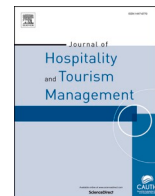


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## Journal of Hospitality and Tourism Management

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## Evaluating sustainability of cultural festival tourism: From the perspective of ecological niche

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## ARTICLE INFO

## Keywords:

Cultural festivals  
 Cultural festival tourism  
 Ecological niche  
 Sustainability  
 Analytic hierarchy process (AHP)  
 Lantern festival

## ABSTRACT

Cultural festivals symbolize cultural identities and serve as a carrier of national emotions. Evaluating the sustainability of cultural festivals tourism has long presented challenges for festival organizers and attendees. Based on the ecological niche theory, this paper presents a theoretical framework including the environment, resources, demands, and spatiotemporal niches to establish an evaluation system to analyze the sustainability of cultural festival tourism. Using an analytic hierarchy process, the sustainability of the Lantern Festival in 34 regions of China was empirically assessed. Results indicate that the environmental niche has the greatest impact on the sustainability of cultural festival tourism, and local government support plays a key role in sustainable festival development. Theoretical and practical implications are discussed based on the results.

## 1. Introduction

As a form of national collective memory, cultural festivals occur at a specific time and host various activities reflecting cultural ‘traditions’ (Lin & Zhu, 2017). These festivals highlight cultural inheritance, offering visitors a unique experience by reinforcing national identity and encouraging social harmony (Huang, 2017; Kato, 2007). Cultural festivals are usually held in particular regions and times, confirming the public’s recall of their regional or national cultural identity (Chen, 2018; Lin & Zhu, 2017) and ancestral roots (Huang, 2017; Lin & Zhu, 2017). Cultural festivals also provide a gateway for interaction between traditional and modern cultures (Huang, 2017; Kong, 2012), where visitors are able to revitalize and appreciate a tourism destination’s culture through festival celebrations (Chew & Tong, 2007; Li, 2015; Choi, Imon, & Couto, 2020).

Cultural exchanges and national integration have become more popular in the context of globalization. Scholars raised concerns about cultural festivals imitating one another, which may diminish a destination’s traditional cultural identity (Li, 2015). Another major influence on traditional cultural festivals comes from the modernization in the form of economic development and increasing international travel (Moriuchi & Basil, 2019). To protect traditional cultural festivals, extensive effort has been devoted to the value-added features and

sustainability of festivals (Huang, 2017). Marketing messages have emphasized traditional festivals as a carrier of the ‘festival economy’ (Fleischer & Felsenstein, 2003; Getz, 2005), and business merchants have attached great importance to exploring the value of these cultural festivals (Huang, 2017). Cultural festivals have thus extended beyond entertainment to serve as a powerful tool to support national and cultural development (Suntikul, 2018). Scholars proposed that commercialization and touristification may increase the tourist inflow and popularize the festival; however, they have also raised the risks of losing authenticity (Chew, 2009; Donlon, Donlon, & Agrusa, 2010). Given the effects of globalization and commercialization, the inheritance and sustainable development of cultural festivals is an urgent matter to be examined. The sustainability of cultural festivals in particular warrants further study (Ko, 2005; Liu, Lin, Wang, & Chen, 2019).

In China, the Lantern Festival is a primary traditional festival that exemplifies the Chinese identity and reinforces family ties, as an important means to inherit and maintain cultural vitality amidst shifting time and social structures (Li, 2015). The longevity of the Lantern Festival suggests a strong social foundation and inheritance ability, which is typical in China’s large-scale cultural festivals. Representing a folk tradition reflective of national public life, it hosts unique rituals and group participation along with entertainment, universality, and family functions. Yet the meaning of common Chinese cultural notions

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Received 22 September 2020; Received in revised form 16 June 2021; Accepted 16 June 2021

Available online 24 June 2021

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embodied in traditional festivals is waning as younger generations increasingly embrace other cultures (Farsani, Coelho, & Costa, 2012). Therefore, academia has called for more discussions on the importance of cultures festivals and their preservation and sustainability (Soini & Birkeland, 2014).

Accordingly, this study aims to address three research objectives: first, a theoretical framework of the sustainability of cultural festivals is constructed from an ecological niche perspective; second, a system of evaluation indicators is proposed to assess cultural festivals' sustainability; and third, the sustainability of the Chinese Lantern Festival in 34 regions of China is examined, and relevant spatial differences are explored. This study applies a cultural festival sustainability evaluation framework generated from the ecological niche theory, so as to expand the theory's application and develop an empirical cultural festival sustainability evaluation index. This study extends the understanding of sustainability of cultural festivals and its constituent elements; the results reveal the influencing factors on cultural festivals' sustainability along with aspects to be improved in practice.

## 2. Literature review

### 2.1. Cultural sustainability

Sustainability has been deemed an essential precondition for protecting our shared future (Pronk, 2015); however, its definition varies across disciplines (Tsang & Siu, 2016). Sustainable development broadly refers to the development that meets current needs without compromising those of future generations (World Commission on Culture and Development [WCED], 1987). Sustainable development is often depicted as having three pillars: economic, environmental, and social aspects (Hansmann, Mieg, & Frischknecht, 2012; Stylianou-Lambert, Boukas, & Christodoulou-Yerali, 2014). However, the concept of cultural sustainability remains relatively new and has not yet been considered within sustainability discourse (Murphy, 2012); more scholarly attention is needed regarding the recovery and protection of cultural identities (Farsani et al., 2012; Sunkul, 2018).

Nassauer (2004) proposed a general perspective on cultural sustainability, positing that the concept consists of cultural values and behaviors that support ecology. Kong (2012) defined cultural sustainability as cultural workers' ongoing ability to engage in their work and the preservation of conditions conducive to that work. Soini and Birkeland (2014) found that cultural sustainability can be organized in seven storylines: heritage (Farsani et al., 2012; Thimm, 2019), vitality (Soini & Birkeland, 2014), economic viability (Farsani et al., 2012; Soini & Birkeland, 2014), diversity (Soini & Birkeland, 2014), locality (Elbakidze, Angelstam, Sandströ), eco-cultural resilience (Van Mansvelt, 1997; Soini & Birkeland, 2014; Thimm, 2019), and eco-cultural civilization (Beddoe et al., 2009; Soini & Birkeland, 2014). These storylines of cultural sustainable development are comprised by sustainable economic, social, environmental and cultural vitality (Stylianou-Lambert et al., 2014). Throsby (2017) reported that cultural sustainability incorporates six principles: material and non-material well-being, intra-generational equity, maintenance of diversity, precautionary principles, maintenance of cultural systems, and recognition of independence. However, cultural sustainability is still regarded as an emerging concept that must be specified to better promote social, economic, and ecological sustainability (Soini & Birkeland, 2014; Thimm, 2019; Tsang & Siu, 2016).

### 2.2. Cultural festival tourism and sustainability

Festivals are typical of cultural tourism activities (Getz, 2005) that enrich visitors' experiences and enhance the tourism products content of destinations. To ensure sustainable festival development, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) created the Intangible Cultural Heritage (ICH) (Liu et al., 2019). ICH has

since tied to festival sustainability in two regards, the first of which is the ecocentric perspective; this viewpoint emphasizes continuous development that does not exert detrimental effects on the natural environment (Zifkos, 2015). Scholars explored the notion of sustainability by addressing drivers behind and constraints to achieving 'green' (i.e., eco-friendly) festival performance (Mair & Laing, 2012; Zifkos, 2015). Sustainable festivals educate participants about sustainable behavior, integrate "green" concept in their core values, and promote environmental responsibility and sustainability (Zifkos, 2015). The second emerging focus in festival-related literature about sustainability is a festival's ability to be 'sustained' (i.e., to help an organization survive or endure) (Stephenson, 2018). Researchers examined perceptions of festival sustainability and noted that most festival leaders interpreted sustainability as a festival's ability to survive instead of considering environmental concerns (Ensor, Robertson, & Ali-Knight, 2011; Zifkos, 2015). Further, Picard and Robinson (2006) defined sustainability as a festival's ability to ensure survival by pooling resources, such as finances. Lee and Groves (2013) suggested that a festival's sustainability involves factors conducive to creating productive, long-term relationships between tourists and a given event, which can potentially contribute to the viability of a festival over time (Zifkos, 2015).

## 3. Theoretical framework of sustainability of cultural festivals

The term 'cultural sustainability' has been evolving and must be framed more clearly to promote concrete evaluation (Stylianou-Lambert et al., 2014). Scholars have applied cultural ecological theory to ICH protection and studied the feasibility of cultural festival protection from a cultural ecosystem perspective (Ying, 2009). However, such studies have largely ignored the cultural ecological theory emphasizing protection of cultural ecological space. In modern society, each festival has its own spatial and functional locations along with interrelationships among relevant ecological niche factors (Xu, 2013), similar to species in an ecosystem. Thus, ecological niche theory is an appropriate framework with which to assess cultural festival sustainability.

Ecologist Joseph Grinnell (1917) proposed the concept of ecological niches, in which each species has a unique niche that distinguishes it from others (Grinnell, 1917). Hutchinson (1957) designed a measure for ecological niches and facilitated its broader application. Ecological niches comprise an important concept related to the environment in which an organism is located, focusing on long-term competition and resource use (Xu, 2013). Ecological niche theory has been widely applied in social science research, including tourism ecosystem optimization (Sun & Liu, 2018). This current study explores the ecological niches of the cultural festival to provide insight into culture protection and sustainable development of cultural festivals.

Applying the ecological niche theory, cultural festivals with similar functions in the same space represent a festival ecosystem and interact within a living environment (i.e., a shared ecosystem) (Jiang, 2005). Similar to a biological community, cultural festivals in a given region is interconnected and mutually constrained; each festival assumes a particular ecological position, and it competes and cooperates with other festivals to comprise a symbiotic and coexisting ecosystem (Jiang, 2005). Festival ecological niche refers to the relative positions and roles of the festival when interacting with the environment in the festival ecosystem. Festival ecological niche reflects the biological niche theory, characterized by spatiality and functionality, and operates dynamically as the ecosystem evolves (Xu, 2013). Festival ecological niche can be deconstructed into resource niche, environmental niche, demand niche, and spatiotemporal niche (Fig. 1). These elements cover the ontological conditions and external relationships that determine the survival and development of cultural festivals in a cultural ecosystem. These elements also coexist to form a relatively stable and closed network system.

The resource niche is the most fundamental factor in sustainable festival tourism development, reflecting the resources (i.e., resource development and use) of festivals. Locals tend to have an abundance of

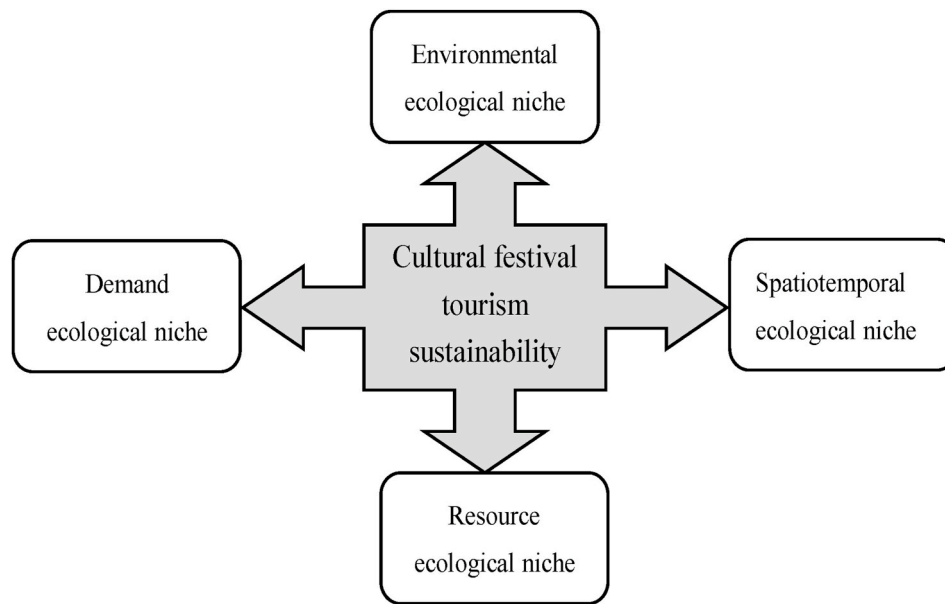


Fig. 1. Theoretical framework of sustainability of cultural festival.

available resources to supplement the characteristics and connotations of a festival (Soini & Birkeland, 2014). The extent of resource development and use is also influenced by festival sustainability (Liu et al., 2019). When festivals have limited resources, the width of the ecological niche can be extended through resource integration and other expansion methods (Soini & Birkeland, 2014).

The environmental niche refers to the external development conditions of festivals, such as the geographical environment, policy environment, and information technology (Stylianou-Lambert et al., 2014; Thimm, 2019; Throsby, 2017). Many cultural festivals take place in remote areas; as such, the geographical environment should be improved. Information technology is similarly crucial to festival preservation, development, and promotion. Digital and new media along with other technologies can greatly enhance the added value of the festival industry, including its communication ability. Furthermore, because festival protection and inheritance involve public welfare, relevant policies related to environmental ecological niche factors can shape festival development. Policy support and fund investment are additional external driving factors behind sustainable festival development.

The demand niche reflects the needs of a festival's visitors and inheritors. Visitors' demands include the use value, experience value, and service demand associated with a product or service, which reflects the demand capacity and popularity of a given market (Thimm, 2019; Throsby, 2017). Inheritors' demands include spiritual and material needs, such as identity recognition, social status, humanistic care, basic income security, and social welfare (Liu et al., 2019). The demand ecological niche strongly guides festival innovation and development (Swanson & DeVereaux, 2017).

The spatiotemporal niche refers to the specific time and performance space in which festival activities are presented (Stylianou-Lambert et al., 2014). This niche encompasses the cultural space necessary for the expression of traditional culture. Festival activities have distinct spatiotemporal requirements (Liu et al., 2019); for example, the Lantern Festival must occur at certain times and places. These constraints can restrict the spread and development of cultural festivals to a certain extent. It is, therefore, imperative to effectively balance time and space restrictions.

Based on the literature, an evaluation index for cultural festivals' sustainability is constructed. The criterion layer includes four dimensions: the environment, resources, demand, and spatiotemporal

ecological niches; and the indicator layer contains 19 factors (Table 1).

## 4. Method

### 4.1. Analytic hierarchy process (AHP)

The analytic hierarchy process (AHP) was used to identify the multiple criteria and assign different weights on these criteria (Hsu, Tsai, & Wu, 2009; Saaty, 1980). In this study, AHP was employed to assess the sustainability of the Lantern Festival. The main AHP include five steps (Cheng, Su, & Tan, 2013; Ma, Li, & Chan, 2018). First, a hierarchy is constructed by identifying the criteria and indicators in the evaluation index. Second, pairwise comparisons are used to capture the experts' (i.e., decision makers') priorities and determine the relative importance of indicators in each layer (Ma et al., 2018; Park & Yoon, 2011). The experts are expected to possess thorough knowledge of these indicators as well as sound judgment (Hsu et al., 2009). This step involves qualitative and quantitative considerations (Cheng et al., 2013). Third, judgment matrices are created, and consistency tests are performed. Fourth, the relative weights of indicators in the criteria and indicator layers are calculated. Finally, the scoring factors at each indicator level are determined.

### 4.2. Survey development and data collection

The data collection was performed in two stages (Ma et al., 2018). In Stage 1, AHP was used to weight items in the evaluation index. Twenty experts' opinions were solicited to judge the weights of evaluation items, including five Lantern Festival professors, three ICH inheritors, five festival researchers, two folk experts, and five visitors who had attended various Chinese traditional festivals. First, experts were asked to evaluate the relative significance of the criteria on a scale from 1 to 9 (Saaty, 1980), enabling construction of a judgment matrix. Second, the maximum eigenvalue of the judgment matrix was calculated; the eigenvector of the largest eigenvalue denoted the evaluation weight vector A (Ma et al., 2018). Next, a consistency test was performed to reduce the subjectivity of judgment and ensure rational weights (Ma et al., 2018). When the consistency ratio was below 0.1, the consistency of the judgment matrix was deemed reasonable (Ma et al., 2018; Saaty, 1980); otherwise, the matrix was adjusted until the consistency was satisfactory (Ma et al., 2018).

**Table 1**  
Evaluation index system of cultural festivals' sustainability.

B. Criterion layer	C. Indicator layer	Implication	Selected references
B <sub>1</sub> Environmental ecological niche	C <sub>11</sub> Impact of social transformation	Festival inheritance from traditional to modern society due to production and lifestyle changes	Xu, 2013; Throsby, 2017; Suntikul, 2018;
	C <sub>12</sub> Local basic environment	The economic development, cultural atmosphere, and education level in a region	Sun & Liu, 2018; Xu, 2013; Throsby, 2017; Suntikul, 2018;
	C <sub>13</sub> Raising reputation	Government agencies to raise the local fame of festival cultural activities	Throsby, 2017; Liu et al., 2019;
	C <sub>14</sub> Scientific and technological development	Effects of changes in science and technology on festival activities, especially in traditional festivals	Sun & Liu, 2018; Xu, 2013; Throsby, 2017;
	C <sub>15</sub> Local government support	Local government's protection of cultural festival activities and the level of capital investment	Sun & Liu, 2018; Throsby, 2017; Soini & Birkeland, 2014; Liu et al., 2019;
B <sub>2</sub> Resource ecological niche	C <sub>21</sub> Cultural connotation preservation status	Degree of preservation and variation in original cultural value connotations symbolized by cultural festival activities	Lee & Groves, 2013; Sun & Liu, 2018; Xu, 2013;
	C <sub>22</sub> Promotional challenges	In the communication and promotion process, the degree of difficulty promoting the festival to a larger platform and a wider population through multiple channels	Thimm, 2019; Liu et al., 2019;
	C <sub>23</sub> Suitability of development and utilization	The suitability of development and use is related to inheritance	Sun & Liu, 2018; Soini & Birkeland, 2014;
	C <sub>24</sub> Ability for survival and innovation	Adaptability to changes in external environment and market demand; vitality maintained in inheritance and development	Tsang & Siu, 2016; UNESCO, 2005; Throsby, 2017; Soini & Birkeland, 2014; Kong, 2010;
	C <sub>25</sub> Enhancing cultural confidence	Government agencies guide local residents to protect festival activities and enhance cultural confidence	Liu et al., 2019;
	C <sub>26</sub> Inheritors' succession status	Balance in the number of people from different age groups in event activities (e.g., gaps between the elderly and the young and middle-aged)	Stylianou-Lambert et al., 2014; Thimm, 2019; Stylianou-Lambert et al., 2014;

**Table 1 (continued)**

B. Criterion layer	C. Indicator layer	Implication	Selected references
B <sub>3</sub> Demand ecological niche	C <sub>31</sub> Inheritors' social prestige	influences festival inheritance	Sun & Liu, 2018; Thimm, 2019;
		Inheritor's social prestige, respect, and recognition of featured folk performances and customs in local society while inheriting festival activities	
		Inheritors' cultural mentality	
	C <sub>33</sub> Inheritors' living standards	Inheritors' economic strength and living standards while inheriting unrelated activities	Sun & Liu, 2018; Thimm, 2019;
		C <sub>34</sub> Visitor structure and consumption	Composition of the audience or visitors of the event; visitors participate in local festivals consumption
B <sub>4</sub> Spatiotemporal ecological niche	C <sub>35</sub> Resident's awareness of protection	The residents awareness of the value of festival activities, cultural pride, protection awareness, spontaneous attention, and publicity, especially willingness to preserve local traditional culture	UNESCO, 2015; Thimm, 2019;
		C <sub>41</sub> Time of festival celebration	Festival is held at a specific time by families, clans, communities, and/or regions
	C <sub>42</sub> Spatiotemporal of festival preservation status	Cultural space (e. g., social customs, activities/celebration places, or performance spaces) on which event activities are based; event activities are held in specific places	Sun & Liu, 2018; Xu, 2013; Thimm, 2019; Soini & Birkeland, 2014; Liu et al., 2019;
C <sub>43</sub> Festival's scope of influence	Extent of popularity and range of influence of intergenerational activities	Thimm, 2019; Liu et al., 2019;	

In Stage 2, to assess the sustainable inheritance status of the Lantern Festival, the revised evaluation index system for cultural festival sustainability was transformed into a survey. The 19 items of social, cultural, political, and economic dimensions of cultural festival tourism sustainability were included in the survey (Table 1). Items were scored on a 5-point Likert-type scale (strongly agree, somewhat agree, neutral, somewhat disagree, strongly disagree). The survey was then distributed by a team of well-trained research associates to all 34 regions in China to

investigate the cultural sustainability of their local Lantern Festival. Snowball sampling was used to recruit tourism department/bureau administrators and employees, folk experts/scholars, ICH inheritors, and festival organizers/practitioners as the survey participants. In addition, convenience sampling was used to select participants who previously attended the Lantern Festival based on each research associate’s specific locations in the 34 regions.

A total of 5146 questionnaires were distributed, 5016 of which were collected with valid responses (effective response rate: 97.47%). An average of over 100 questionnaires were collected from each region from September 2016 to July 2018 and May to July 2020 (Table 6). As the inheritance process of the Lantern Festival in the 34 regions of China is dynamic, traditional Lantern Festival culture has persisted in some regions but not in others. The questionnaire aimed to analyze the status and characteristics of Lantern Festival sustainability in each region.

## 5. Results

### 5.1. wt associated with sustainability evaluation indices for cultural festivals

Firstly, this research built judgment matrices and examined consistency tests. To quantify the weights of the cultural festival sustainability evaluation indices, a judgment matrix was constructed using the 1–9 scale method according to the hierarchy and quantity of indices (Cheng et al., 2013). Comparing indicators within a given layer with those in an upper layer (Table 1) yielded a judgment matrix. Ultimately, six judgment matrices were constructed: one matrix for the criterion layer against the target layer, one matrix for indicator layers against the target layer, and four matrices for indicator layers against the criterion layer (Ma et al., 2018) (Table 2). The general forms of judgment matrices and scale value meanings of 1–9 appear in Tables 2 and 3, respectively. Expert scoring was then used to assign values to judgment matrices, resulting in a matrix for the criterion layer against the target layer and a matrix for the indicator layers against the criterion layer (Ma et al., 2018).

The importance of each weighted factor was largely determined by comparing evaluation indices of the cultural festival (Ma et al., 2018); judgment in consistencies may result in error. It was therefore necessary to test the consistency of judgment matrices for the evaluation index in the indicator layer (C) and the criterion layer (B) (Ma et al., 2018). Data were input into mceAHP software (yaahp) to (a) construct the model and obtain the weight of each index in the matrix and (b) determine whether the matrix was consistent (Cheng et al., 2013). All matrices were found to be consistent.

Secondly, indicator weights by layer were calculated. Once the judgment matrices passed consistency tests, a matrix-calculation formula was used to calculate the weight of each indicator in the matrix (Ma et al., 2018). Of the 20 questionnaire copies distributed to experts, 16 were returned (response rate: 80%). Because small errors could manifest in experts’ pair wise comparisons, a minimum change algorithm was adopted to minimize the judgment matrix consistency ratio and matrix modification. Finally, factor weights were obtained. mceAHP was again used to process the data and determine index weights as listed in Table 4.

**Table 2**  
Forms of judgment matrices.

A <sub>k</sub>	B <sub>1</sub>	B <sub>2</sub>	B <sub>j</sub>	B <sub>n</sub>
B <sub>1</sub>	b <sub>11</sub>	b <sub>12</sub>	...	b <sub>1n</sub>
B <sub>2</sub>	b <sub>21</sub>	...	b <sub>2j</sub>	b <sub>2n</sub>
B <sub>i</sub>	...	b <sub>i2</sub>	b <sub>ij</sub>	...
B <sub>n</sub>	b <sub>n1</sub>	b <sub>n2</sub>	b <sub>nj</sub>	b <sub>nn</sub>

**Table 3**  
Scale value definitions.

Scale value	Definition	Scale value	Definition
1	Two indicators are of equal importance		
3	B <sub>1</sub> is moderately more important than B <sub>2</sub>	1/3	B <sub>1</sub> is moderately less important than B <sub>2</sub>
5	B <sub>1</sub> is strongly more important than B <sub>2</sub>	1/5	B <sub>1</sub> is significantly less important than B <sub>2</sub>
7	B <sub>1</sub> is very strongly more important than B <sub>2</sub>	1/7	B <sub>1</sub> is very significantly less important than B <sub>2</sub>
9	B <sub>1</sub> is extremely more important than B <sub>2</sub>	1/9	B <sub>1</sub> is extremely less important than B <sub>2</sub>
2,4,6,8	Intermediate values of the above adjacent judgments	1/2, 1/4, 1/6,1/8	Intermediate values of the above adjacent judgments

### 5.2. Analysis of sustainability evaluation index weights for cultural festival tourism

Based on the weights of criteria layers, the environmental ecological niche exerted the greatest impact on the sustainability of cultural festivals: the weight of this niche reached 0.3194, indicating that such festivals had significant effects on social, institutional, technological, and other social environmental factors, and government agencies’

**Table 4**  
Results of evaluation index weights for criterion and indicator layers.

B. Criterion layer	Weight	C. Indicator layer	Individual weights	Overall Weights
B <sub>1</sub> Environmental ecological niche	0.3194	C <sub>11</sub> Impact of social transformation	0.1349	0.0240
		C <sub>12</sub> Local basic environment	0.2057	0.0268
		C <sub>13</sub> Raising reputation	0.1112	0.0352
		C <sub>14</sub> Scientific and technological development	0.2642	0.0530
		C <sub>15</sub> Local government support	0.2840	0.1101
B <sub>2</sub> Resource ecological niche	0.1372	C <sub>21</sub> Cultural connotation preservation status	0.2607	0.0840
		C <sub>22</sub> Promotional challenges	0.1094	0.0420
		C <sub>23</sub> Suitability of development and utilization	0.2416	0.0672
		C <sub>24</sub> Ability for survival and innovation	0.1796	0.0621
		C <sub>25</sub> Enhancing cultural confidence	0.0634	0.0214
B <sub>3</sub> Demand ecological niche	0.2443	C <sub>26</sub> Inheritors’ succession status	0.1453	0.0462
		C <sub>31</sub> Inheritors’ social prestige	0.2082	0.0390
		C <sub>32</sub> Promoting pro-environmental practices	0.1204	0.0150
		C <sub>33</sub> Inheritors’ living standards	0.2318	0.0347
		C <sub>34</sub> Visitor structure and consumption	0.1828	0.0280
B <sub>4</sub> Spatiotemporal ecological niche	0.2992	C <sub>35</sub> Residents awareness of protection	0.2568	0.0703
		C <sub>41</sub> Time of festival celebration	0.3844	0.0880
		C <sub>42</sub> Spatiotemporal of festival preservation status	0.3424	0.0784
		C <sub>43</sub> Festival’s scope of influence	0.2732	0.0745

support was essential. The resource ecological niche had a weight of 0.1372, framing it as an important contributor to cultural festivals' sustainable development. Resources play an undeniable role in the inheritance process; resource retention, conditions for development and use, inheritors' status, and the vitality of cultural survival are similarly important carriers for the inheritance and sustainable development of festival activities.

The weight of the demand ecological niche was 0.2443, indicating that inheritors' status and publics' protection awareness were essential. A strong overall inheritance environment, inheritance carrier, and space are needed for an intangible and sensitive festival. The weight of the spatiotemporal ecological niche was 0.2992, representing a significant role in cultural festival sustainability. This effect may be partially due to activities being held at specific times and places, marking a fundamental difference between other festival activities. Festival activities can gradually change over time, but the unique nature of such activities is difficult to alter or imitate.

Regarding the weight distribution of the indicator layer, the top six evaluation indicators were local government support (0.1101), time of festivals celebration (0.088), cultural connotation preservation status (0.084), spatiotemporal of festival preservation status (0.0784), festival's scope of influence (0.0745), and residents protection awareness (0.0703). The sum of these weights was 0.5053, indicating that these factors play key roles in the sustainable development of cultural festivals.

Among criteria layers, the specific weight value of each indicator was particularly informative. In the environmental ecological niche, the weight of local government support was significantly higher than that of other indicators. In the ecological demand niche, the means of inheritors' social prestige demonstrated the largest weights. Inheritors' social prestige appeared to largely determine festival inheritance trends in events marked by vitality. The question of how to transmit festivals and relevant customs should not be overlooked, and inheritors' status is equally important.

In the resource ecological niche, cultural connotation preservation status demonstrated the largest weight (0.2607), indicating its influence on festival inheritance development and trends. The suitability of development and utilization warrants urgent consideration in light of ICH inheritance in festivals; suitable festival development and utilization will influence festival inheritance development and trends to some extent. In the spatiotemporal ecological niche, time of festival celebration, the state of preservation of cultural festivals and festival's scope of influence are three important aspects. Festivals are held at a specific time by families, clans, communities, or regions, which display the authenticity of traditional cultural festivals. Festival's scope of influence demonstrated a weight of 0.2732; it appeared to largely determine the festival inheritance trends in events marked by vitality. Therefore, how to transmit festivals and relevant customs is a key issue to be considered.

### 5.3. Analysis of Lantern Festival sustainability

#### 5.3.1. Building an evaluation model

Each evaluation index in the evaluation system reflects its influence on festival sustainability from different aspects. It is thus necessary to calculate each evaluator's ratings of each index regarding Lantern Festival sustainability. To more easily compare indicator weights, evaluators scored index items on a 5-point scale (agree, somewhat agree, neutral, somewhat disagree, disagree). Each evaluation index in the questionnaire was assigned a score of 10, 8, 6, 4, and 2, respectively. Questionnaire data were then converted into corresponding scores and multiplied by weight values to obtain a total evaluation per sample region as follows:

$$F = \sum_{i=1}^n Q_i P_i (i = 1, 2, 3, \dots)$$

$$E = \sum_{j=1}^4 W_j F_j$$

where  $F$  is the score of each dimension;  $E$  is the cumulative score of Lantern Festival sustainability;  $Q_i$  is the individual weight value of the  $i$  evaluation index;  $P_i$  is the mean score of the  $i$  evaluation index;  $W_j$  is the weight value of each criterion dimension;  $F_j$  is the score of the  $j$  criterion dimension; and  $n$  is the number of evaluation indicators.

The higher the cumulative score, the better the Lantern Festival's inheritance status and protection; a lower score indicates lower sustainability in a given region, which corresponds to a higher risk level and thus warrants attention.

#### 5.3.2. Evaluation criteria for regional Lantern Festival sustainability

According to the evaluation results of Lantern Festival sustainability in 34 Chinese regions, the festival status spanned five levels: energetic, vigorous, neutral, at risk, and endangered (Table 5). This standard was used to judge Lantern Festival sustainability.

#### 5.3.3. Analysis of Lantern Festival sustainability in China

Based on questionnaire data and evaluations, cumulative evaluation scores of the Lantern Festival's sustainability status in 34 regions of China and of the four criterion layers are shown in Table 6. The spatial distribution of festival sustainability characteristics is analyzed below.

Cumulative scores of the Lantern Festival's sustainability in 34 regions were largely ranged between 70 and 80. The highest value appeared in Jiangsu (80.2089); Hong Kong scored the lowest (61.4140). Inheritance and protection of the Lantern Festival thus seem to have a certain foundation. Lantern Festival sustainability also differed among the 34 regions. The overall sustainability of Jiangsu, Zhejiang, and Beijing accorded with an 'energetic' status; the remaining regions fell into the second level "vigorous".

Based on the spatial differences in the ecological niche in social aspect, Lantern Festival sustainability in all regions was either energetic or vigorous. Zhejiang, Hunan, Jiangsu, Beijing, and Fujian were energetic, whereas Hong Kong displayed the lowest result. The spatial distribution of the demand ecological niche was relatively scattered. Lantern Festival inheritance was at greatest risk in Hong Kong, Anhui, and Shanxi. The other regions were deemed vigorous. Guizhou scored highest within the spatial differentiation resource ecological niche, demonstrating an energetic status. Other energetic regions included Sichuan, Zhejiang, Beijing, and Hunan; others were in a state of vitality. Within the spatiotemporal ecological niche, Jiangsu, Zhejiang, Beijing, Shandong, Hunan, Shanghai, Taiwan, and Tibet exhibited an energetic state, whereas the others were vigorous.

## 6. Conclusion and discussion

Cultural festivals are major carriers of national emotions and convey local cultural identity. Social and technological progress has greatly shaped the cultural connotations and display of cultural festivals. Research on cultural festival sustainability has been challenging. Drawing from ecological niche theory, this paper puts forward a theoretical framework of cultural festivals' ecological niches, constructs an evaluation index to assess festival sustainability, and applies AHP to analyze the Lantern Festival in 34 regions of China.

**Table 5**  
Evaluation criteria for Lantern Festival sustainability.

Level	First level	Second level	Third level	Fourth level	Fifth level
Five-grade (E)	(80, 100]	(60, 80]	(40,60]	(20,40]	(0, 20]
Status	Energetic	Vigorous	Neutral	At risk	endangered

**Table 6**  
Sustainability status scores of Lantern Festival throughout China.

Regions (N)	Total ecological niche	Environmental ecological niche	Demand ecological niche	Resource ecological niche	Spatiotemporal ecological niche
Jiangsu (154)	80.2089	82.6399	73.8747	77.7551	83.8840
Zhejiang (176)	80.1840	84.5188	73.9611	80.4082	80.5080
Beijing (198)	80.0879	82.0097	72.7560	80.8746	83.6357
Shandong (136)	78.2919	78.7802	76.7700	73.9942	80.9579
Hunan (132)	77.9274	83.8723	64.3819	81.0204	81.1865
Shanghai (176)	77.7232	77.4483	73.7131	78.2216	81.0364
Taiwan (165)	77.0800	74.2708	75.6447	70.3535	84.3095
Fujian (199)	76.4242	80.5091	71.8502	70.4373	78.5180
Sichuan (151)	76.2453	71.3128	77.6013	83.6735	76.9719
Inner Mongolia (136)	76.1848	73.6143	79.3045	78.5714	75.2614
Guizhou (126)	75.6236	76.3716	75.3561	91.3265	67.8175
Yunnan (165)	74.3727	75.8926	68.5874	76.2682	76.5799
Tibet (104)	74.3209	71.9164	71.9443	66.8367	82.2353
Hebei (143)	74.2917	75.0235	72.0544	69.5758	77.4749
Liaoning (138)	74.2044	76.6938	67.6983	75.3061	76.3292
Ningxia (142)	74.0746	73.0535	75.3172	65.8506	77.8967
Jiangxi (138)	73.9899	72.0607	73.9689	78.5423	73.9542
Tianjing (143)	73.5948	71.3287	70.7540	73.4380	78.3807
Jilin (121)	73.5794	72.4928	76.0716	75.8163	71.6541
Qinghai (165)	73.0871	73.2699	70.2673	74.8105	74.3797
Hainan (154)	72.3275	71.9521	75.4589	71.1953	70.6664
Shaanxi (140)	72.2553	71.7636	70.0847	72.0991	74.6003
Gansu (126)	72.1169	70.1080	68.9251	79.3003	73.5491
Chongqing (121)	72.0604	75.8363	74.6971	69.3878	67.0782
Hubei (121)	72.0529	70.3770	73.0905	65.5102	75.9709
Guangdong (176)	71.7924	72.4862	70.3958	69.6210	73.1638
Guangxi (176)	71.6875	76.1700	70.4056	73.1195	67.2684
Heilongjiang (132)	71.0851	73.9152	71.7384	67.5219	69.1407
Henan (143)	70.6722	69.9778	68.9935	71.8054	72.2410
Xinjiang (121)	69.8433	65.6412	69.4781	75.4730	72.0227
Macau (123)	68.4140	72.9628	60.8241	70.0680	68.0084
Shanxi (166)	65.8368	69.1453	58.0045	77.3469	63.4001
Anhui (165)	63.0624	64.1462	59.7286	63.8192	64.1390
HongKong (144)	61.4140	61.4281	59.8813	65.5102	60.0084

6.1. Theoretical contributions

The theoretical contributions of this research are three-fold. First, scholars have mostly evaluated cultural sustainability based on the stakeholder theory (Liu et al., 2019; Throsby, 2017). The current study constructed a theoretical framework of the cultural festival niche from an ecological niche perspective. Key factors to evaluate the sustainability of cultural festivals include the environmental, resources, demand, and spatiotemporal aspects, following the order of its weight based on this study’s findings.

Prior studies reported the importance of government support in the sustainability of culture and tourism (Liu et al., 2019; Soini & Birkeland, 2014). This study advanced the existing literature by revealing that from the environment ecological niche, local government support is the most important indicator in evaluating the sustainability of cultural festivals. In addition, this study revealed that public’s awareness of the protection function of cultural festivals, which consists of cultural identity and cultural confidence, is essential (Sun & Liu, 2018; Suntikul, 2018; Throsby, 2017; Xu, 2013). The Lantern Festival reinforces local collective memory and identity through strong social attributes, thus cultural inheritance is the primary function of the Lantern Festival, which exemplifies national culture and promotes its inheritance.

In terms of resources ecological niche, this study revealed that the vitality of a cultural festival (e.g., cultural preservation, inheritance, and innovation) is the driving force for this festival’s sustainable development. A viable festival can presumably manage changes in the market and external environment, and is likely to present its own features and transform into a competitive cultural space (Thimm, 2019; Liu et al., 2019). Furthermore, this study identified the challenges in festival promotion as an essential factor which shapes the festival inheritance and development. In the case of limited resources, niche expansion methods, such as resource integration, should be adopted, so that the

festival has a richer resources ecological niche (Sun & Liu, 2018).

In the demands ecological niche, the study identified residents’ awareness of protection as the most important indicator, which is consistent with prior research findings (Thimm, 2019; UNESCO, 2015). Given the nature of intangible heritage festivals and rapid social change, folk performances and traditional skills in festivals are facing challenges to be communicated and have the risk to decline or even vanish entirely (Xu, 2013). This study advanced prior research by emphasizing cultural inheritors’ living standards and social prestige, as well as visitors’ structure and consumption, in cultural festivals’ sustainability.

Regarding the spatiotemporal aspect, this study reported that the time of festival celebration, the preservation status of cultural festivals and the festivals’ overall influence substantially determine the sustainability of cultural festivals. The state of cultural space indicates the place, space, and performance/activities that cultural connotations convey to the public, which collectively constitute the theme of a festival and its popularity amidst social changes in the aforementioned characteristics (Thimm, 2019; Liu et al., 2019). Therefore, time and space may restrict sustainable development of cultural festivals and should be carefully considered (Sun & Liu, 2018).

Second, this study reveals innovative factors influencing the sustainability of cultural festivals. Resource vitality was identified as prominent in maintaining the sustainability of the festival ecosystem. In addition, based on the evaluation results of the Lantern Festival in 34 regions of China, Guizhou scored the highest in the resource niche due to its abundant cultural festival resources. Protection and inheritance of cultural festival resources are pivotal to realizing sustainable festival development (Lee & Groves, 2013; Sun & Liu, 2018; Xu, 2013).

Cultural festivals have profound cultural connotations in terms of the function and social values (Chen, 2018; Stylianou-Lambert et al., 2014). The periodic nature of the Lantern Festival conveys gratitude and love to visitors’ family and friends by inheriting the Chinese cultural tradition

of “respecting the old and cherishing the young”, through which a unique attachment and dependence on kinship is cultivated (Han, 2015). Lantern Festival rituals such as visiting relatives, offering one another gifts, and worshipping ancestors enable people to connect with society and develop social harmony (Han, 2010, 2015). Moreover, by displaying unique cultural expressions, the Lantern Festival enhances a broader sense of national identity (Han, 2010). The function of these festivals for ethnic identity is therefore readily apparent (Chen, 2018).

Third, this study extends understanding of the characteristics of cultural festivals. Earlier research mainly focused on the cultural significance and local identity of these festivals (Chen, 2018; Lin & Zhu, 2017). This study extended such work by incorporating spatial differences into festival protection and inheritance. Taking the traditional Chinese Lantern Festival as an example, spatial differences in the festival’s sustainability in 34 regions were evaluated. Although the sustainability appeared energetic and vigorous across regions, many differences emerged among the environmental, resource, demand, and spatiotemporal niches. For example, the sustainability of the Lantern Festival in Hong Kong was found to be weaker than in other regions, posing risks to inheritance. Public awareness of traditional festival culture protection should therefore be raised.

The sustainable development of cultural festivals involves maintaining a balanced and stable ecosystem. Meantime, each festival is also heavily shaped by its local context and resources. Cultural festival is thus regionally distinct, such that the visibility and development of these celebrations embody different inheritance models. Cultural festivals are representative of public life as each region has its own inheritance foundation; however, the sustainable development of cultural festivals includes several common elements. To ensure the sustainability of cultural festivals, this study explores common elements underpinning festival traditions.

## 6.2. Practical implications

Based on these findings, the following suggestions are proposed to better protect and inherit Chinese traditional festivals while maintaining local characteristics. First, localities should consider internal and external factors that affect sustainable festival development. The resource and spatiotemporal niches constitute internal factors that can be changed and are relatively fragile in the short-term, whereas the environmental and demand niches represent external influences. Several measures could be taken to enhance the vitality of festival events and achieve sustainable development. Specifically, attention should be paid to the number and age distribution of festival inheritors. The government should provide economic support to inheritors of festival culture, seek to guide the inheritance team’s development, and explore incentives for young apprentices. These strategies could help alter the unsustainable status of folk performances, protect and promote unique festival-related skills, and develop innovative models that can adapt to modern social and familial structures from the spontaneous inheritance of traditional apprenticeship and family inheritance.

Second, the government agencies should take support measures or designate relevant policies (e.g., the introduction of relevant protective policies, funding guarantees, protection models, and festival inheritors’ mechanisms) to guide the public to take initiative to establish cultural festival atmosphere and enhance cultural confidence. Festival celebrations should suit the needs of people and be shared by all. Therefore, the inheritance and protection of festival activities must be taken seriously throughout every social sector to enhance public awareness of related protection and participation. The government should offer financial support and incentives to festival patrons and organizers, encourage various approaches to cultural festival activities, publicize activities through numerous media channels, promote shared participation in festival protection, and create a cultural atmosphere of inheritance and protection. These methods could maximize the public’s role in festival protection and operate synergistically to facilitate cultural inheritance.

Third, regional governments should analyze market potential, increase cultural highlights, enrich the content of festival cultural products, and enhance visitor’s participation and sense of identity. The market is an invisible booster; only by assessing visitor needs and modifying celebrations accordingly can cultural festival activities enjoy enduring inheritance. Festival activities should be aimed at projecting cultural connotations, emphasizing regional characteristics, enhancing activity-related experiences for patrons of all ages, and engendering public participation. In-depth experiences would boost the public’s sense of festival inheritance and protection to bolster their sense of identity.

## 6.3. Limitations and future research

The theoretical framework of cultural festival tourism sustainability based on the ecological niche theory was constructed and the evaluation indices were mainly derived from prior research using a qualitative approach. In the future, first, the proposed measurement indices should be cross-validated in different cultural contexts in order to exam the generalization of the sustainability of cultural festivals. Moreover, the survey distribution in this study used the snowball and convenience sampling, which may not be representative of all Lantern Festivals despite the coverage of 34 regions in China. Subsequent studies should increase the sample size and obtain a more representative sample via different means to examine the robustness of this study.

## Acknowledgements

This study is funded by Huaqiao University’s Academic Project Supported by the Fundamental Research Funds for the Central Universities (21SKGC-QT03).

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