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THE SUSTAINABLE RHYTHM OF DESTINATION POPULARITY: A SONG OF LOCAL WELL-BEING AND LASTING CHARM

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Abstract

Destination popularity has long-term effects on the local community's quality of life and the destination's attractiveness. This study examines the impact of environmental, economic, and social factors on destination popularity while introducing a new sustainable tourism index as a novel approach to measuring sustainability in destinations. The study acknowledges that, although popular destinations generate high revenue, excessive popularity can have negative consequences for long-term destination appeal. Unlike the traditional country-level and qualitative approach, the proposed index relies on open-source data, allowing for frequent updates at the local level. By analyzing 2,164 US counties, the study reveals a positive relationship between economic, environmental, and social factors and destination popularity, with variation in the magnitude of these effects. The study also presents examples of potential applications for the proposed index, offering valuable insights into the complex dynamics of destination popularity and providing a practical tool for assessing sustainable tourism.

Keywords: destination popularity; open-source data-based sustainable tourism index; triple bottom line; local community; Gaussian copulas.

1. INTRODUCTION

As the tourism sector expands and evolves, the success of tourism is evaluated based on a triple bottom line, which aims to strike a balance between profitability and the preservation of natural and cultural resources of the destination (Cook et al., 2018). Along with the philosophy of sustainable development and sustainable tourism defined by the World Tourism Organization, UNWTO emphasizes the importance of considering the triple bottom line – Profit, Planet, and People – and continues to drive sustainable tourism development (Grilli et al., 2021). Specifically, the key players in sustainable tourism include visitors, the industry, the environment, and the host community. Hence, it is necessary for sustainable tourism development to address the key players by considering the current and future economic, social, and environmental impacts. To do so, it is essential to acknowledge that sustainable tourism requires careful consideration of the benefits and drawbacks associated with different stakeholders' interests, as well as the inevitable tradeoffs between economic opportunities and potential environmental and social consequences that may compromise long-term local development. Previous studies have extensively discussed the dual nature of destination sustainability, highlighting its potential benefits and challenges (Comerio & Strozzi, 2019; Kurniawan et al., 2019). Depending on the level of tourism development in the destination, an increasing number of tourists can generate profits for the local economy but also have adverse effects on limited resources, representatively, triple bottom line resources (Telfer & Sharpley, 2008). To comprehensively analyze the interplay between destination popularity and sustainability, we will concentrate on the triple bottom line factors while considering the level of area popularity at the county level in the United States. We aim to propose enduring strategies for sustainable tourism development, utilizing a sustainable tourism index derived from our empirical dataset.

Over several decades, researchers have developed a modern version of the

destination life cycle model to comprehend better the multifaceted aspects of destination sustainability and its relationship with internal factors in a particular area (Butler, 1980; Getz, 1992; Buhalis, 2000; Su et al., 2022). This strategic model explicitly delineates the stages of destination development, ranging from birth and growth (involvement/ exploration – development) to maturity (consolidation – stagnation) and, eventually, either decline or rejuvenation (Butler, 1980). By pinpointing the current stage of a destination area, tourism policy makers and decision takers can optimally allocate their limited resources, guided by this model (Plog, 2001). In order to identify the progress of each destination's sustainability level, this study aims to present an overview of the sustainability trend of tourist destinations in the US counties. To gauge the sustainability level of each destination, a set of indexes has been proposed and developed, measuring environmental, economic, and social changes in these destinations over the study period spanning 2010 to 2018. These data-driven indexes that quantify sustainability for tourism destinations are constructed using multidimensional data sources in a local-level approach (i.e., counties). This represents an improvement to the county-level destination research, followed by previous studies (Berbekova et al., 2022; Burgess & Heap, 2012; Kim et al., 2013).

Unlike prior studies that primarily relied on qualitative research methods such as the Delphi method (Choi & Sirakaya, 2006; Miller, 2001; Mowforth & Munt, 2003) or data at the country or a single state level (Perdue & Gustke, 1991; Roehl, 1999; Kim et al., 2013; Lee & Jan, 2019), this study employs quantitative methods with open sourced empirical data. This allows for the possibility of continuous future research, as the variables used and observations gathered can be easily updated over shorter periods. The proposed indexes, both overall and individuals (e.g., one composite index to measure sustainable tourism development and four individual indexes for economic, environmental, social impacts, and destination popularity), can serve as valuable tools for tourism practitioners. They are expected to provide the level of

development in each destination and establish appropriate strategies for the subsequent stages of the destination life cycle.

The following section presents the literature review on the overall destination development life cycle with triple bottom line indexes with a destination popularity index. The research design covers data analysis, data collection, and variable measurement. The results present the effect of the economic, environmental, and social factors on destination popularity and some examples of potential applications of the new index proposed. The conclusions section shows the implications and future research lines.

2. LITERATURE REVIEW

2.1 Destination popularity

In general, destination popularity is defined as "the tourists' attention to tourism destinations" (Yunxian et al., 2020). However, in the context of sustainable tourism, it becomes a double-edged sword for all tourism stakeholders, including visitors, residents, and tourism businesses in that area. The popularity and growth of a destination have long-term effects on the local community's overall quality of life and the destination's attractiveness (Plog, 2001). As more and more tourists come to the destination and the number of tourists reaches beyond the acceptable number, both visitors and residents may encounter problems, and benefits derived from tourism decrease as well. This threshold is known as the carrying capacity, encompassing physical, environmental, ecological, and social criteria (Cook et al., 2018). By understanding and managing the carrying capacity well, local tourism practitioners and policymakers can effectively regulate tourism resources, such as the number of tourists, facility development, and the well-being of residents, thereby ensuring a sustainable balance that maintains the quality of life for residents, generates profits from the tourism industry, and

continues to attract tourists.

For these reasons, destination popularity is closely associated with destination attractiveness or image (Formica & Uysal, 2006). Tourist destinations can be seen as physical spaces characterized by distinct attributes that significantly contribute to their overall appeal (Buhalis, 2000). Factors such as tourist experiences, local community, physical and cultural facilities, and the natural environment of the area collectively influence the popularity and attractiveness of a destination (Ruiz-Real et al., 2020). The competitiveness and attractiveness of a destination, in turn, enhance tourists' satisfaction with their overall experience (Vengesayi, 2003). Additionally, Plog's (2001) Psychocentric-Allocentric model posits that the popularity of tourist destinations varies according to the travel preferences of tourists and residents' perceptions, which allows for predictable growth patterns in a specific area. By harnessing this theoretical knowledge in conjunction with the destination life cycle model, tourism stakeholders can proactively manage resources to accommodate predicted demand, balance the needs of residents and visitors, and promote sustainable tourism development (Kim et al., 2013; Milano et al., 2019). This strategic approach not only preserves the quality of life for local residents but also fosters economic prosperity and provides fulfilling experiences for tourists. By specifically focusing on triple bottom line factors for sustainable tourism development of destinations, we can identify the relationship between three factors and destination popularity. This understanding allows us to suggest strategic long-term implications for each US county based on its sustainability level using our own generated *sustainable tourism index* with its practical implications.

2.2 Triple bottom line

Recent tourism research has considered 'sustainability' a critical success factor for tourist destinations (Santos et al., 2022). As UNWTO stated, sustainable destination development consists of three criteria to evaluate the success of tourism, which is closely

aligned with the concept of triple bottom line. This term is minted by Elkington (1999) to equally set a focal point on the local community's economic, environmental, and social values. Tourism can either enhance or undermine these values since transitioning to *sustainable capitalism* represents an inevitable trend in the midst of the mass tourism era, regardless of some potential compromising results.

From the long-term perspective for tourism development, triple bottom line elements address the crucial aspects of people, profit, and planet in the context of macro-level tourism marketing (Gao et al., 2022; Vrontis et al., 2022). Primarily, these factors hold practical significance in the real world. Findings emphasize the importance of equilibrium among economic prosperity, clean environment, and residents' well-being (Crouch & Ritchie, 1999); they underscore the value of sustaining a destination's longevity in a marketplace to ensure its long-term competitiveness (Hassan, 2000). Furthermore, understanding travelers' psychological changes and incorporating factors that facilitate sustainable destination development are pivotal for strategic positioning (Plog, 2001). By making significant investments and implementing comprehensive destination planning strategies, destinations can effectively attract a large number of tourists while mitigating the negative impact of seasonality during the shoulder and off-seasons (Dwyer & Kim, 2003). In the same vein, another study has investigated the correlation between residents' perceptions of tourism and their satisfaction, taking into account the economic, social, cultural, and environmental dimensions of tourism impacts. The study suggests that residents' perceptions are influenced by the tourism developmental life cycle (Kim et al., 2013). Additionally, these findings are supported by another research that demonstrates how residents' economic, social, and environmental perceptions evolve throughout different stages of tourism development (Lee & Jan, 2019). Considering the triple bottom line factors and their relationship with destination popularity, this analysis focuses on examining each component in detail within the context of

the tourist destination life cycle.

2.2.1. Economic factor

Tourism-generated profits have long been considered a key measure of success for tourist destinations, reflecting the economic well-being of residents (Kim et al., 2013). This is mainly decided by residents' perception of their standard of living (e.g., cultural facilities, quality of infrastructures) (Belisle & Hoy, 1980; Comerio & Strozzi, 2019; Sharpley, 2014), as well as the increased job opportunities and business investment associated with tourism (Lee & Jan, 2019; Yu et al., 2016). Specifically, this economic impact factor can be measured using traveler spending growth rate, direct travel employment growth rate, and state travel tax growth rate to identify the direct economic benefits of tourism development (Perdue & Gustke, 1991; Toh et al., 2001; Uysal et al., 2016). However, the tourism industry also brings negative economic impacts when the number of tourists exceeds the carrying capacity of the destination, such as tax increases and inflation (e.g., cost of living increase) problems (Grzeskowiak et al., 2003). Therefore, it is crucial to implement controlled and well-managed strategies to ensure the economic advantages of local development, which can vary depending on the stage of tourism development in a particular area (Diedrich & García-Buades, 2009; Sharpley, 2014; Uysal et al., 2016).

According to Plog's (2001) allocentric model, the positive economic impacts of tourism start to decline before the destination deteriorates into an uncontrolled and unattractive place characterized by low-quality shops and illegally managed bars or accommodation facilities. This decline can be seen as a signal of the *stagnation* or *decline* stages of tourism in that area. In contrast, during the *discovery* and subsequent *growth* stages, all tourism stakeholders are satisfied, visitors have positive experiences, local businesses can expect good profits, and residents witness a significant economic boost in their community. These favorable economic perceptions spill over to the social and environmental dimensions

of the triple bottom line, leading to an overall improvement in residents' quality of life, revenue, and well-being (Jurowski et al., 1997; Stylidis et al., 2014).

Given these considerations, previous studies emphasize the economic impact of tourism as a fundamental indicator for evaluating destination competitiveness (Jurowski et al., 1997; Mendola & Volo, 2017). Specifically, destination-oriented achievements such as tourist arrivals, market quotas, tourism expenditure, and the average number of nights by visitors are used to assess tourism performance (Abreu Novais et al., 2018). Additionally, the market value of the tourism industry, its contribution to GDP, tourism employment growth, and residents' quality of living are also important factors (Croes et al., 2018; Paramati et al., 2017). As the tourist destination is explored and evolves, residents become aware of the economic boom generated by increasing numbers of travelers, leading to the development of local businesses; eventually, they can directly perceive tourism-related economic benefits through local GDP and more job opportunities. At the growing stages of tourism development, the economic benefits are most evident, which aligns with the destination's popularity. Based on these observations, the following hypothesis can be stated:

Hypothesis 1: Economic factors have positive effects on destination popularity.

2.2.2. Environmental factor

The environmental quality of tourism destinations, encompassing natural scenery and a clean, pristine environment, plays a pivotal role in determining destination competitiveness (Inskeep, 1991; Mihalič, 2000). However, the environmental impact on destinations exhibits ambivalent characteristics similar to the economic impact of tourism development. On the one hand, an increasing number of tourists can positively influence the local environment by fostering greater awareness of the need for environmental preservation (Var & Kim, 1989). Conversely, this influx of visitors can also lead to the deterioration of flora and fauna and

cause environmental pollution (Koenen et al., 1995; Var & Kim, 1989; L. Wang et al., 2018). The depletion of natural resources further undermines the destination's economic and social attractiveness. Recognizing the significance of natural attractions, the Calgary model of competitiveness in tourism identifies elements such as the natural features and climate of tourism destinations, along with cultural heritage, social infrastructure, visitors' attitudes, uniqueness, and price/cost levels as essential components of destination attractiveness (Mihalič, 2000).

Several previous studies support the idea that environmental features serve as a competitive advantage of tourism destinations, and the pro-environmental image of destinations holds substantial sway over potential visitors' when selecting their travel destinations. Naturally, prospective travelers are drawn to destinations that advocate for an environmentally-responsible identity, as they identify with the unique characteristics of such places, which contribute to their sense of self-continuity, self-distinctiveness, and self-enhancement (Kim & Park, 2023; Su et al., 2022; Senbeto, 2023; Vatankhah et al., 2023). In light of this, it is important to recall that attractiveness is contingent upon how well it aligns with the sustainability needs of travelers (Cheng et al., 2013; Lee et al., 2010). For example, the pro-environmental image—conveyed through direct messages or via third parties such as green certifications (Kuokkanen & Sun, 2023; Wei et al., 2023)—has proven to have a positive impact on various aspects of tourists' experiences, including purchase intentions, willingness to pay, revisitation, and positive word-of-mouth after traveling (Eid et al., 2021; González-Rodríguez et al., 2019; Lee et al., 2010; Wang & Chen, 2021). Furthermore, during the early stages of the tourism life cycle, the host community endeavors to enhance the surroundings of the destinations (Perdue et al., 1987; Sharpley, 2014) through infrastructural development and cultural resources, aligning with the increasing popularity of the area. Incredibly, the variable of air quality has been overlooked by previous tourism researchers;

however, it holds the closest relationship to both visitors' and residents' health issues when compared to other physical and aesthetic environmental resources (Costa et al., 2014). Acknowledging this crucial aspect, it becomes evident that air quality can directly influence a destination's competitiveness (Eusébio et al., 2020; Saenz-de-Miera & Rosselló, 2014) as the quality of the physical environment significantly impacts tourists' overall experiences. Particularly for travelers seeking picturesque scenery and a relaxing atmosphere, low air quality can diminish visibility and even hinder the enjoyment level at the destination (Rizzi et al., 2014). Consequently, maintaining clean and healthy air quality becomes paramount in shaping the long-term attractiveness of the area. Building upon this understanding, we anticipate discovering a positive correlation between environmental factors, including air quality, and the overall popularity of a destination. The following hypothesis is stated:

Hypothesis 2: Environmental factors have a positive effect on destination popularity.

2.2.3. Social factor

Concerning the social aspect of the *triple bottom line*, existing studies mainly focus on the negative socio-cultural consequences of tourism development, representatively, cultural deterioration issues (e.g., demonstration effect, authenticity issue) (Bakhsh et al., 2021; Cook et al., 2018; Croes et al., 2018; Moore et al., 2021; Wu et al., 2012) with some social problems, such as traffic congestion, overcrowding (Ji et al., 2023; Sanz-Blas et al., 2019). The term 'Overtourism' describes the problematic social situations arising from tourism development (Capocchi et al., 2019; Mihalic, 2020; Perkumienė & Pranskūnienė, 2019).

At the very early stages of the tourism life cycle, the local community may experience discomfort due to the increasing influx of tourists and new residents, leading to higher population density and complexities in daily life. However, as tourism generates

revenue, policymakers effort to manage the growing number of tourists systematically, and businesses invest in the area, positive aspects emerge (Kim et al., 2013; Uysal et al., 2016). Increased interactions between residents and tourists, along with the revitalization of traditional heritage and cultures by the local community, contribute to the preservation of socio-cultural resources with the help of external support (Rasoolimanesh et al., 2020; Sharpley, 2014; Uysal et al., 2016). In general, previous studies have focused on residents' perceptions and attitudes towards local tourism development, with their satisfaction being regarded as a key element for the success of sustainable tourism in a given area (Boley et al., 2017; Moreira Gregori et al., 2022; Obradović et al., 2021; Woo et al., 2015). Notably, tourism led by the local community tends to result in higher satisfaction levels, attributed to improved social infrastructures and increased awareness of their own culture (Lee et al., 2013; Lee & Jan, 2019; Wearing et al., 2010).

Social impact studies have shown that population can serve as an indicator to detect social changes in a given area. For instance, Kim et al. (2013) used the population growth rate (PGR) to gauge Virginia residents' perceptions of tourism social impacts. Perdue and Gustke (1991) examined North Carolina residents' perception regarding tourism development by using population measurement alongside crime and education level. Population growth, along with an increasing number of visitors, is considered an essential indicator of local development, often indicating an influx of people for job seeking or improved social infrastructures. Consequently, we propose the following hypothesis:

Hypothesis 3: Social factors have a positive effect on destination popularity.

3. RESEARCH DESIGN

3.1 Methodology

To examine the effects of economic, environmental, and social factors on destination popularity, a regression analysis is conducted using the following empirical model:

$$DP_i = \alpha_i + \beta_1 \cdot EF_i + \beta_2 \cdot ENF_i + \beta_3 \cdot SF_i + \beta_4 \cdot SCI_i + \varepsilon_i,$$

where α is the constant term, β_1 is the coefficient that captures the effect of economic factor (EF_i), β_2 reflects the impact of environmental factors (ENF_i), β_3 shows the influence of social factors (SF_i), β_3 captures the effect of state coincident indexes (SCI_i) on destination popularity (DP_i). The term ε_i represents a normally distributed error term.

The error term can be correlated with economic, environmental, and social factors because of potential existing endogeneity, mainly due to reverse causality. The reverse causality between destination popularity and environmental factors may emerge because a popular destination might experience increased environmental pressures due to higher visitation rates, leading to changes in environmental conditions. Conversely, better environmental conditions might attract more tourists, increasing the destination popularity. The reverse causality between destination popularity and economic conditions, such as employment rate, would take place because, while employment may affect destination popularity, it is also possible that destination popularity affects employment. If more tourists visit a destination due to its popularity, this can lead to an increase in work opportunities. Simultaneously, higher employment can make the destination more appealing to tourists. The reverse causality between destination popularity and social conditions such as population would appear because, while it may seem intuitive that the population of a destination affects its popularity, a destination's popularity might lead to an influx of residents, which can cause an increase in the local population. In other words, a popular tourist destination might attract

more people to live or work there, leading to a larger local population.

Therefore, it is essential to control for endogeneity. To address this issue, we use Gaussian copulas, an approach that does not rely on instrumental variables and directly models the joint distribution of potentially endogenous variables and the error term (Park & Gupta, 2012). The copula terms for the economic (*EF*), environmental (*ENF*), and social (*SF*) variables are calculated as follows:

$$EF_i^c = \emptyset^{-1}[H_{EF}(EF_i)]$$

$$ENF_i^c = \emptyset^{-1}[H_{ENF}(ENF_i)]$$

$$SF_i^c = \emptyset^{-1}[H_{SF}(SF_i)],$$

where $\emptyset^{-1}$ is the inverse of the cumulative normal distribution, and $H_{EF}(EF_i)$, $H_{ENF}(ENF_i)$, and $H_{SF}(SF_i)$ represent the empirical distribution functions of *EF*, *ENF,* and *SF*, respectively.

According to Park and Gupta (2012), this copula-based method requires that the empirical distribution of the potential endogenous variables is not normally distributed. If the copulas have significant parameters, then endogeneity exists, and those copulas with significant parameters are included in the final regression. Thus, in line with the two-step process suggested by Mathys et al. (2016), we first include the copulas for *EF*, *ENF*, and *SF* in the regression model, and we keep the copulas that were significant in the previous stage to obtain the final parameter estimates corrected for endogeneity.

3.2 Data collection

The index was constructed using five variables (outlined in Appendix A). Data for this analysis were collected from multiple open sources (also specified in Appendix A). The time covered the period from 2010 to 2018, allowing us to investigate the temporal changes in the

tourism destination indexes. This study utilized a comprehensive dataset of 3,142 US counties to ensure a granular analysis. In addition to the variables mentioned above, geographic coordinates for all 3,142 counties were obtained to facilitate visualization and illustrate the temporal changes in the index for each county. However, it's important to note that several counties had missing coordinate data for particular years before 2018. To construct a robust indicator, the variables were transformed using normalization and standardization. Each variable was scaled within three standard deviations, with an average value of 1 and a range between 0 and 2 (refer to Appendix B for visualization). This rigorous scaling approach ensures that observations are comparable and facilitates meaningful analysis of the index's temporal variations across the diverse set of US counties.

3.3 Variables

3.3.1 Dependent variable

Popularity of tourism destinations. The popularity of tourism destinations can be analyzed over time using data provided by Expedia Group, which measures popularity through 20 ‘buckets’. These buckets represent different levels of popularity, with the first bucket representing the bottom 5 percent of destinations and the twentieth bucket representing the top 5 percent, which is above the 95th percentile. In simpler terms, a destination assigned to bucket 0 indicates it is ‘not popular’, while a destination in bucket 20 signifies it is ‘very popular’.

3.3.2 Independent variables

Economic factor. We utilize the employment data from the tourism sector, which serves as an indicator of the destination's popularity. Previous studies have highlighted that residents can directly perceive the increases in tourism-specific GDP and employment,

reflecting the growing trend of destination popularity (Kim et al., 2013; Lee & Jan, 2019; Perdue & Gustke, 1991; Uysal et al., 2016). Specifically, to quantify the volume of employment in the tourism sector, we calculate the employment for county i by multiplying the employment figure of that county with the ratio between the "GDP in accommodation and food services" and the overall GDP of the county. This method enables us to better understand the economic impact of the tourism industry on the region and its relation to the destination's popularity:

$$Tourism\ Sector\ Employment_i = \frac{GDP\ in\ Accommodation\ and\ Food\ Services_i}{Total\ GDP_i} \times Employment_i$$

Environment factor. To assess the impact of the environmental factor, we focus on the air quality index, aligning with measures from previous studies (Costa et al., 2014; Rizzi et al., 2014; Wang & Chen, 2021). In this regard, we employ the number of days with good air quality, as quantified by the US Environmental Protection Agency, to measure the overall air quality of counties during a given year. The expression used to quantify this measurement is as follows:

$$Air\ Quality\ Index = \frac{Days\ with\ good\ air\ quality}{Total\ days\ of\ the\ air\ quality\ index\ being\ measured}$$

To address the issue of missing air quality information in many counties, we employ a method of interpolation. Since it is reasonable to assume that adjacent counties have a similar level of air quality, we assign a missing county the average air quality index of its five nearest counties, determined by their geographic coordinates using the Euclidean distance metric. This approach allows us to estimate the air quality for counties with missing data. The spatial interpolation calculation formula used for this purpose is based on the works of Lam (1983), Li and Heap (2014), and Mitas and Mitasova (1999).

$$Air\ Quality\ Index_i = \frac{1}{5}\sum_{j=1}^{5} Air\ Quality\ Index_j,$$

where *i* denotes a given US county where the air quality index is missing, and *j* refers to one of its five nearest neighboring counties. By applying this spatial interpolation technique, we can derive a more comprehensive picture of the air quality across various counties, enabling us to examine its relationship with the popularity of destinations more effectively.

Social factor. The county's population, obtained from the US Census American Community Survey, serves as a crucial social factor that reflects the evolution of social dynamics. By analyzing changes in population size over time, we gain insights into the social aspects that might influence tourism trends and destination preferences.

Control variable. To account for macro-economic variations, we incorporate the state coincident indexes[1] provided by the Federal Reserve of Philadelphia as a control variable. This state coincident index helps us assess and control the overall economic situation at the state level. By considering this macro-variable, as outlined in the work of Crone and Clayton-Matthews (2005), we can better isolate and understand the specific impacts of environmental and social factors on the popularity of tourism destinations.

3.3.3. Index generation

We develop an overall index by incorporating the aforementioned variables to complement the analysis and provide a comprehensive view. Before aggregation, each variable is scaled to ensure that observations fall within a three-standard deviation range, with an average value of 1 and a range between 0 and 2 (see Appendix B). Next, the popularity index

[1]https://www.philadelphiafed.org/surveys-and-data/regional-economic-analysis/state-coincident-indexes

along with the economic, environmental, and social factors, are averaged to create a single composite index for each county. To maintain consistency, the composite index is further standardized, resulting in an average value of 1 (see Appendix C). This iterative procedure is conducted for all counties in the dataset from 2010 to 2018. After filtering out counties with missing or non-imputable variables, a total of 2,164 counties are retained for the analysis. Based on their individual index values, the counties are ranked and subsequently clustered into three distinct groups: low, mid, and high. This clustering process aids in identifying and comparing counties with similar levels of overall index values, providing valuable insights into the variations in tourism destination attractiveness across different regions.

4. RESULTS

4.1 Effects of Triple bottom line factors on destination popularity

Prior to estimating the regression models, we conducted a thorough examination for potential collinearity among the explanatory variables. Apart from performing a correlation analysis (see Table 1), all variance inflation factors of the parameters were found to be below the recommended value of 10 (Neter & Ben-Shakhar, 1989), indicating that collinearity is not a concern in our analysis. Additionally, to address the issue of homoskedasticity, we performed the Breusch-Pagan test, which did not reject homoskedasticity (Wald test = 151.3; $p < 0.01$). As a result, we proceeded to estimate the significance of the parameters using white heteroskedasticity-consistent standard errors.

Regarding the endogeneity issue, we needed to confirm the non-normality of the explanatory variables that might be endogenous. The Jarque-Bera test results indicate that the variables EF (JB_{EF}=4152.4; $p<0.01$), ENF (JB_{ENF}=1030.87), and SF (JB_{SF}=453.07; $p<0.01$) are not normally distributed. Consequently, when we introduced the three copulas in the

model (Equation 1 in Table 2), the copulas for economic and environmental factors were found to be significant. Therefore, following the two-step approach proposed by Mathys et al. (2016), we included these two copula terms when estimating the final model (Equation 2 in Table 2). This methodology allows us to account for the endogeneity issue and obtain reliable parameter estimates for our analysis.

Table 1. Correlations among the triple bottom line variables and destination popularity

	Destination popularity	Environmental index	Economic index	Social index	Copula correction *Environmental index*	Copula correction *Economic index*	Copula correction *Social index*
Destination popularity	1.000	-0.254	0.756	0.756	-0.278	0.748	0.746
Environmental index	-0.254	1.000	-0.244	-0.184	0.984	-0.243	-0.175
Economic index	0.756	-0.244	1.000	0.654	-0.263	0.995	0.638
Social index	0.756	-0.184	0.654	1.000	-0.197	0.645	0.995
Copula correction *Environmental index*	-0.278	0.984	-0.263	-0.197	1.000	-0.262	-0.187
Copula correction *Economic index*	0.748	-0.243	0.995	0.645	-0.262	1.000	0.633
Copula correction *Social index*	0.746	-0.175	0.638	0.995	-0.187	0.633	1.000

Table 2. Effect of environmental, economic, and social factors on destination popularity

	Equation 1		Equation 2		Equation 3	
Variable	Parameter	Std. Error	Parameter	Std. Error	Parameter	Std. Error
Environmental index	2.556a	0.217	2.552a	0.217	2.537a	0.217
Economic index	8.486a	0.872	8.279a	0.751	8.349a	0.747
Social index	5.630a	0.698	6.092a	0.076	6.046a	0.076
Coincident index	0.548a	0.082	0.549a	0.082		
Copula correction *Environmental index*	−1.435a	0.098	−1.432a	0.098	−1.450a	0.098
Copula correction *Economic index*	−0.437b	0.228	−0.383b	0.197	−0.384b	0.196
Copula correction *Social index*	0.151	0.222				
Constant	−13.584a	0.859	−13.869a	0.820	−11.264a	0.710
R-squared	0.6981		0.6982		0.697	
Adjusted R-squared	0.6980		0.6981		0.695	
F-statistic	7108.88a		8298.42a		9935.4a	

a=p<0.01; b=p<0.1

Equation 2 in Table 2 shows significant and positive effects of the three indexes on destination popularity. These findings provide strong support for the three research hypotheses, suggesting that environmental, economic, and social factors all positively influence destination popularity. As a result, destinations enhance their attractiveness through economic development, making them more competitive than rivals. Furthermore, their favorable environmental conditions attract travelers who identify with environmentally oriented destinations and appeal to the general public due to the expected high quality and good health conditions. Finally, the social environment plays a vital role in augmenting the popularity of the destination. Interestingly, the effects of all three factors exhibit significant variations; for example, economic factors have the largest effect, significantly higher than the second-largest effect.

For the sake of robustness, we re-estimated Equation 2 without the control variable "coincident index" to avoid potential collinearities. The results found in Equation 3 are very similar to those in Equation 2 (Wald test=7.97, $p<0.001$), attributed to social factors. In turn, the effects of social factors are higher than those of environmental factors (Wald test=231.3, $p<0.001$). These results demonstrate that while environmental elements may influence destination selection and popularity, other factors, particularly economic and social factors, have a more dominant influence on the overall popularity of the destination. As for the control variable, the coincident index reflecting the economic situation at a specific time also exhibits a positive effect, consistent with the positive effect of economic factors mentioned earlier. With an adjusted R^2 of 69.80%, these variables collectively explain a substantial portion of the target variable, and the F-statistic confirms the overall significance of this regression estimation. The findings of this study shed valuable light on the multidimensional factors contributing to destination popularity, offering essential insights for policymakers and industry stakeholders to enhance destination appeal and competitiveness effectively.

4.2. Using the sustainable tourism index to rank destinations

For illustrative purposes, we present the extreme values of the ranked destinations in Tables 3 and 4, which provide descriptive statistics for the top 10 and bottom 10 counties, respectively. The composite index is computed by averaging the triple bottom line factors (environmental, economic, and social) along with the popularity index. Similar to the individual indexes, the sustainable tourism index has been adjusted to ensure that observations fall within three standard deviations from the mean, with a range between 0 and 2. In line with Burgess and Heap (2012), equal weighting is used to create one composite index.

Subsequently, the observations were clustered into three levels (high, mid, and low) based on the first and third quantiles. As multiple counties may fall into the same rank, the lowest rank is represented by position 819th (Table 3). While this ranking predominantly indicates the counties' positions in a given year, it does not explore temporal changes over the years. To address this aspect, we consider the rank in a specific year and investigate trends to identify counties that have shown significant evolution—either an improvement or a decline—in their ranking. The following two sections present a visual and analytical examination of this temporal evolution, offering valuable insights into the dynamic shifts in destination popularity across different regions over time.

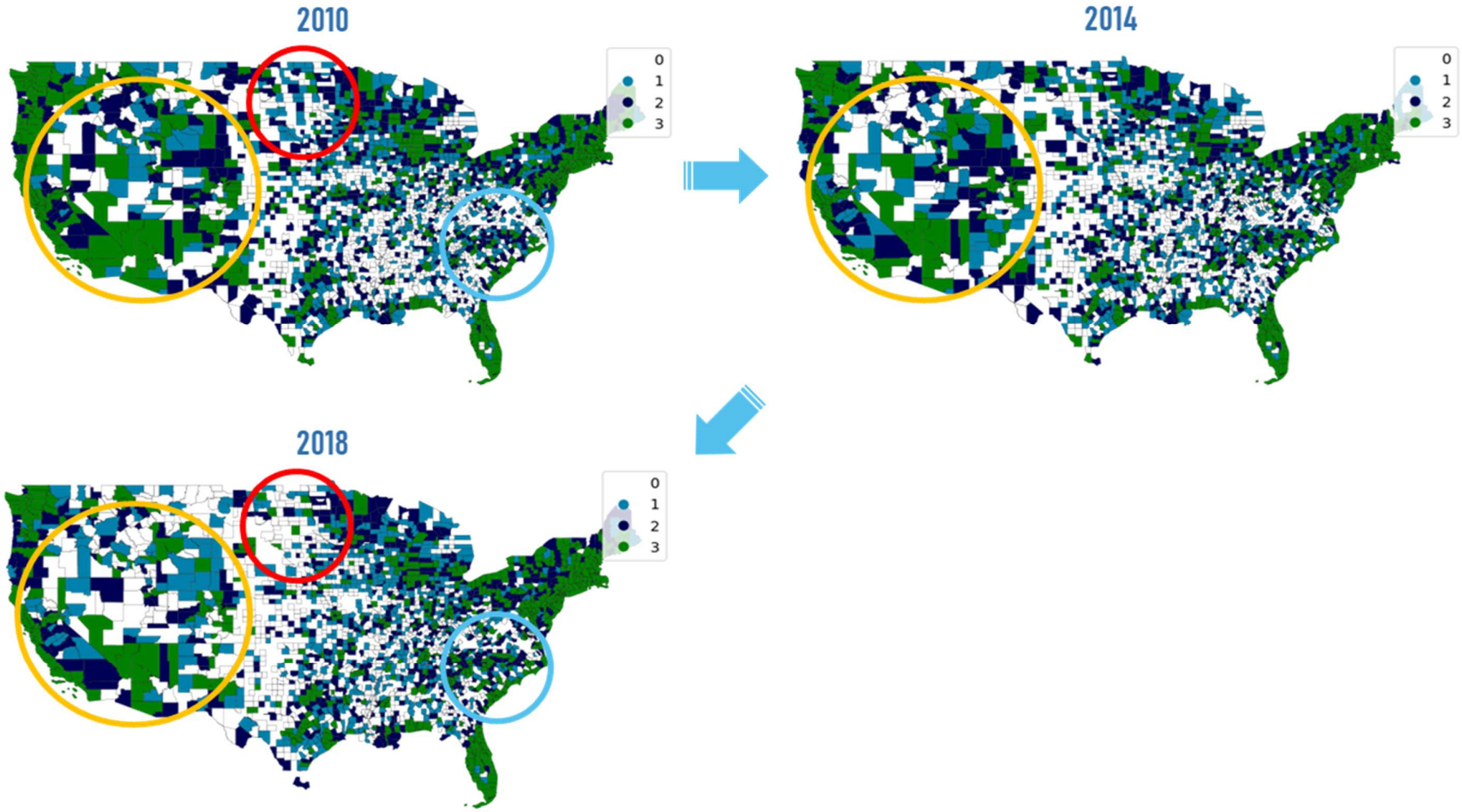
Table 3. Top-Bottom 10 counties in the composite index (2018)

County Info			Individual Index				Composite(SRT) Index		
Geo ID	State Code	County Name	Environmental	Economic	Socio-Cultural	Destination	Index	Rank	Cluster
Top 10									
15003	HI	Honolulu	1.980	1.620	1.752	1.619	1.869	1	H
8097	CO	Pitkin	2.220	1.939	0.803	1.504	1.720	2	H
36053	NY	Nassau	1.541	1.816	1.830	1.251	1.712	3	H
25017	MA	Middlesex	1.164	1.776	1.871	1.582	1.699	4	H
36061	NY	New York	0.552	2.357	1.873	1.6	1.696	5	H
36047	NY	Kings	1.357	1.496	1.982	1.5	1.682	6	H
12099	FL	Palm Beach	1.121	1.786	1.851	1.56	1.677	7	H
25025	MA	Suffolk	1.147	1.769	1.706	1.58	1.643	8	H
34027	NJ	Morris	1.248	1.803	1.590	1.545	1.638	9	H
27053	MN	Hennepin	1.057	1.718	1.812	1.563	1.627	10	H
Bottom 10									
6091	CA	Sierra	0.402	0.744	0.42	0.378	0.391	810	L
48095	TX	Concho	1.052	0.019	0.368	0.463	0.379	811	L
46017	SD	Buffalo	1.293	−0.07	0.368	0.287	0.372	812	L
48033	TX	Borden	0.706	0.725	0.368	0.015	0.353	813	L
48045	TX	Briscoe	0.791	0.434	0.368	0.217	0.352	814	L
48269	TX	King	0.898	0.638	0.368	-0.187	0.324	815	L
49031	UT	Piute	0.562	0.418	0.42	0.205	0.292	816	L
32011	NV	Eureka	0.399	0.529	0.368	0.283	0.284	817	L
48301	TX	Loving	0.837	0.65	0.368	-0.329	0.268	818	L
28055	MS	Issaquena	0.951	−0.382	0.368	0.182	0.149	819	L

4.3. Geographic distribution of the composite index

Using the generated composite index, we created multiple geospatial heat maps to visualize the trends from 2010 to 2018. Upon examination, it is evident that several counties in the Midwest display a decreasing trend in the index over this period. Conversely, the indexes of counties in the Southwest regions have shown a notable increase during the same timeframe. Moreover, specific counties have experienced a remarkable decline in their index values, as indicated by the red circle in Figure 1. These observations provide valuable insights into the temporal changes in the overall attractiveness of various tourism destinations across different geographic regions. The geospatial heat maps serve as a powerful tool in visually representing and understanding the variations in destination popularity over time, aiding researchers and stakeholders in making informed decisions and strategies for the tourism industry.

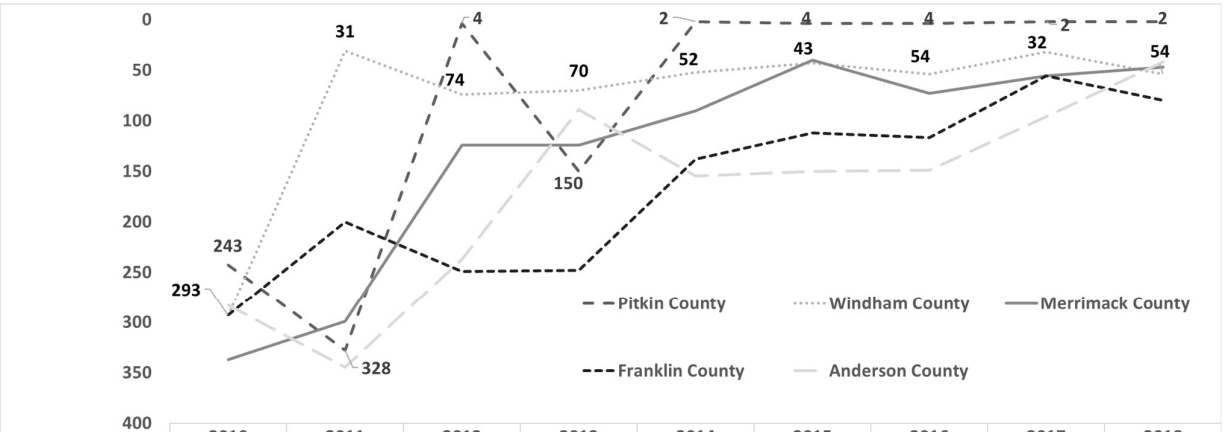
Figure 1. Geographic heatmap of the composite index



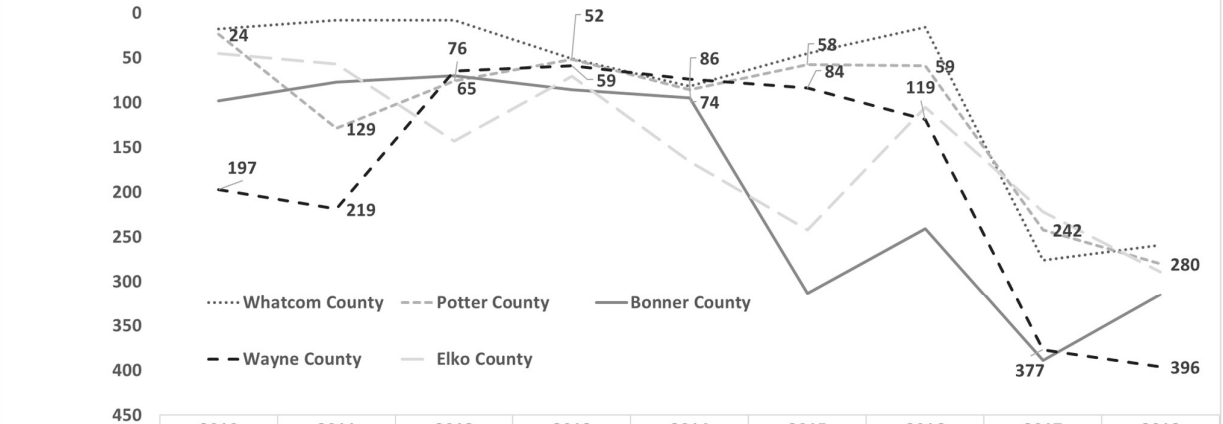
4.4. Temporal changes in county index (positive-negative top 5)

This section analyzes the composite index's annual variation from 2010 to 2018. The average ranking change was calculated by averaging the annual index differences for each county to assess the temporal trends. Based on this analysis, the top 5 counties with positive temporal trends throughout the period were identified as Pitkin (CO), Windham (VT), Merrimack (NH), Franklin (PA), and Anderson (SC). While the geographic heat map presented above provides an intuitive representation of the temporal changes, Figure 2 provides the exact numerical values of the annual variation over the entire period. Conversely, the top 5 counties with negative trends in the composite index were found to be Whatcom (WA), Potter (TX), Bonner (ID), Wayne (IN), and Elko (NV). These findings shed light on the dynamic nature of destination popularity and allow for a more comprehensive understanding of the temporal shifts in attractiveness for various counties. Such insights are valuable for tourism stakeholders and policymakers to make informed decisions and devise strategies to enhance destination appeal and competitiveness.

Figure 2. Top 5 counties with positive-negative changes in the index



	2010	2011	2012	2013	2014	2015	2016	2017	2018
Pitkin County	243	328	4	150	2	4	4	2	2
Windham County	293	31	74	70	52	43	54	32	54
Merrimack County	337	299	124	124	90	40	73	56	47
Franklin County	293	200	249	248	138	112	117	56	80
Anderson County	283	345	237	89	155	150	149	96	42



	2010	2011	2012	2013	2014	2015	2016	2017	2018
Whatcom County	18	8	8	51	82	45	16	276	259
Potter County	24	129	76	52	86	58	59	242	280
Bonner County	98	77	70	86	95	313	241	389	315
Wayne County	197	219	65	59	74	84	119	377	396
Elko County	45	57	143	71	166	242	105	222	289

5. CONCLUSIONS

The primary aim of this study is to investigate the impact of environmental, economic, and social factors on destination popularity. It also proposes a novel sustainable tourism index for assessing sustainability in destinations. To achieve this, we conducted an extensive analysis of 2,164 US counties over time. Our results confirm significant and positive effects of these three factors on destination popularity, affirming our research hypotheses. Notably, economic factors exerted the most influence, surpassing social and environmental factors. This suggests that economic development enhances destination attractiveness, providing a competitive advantage. Additionally, favorable ecological conditions attract environmentally-conscious travelers, while a positive social environment augments destination popularity.

To ensure the validity of our analysis, we addressed potential endogeneity issues using copula correction terms in our regression model. By accounting for endogeneity, our study obtained reliable parameter estimates and established a robust connection between the factors and destination popularity. Furthermore, our proposed sustainable tourism index offers an innovative approach to rank destinations based on a composite of environmental, economic, and social factors, alongside their popularity. This index enables a comprehensive assessment of destinations' sustainability, offering valuable insights for industry stakeholders and policymakers to make informed decisions and devise strategies to enhance destination appeal and competitiveness.

Our study goes beyond empirical findings by using illustrative heat maps to visualize temporal trends in destination popularity across different regions. These geospatial heat maps highlight decreasing attractiveness in certain Midwest counties and a notable increase in popularity in Southwest counties. We also identify specific counties that experienced significant shifts in their ranking over time, both positively and negatively. Such dynamic insights provide valuable information for tourism stakeholders to adapt strategies and enhance sustainability efforts to meet evolving travel demands and market preferences. Overall, we shed light on the complex dynamics of

destination popularity and provide a practical tool for assessing and promoting regional sustainable tourism.

In this context, sustainability, much like the melody that shapes a song (destination popularity), can be either harmonious or discordant. Accordingly, the phenomenon of a destination gaining or losing popularity is not static but dynamic, akin to a song's evolving trendiness over time. The study delves into how environmental, economic, and social factors combine to form this dynamic “song” of destination popularity. This, in turn, impacts the well-being of local communities and the lasting “charm” of a destination, a charm that should be preserved even as the destination’s popularity grows.

Regarding managerial implications, while environmental factors affect destination popularity to some extent, they are the least relevant compared to economic and social aspects. Thus, destinations should prioritize improving green awareness and sustainable tourism practices to enhance their overall appeal and competitiveness. Prior studies have also shown that tourists’ high awareness of the environmental consequences (e.g., excessive energy consumption or waste from rooms and restaurants) (Eid et al., 2021; Zhang et al., 2017) is strongly associated with the choice of eco-friendly accommodations. They tend to feel social responsibility to choose eco-friendly alternatives. As a pivotal determinant in consumers' decision-making processes, our sustainable tourism index offers invaluable insights for decision-makers in two key ways. First, it allows them to track destination evolution over time and gauge the effectiveness of sustainability strategies. Second, it enables benchmarking against rival destinations to identify successful strategies and specific actions that boost popularity. A notable example is Pitkin County in Colorado, known for its scenic beauty and thriving tourism industry. Its sustainable economic prosperity serves as a model for other destinations seeking similar success by adopting Pitkin's strategies.

Concerning research implications, this empirical longitudinal data-based measurement for sustainable tourism has three advancements from previous studies. Firstly, it distinguishes itself by

employing quantitative methods, departing from the reliance on qualitative approaches, such as the Delphi method, which was common in prior studies, such as indicators for measuring community tourism development (CTD) (Choi & Sirakaya, 2006) and tourism product (Miller, 2001). This shift not only enhances the robustness of the method but also facilitates updates, reducing the challenge and time required for adjustments. Secondly, this study arguments its credibility by confirming its findings through an empirical research model, thereby providing a more grounded and reliable basis for its measurements. This empirical validation strengthens its contribution to the field of sustainable tourism research. Finally, this study stands out due to its reliance on readily available variables and open-source data, which can be regularly updated. This feature is particularly noteworthy as it allows for the possibility of annual updates, ensuring the longevity and relevance of the research for future studies and policy making efforts in the realm of sustainable tourism. Moreover, this research can serve as a basis for expanding guidelines to develop comprehensive measurements for triple bottom line indexes, leading to the creation of an integrated index.

One limitation of our study is that the dataset did not cover all US county-level regions. To create a comprehensive dataset, we aggregated information from multiple sources, leading to the removal of counties with missing or uncomputable values. As a result, only 2,164 out of 3,142 counties (70% of the total) were included in the analysis and index creation. To enhance the representation of environmental and social factors, collecting additional variables is necessary. Currently, these factors are each represented by only one variable, but incorporating data on water quality and public leisure facilities in counties could provide a more comprehensive understanding.

For future research, exploring how the proposed index values affect destination choice based on the type of tourism could be a relevant avenue. Understanding whether the index influences beach destinations differently than inland destinations or destinations for relaxation as opposed to urban ones. Such an investigation could allow decision-makers to fine-tune their policies and strategies accordingly. It could help tailor sustainable tourism efforts to specific destination types and better

cater to the preferences of different traveler segments. Also, while this study has utilized the framework of the triple bottom line, further studies should use the environmental, social and governance (ESG) scheme to enhance the set of potential dimensions for analysis (such as the inclusion of governance-related factors). ESG and triple bottom line are frameworks that focus on sustainability and responsible business practices, but their scope varies (Ferrell, 2021). The former primarily provides a structured framework for evaluating a company's performance and impact in the specific domains of environmental, social and governance. In contrast, the triple bottom line also looks at environmental (planet) and social (people) aspects, but it explicitly includes economic considerations (profit) (Elkington, 2018); which aligns more closely with the purpose of our study.

In addition, it is imperative to adapt the index for assessing tourism sustainability in other countries. Since county-level regions in the United States represent a unique geographic system with distinct area sizes, adjustments are necessary for international application. To effectively utilize and comprehend this index, future studies should encompass a multidimensional approach to destinations, considering factors such as seasonality, the level of commercial development of the country, and the primary objectives of its major visitors. In this context, the guidelines for the Travel & Tourism Development Index (TTDI) provide a comprehensive framework to evaluate the developmental level of the tourism industry, encompassing governance, infrastructures, resources, and sustainability of the regional travel industry with its economic aspects. While there may be some overlap with our proposed index, the detailed guidelines of TTDI could serve as fundamental elements for evaluation, specifically the competitiveness of the travel and tourism industry. Overall, addressing these limitations and pursuing further research in this direction would provide valuable insights for destination management and the promotion of sustainable tourism practices.

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