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The sustainability of tourism-oriented places in México[1]

La sostenibilidad de las plazas de vocación turística en México

Francisco Iván Hernández-Cuevas[2], Allison Montalvo-Velázquez[3], Miguel Alejandro Pasos-Cimé[4], Ivonne Montserrat Barrientos-Carrillo[5], Mariel Corona-González[6]

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Abstract

Tourism can provide higher well-being levels for society, yet it is currently under question whether these benefits have reached the host population. Sustainable tourism delivers a triple benefit: environmental conservation, economic development, and social progress. This document aims to compile a Tourism Sustainability Index (TSI) in México. Using the quantitative approach, 276 municipalities in México designated tourist destinations were analyzed. Twenty-five variables obtained from secondary sources were processed using the Principal Component Analysis (PCA) statistical technique. The results indicate a national average performance of 0.50, where the Sea of Cortés region presents the best performance with 0.57, and the Yucatán peninsula shows the lowest performance with 0.47. This information facilitates the appropriate formulation of tourism-oriented public policies to promote sustainable local development within society.

Keywords: development indicators, index, regional economy, sustainable development, tourism.

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[2] Ph.D. in Social Sciences, Universidad Marista de Mérida, México, Escuela de Administración, Turismo y Mercadeo, Address: Periférico Norte; Tablaje Catastral 13941. Carretera Mérida-Progreso, C. P. 97300. Mérida, Yucatán, México. ORCID ID: https://orcid.org/0000-0002-1310-7574. Institutional e-mail: fhernandez@marista.edu.mx. Author's Credit role: research.

[3] Bachelor's degree in Tourism, Universidad Marista de Mérida, México. Address: Periférico Norte; Tablaje Catastral 13941. Carretera Mérida-Progreso, C. P. 97300. Mérida, Yucatán, México. ORCID ID: https://orcid.org/0009-0007-2684-397X. Institutional e-mail: amontalvo1913006@a.marista.edu.mx. Author's Credit role: research.

[4] Bachelor's degree in Tourism, Universidad Marista de Mérida, México. Address: Periférico Norte; Tablaje Catastral 13941. Carretera Mérida-Progreso, C. P. 97300. Mérida, Yucatán, México. ORCID ID: https://orcid.org/0009-0007-3305-483X. Institutional e-mail: mpasos1913007@a.marista.edu.mx. Author's Credit role: research.

[5] Student of the bachelor's degree in Natural Resources Management, Universidad Marista de Mérida, México. Address: Periférico Norte; Tablaje Catastral 13941. Carretera Mérida-Progreso, C. P. 97300. Mérida, Yucatán, México. ORCID ID: https://orcid.org/0009-0003-6060-0374. Institutional e-mail: ibarrientos2105001@a.marista.edu.mx. Author's Credit role: research.

[6] Bachelor's degree in Natural Resources Management, Universidad Marista de Mérida, México. Address: Periférico Norte; Tablaje Catastral 13941. Carretera Mérida-Progreso, C. P. 97300. Mérida, Yucatán, México. ORCID ID: https://orcid.org/0009-0003-6511-1668. Institutional e-mail: mcorona1805007@a.marista.edu.mx. Author's Credit role: research.

Resumen

El turismo posibilita alcanzar mejores niveles de bienestar para la sociedad; sin embargo, en la actualidad se cuestiona si realmente estos beneficios han llegado a la población receptora. El turismo sostenible es una alternativa de triple beneficio: conservación ambiental, desarrollo económico y social. El objetivo del documento es construir un índice de sostenibilidad turística en México. Con un enfoque cuantitativo, se analizaron 276 municipios de México denominados como plazas con vocación turística. A través del uso de fuentes secundarias se obtuvieron 25 variables procesadas por la técnica estadística de Análisis de Componentes Principales (ACP). Los resultados muestran un desempeño promedio nacional de 0,50, con la región del mar de Cortés como la mejor puntuada (0,57), y la península de Yucatán como la de menor desempeño (0,47). Esta información permite la adecuada formulación de políticas públicas de corte turístico orientadas a promover un desarrollo local sustentable en la sociedad.
Palabras clave: desarrollo sostenible, economía regional, índice, indicadores de desarrollo y turismo.

Introduction

International tourism activity has registered a remarkable recovery in 2022 of close to 63% compared to pre-pandemic figures, reflected in an increase in tourist flows and tourism expenditure that contributes to the growth and regional development of countries (United Nations World Tourism Organization [UNWTO], 2022). Particularly in México, tourism represents an important economic activity, occupying sixth place in the 2022 UNWTO International Tourism Ranking (Secretaría de Turismo [SECTUR], 2023). In addition, it holds sixth place in the world in lodging establishments and eleventh in jobs generated (ONU Turismo, 2023a). The relevance of tourism activity in the economy, given its multiplier effect, impacts on investment, employment, and foreign exchange (Arellano & Chapa, 2017).

The search for economic development in tourism focuses on providing a standard of well-being transferred to society, particularly to the most disadvantaged populations (Gauna Ruiz de León & Peláez, 2021). Despite the economic potential of the activity, there seems to be a counterforce that poses a dilemma to society and political decision-makers since once the tourist destination is "consolidated," it is complex to find the admissible limits to maintain economic fluidity without overloading ecosystems (pollution) and the daily life of the inhabitants of the receiving destinations (gentrification) (González Damián, 2021).

The economic importance of tourism in México is unquestionable since, according to figures from the Tourism Satellite Account for 2021of the Instituto Nacional de Estadística y Geografía (INEGI), tourism activity contributed 7.6% to the national Gross Domestic Product (INEGI, 2023), mainly concentrated in the activities of accommodation, passenger transport, restaurants, bars and nightclubs, and goods and handicrafts.

This economic importance of tourism in México has been mainly concentrated in two models: one focused on the mass model (sun and beach) known for the maximization of profitability, exporting and highly polarized and governed by a current of dependence on tourism activity (Osorio García, 2021). The other model corresponds to alternative tourism, with a community-based, nature-focused, but performance-based current. Some examples of this model are ecotourism, adventure tourism, and hunting tourism, which are implemented in México through different initiatives such as the Magical Towns Program, the Mayan World Program, and the Colonial Treasures Program, among others (Osorio García, 2021). The current federal government has continued to establish tourist destinations known as Tourist Vocation Plazas (Spanish PVT) as part of its tourism development policy. These areas are designed with a specific tourism offer, including attractions, services, and infrastructure, aimed at travelers with the economic capacity to visit and spend in these places (González Damián, 2021).

Today, incorporating environmental and social aspects in a sustainable tourism model has become a pivotal factor in improving tourism competitiveness, especially in destinations near natural protected areas (Murillo Flores & Orozco Alvarado, 2006). The need to maintain the natural and sociocultural resources of tourist destinations allows one to see beyond an activity-based

purely on its economic scope and profitability (Camacho-Ruiz *et al*., 2016; Luffiego & Rabadán, 2000).

The UNWTO defines sustainable tourism as "considering current and future economic, social, and environmental impacts to meet the needs of visitors to the industry, the environment, and the host communities" (ONU Turismo, 2023b). From this perspective, sustainable tourism emerges as a triple-benefit alternative: it promotes environmental conservation, economic development, and respect for the local communities where it takes place (Monsalve-Peláez *et al*., 2023).

The prism of sustainability

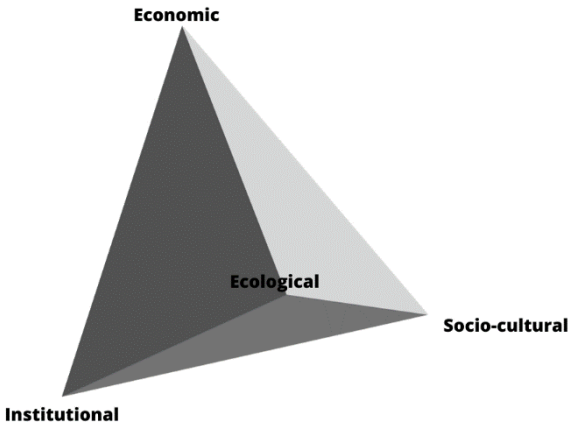
Various environmentally responsible or socially committed approaches have been proposed, such as green tourism, alternative tourism, solidarity tourism, and community-based tourism (Cañero Morales & Orgaz Agüera, 2017), to achieve sustainability in tourism. However, the prism of sustainability that Valentin and Spangenberg (2000) suggested covers four dimensions: social (related to human capital), economic, environmental (to the use of natural resources), and institutional (Figure 1).

These interrelationships create an arena in which government, society, and industry collaborate to invest in infrastructure and development while preserving the environment and harnessing the potential of destinations responsibly.

However, to measure and evaluate tourism sustainability, indicators must be used to describe aspects of a society or activity to identify changes in these factors (Volo, 2020).

Figure 1

Prism of sustainability



Note. Source: Valentin and Spangenberg (2000).

Indicators provide an accurate description and measurement of the situation of a destination, facilitating the understanding of a specific area and the elements and processes occurring therein (Torres & Palomeque, 2014). At the same time, sustainable tourism indicators should consider (a) monitoring the development of the sector to evaluate policies and practices, (b) measuring sectoral progress and planning future strategies, and (c) communicating the information through quantitative and objective data that broaden the understanding of tourism phenomena in their spatial context (Castellani & Sala, 2010; Valentin & Spangenberg, 2000).

Regarding the studies conducted to measure tourism performance, Table 1 shows that various authors worldwide have adopted indicators with the use of different methods and techniques such as Amoeba of Tourism Sustainability Indicators (ATSI), Sustainable Development Goals (SDGs), Barometer of Tourism Sustainability (BTS), among others. None of the related documents mentions or approaches its study from the PCA, which aims to reduce the existing dimensions and enables taking the most meaningful information from large databases. Social, economic, and environmental characteristics of particular territories cause indicators to outweigh others and are also sensitive to their availability and frequency. Particularly in México, Madrid and Cerón (2013) use the PCA combining qualitative and quantitative indicators, which enhances the impact of the index; however, it is difficult to collect information for subsequent years and monitor progress over time.

Table 1

Studies related to tourism performance

Author	Study	Country
Valentin and Spangenberg, 2000	A guide to community sustainability indicators	Germany
Madrid and Cerón, 2013	Evaluation of the performance of tourist destinations in the CCRR framework	México
Rioja-Paradela *et al*., 2020	Adaptation of sustainable tourism indicators: Implementation in Chiapas, México	México
da Silva-Melo *et al*., 2021	Sustainability index of the Gruta do Lago Azul natural monument, Bonito Mato Grosso	Brazil
Pimentel de Oliveira, 2022	Tourism sustainability through a synthetic index based on the 17 SDGs.	Spain
Font *et al*., 2021	The impact of sustainable tourism indicators on destination competitiveness: The European Tourism Indicator System	Europe

Note. Source: own elaboration.

Globally and particularly in México, the development of tourism statistics has been slow and insufficient (Rioja-Paradela *et al*., 2020), even more so when directly linked to sustainable tourism, so the design of a TSI is required to help measure the level of sustainability of places with a tourist vocation. This approach intends to optimize macro data and establish a new practical tourism framework for professionals, government officials, and academics in the tourism sector (Volo, 2020). In addition, it makes it possible to add the sustainability perspective to all the multidimensional factors of tourism, which facilitates a comprehensive transformation of the awareness around sustainable tourism development of the parties involved, such as society, tourists, government, private industry, and academia (Pimentel de Oliveira, 2022).

Materials and methods

The study has a non-experimental quantitative approach and descriptive scope focused on estimating numerical indicators of the sustainability index of places with a tourist vocation in México.

Of the Mexican Republic, 276 municipalities of the 32 states, called magical towns or areas with a tourist vocation by the Federal Ministry of Tourism, were analyzed (Ministerio de Turismo, 2019). These municipalities were categorized into the following tourist regions:

- Central region: 55 municipalities.
- North central and west region: 86 municipalities.
- Gulf region: 22 municipalities.
- Sea of Cortés region: 31 municipalities.
- Northeast region: 23 municipalities.
- North central region: 14 municipalities.
- South Pacific region: 19 municipalities.
- Yucatán Peninsula region: 26 municipalities.

Given that the information is municipal, there is a scarcity of indicators to choose from, particularly affecting the environmental indicators and limiting the ability to reflect the complete reality of the territories.

Indicators based on accounting criteria were used—expressed in monetary terms or some physical accounting unit (Schuschny & Soto, 2009)—to compile the index. One of the advantages of this type of indicator is its descriptive feature when interpreting the values obtained since they are based on accounting units. The selection of indicators was made in the first instance, considering their availability and level of updating.

Twenty-five indicators were used and distributed as follows (Table 4): seven for the sociocultural dimension, six for the economic and tourism dimension, nine for the institutional dimension, and five for the ecological.

For the construction of the index, the official databases of the government secretariats were accessed manually, and their contents were entered into a spreadsheet in Google Sheets to estimate the descriptive statistics.

QGIS software showing the TSI results by dimension and tourist region helped design a map of the Mexican Republic. It used a gray color palette where darker shades represent higher values and lighter correspond to the lower ones.

To determine the impact of each indicator in the system and subsequently normalize the data (Mancero, 2001; Pimentel de Oliveira, 2022; Sepúlveda *et al*., 2005), …2005), Equation 1 was used:

Positive indicators: $f(x) = \frac{x-m}{M-m}$ (1)

Negative indicators: $f(x) = \frac{x-M}{m-M}$

Where

x corresponds to the indicator's value in a period.

m is the minimum value of the indicator in a period.

M is the maximum value of a value in a period.

As there is heterogeneity in the municipalities under study, economically and touristically (Arellano & Chapa, 2017; González Damián, 2021), the monetary variables were normalized with the natural logarithm, and for the other variables, the 90th percentile was taken as the maximum value.

To make it easier to interpret, the index was constructed to take values ranging from 0 to 1, where those close to zero show worse performance, while those close to 1 show better performance. However, for a better understanding of the index, the research included the Rodríguez Miranda *et al*. (2021) structure (Table 2):

Table 2

Analysis criteria of the TSI

Criteria	Interpretation
0 - 0.3	Low
0.3 - 0.4	Medium-low
0.4 - 0.5	Middle
0.5 - 0.6	Medium-high
0.6 - 0.7	High
0.7 - 1.0	Very high

Note. Source: own elaboration.

Furthermore, PCA was used to identify and explain the correlation patterns of the available variables and confirm the theoretical model (prism of sustainability). This element was addressed by performing the Kaiser-Mayer-Olkin (KMO) statistical test with an acceptance criterion ≥ 0.60. Likewise, the factors that met the criterion of presenting eigenvalues higher than 1.0, exceeding the cumulative variance of 50%, were retained.

Finally, the factorial rotation procedure was applied using the varimax technique to interpret the factors and elaborate on the index.

Moreover, to obtain a more detailed overview of the TSI, a map was prepared for the states, providing the arithmetic average of the municipalities belonging to each state. Student's mean difference t-test was performed to better understand the dynamics of the TSI between localities and cities with a tourist vocation.

Results

Table 3 shows the results of the PCA, where an adequate performance is observed for the four factors identified, covering a data variability of 97%.

Table 3

PCA results

Factor	Self-esteem	Difference	Accumulated
1	12.13	10.71	0.73
2	1.42	0.08	0.82
3	1.33	0.30	0.90
4	1.03	0.54	0.97

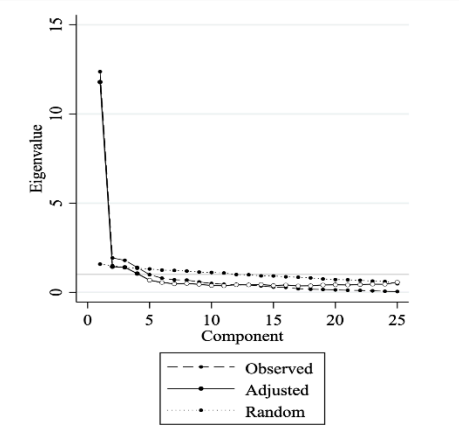
Note. Source: own elaboration.

Table 4 indicates the results of the KMO test, which reveals a remarkably positive overall performance of 0.93.

The parallel analysis results, including the sedimentation plot between the eigenvalues and the indicators (components), are in Figure 2.

Figure 2

Sedimentation plot



Note. Source: own elaboration.

Table 4

Indicators used for compiling the TSI

ID	Indicator	Unit	Year	Source	Impact	KMO
1	Inhabitants	Number	2020	INEGI	-	0.95
2	Age (median)	Years	2020	INEGI	+	0.84
3	Population with medium and higher education	Percentage	2020	INEGI	-	0.95
4	Native language speakers	Percentage	2020	INEGI	+	0.79
5	Migrant population	Percentage	2020	INEGI	-	0.71
6	Population in moderate poverty	Percentage	2020	CONEVAL	-	0.85
7	Economically active population	Percentage	2020	INEGI	+	0.82
8	Gross Domestic Product	Millions of $MXN	2020	SECTUR	+	0.93
9	Tourism Gross Domestic Product	Millions of $MXN	2020	SECTUR	+	0.93
10	Remittance income	Miles de $USD	2020	Data México	+	0.94
11	Restaurants & Bars	Number	2020	INEGI	+	0.94
12	Hotels, motels & hostels	Number	2020	INEGI	+	0.93
13	Churches and monuments	Number	2020	INEGI	+	0.96
14	Certified tour guides	Number	2020	SECTUR	+	0.91
15	Public investment	$MXN	2020	INEGI	+	0.89
16	Government transfers	$MXN	2020	INEGI	+	0.90
17	Justice centers	Number	2020	INEGI	+	0.97
18	Hospitals	Number	2020	INEGI	+	0.96
19	Recorded offenses	Number	2021	INEGI	-	0.97
20	Companies with H (hygiene) label	Number	2022	SECTUR	+	0.94
21	Companies with the S (sustainability) label	Number	2022	SECTUR	+	0.94
22	Natural protected areas	Number	2022	CONANP	+	0.82
23	Botanical gardens and zoos	Number	2020	INEGI	+	0.96
24	Caves, natural parks, and others	Number	2020	INEGI	+	0.86
25	Daily waste generation	Kg	2021	INEGI	-	0.98

Note. Source: own elaboration.

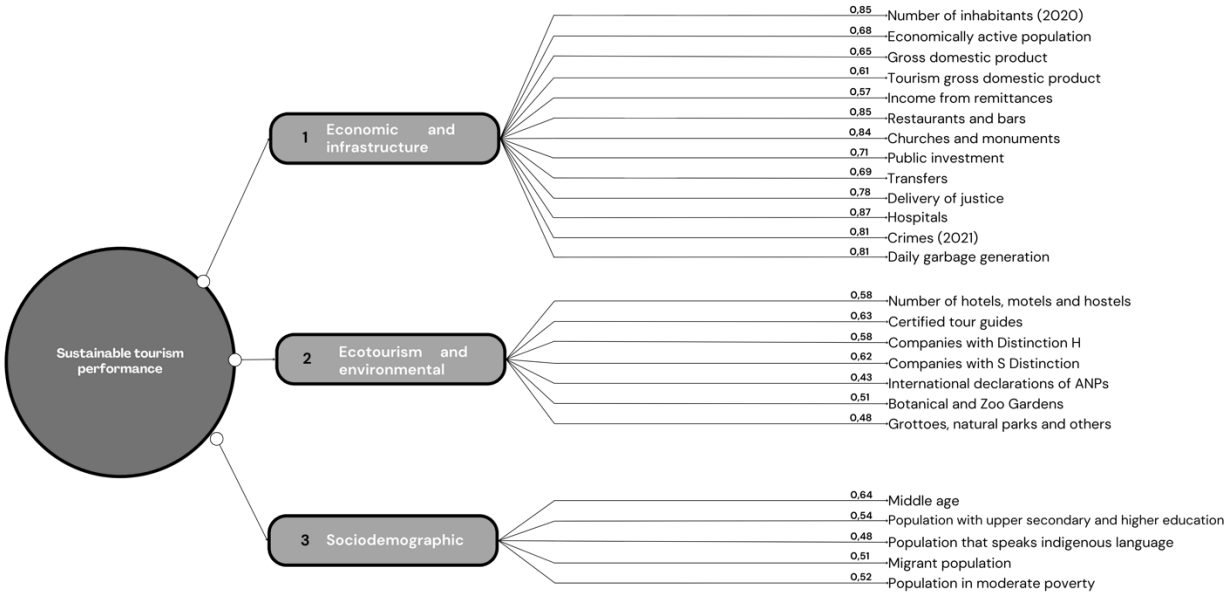
From the PCA, four factors were retained; however, for a better interpretation, factors one and four were unified, leaving the following dimensions:

1. D1. Economic and infrastructure
2. D2. Ecotourism and environment
3. D3. Sociodemographic.

The grouping of indicators by dimension is shown in Figure 3, with their respective factor loads for each dimension.

Figure 3

Grouping of factors for the TSI



Note. Values. Source: own elaboration.

The results obtained through this procedure and with the variables available at the municipal level show an *average* level of tourism sustainability throughout the country, reaching an average of 0.49 in the index. The municipality of Palizada, in Campeche, obtained the highest value, 0.70. At the same time, Motul in Yucatán registered the lowest value.

Globally, analyzing by dimension, the lowest on average was Ecotourism and environment with 0.33, followed by Sociodemographic with 0.55, and the

highest Economic and infrastructure with 0.59; these data are in Table 5.

The analysis by tourist region reveals the most particular dynamics of México's tourist regions. According to Table 5, the zone corresponding to the Sea of Cortés obtained the best overall rating (0.57), followed by the Northeast (0.51) and the Gulf (0.49). The regions with the lowest performance are the Yucatán Peninsula (0.47) and the central, north-central, and west regions, with a value of 0.48.

Despite the overall results, there are significant differences between the scores obtained for the tourist regions and the TSI dimension. In the Economic and infrastructure dimension, the performance of the Sea of Cortés region stands out (0.63) and the North Central and Gulf (0.62); as for the Ecotourism and environmental dimension, the Yucatán Peninsula stands out with 0.48, followed by the South Pacific with 0.43. Finally, in the Sociodemographic dimension, the performance is higher in the Sea of Cortés region with 0.73.

Figure 4 illustrates the TSI results at the state level, where a better performance of the index is observed in the states of Baja California (0.66), Baja California Sur (0.64), and a lower performance in Yucatán (0.40) and San Luis Potosí (0.44).

Table 5

Results of the TSI

TSI dimensions	National	Tourism regions of México							
		Central	North-central and west	Gulf	Sea of Cortés	Northeast	North-central	South Pacific	Yucatán Peninsula
1. Economic and infrastructure	0.59	0.59	0.59	0.62	0.63	0.59	0.62	0.57	0.51
2. Ecotourism and environmental	0.33	0.34	0.29	0.28	0.34	0.29	0.32	0.43	0.48
3. Sociodemographic	0.55	0.50	0.55	0.58	0.73	0.65	0.54	0.46	0.43
Global	0.49	0.48	0.48	0.49	0.57	0.51	0.50	0.49	0.47

Note. Source: own elaboration.

Figure 4

Map of the TSI results by dimension and tourist region

State	Global Index	State	Global Index	State	Global Index	State	Global Index	State	Global Index	State	Global Index
Aguascalientes	0.46	Chiapas	0.47	Jalisco	0.51	Oaxaca	0.5	Sonora	0.56	Zacatecas	0.48
Baja California	0.66	Chihuahua	0.49	Mexico	0.46	Puebla	0.45	Tabasco	0.46		
Baja California Sur	0.64	Durango	0.53	Michoacan	0.46	Queretaro	0.46	Tamaulipas	0.54		
Campeche	0.5	Guanajuato	0.45	Morelos	0.59	Quintana Roo	0.57	Tlaxcala	0.51		
Coahuila	0.49	Guerrero	0.52	Nayarit	0.54	San Luis Potosi	0.44	Veracruz	0.53		
Colima	0.59	Hidalgo	0.48	Nuevo Leon	0.49	Sinaloa	0.54	Yucatan	0.4		

Note. Source: own elaboration with QGIS.

Among their characteristics, tourist places include cities and towns; this implies a conditioning element for the performance of the index indicators because a large part of the economic and social flows, as well as the environmental effects of commercial activities, intensifies in the metropolises.

Moreover, the results of the student's t-tests are statistically significant (Table 6) and show that cities present a higher overall performance in the index compared to localities (t = 5.01); in particular, these results are noted mainly in dimensions 1, Economic, and infrastructure, (t = 5.05) and dimension 3, Sociodemographic (t = 3.02).

Dimension 2, Ecotourism and environment, did not show a statistically relevant difference (t = 1.14). However, being the dimension with the lowest performance of the entire index, it opens areas of opportunity to address the compatibility of economic activities, mainly tourism, with the economic spillover they can generate.

Table 6

Student's mean difference t-test

Variable	Tourist destinations	Cities with tourist vocation	|t|

Global	0.46	0.52	5.01 *
Economic and infrastructure	0.53	0.63	5.05 *
Ecotourism and environment	0.32	0.34	1.14
Sociodemographic	0.52	0.59	3.02 *

Note. * $p < 0.05$.

Discussion

The findings of this research propose a transparent and summarized method to monitor the progress of sustainable tourism development in the localities/municipalities of México. Unlike other studies where four dimensions of tourism sustainability are proposed (Valentin & Spangenberg, 2000) or seven, as in the case of Madrid and Cerón (2013), the PCA confirms that these dimensions can form three principal elements: Economic and infrastructure, Ecotourism, and environment, and finally, Sociodemographic. This suggested index allows capturing more elements of the complex process of tourism development, shedding additional light on its progress, unlike what is proposed by the Ministerio de Turismo (2019) in the digitalization of tourist destinations, integrating only GDP and GDP of tourism as performance metrics.

Still, one element consistent with the index proposed by Madrid and Cerón (2013) is concentrating the economic and tourism activity in capital cities compared to tourist locations, which translates into higher performance levels or, in our case, increased sustainability. This element poses a particularly enormous challenge in tourism planning for the federal as well as the state and municipal governments so that the benefits generated by tourism are distributed to society fairly and all adverse impacts are minimized. Otherwise, only "consolidated" spaces for tourism activity would be established, and their limits would be blurred.

The principal limitations of this study lie in the complexity of the interrelationship between the economic, social, and environmental systems (based on non-linear relationships, structures, levels of analysis, and processes) (Serrano-Barquín *et al*., 2012), which compels the incorporation of other variables associated with each of these systems but, due to their difficulty, are unavailable for the municipalities, for example, CO_2 emissions, which usually have a national and state level of measurement, in addition to gentrification, to name a few.

It is necessary to highlight the complexity of obtaining data from the official secondary sources used in this study: INEGI, CONEVAL, SECTUR, CONANP, and Data México, due to the difference between the frequency of updating or availability of information in the most marginalized localities or municipalities compared to the capitals or larger settlements: a limiting factor for the inclusion of other variables within each dimension, of which the environmental deserves special mention, with an eventual higher number of interrelated variables.

Likewise, the areas of opportunity in each index dimension are evident. This element enables better decision-making on management plans for green areas and public and private investments; it will also promote the diversification of all the services offered by tourism and support programs for the population, focusing on small and medium-sized community-based producers.

The PCA method used is a practical tool to validate the interrelation of the variables selected for developing the index. When contrasting the basic theoretical model, the prism of sustainability, it is possible to reduce the four dimensions proposed to only three and obtain optimal results to explain the variation of the studied indicators.

However, within the limitations of the index, the results only reflect the "internal" behavior of the observations (municipalities), i. e., an ideal maximum was not established, which would undoubtedly modify the values obtained but depends enormously on the social, economic, and environmental conditions of each region. Some authors, such as Pimentel de Oliveira (2022), establish "achievement functions" that use ranges through percentiles of the indicators and are appropriate for each type of region.

Conclusions

This document can be progressively updated as more observations are added, allowing measuring progress in sustainable regional development with the impulse of tourism and opening the debate around the search for economic progress.

This research advocates the monitoring of tourism development but, above all, it provides a basis for considering a growing number of indicators that can

be used to design policies, practices, and strategies aimed at tourism sustainability. The purpose is to ensure that the benefits produced by this economic activity are fair and equitable to the parties involved, particularly the members of local communities.

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Conflict of interest
The authors declare they do not have a conflict of interest with the subject, the data, the discussion, and the conclusions reached in this document.

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