8	En -Ec -S
[41]	Event	25	En -Ec -S -G -I	[93]	Protected Areas		
[42]	Coral reef	19	En -Ec -S -G	[94]	Island	24	En -Ec -S -G
[43]	Tourism Accommodation	13	En -G		Conflict and war regions	8	En -Ec -S -I
[44]	Coral reef	1	En	[95]	Resort area	34	En -Ec -I
[45]	Tourism Accommodation	41	En -Ec -S -M -G -I	[96]	Country	50	En -Ec -G -I
				[97]	Coastal area	29	En -Ec -S -M
[46]	Coastal area	30	En -Ec -S -I	[98]	Product	12	En -Ec -S -M -G -I

(Continued)

Table 3. (Continued).

Code	Destination	No. of indicators	Dimensions covered	Code	Destination	No. of indicators	Dimensions covered
[47]	Event	57	En -Ec -S -G -I	[99]	Cultural heritage site	69	En -Ec -S -M -G
[48]	Country	32	En -Ec -S -G -I	[100]	Tour operator	18	En -Ec -S -M -G -I
[49]	Urban area	28	En -Ec -S -G -I	[101]	Region	13	En -Ec -S
[50]	Island	14	En -Ec -S	[102]	Region	33	En -Ec
[51]	Island	n.a.	n.a.	[103]	Region	15	En -Ec -S -G -I
[52]	Wetland	130	En -Ec -S -M -G -I	[104]	Urban area	130	En -Ec -S -M -G -I

In this paper, the three typical dimensions of sustainability will be analyzed, underlining that it is possible to integrate them with other transversal aspects that are also reflected in the high number of indicators in the bibliography.

Figure 2(a) describes, for each dimension considered, the number of papers that use sustainability indicators for its characterization. In particular, the environmental aspect constitutes the dimension analyzed by all of the authors. The economic and social aspects are treated comparatively less: 85% and 78%, respectively. The reasons are attributable to two causes:

1. Some authors analyze only environmental aspects through the use of specific indicators and tools for this dimension.
2. In some cases, the social component has been analyzed as a factor related to the economic dimension (e.g. through the income derived from the tourism sector for local communities).

The first point finds its expression in the use of carbon, water and the ecological footprint, used by some authors as a representative indicator of the sustainability of a tourist destination. The carbon footprint is used for a high-quality tourism experience with low carbon emissions during transportation, accommodation, sightseeing, shopping and entertainment. Life Cycle Assessment (LCA) represents the most widely used approach in assessing the carbon footprint, thanks to its ability to apply a rigorous and transparent methodological method (as well as internationally standardized).

In particular, this is the approach adopted in the studies of Dolf and Teehan (2015), Cadarso *et al.* (2016), Pereira, Ribeiro, and Filimonau (2017), Lenzen *et al.* (2018) and Rico *et al.* (2019). In contrast, Cheng, Su, and Tan (2013) applied 27 low-carbon evaluation indexes for tourist attractions, while Cazcarro, Hoekstra, and Cholz (2014) evaluated the water footprint through an input-output (IO) analysis.

Other experiences applied the ecological footprint to assess the sustainability of tourism within a specific destination. This index expresses the area of productive land of occupied, consumed and waste intake caused by tourist activity. Hunter and Shaw (2007), Huiqin and Linchun (2011) and Castellani and Sala (2012) are the authors who applied the ecological footprint.

Finally, Canteiro, Cordova-Tapia, and Brazeiro (2018) use a Tourism Impact Assessment approach to understand the negative impacts of tourism on the environment.

Sarmiento and El Hanandeh (2018) applied environmental sustainability indicators to evaluate customers' expectations and attitudes toward green restaurants, without considering other dimensions (environmental or social).

The set of experiences that have been analyzed allow us to represent, in addition to the domains that characterize the TBL, further possible transversal aspects that characterize the sustainability of tourist destinations (Agyeiwaah, McKercher, and Suntikul [2017] define them as peripheral dimensions of sustainability).

In this study, the following peripheral dimensions have been selected (Figure 5):

- Managerial: refers to land management skills and to organizing cooperation between different local actors (including private ones)
- Governance/institutional: refers to all the institutional and regulatory aspects that support the development and diffusion of sustainable tourism in the area, such as strategies and policies, and local funding.

- **Infrastructure:** indicates the presence of local structures to support tourism (infra-structures, means and transport services, presence of tourist attractions). It also includes the technological component.

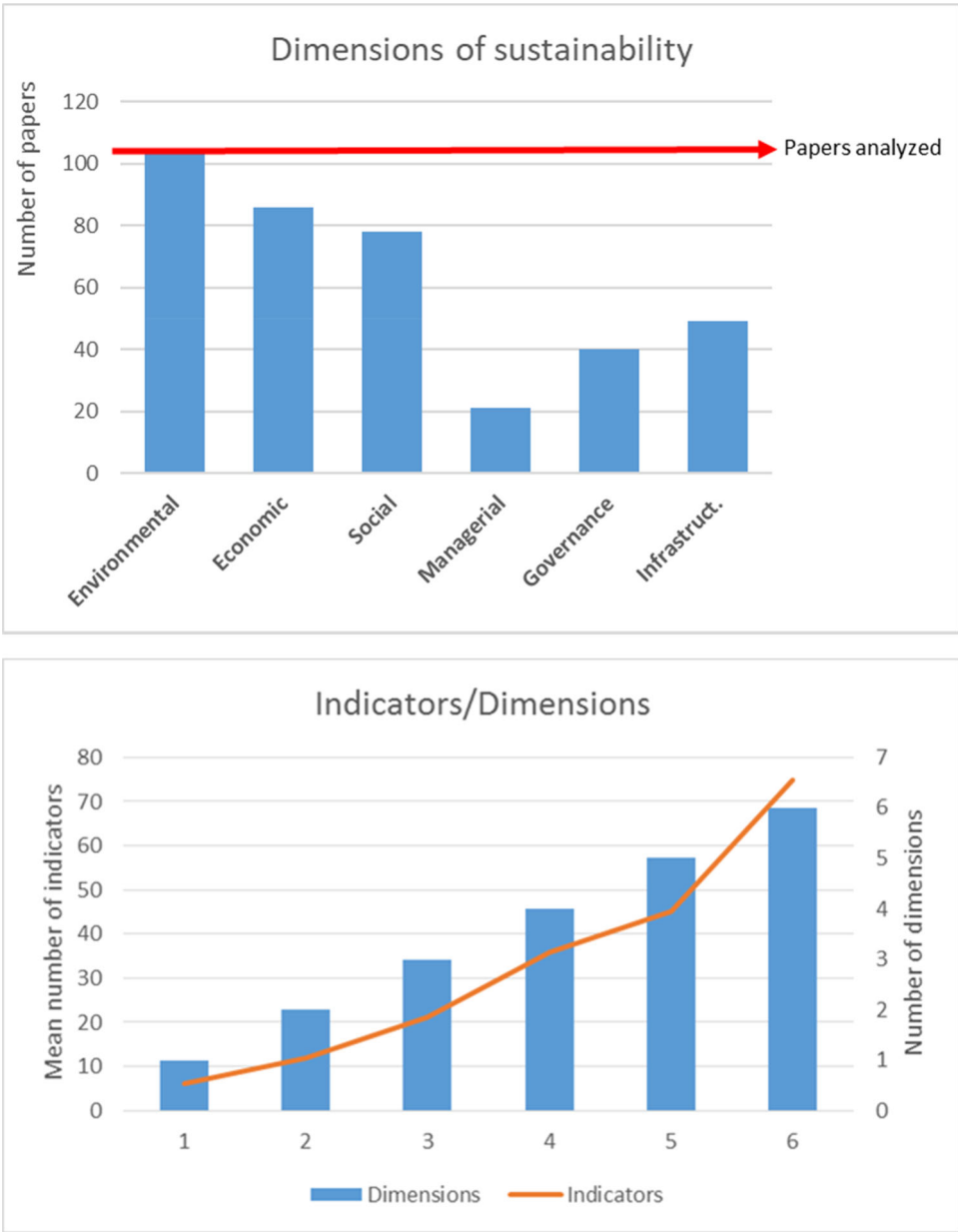


Figure 5. Dimensions of sustainability analyzed by the papers: (a) frequency distribution of the sustainability dimensions analyzed by the authors; (b) number of indicators and dimensions analyzed by each author.

The infrastructure component represents the most widespread aspect among the authors analyzed (56%), followed by governance (40%) and, finally, by the managerial component (21%).

Figure 2(b) shows the relationship between the number of indicators considered and the dimensions of sustainability analyzed. These two aspects are directly connected to each other with a directly proportional relationship. As the number of indicators increases, the dimensions considered also increase according to the order of priority shown in Figure 2(a) (environmental, economic, social, infrastructure, governance, managerial).

4.5. Sustainability indicators

The number of sustainability indicators argued by each analyzed author represents, in turn, a good indicator to express the high complexity in the tools for assessing the sustainability of tourist destinations. Table 3 shows the number of indicators described by each paper and the related dimensions of sustainability considered.

With the exception of papers where a specific indicator has been analyzed (e.g. carbon footprint), there is a wide difference in the composition of the indicator sets: there are authors who analyze seven indicators, while others analyze 167, with relative differences too in the size of the sustainability considered (see Section 3.4).

This aspect highlights the high flexibility and adaptability of the indicators as evaluation tools and, at the same time, the lack of standardized approaches in their use. This makes it difficult to compare the performances obtained from different destinations.

It is possible to observe a direct relationship between the number of dimensions of sustainability analyzed and the average number of indicators (Figure 5), with a correlation index between the two data sets that is equal to 0.96.

4.6. Sustainability themes

To represent the multitude of indicators present in the literature, some main themes have been identified. A theme represents a particular specific sustainability aspect that can be represented by several types of indicators at the same time. It is possible to imagine a sustainability theme as an intermediate level between the sustainability dimension and indicators.

From the initial analysis, over 60 sustainability themes have been identified. Of these, the main 40 have been selected, divided as follows: 10 for each of the environment, economy and society dimensions and 10 overall themes for the other peripheral dimensions of sustainability proposed in this study. Table 4 shows their usefulness.

The reported results, as graphically represented in Figure 6, highlight a marked prevalence of the themes representative of the environmental and economic dimension, with frequencies that exceed 50% several times.

Environmental sustainability is often represented by aspects related to waste and its management, the use of water resources, the level of pollution and energy consumption, as well as the protection of natural environments and biodiversity. The carbon footprint and green certifications are not as significant. The economic aspect has a predominant theme compared to all the others: tourism-related employment opportunities

Table 4. Rating of the usefulness of sustainability issues.

Dim.	Theme	Code	Rating of the usefulness (%)
En	Level of pollution (water, sound, soil and air)	En1	57
	Energy use and efficiency	En2	53
	Waste reduction/reuse/recycling	En3	63
	Water use and efficiency	En4	58
	CO ₂ emissions and low carbon practices	En5	18
	Biodiversity, natural habitats, protected areas	En6	56
	Resource utilization	En7	36
	Training and awareness	En8	36
	Communication and promotion	En9	24
	Green certification	En10	18
Ec	Average expenditure	Ec1	40
	Employment opportunity	Ec2	61
	Income to the local communities	Ec3	36
	Local economic support	Ec4	18
	Impact on GDP	Ec5	19
	Tourist presence	Ec6	38
	Duration of stay	Ec7	38
	Tourist satisfaction	Ec8	31
	Seasonality level	Ec9	15
	Percentage of return visitors	Ec10	25
S	Willingness-to-accept	S1	17
	Level of equity between residents and tourists	S2	15
	Quality of host-guest interaction	S3	19
	Protection of rights of the local population	S4	13
	Variety and availability of local identities and their retention	S5	13
	Attractiveness of the destination	S6	18
	Physical accessibility to the tourist heritage	S7	19
	Percentage of criminality, vandalism, accidents	S8	34
	Availability of basic services (banks, healthcare)	S9	15
	Additional services (e.g. water, electricity, health facilities) caused by tourism	S10	15
P	Managerial practice/knowledge	P1	18
	Cooperation between public and private sector	P2	8
	Level of local residents' participation in tourism decision making process	P3	22
	Availability of local plans and strategies for tourism and / or for tourism sustainability	P4	25
	Presence of support for development projects at regional level	P5	22
	Number of sites and attractions	P6	17
	Access infrastructures and transport services (roads / railways)	P7	38
	Traffic congestion due to tourism	P8	30
	Density of built areas	P9	26
	Technological innovation	P10	3

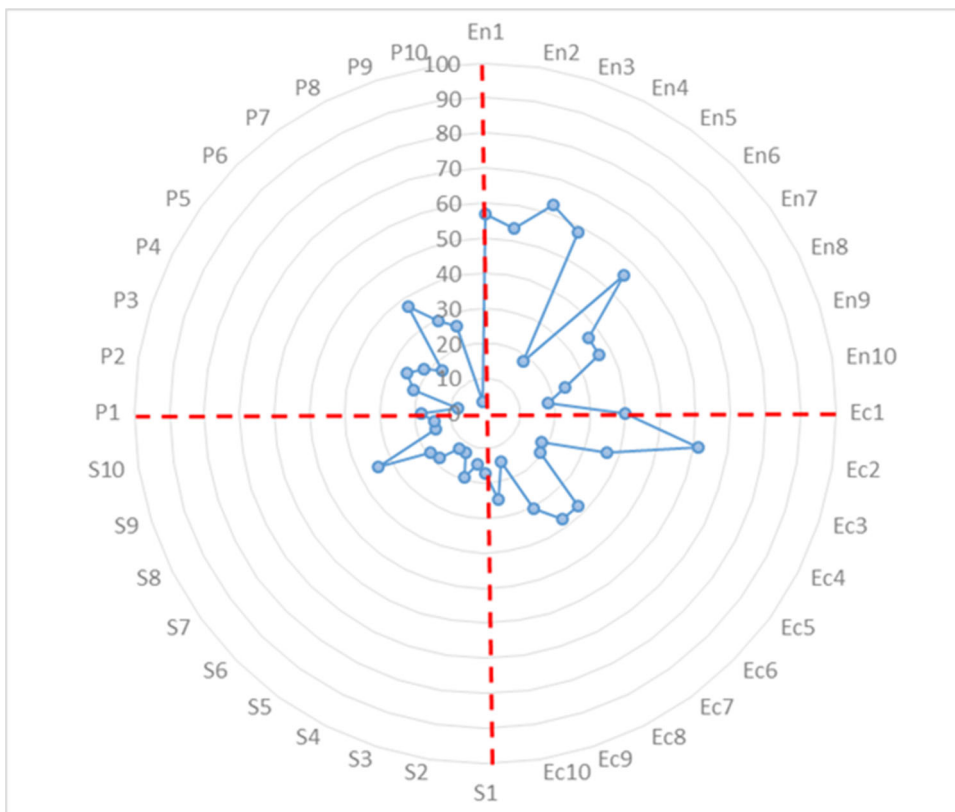


Figure 6. The sustainability themes for each considered dimension.

(61% of the authors), followed by exposure expenditure. The level of seasonality is less relevant (15%).

For social sustainability, particular importance is given to the issue of destination safety (34%), while the protection of the rights of local populations and the safeguarding of local identities are less considered (13%). Finally, as regards the peripheral dimensions, the presence of adequate infrastructures is the main theme of interest, while technological innovation is not yet a frequent element of evaluation.

We also investigated how the frequency of use of the themes changes according to the type of destination and in relation to the year of publication of the paper.

Figure 7(a)–(c) shows the frequency of use of each themes, in relation to the type of destination. The destinations have been divided into three groups with respect to the spatial dimension (country, region, local), the studied environment (island, coastal area or urban area) and specific areas (touristic accommodation, events). The objective of the evaluation is to understand if there are any characterizing aspects of each type of destination with respect to the themes used.

Figure 7(a) shows as a greater frequency of themes is concentrated in the environmental and economic dimensions. In particular, for local areas, there are themes that are used as an evaluation element by all the authors analyzed: EN1 (level of pollution), EN4 (water use and efficiency), EC3 (income to the local communities) and EC5 (impact on GDP). These same issues are less widespread in the case of assessments

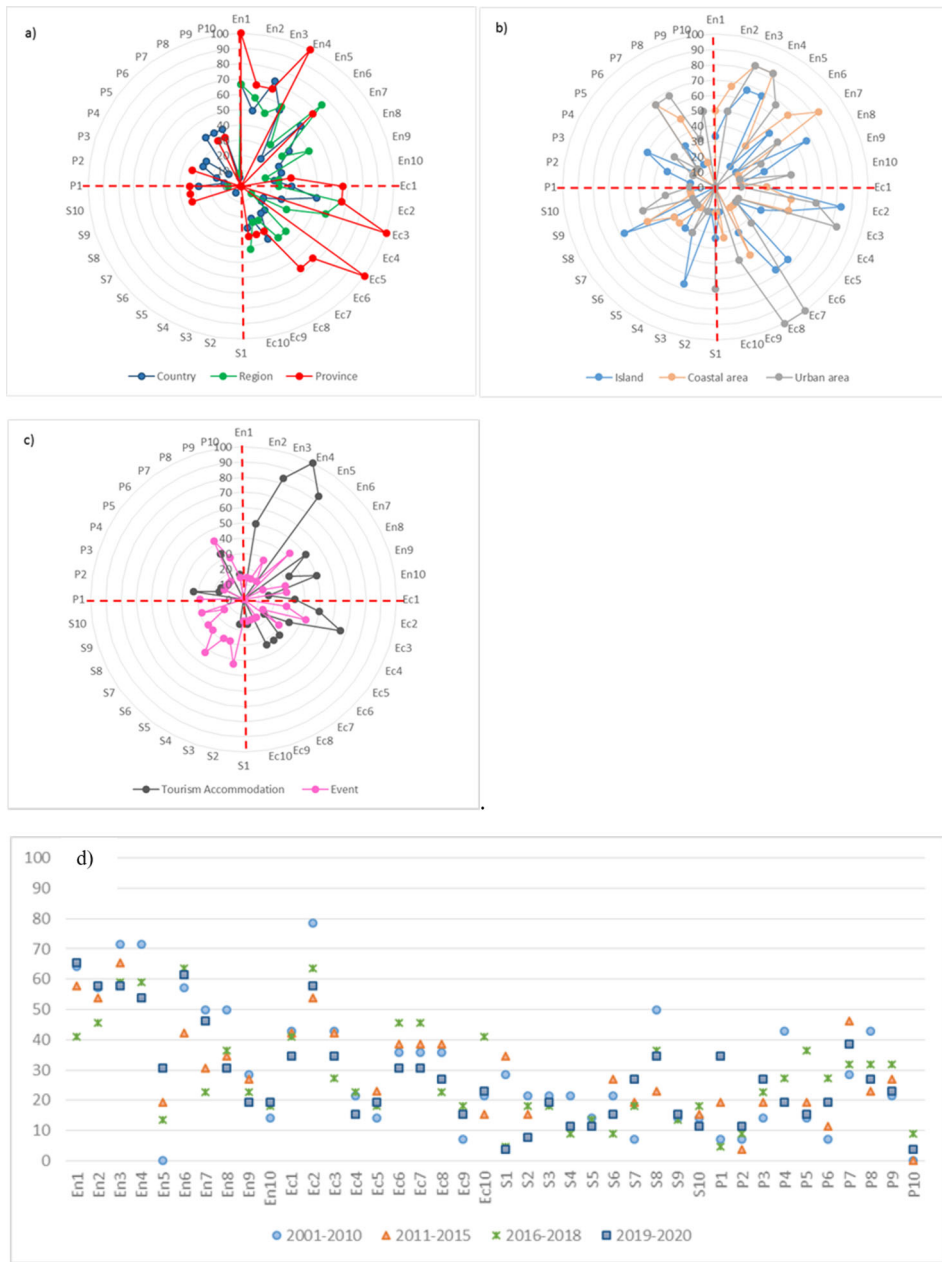


Figure 7. Rating of the usefulness of sustainability issues with respect to the type of destination. (a) Country-region-province, (b) island-coastal area-urban area, (c) tourism accommodation-event and in relation to time (d).

conducted with wider territorial levels: for example EN4 (water use and efficiency) is used by 58% of the authors who make assessments at a regional level and by 55% by those who work at national level. EC3 (income to the local communities) also goes from 100% and local level, up to 28% at national level. This information is important

because it allows to understand how, operating at a local level, there are priority themes that are always adopted by the authors analyzed. The social and peripheral aspects are less analyzed, with similar frequencies between national and local contexts. The only most relevant difference is related to the S9 (availability of basic services) theme, applied by 35% of authors who conduct assessments at the local level, but only by 10% of authors who conduct assessments at national and/or regional level.

Figure 7(b) shows a more homogeneous distribution of the themes used for each type of destination considered, involving the social and peripheral aspects with greater significance. S3 (quality of host-guest interaction), S8 (traffic congestion due to tourism), P7 (access infrastructures and transport services) and P8 (traffic congestion due to tourism) are applied by about 70% of the authors analyzed. In this case, only 2 themes were used by all authors, EC7 (duration of stay) and EC8 (tourists' satisfaction) applied to the evaluation of urban environments. These same themes are used less frequently for islands and coastal areas (70% and 18% for EC7 and 50% and 30% for EC8).

Figure 7(c), specific for tourism accommodation and events, highlights a homogeneous situation in the themes used, especially for the economic and peripheral dimensions. For the social dimension, themes are used more frequently for the evaluation of events. Finally, only one theme is used by all authors, EN4 (water use and efficiency), while EN3 (waste reduction/reusing/recycling) and EN5 (CO₂ emissions and low carbon practices) are used by 83% of the authors who have conducted evaluations on touristic accommodation.

Figure 7(d) shows the evolution of the themes analyzed over time, using four groups: 2001–2010, which represents 14 papers; 2011–2015 with 26 papers; 2015–2018 with 26 papers; and 2019–2020 with 22 papers. The results allow to evaluate how the use of the different themes has changed over time. Some decreased in use, such as S1 (willingness-to-accept) which went from about 30% in the period 2001–2010 to 5% in 2020. Also for the EN8 (training and awareness) theme, the use it decreased from 50% in 2001–2010 to 30% in 2020. Other indicators, rarely used in the past, have had increasing use in recent years. This is the case of the EN5 (CO₂ emissions and low carbon practices) theme which went from 0% in 2001–2010 to 30% in 2020, or P1 went from 8% to 36%.

From these results it is possible to isolate three main conditions:

1. a general growth over time in the use of a specific theme. This condition represents CO₂ emissions that go from a percentage of 0% to 31%. Other examples are 'average expenditure' and 'level of local residents' participation in the tourism decision-making process'.
2. a progressive reduction over time. This is the condition of the 'training and awareness' theme, which goes from 50% to 31%. Other examples are 'willingness to accept' and 'level of equity between residents and tourists'.
3. a stable condition, such as the case of 'green certification'. Other examples are 'quality of host-guest interaction' and 'cooperation between public and private sector'.

5. Conclusions

The study reports a critical analysis of the main results concerning sustainable tourism analyzed through the use of indicators. The extensive bibliography available on this topic has been analyzed in relation to specific aspects: (a) descriptive aspects of each

paper, collection methods and type of work; (b) type of destination; (c) dimensions of sustainability; (d) indicators considered; (e) sustainability issues and their temporal evolution and with respect to the type of environment analyzed.

The conclusions of the study, including indicating some limitations, are as follows:

- Although it represents a consolidated sector of great interest for the scientific and research sector, progress in the development of sustainable tourism is slow and fragmented in territories.
- Territory development policies and strategies need operational support in assessing and monitoring their impacts. The indicators represent a widely used and sufficiently flexible tool in adapting to the needs of evaluating them.
- The overabundance of indicators available and the poor alignment between them are evident. Many indicators are applicable to many destinations and territorial attractions, albeit different from each other. Others, however, are specific to the context they are analyzing. This determines the availability of too many possible choices, a condition that generates operational (choice) difficulties and poor comparability in the results obtained.
- The TBL approach is undoubtedly the most widespread and frequently applied structure among the authors. However, there are possible transversal aspects (some authors define them as peripheral dimensions) that can integrate the typical dimensions of the TBL by extending its scope and specificity in the analysis. As the number of dimensions analyzed increases, the number of indicators also increases linearly.
- To overcome the specificity of the indicators, this study focused on a more generic aspect, potentially represented by several indicators at the same time: the sustainability theme. Forty themes were selected, the importance of which has been assessed in relation to the frequency of authors who proposed indicators related to the topic. For each dimension, priority themes are identifiable, such as waste, employment, safety and infrastructure, respectively, for the environmental, economic, social and peripheral dimensions.
- The relevance of these issues (expressed in terms of frequency) changes in relation to the type of destination and, in some cases, according to time. Others, however, always remain priorities, regardless of the territory of investigation and the year: employment and criminality are examples.

These results contribute to strengthening the understanding of the use of indicators for the evaluation and monitoring of tourism sustainability, providing useful insights to understand the choices that the scientific literature describes regarding the definition of the sets of indicators with respect to the analyzed destination and respect to the estimated dimensions. Certainly, environmental, social and economic issues, as classic constitutive elements of the concept of sustainability, are widely spread and known. Less investigated are the peripheral dimensions which can be elements of great interest in understanding how local skills and resources play a key role in greater awareness and in the ability to manage the sustainability of tourism.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

The research has been supported by the LUME-PlannER project (POR-FESR 2014–2020, DGR 774/2015—CUP E82I150 02660 0 02), co-funded by the European Regional Development Fund (ERDF)—ROP of the Emilia-Romagna Region (IT).

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