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Design Dilemma between Urban Tourism and Quality of Life: Assessment of Livability Barriers in Different Contexts

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Abstract: Urban tourism has been instrumental in the global economic revival, particularly following the easing of COVID-19 pandemic restrictions. However, tourism is not neutral with respect to local quality of life, and little attention is given to the specific barriers that tourism presents to urban livability. This study aims to fill this research gap by identifying the most significant barriers to livability in tourist cities using livability satisfaction as the measure of urban livability. Kuala Lumpur, Malaysia, and Guilin, China, two international tourist cities with different contexts, were used as the study areas. This study used a questionnaire survey with a combination of probability sampling and quota sampling to obtain valid data from 793 respondents, including tourists and locals, of whom 395 were from Kuala Lumpur and 398 were from Guilin. The collected data were analyzed using a dual-stage PLS-SEM–ANN approach. The results indicated that economic burden, government, tourism ecology, infrastructure, and environmental quality barriers significantly influence livability satisfaction, with economic burden and tourist ecology barriers emerging as paramount concerns in both cities. Important differences between the two cities were also observed. Kuala Lumpur is more strongly impacted by environmental quality barriers, while infrastructure barriers more severely impact Guilin. The findings revealed that government leadership, equitable distribution of tourism benefits, and context-sensitive policy adjustment procedures are critical to balancing tourism development with the enhancement of urban livability. This study contributes to the urban livability and tourism literature through empirical quantification of livability barriers within urban tourism contexts. The study findings provide certain implications for stakeholders involved in the development and maintenance of tourist cities.

Keywords: urban tourism; barriers; livability satisfaction; PLS-SEM; ANN

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1. Introduction

In the current era, marked as the 'urban century,' the rapid urbanization experienced worldwide posits urban livability at the forefront of sustainable urban planning discussions. As over half of the world's population now resides in urban areas, the challenges to maintaining and enhancing urban livability have intensified, especially against the backdrop of escalating urban tourism post-COVID-19 pandemic easing [1,2]. This shift, while contributing to the recovery of the economy, has raised pressing concerns about the sustainability of the urban living environment, with livability as a core component [3,4].

The tourism sector's growth, heralded as a key economic driver by numerous emerging and developing nations [5], underscores the coupling of urbanization and tourism. This nexus, while recognized for its economic dividends, begets barriers to urban livability, as the needs and interests of tourists sometimes overshadow those of locals, leading to adverse impacts on the local socioeconomic and environmental fabric [4,6]. These barriers are particularly evident in tourist cities, where the influx of tourists in large numbers can strain urban resources, infringe upon the living space of residents, and potentially compromise urban sustainability [7,8]. The resulting negative impacts have led to citizens being low-satisfied with the local livability [9]. An obvious example is illustrated by "Lisboa does not love", which aims to draw attention to aspects that make life difficult for the city's residents and make tourism no longer a desirable phenomenon. This situation has forced authorities to think more carefully about a sustainable development model for tourist cities. With the transformation of city functions from material production to human-oriented services supply, the explicit identification of the primary barriers to the livability of tourist cities is of great significance to the formulation or adjustment of sustainable development policies for tourist-centric cities [4,8].

The evaluation of urban livability encompasses both objective and subjective metrics, analyzed at various spatial scales [10,11]. Among these, the neighborhood scale is particularly emphasized in scholarly inquiries and is recognized as the most appropriate scale for urban development strategies [10]. The subjective appraisal of livability in tourist cities at this scale is conducted through the perceptions and experiences of both residents and visitors, notably through assessments of satisfaction [9,12,13]. Satisfaction reflects the overall happiness with one's living conditions and quality of life and is linked to the broader concept of human settlements, as demonstrated in pertinent literature [11,14,15], thereby serving as a valuable metric for gauging urban livability.

Research on the assessment of urban livability towards sustainable urban development through satisfaction has been developing rapidly. For instance, Mouratidis and Yiannakou [11] evaluated the living environment of Thessaloniki, Greece, through livability satisfaction, and noted that street design deficiencies such as tree cover could be potential barriers. Pang et al. [12] conducted a socio-spatial exploration of livability in Beijing, China, and pointed out that economic burden is a significant barrier to livability satisfaction and may lead to unsustainable urban development. Through an exploration survey in Dubai's urban area, Tournois [16] found that individual characteristics may affect satisfaction with urban livability. Nevertheless, a critical examination of the current body of literature reveals several gaps and limitations that require enhancement for the findings to be more applicable and generalized. First, many studies have highlighted barriers to urban livability without quantifying their impacts. The determination of how various barriers influence urban livability is crucial, enabling stakeholders to effectively strategize and allocate resources to mitigate the most significant impediments. Second, the perception of satisfaction with urban livability and its barriers may vary according to the local environment [11,17]; however, there is an evident gap in comparative studies across diverse contexts, particularly those with significant cultural, socio-spatial, and policy variances. Third, the majority of existing research on livability satisfaction has relied on a singular methodological approach, such as structural equation modeling (SEM). Despite SEM's utility, it might not fully encompass the intricacies of human perception and experience [18]. For instance, Kweon et al. [19] identified a positive correlation between tree coverage and satisfaction with urban livability, whereas Mouratidis and Yiannakou [11] suggested a negative correlation. Leong et al. [18] attribute such inconsistencies to the complex nature of cognitive and experiential processes, where the compensatory judgment rules of locals and visitors lead to changes in the priorities of influencing factors. Thus, a hybrid analytical approach should be employed that examines both linear and nonlinear relationships and ranks significant antecedents to reveal the most critical barriers to satisfaction with livability due to various factors.

Based on these identified gaps, this study aims to explore various barriers to urban livability and their impact on satisfaction with livability in tourist cities. Through an empirical survey examining two tourist cities from distinct cultural, spatial, and policy contexts (Kuala Lumpur, Malaysia, and Guilin, China), this study endeavors to quantify feedback from stakeholders, including locals and visitors, on barriers to urban livability, thereby contributing to the tourist-centric cities developing or calibrating policies towards sustainable development. The primary research questions of this paper include: (1) What are the key barriers to livability in tourist cities? (2) How do these barriers impact satisfaction with urban livability?

In addition, to address the limitations of the SEM, this study integrated the use of artificial neural network (ANN) analysis to complement the SEM findings, as ANN analysis is well suited to capturing nonlinear correlations between variables [18,20,21]. Thus, a dual-stage hybrid SEM and ANN approach was emphasized in this study, where the SEM technique was utilized to model the quantified correlation among the identified barriers to urban livability, while the ANN was used for the completion of an accurate comparison of the intensity effects of different barriers that could potentially affect satisfaction with urban livability.

The remainder of the paper is organized as follows: Section 2 introduces the theoretical background, identifies barriers, and builds the research model. Section 3 provides an overview of the study areas and analysis methods. Section 4 presents the results, followed by Section 5, which compares the differences and consistency of the results from both cities point by point based on previous studies. Finally, the study's theoretical and practical contributions, limitations, and future research are concluded.

2. Literature Review

2.1. Theoretical Background

The quest for sustainable human well-being is increasingly recognized as a paramount objective in human societal progression. Urban livability has emerged as a key metric within scholarly discourse [9,10]. Urban livability can be conceptualized as a city's capacity to furnish conditions conducive to residents thriving and having a high quality of life [22]. In urban planning literature, this capacity is further categorized into three operational areas: economic vitality, social stability, and environmental health, in response to the additional pressures on limited space, resources, and the environment caused by ongoing urban expansion and densification [4,13,23]. The term livability is nowadays broadly defined as "the sum of the factors that add up to the quality of life—including the built and natural environments, economic prosperity, social stability and equity, educational opportunity, and cultural, entertainment, and recreation possibilities" [23]. As such, improving urban livability not only fosters an environment conducive to human well-being but also directly supports broader objectives of sustainable urban development. Essentially, urban livability is an important parameter of sustainable urban development [4]. A well-planned and effectively managed city with citizens thriving has the potential to create significant value in economic, social, environmental, and other unquantifiable areas. Livable city construction is a vital manifestation of progress toward supporting sustainable urban development, resolving the conflicts between socioeconomic growth and ecological preservation [24].

Tourism, an integral component of urban functions, influences the living environment through its development, diversification of demand, and the resultant sustainable development capability [6,25]. The influx of people, information, and funds enhances the city's role as a hub for shopping, recreation, and culture [4]. Evidence indicates that tourism contributes positively to job creation, recreational opportunities expansion, cultural activities enhancement, natural parks development, and overall improvement in residents' life quality [1,4,9,25]. More importantly, tourism development can foster environmental awareness among local populations, contributing to the advancement of an urban ecological civilization harmoniously aligned with livability principles [5].

However, several studies show that the relationship between tourism development and urban livability follows an inverted U-shaped curve, indicating a threshold effect [4,5,25]. Excessive development of tourism easily leads to inefficiencies in city planning, chaotic land utilization, improper spatial organization, and unchecked financial allocations [8]. This progression may initiate a series of environmental and social challenges, thereby negatively impacting the city's habitability [9]. Balaban's research [26] in South Carolina illustrated that a substantial influx of tourists can trigger an overall increase in prices, thereby diminishing the living standards of the local population. Furthermore, Al Haija's findings [8] indicate that an overreliance on tourism as a primary economic pillar can detrimentally affect alternative sectors, such as manufacturing and agriculture, while simultaneously instigating a plethora of environmental issues. These include water pollution, traffic congestion, overpopulation, and administrative difficulties [4].

Satisfaction is a pivotal aspect in the subjective assessment of urban livability at the neighborhood scale [11]. Some studies have examined the factors that influence satisfaction with livability in the context of cities as tourist destinations. The research conducted by Mahanta and Borgohain in Guwahati, India [27], found that socioeconomic attributes significantly influence livability satisfaction. In China, Kang et al. [5] highlighted the natural environment and sociocultural environment as significant factors correlated with livability satisfaction. Lee's [28] investigation in Seoul, South Korea, demonstrated that enhanced urban environments, particularly accessibility, positively influence livability satisfaction. Additionally, Baig et al.'s [15] survey in Pakistan revealed that income level is pivotal in assessing satisfaction with urban livability.

Although existing literature has provided a preliminary theoretical basis for understanding the relationship between tourism development and satisfaction with urban livability within urban sustainability, it predominantly concentrates on the general impacts, with less attention given to specific barriers to urban livability. Furthermore, there is a lack of empirical research exploring the consistency and differences in these barriers, and comparative analyses of tourist destinations in different countries with different cultures and policies are even scarcer. Thus, conducting comparative analyses of the specific barriers affecting livability satisfaction in tourist cities from distinct contexts contributes to understanding how to combine the healthy development of urban tourism with the promotion of livable city construction.

2.2. Identifying Barriers and Research Models

A few empirical studies have unexpectedly found some factors that are negatively associated with satisfaction when exploring factors influencing urban tourism and urban livability, for example, Chen et al. [14] and Mouratidis and Yiannakou [11]. A review of these studies is necessary in order to identify potential barriers to satisfaction with livability in tourist cities. Consequently, this research adopted a systematic review approach for an extensive examination of the literature, in alignment with the guidelines set forth by Kitchenham et al. [29]. Keywords pertaining to urban livability and tourism satisfaction were merged with "barriers", "challenges" or "obstacles" through the application of the Boolean operator AND. The investigation utilized the Web of Science (WoS) database for data collection. Studies not pertinent to the subject matter were omitted, with the inclusion criteria limited to peer-reviewed articles published in English. This search strategy yielded a total of 333 publications.

Based on the review and coding, 30 barriers were extracted from the literature review and then categorized under different major potential barrier groups: economic burden, government, social justice, tourist ecology, infrastructure, environmental quality, and individual characteristics, as shown in Table 1. These potential barrier categories were developed based mainly on the studies by Pang et al. [12], Zhang et al. [30], Sultana and Asad [31], Pan et al. [32], Baig et al. [15], and Mouratidis and Yiannakou [11]. To better understand whether these barriers were appropriate for the tourist cities' contexts, three experts in the development of tourist cities were interviewed to meticulously evaluate the list of barriers. The objective of these discussions was to verify the comprehensive identification of any critical barriers affecting livability within tourist cities, ensuring no significant barriers were disregarded. The experts unanimously endorsed the compiled list of barriers, and no additional amendments were proposed.

Table 1. List of barriers.

Potential Barrier Categories	Code	Barrier	Key References
Economic burden	EB1	Burden of production expenditure	[12,33,34]
	EB2	Burden of living expenditure	[12,35]
	EB3	Burden of education expenditure	[12,36]
	EB4	Burden of medical expenditure	[12,36,37]
	EB5	Burden of housing expenditure	[10,12,38]
Government	G1	Lack of codes and regulations that cover livability	[15,30,36]
	G2	Insufficient promotion of characteristic culture	[39,40]
	G3	One-size-fits-all policies exist	[41,42]
Social justice	SJ1	Nepotism	[31,41]
	SJ2	Lack of democratic management	[5,39,41,43]
	SJ3	Poor healthcare quality	[31,44,45]
Tourist ecology	TE1	Social media rumors	[46–48]
	TE2	Traffic congestion	[8,32,34,49]
	TE3	Extensive water consumption	[32,40,49]
	TE4	Carbon emissions	[32,34,49]
	TE5	Impact on biodiversity and natural resources	[32,34,40]
	TE6	Waste generation	[32,34,40]
Infrastructure	I1	Lack of maintenance of infrastructure	[15,36,39]
	I2	Insufficient parking availability	[14,40]
	I3	Uneven distribution of urban lighting	[10,15]
Environmental quality	EQ1	Air pollution	[9,11,12,50]
	EQ2	Noise pollution	[9,11–13]
	EQ3	Flaws in street design	[10,39,51]
Satisfaction with urban livability	SUL1	Unhealthy consumption	[5,12,34]
	SUL2	Corruption	[31,41]
	SUL3	Limited pedestrian friendliness	[43,52]
	SUL4	Low sense of security	[10,11,31,40]
Individual Characteristics		Gender	[16,52,53]
		Age	[16,54]
		Education levels	[16,53,54]

This study focuses on the barriers to livability satisfaction in tourist cities and assesses the extent to which these barriers affect livability satisfaction by comparing tourist cities in different contexts, cultures, and policies, thereby contributing to the tourist cities developing or calibrating sustainable development policies. Previous studies and systematic literature reviews have shown that the main reasons hindering the livability of tourist cities are associated with economic burden [12], legislation [30], social justice issues [31], overtourism [32,40], urban infrastructure [15], and living environment [11]. Therefore, this study constructed a research model on barriers to livability satisfaction in tourist cities by identifying livability satisfaction as the dependent variable, individual characteristics as the control variable, and main potential barriers as the independent variables. Figure 1 shows the hypothesized relationships between these variables as well as their respective measurement items.

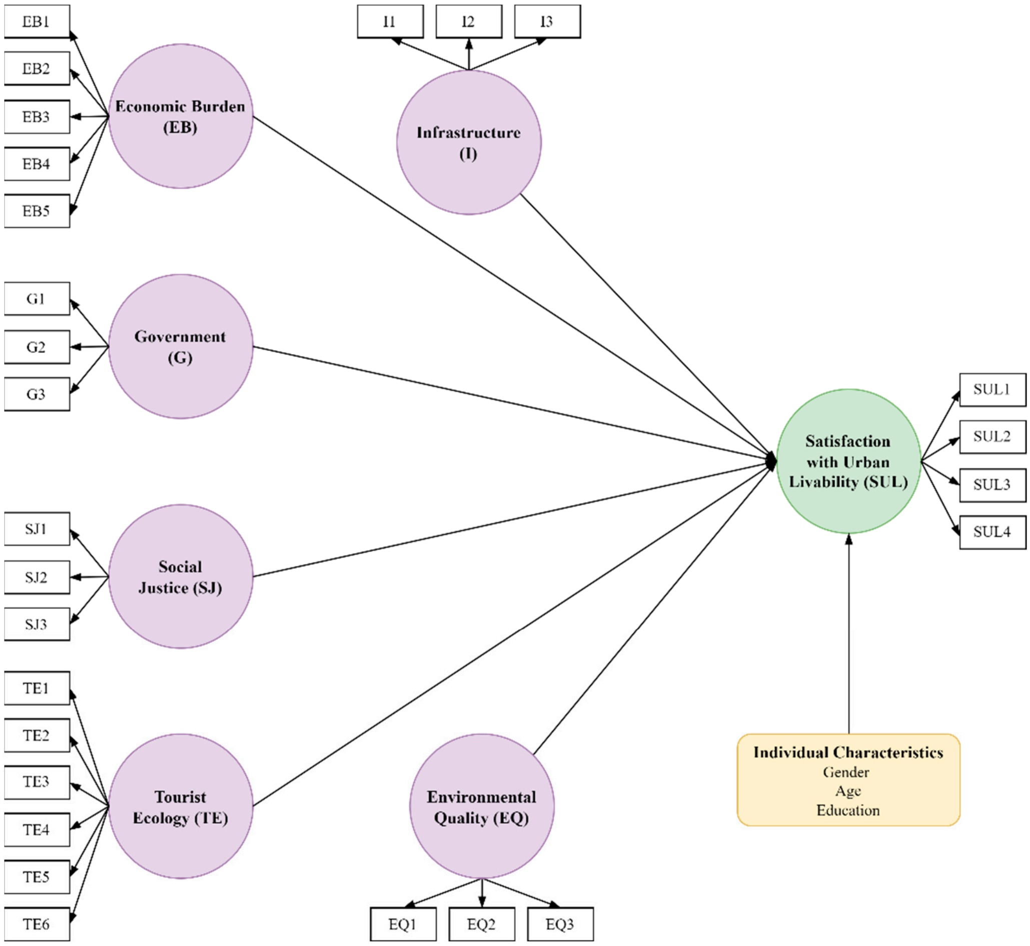

Figure 1. Hypothesized research model.

3. Materials and Methods

3.1. Study Areas

The focus of this study encompasses two distinct empirical locations: Kuala Lumpur, Malaysia, and Guilin, Guangxi, China (see Figure 2).

Kuala Lumpur, the vibrant capital city of Malaysia, spans an area of 243 km^2 and boasted a population of 2,163,000 in 2022. It is a religiously diverse city with tourism as one of its economic pillars. Kuala Lumpur's tourism sector has a blend of natural attractions, historical heritage, contemporary architecture, and shopping districts. It achieved the rank of the 6th most-visited city globally according to the Mastercard Destination Cities Index in 2019. In order to revive the tourism industry that has been hit hard by COVID-19, the local government has implemented several policies to promote tourism development, including (1) providing tourism infrastructure financing funds, (2) stimulating the vitality of Kuala Lumpur through urban revitalization, and (3) creating a preferred destination for medical and health tourism. While the policies have been recognized for their economic dividends, they also pose sustainability challenges. Recent studies have shown that congestion and environmental degradation are the main dilemmas facing Kuala Lumpur [55].

Guilin, on the other hand, located in the northeast of Guangxi, China, is renowned as one of China's premier tourist destinations. Covering 27,809 km^2, it has a population of 4,931,137. This city presents a tranquil escape into nature, famed for its distinctive karst landscapes. The State Council of China recognized Guilin as a nationally famous historical and cultural city in the inaugural edition of its list. To achieve the goal of constructing a world-class tourist destination, the Guilin government has promulgated a series of policies linked to the high-quality development of Guilin tourism, including (1) building a regional comprehensive transportation hub, (2) promoting the marketization of the construction and operation of urban and rural environmental protection facilities, and (3) improving tourism management and service levels to promote consumption upgrades. Although Guilin has received widespread attention for these initiatives, challenges remain in harmonizing tourism development with environmental sustainability and community well-being [56].

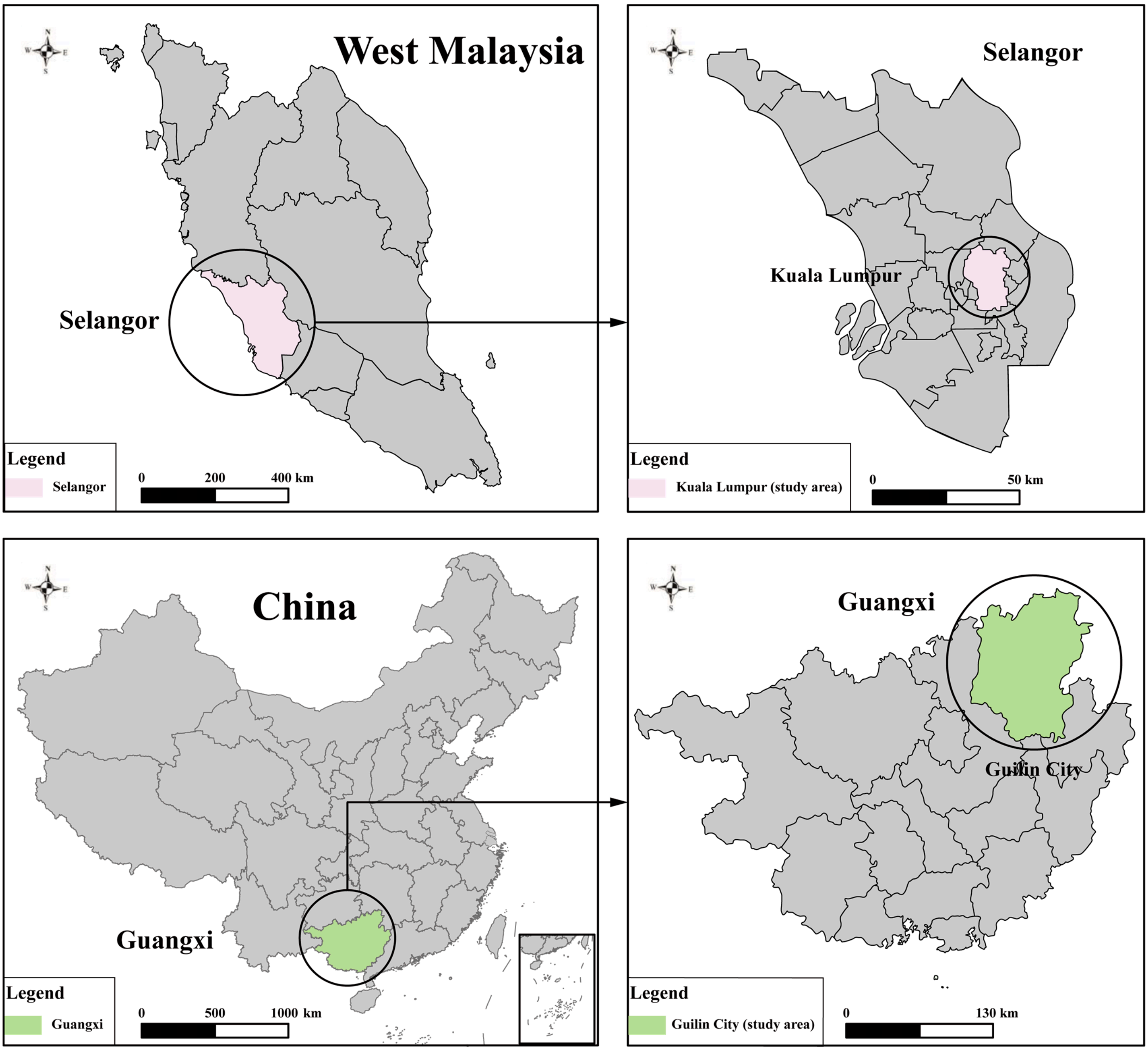

Figure 2. Locations of Kuala Lumpur, Malaysia (**top**) and Guilin, Guangxi, China (**bottom**).

The choice of Kuala Lumpur and Guilin as study areas facilitates a nuanced analysis of urban livability satisfaction within the ambit of tourist cities that vary significantly in urban form, cultural background, and policy dynamics. The juxtaposition of Kuala Lumpur's intense urbanization and multicultural society against Guilin's emphasis on natural heritage and traditional Chinese culture highlights their divergent yet complementary urban and tourism dynamics. This contrast underpins the investigation into both universal and context-specific barriers impeding urban livability, offering insightful perspectives on enhancing livability in tourist-centric cities towards sustainable urban development.

3.2. Instrument and Data Collection Procedures

This study adopts a structured questionnaire for data gathering, facilitating the acquisition of quantitative insights in a uniform manner, thus ensuring internal coherence and consistency for subsequent analytical processes [57]. The questionnaire is divided into three sections: the initial part offers a concise overview of the research objectives and guarantees respondent anonymity and confidentiality. The second segment collects demographic information, and the third seeks input from stakeholders, including both locals and tourists, on the barriers to achieving livability satisfaction in tourist cities. To ensure that respondents accurately express the extent to which they acknowledge barriers to livability in tourist cities, this study expanded the 27 barriers into items with general statements following the scale development principles outlined by Creswell, W. John, and Creswell [58], for example, "The low sense of security in the city reduces my satisfaction with urban livability". Responses are recorded using a 5-point Likert scale, with "1" denoting "strong disagreement" and "5" indicating "strong agreement". These items are designed to capture individuals' comprehension of barriers and their overall satisfaction with the livability of tourist cities. Detailed information on these items is presented in Table A1.

To identify a suitable sample size, we referred to several traditional principles. First, Hair [59] suggested that the ratio of the sample size to measurement items was roughly 10:1, and the measurement items in this study are 30, thus the effective sample size should be more than 300. Secondly, Stevens [60] stated that to ensure the statistical power and accuracy of SEM, the sample size should be at least 350 to prevent model specification errors. Moreover, we also consider the potential of adjusting sample sizes moderately, based on model complexity, and measurement items per variable number [61,62]. Based on these, we argued that a sample size between 350 and 400 was suitable for our study. Furthermore, to ensure data reliability, a pilot study was conducted with a sample size of 60 before the main survey, as suggested by Stevens [60]. Through analysis of the pilot study results, the question description language and overall logic were optimized to ensure that the respondents were more intuitive and accurate in obtaining the questions' meaning and options set. The final questionnaire was reviewed for clarity and relevance by a Malaysian public university professor and a Chinese public university professor, respectively. Before conducting data collection, this study was approved by the Ethics Committee for Research Involving Human Subjects of Universiti Putra Malaysia (JKEUPM-2022-269) and the Academic Integrity and Research Ethics Committee of Guilin University of Technology (-GLUTYS-2023-37).

The Kuala Lumpur survey was conducted from June to July 2023, while the Guilin survey was conducted from December 2023 to January 2024. The target respondents mainly included locals and tourists, as they are the largest stakeholder groups facing barriers to livability in tourist destinations. Considering the mobility of tourists, we did not focus on a certain community like the traditional neighborhood scale [15]. Instead, we refined the spatial scale to focus on the landmark building areas of two cities, including the Petronas Twin Towers in Kuala Lumpur and the Sun and Moon Twin Towers in Guilin. Once the respondent was identified, he or she was invited to fill out the questionnaire. The primary method for questionnaire completion entailed digital submission via WeChat and WhatsApp. For respondents lacking proficiency in digital survey interfaces, on-site data collection was implemented. Respondent participation was both voluntary and anonymous and all respondents were rewarded with discount coupons for coffee.

To ensure efficient and safe data collection, this study combined probability and quota sampling. Probability sampling gives an equal opportunity for the evaluation of satisfaction with urban livability from stakeholders with different demographic backgrounds to be selected as a sample [63], while quota sampling is used to assure efficiency and safety in the collection of the data [60]. The study disseminated a total of 420 questionnaires in Kuala Lumpur. During the subsequent phase of data screening, 25 responses were jettisoned owing to incomplete data. Consequently, a total of 395 valid questionnaires were retained—an effective rate of

94.0%. A total of 420 questionnaires were also distributed in Guilin and 22 responses were excluded due to their manifested disinterest in urban livability, as evidenced by a completion time not exceeding 10 s, as indicated by the backend analytics of the online survey platform. Thus, 398 valid questionnaires were retained—an effective rate of 94.7%.

3.3. Data Analysis

As discussed earlier, a hybrid analytical approach is utilized in this study, initially using SEM followed by ANN analysis. SEM was used to predict the linear effects of major potential barriers to livability satisfaction. Subsequently, ANN uses nonlinear analysis to rank the relative extent to which major potential obstacles affect livability satisfaction. The subsequent sub-sections will detail the procedures involved in these analyses.

3.3.1. Partial Least Squares Structural Equational Modeling (PLS-SEM)

SEM provides a robust analysis for quantifying structural correlations between variables and has been widely used by researchers around the world to assess and predict issues associated with tourism, livability, and satisfaction [10–13,15]. Thus, ample evidence supports the suitability of the SEM approach for undertaking multivariate regression analyses, catering to both exploratory and confirmatory research inquiries. The primary tools for multivariate statistical analysis in contemporary research encompass covariance-based structural equation modeling (CB-SEM) and partial least squares structural equation modeling (PLS-SEM) [20]. PLS-SEM is suitable for theoretical construction in exploratory studies with small to medium-sized samples and does not need to meet the assumptions of normality [57]. For this study, PLS-SEM was an appropriate choice for analyzing the barriers to livability satisfaction in tourist cities.

The analysis using PLS-SEM was conducted in accordance with the two-step method suggested by Anderson and Gerbing [64], which includes measurement model and structural model phases. The measurement model phase was employed to delineate the associations between the latent variables and their indicators, whereas the structural model phase aimed to elucidate the causal relationships between the latent variables [12,13,57]. The equations pertinent to these two models are presented as follows:

$$X = \Lambda_x \xi + \delta \quad (1)$$

$$\eta = B\eta + \Gamma\xi + \zeta \quad (2)$$

Equation (1) is the measurement model, where X is the vector of observed variables; Λ_x is a matrix encapsulating the factor loadings, which elucidates the relationship between the latent constructs and their corresponding observed variables; ξ is a vector comprising the latent constructs; and δ is a vector representing the error terms or the unique variances of the observed variables.

Equation (2) is the structure model, where η is a vector of the endogenous latent constructs; B is a matrix of path coefficients explicating the relationships among endogenous latent constructs; Γ is a matrix of path coefficients explaining the relationships between exogenous and endogenous latent constructs; ξ is a vector of the exogenous latent constructs; and ζ is a vector of the error terms or the disturbances in the endogenous latent constructs.

The PLS-SEM was executed using SmartPLS 3.2.9 software, while descriptive statistics were conducted using SPSS 26.0 software.

3.3.2. Artificial Neural Network (ANN)

After establishing the critical hypothesized relationships through PLS-SEM, further analysis can proceed using ANN. ANN is an advanced artificial intelligence system capable of processing and interpreting complex datasets, mimicking the cognitive functions of the human brain such as learning and decision-making [65]. The use of ANN in research enables the prediction of the significance of precursors through the application of machine learning algorithms, thus aiding in the validation and enhancement of findings derived from PLS-SEM [18]. The advantage of ANN lies in its ability to produce more reliable outcomes and higher precision compared to traditional SEMs or stepwise regressions. Prasad Das et al. [20] introduced a structured framework of constructs, arranged them according to their sensitivity, and tackled the aspects of non-linear and linear relationships among these constructs. Hence, it is reasonable to conclude that PLS-SEM and ANN analyses are mutually reinforcing methodologies [21].

Following the SEM–ANN framework suggested by Prasad Das et al. [20], this investigation adopts the feed-forward-back-propagation (FFBP) architecture within multi-layer perceptron (MLP) neural networks. Esteemed for its efficiency in error reduction throughout the deep learning phase [65], the MLP framework is structured into three primary layers: input, hidden, and output. Each layer consists of neurons linked to those in the next layer via synaptic weights, facilitating signal transmission from the input through the hidden to the output layer. The stimulation received by each neuron from the input vector x determines its output. The weights W_{ji} and V_{kj} symbolize the connections from the input component i to the hidden neuron j and from the hidden neuron j to the output neuron k, respectively. Neurons compute their output by applying a sigmoid function to the weighted sum of their inputs, a process detailed by [65]. Equations (3) and (4) provide the formulas for the output of the j-th hidden neuron and the k-th output neuron, respectively.

$$net_j^h = \sum_{i=1}^{N} W_{ji} x_i \text{ and } y_j = f\left(net_j^h\right) \tag{3}$$

$$net_k^o = \sum_{j=1}^{J+1} V_{kj} y_j \text{ and } o_k = f\left(net_k^o\right) \tag{4}$$

The sigmoid function, denoted as Equation (5) with a parameter λ, is employed to modulate the function's gradient, which monotonically increases from 0 to 1 and is continuously differentiable. During the learning phase, the network produces an output o_k for each specific input pattern. This output is then compared to the desired response d_k for every neuron. Subsequently, weight adjustments are made to reduce or rectify the error before processing the next pattern. The formula for adjusting the weights of the output layer V is given by Equation (6), while the adjustments for the hidden layer weights W are defined by Equation (7), where d_{pk} represents the desired output and o_{pk} the actual output of neuron-k for input pattern-p. This procedure employs Equation (8) to iteratively refine all weights, aiming to minimize the overall sum of squared errors (SSE) [18,20].

$$f(net) = \frac{1}{1 + e^{-\lambda net}} \tag{5}$$

$$V_{kj}(t+1) = v_{kj}(t) + c\lambda(d_k - o_k)o_k(1 - o_k)y_i(t) \tag{6}$$

$$W_{ji}(t+1) = w_{ji}(t) + c\lambda^2 y_j(1 - y_j)x_i(t)\left(\sum_{k=1}^{K}(d_k - o_k)o_k(1 - o_k)v_{kj}\right) \tag{7}$$

$$SSE = \frac{1}{2P}\sum_{p=1}^{P}\sum_{k=1}^{K}\left(d_{pk} - o_{pk}\right)^2 \tag{8}$$

To mitigate the risk of overfitting, this study adopts a 10-fold cross-validation method, as recommended by previous studies [18,20]. This method involves dividing the dataset into ten subsets, using nine subsets for training and one subset for testing, maintaining a data training-to-testing ratio of 9:1. Additionally, assessing the predictive accuracy of the ANN analysis is crucial. Parot et al. [66] suggest using root mean squared error (RMSE) values for this purpose. The RMSE is calculated from the SSE and should ideally exhibit a small magnitude to indicate high prediction accuracy. Furthermore, this study incorporates a goodness-of-fit index (R^2), as suggested by Aw et al. [65], to provide an additional measure of predictive accuracy. Finally, the relative importance of the input neurons to the output neurons is determined through sensitivity analysis, following the methodology outlined by Prasad Das et al. [20]. This comprehensive approach ensures not only the robustness of the model but also the reliability and validity of the findings. When running ANN, SPSS 26.0 software is used.

4. Results

4.1. Descriptive Comparisons

The demographic profiles of respondents from Kuala Lumpur and Guilin are shown in Table 2. The distribution of respondents in terms of gender was fairly balanced in both cities, with Kuala Lumpur having a slight female majority (50.6%) and Guilin having a slight male majority (51.5%). In terms of age, Kuala Lumpur exhibited a concentration in the 26–35 age group (37.0%), whereas Guilin's age distribution was more evenly spread across the 36–55 age range (27.9%). When examining educational attainment, Kuala Lumpur respondents demonstrated a higher percentage of bachelor's degree holders (40.0%) compared to Guilin, where the largest share of respondents had achieved a master's degree (30.4%). Attitudinal responses towards the balanced development of urban tourism and livability revealed that Kuala Lumpur was more optimistic, with 42.0% expressing either 'Optimistic' or 'Very optimistic' sentiments. Contrastingly, in Guilin, there was a more cautious perspective, with a combined optimism rate of 32.6%. This variation may reflect differing experiences or expectations of the impact of tourism on urban livability in these cities.

Table 2. Demographic overview of respondents.

Demographics	Kuala Lumpur (N = 395)		Guilin (N = 398)	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Gender				
Male	195	49.4	205	51.5
Female	200	50.6	193	48.5
Age				
18–25 years	89	22.5	41	10.3
26–35 years	146	37.0	109	27.4
36–45 years	65	16.5	96	24.1
46–55 years	78	19.7	111	27.9
56 years and above	17	4.3	41	10.3
Education level				
Under Junior high school	81	20.5	48	12.1
High school	78	19.7	88	22.1
Bachelor's degree	158	40.0	101	25.4
Master's degree	72	18.2	121	30.4
PhD and above	6	1.5	40	10.1
What are your thoughts on the balanced development of urban tourism and livability? (Attitude)				
Very Pessimistic	75	19.0	41	10.3
Pessimistic	92	23.3	105	26.4
Fair	62	15.7	122	30.7
Optimistic	76	19.2	100	25.1
Very optimistic	90	22.8	30	7.5

Furthermore, a closer look at the local versus visitor demographics within both cities (see Figure 3), attitudinal differences toward the balanced development of urban tourism and livability are noteworthy. The majority of Kuala Lumpur locals held a "pessimistic" view, at 24.4%, while 23.7% of visitors appeared "very optimistic". This suggests that visitors may have a more favorable view of the city's tourism development compared to residents. In contrast, both Guilin's locals and visitors exhibited a more reserved attitude, with 'Fair' (31.8% and 29.6%) being the most common response. Meanwhile, the percentage of locals with a 'very pessimistic' view was equal to that of visitors (10.3%). This could be attributed to the people's direct experience of the challenges posed by tourism on urban livability.

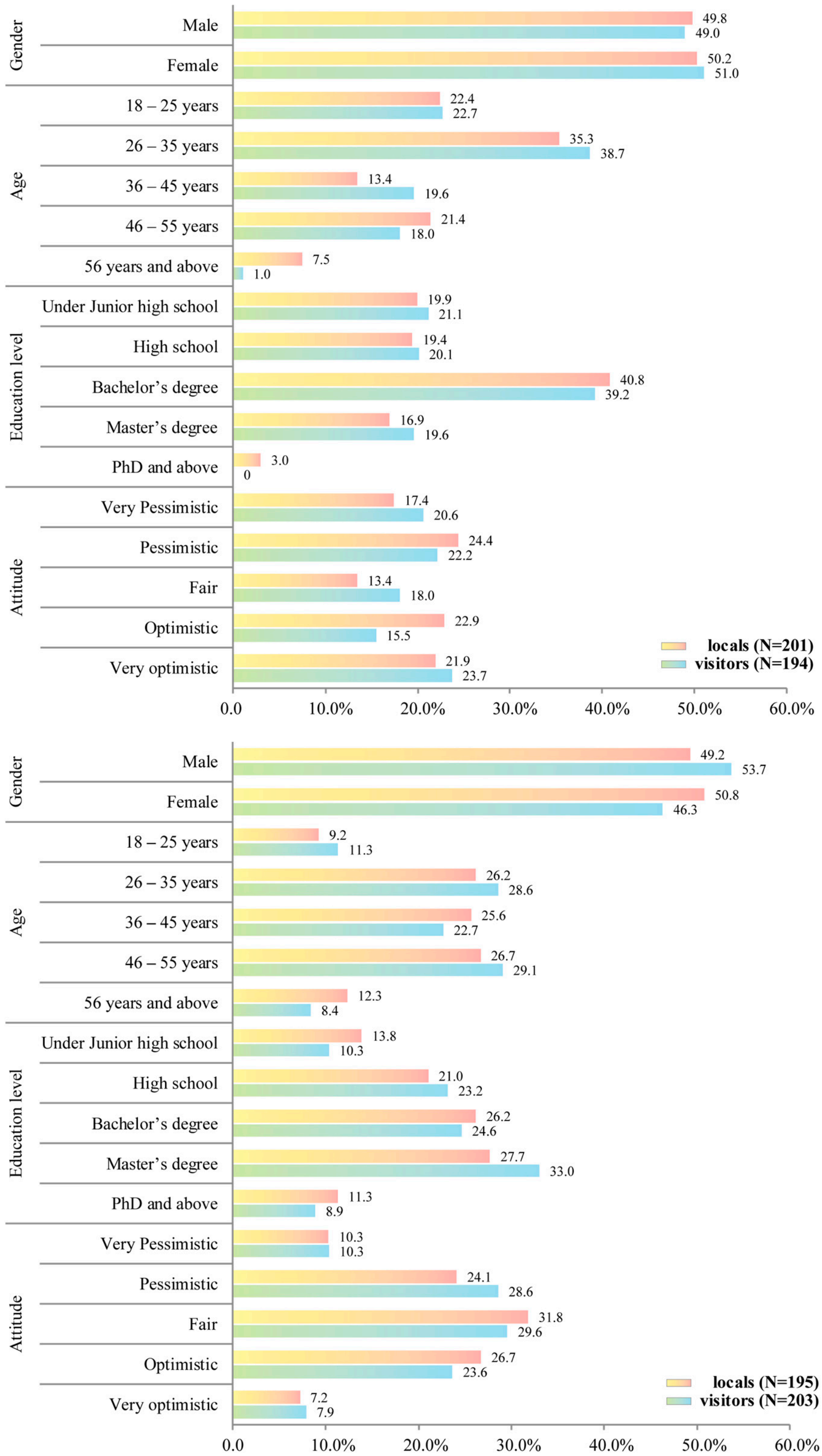

Figure 3. Demographics of locals and visitors in Kuala Lumpur (**top**) and Guilin (**bottom**).

4.2. PLS-SEM Analysis

The study constructed structural equation models of barriers to livability satisfaction in Kuala Lumpur and Guilin. The reliability and validity of measurement models were evaluated before deriving the final structure models [64]. As suggested by previous research [12,13,57], the reliability was evaluated using Cronbach's α (Cα), rho-A, and Composite Reliability (CR), while the validity was tested using Average Variance Extracted (AVE) and factor loadings. As shown in Table 3, the reliability of both models was confirmed, as all CR values were larger than 0.70 [12], and rho-A and Cα values were larger than 0.80 [57]. On the other hand, all AVE were larger than 0.50 and all square roots of AVE exceeded their respective correlation coefficients (Table 4). Additionally, each indicator received the highest loading on its corresponding construct (Table 5), thereby corroborating the validity of both models [13].

Table 3. Reliability and convergent validity of measurement models.

Construct	Indicator	Kuala Lumpur (N = 395)					Guilin (N = 398)				
		VIF	Cα	rho_A	AVE	CR	VIF	Cα	rho_A	AVE	CR
Economic Burden (EB)	EB1	2.136	0.893	0.898	0.701	0.921	2.608	0.882	0.891	0.679	0.913
	EB2	2.147					2.198				
	EB3	2.197					1.804				
	EB4	2.227					1.915				
	EB5	2.409					2.128				
Government (G)	G1	1.989	0.829	0.835	0.744	0.897	2.284	0.844	0.904	0.755	0.902
	G2	1.946					1.945				
	G3	1.778					1.943				
Social Justice (SJ)	SJ1	1.894	0.834	0.858	0.748	0.899	1.511	0.829	0.863	0.74	0.895
	SJ2	2.011					2.603				
	SJ3	1.897					2.506				
Tourist Ecology (TE)	TE1	2.289	0.897	0.902	0.659	0.921	2.824	0.895	0.901	0.656	0.92
	TE2	2.114					2.001				
	TE3	1.974					2.008				
	TE4	2.374					1.968				
	TE5	2.085					1.91				
	TE6	1.993					2.088				
Infrastructure (I)	I1	2.397	0.873	0.893	0.796	0.921	2.257	0.816	0.818	0.732	0.891
	I2	2.312					1.798				
	I3	2.305					1.701				
Environmental Quality (EQ)	EQ1	1.793	0.807	0.817	0.72	0.885	1.949	0.809	0.879	0.715	0.882
	EQ2	1.827					1.763				
	EQ3	1.663					1.662				
Satisfaction with Urban Livability (SUL)	SUL1	2.09	0.865	0.866	0.713	0.908	2.79	0.873	0.874	0.724	0.913
	SUL2	2.206					2.071				
	SUL3	1.909					1.885				
	SUL4	2.254					2.159				

Furthermore, given that this research relies on self-reported empirical data from identical sources, the possibility of common method biases (CMB) cannot be overlooked [59]. To mitigate this concern, an initial step involved conducting Harman's single-factor analysis, which indicated that only 22.473% and 29.881% of the variance could be attributed to a single factor, remaining well under the 50% threshold [60]. Furthermore, a comprehensive collinearity assessment for CMB was undertaken. The results showed that all Variance Inflation Factors (VIFs) were below 3 and tolerance levels were above 0.10, suggesting that CMB does not pose a significant threat to our findings [12,13].

Based on the reliability and validity of the measurement models, we evaluated the structural models using bootstrapping of 5000 samples, and 300 observations were recorded [57]. Goodness-of-fit measures (SRMR = 0.042, NFI = 0.859; SRMR = 0.044, NFI = 0.855) indicated that the models fit the data well [59]. Table 6 shows the structural model path results for both Kuala Lumpur and Guilin.

Table 4. Discriminant validity of measurement models.

	EB	EQ	G	I	SUL	SJ	TE
Kuala Lumpur (N = 395)							
EB	0.837						
EQ	0.133	0.849					
G	0.363	0.051	0.863				
I	0.295	0.019	0.194	0.892			
SUL	0.314	0.33	0.246	0.237	0.844		
SJ	−0.047	−0.045	0.091	−0.073	−0.128	0.865	
TE	0.075	0.092	0.059	0.115	0.396	−0.089	0.812
Guilin (N = 398)							
EB	0.824						
EQ	0.083	0.846					
G	−0.054	−0.087	0.869				
I	0.373	0.006	−0.052	0.855			
SUL	0.527	0.127	0.108	0.377	0.851		
SJ	0.005	−0.038	−0.052	0.016	−0.103	0.86	
TE	0.662	0.057	−0.202	0.43	0.528	−0.036	0.81

Table 5. Cross loadings of indicators.

	EB	G	SJ	TE	I	EQ	SUL
Kuala Lumpur (N = 395)							
EB1	**0.828**	0.273	−0.081	0.054	0.237	0.11	0.256
EB2	**0.815**	0.237	−0.022	0.054	0.217	0.06	0.218
EB3	**0.841**	0.349	0.006	0.092	0.311	0.144	0.278
EB4	**0.842**	0.284	−0.049	0.062	0.23	0.1	0.273
EB5	**0.858**	0.36	−0.049	0.05	0.233	0.131	0.281
G1	0.333	**0.874**	0.077	0.054	0.163	0.065	0.213
G2	0.288	**0.879**	0.074	0.052	0.171	0.059	0.228
G3	0.321	**0.835**	0.086	0.047	0.17	0.002	0.192
SJ1	−0.081	0.061	**0.885**	−0.073	−0.087	−0.04	−0.126
SJ2	−0.003	0.09	**0.879**	−0.065	−0.063	−0.024	−0.114
SJ3	−0.03	0.091	**0.829**	−0.099	−0.029	−0.057	−0.085
TE1	0.047	0.03	−0.034	**0.809**	0.089	0.013	0.256
TE2	0.085	0.005	−0.047	**0.801**	0.118	0.064	0.308
TE3	0.041	0.073	−0.086	**0.81**	0.084	0.116	0.373
TE4	0.069	0.051	−0.107	**0.844**	0.107	0.043	0.345
TE5	0.043	0.044	−0.068	**0.803**	0.079	0.102	0.298
TE6	0.08	0.076	−0.076	**0.803**	0.081	0.096	0.326
I1	0.272	0.153	−0.101	0.111	**0.914**	0.027	0.244
I2	0.287	0.185	−0.032	0.107	**0.884**	0.016	0.196
I3	0.228	0.189	−0.053	0.086	**0.878**	0.006	0.186
EQ1	0.131	−0.009	−0.07	0.101	0.041	**0.848**	0.273
EQ2	0.07	0.06	−0.052	0.076	−0.001	**0.838**	0.246
EQ3	0.131	0.075	−0.001	0.061	0.009	**0.86**	0.315
SUL1	0.282	0.217	−0.106	0.352	0.199	0.25	**0.842**
SUL2	0.269	0.227	−0.099	0.328	0.166	0.322	**0.858**
SUL3	0.264	0.191	−0.089	0.328	0.184	0.274	**0.816**
SUL4	0.245	0.193	−0.138	0.33	0.253	0.269	**0.86**

Table 5. *Cont.*

	EB	G	SJ	TE	I	EQ	SUL
Guilin (N = 398)							
EB1	**0.866**	−0.023	0.009	0.552	0.326	0.05	0.417
EB2	**0.853**	−0.05	−0.009	0.582	0.34	0.086	0.505
EB3	**0.775**	0.021	−0.019	0.483	0.253	0.042	0.39
EB4	**0.786**	−0.1	−0.005	0.523	0.284	0.034	0.369
EB5	**0.836**	−0.07	0.039	0.576	0.324	0.115	0.467
G1	−0.053	**0.903**	−0.054	−0.178	−0.056	−0.075	0.101
G2	−0.012	**0.898**	−0.037	−0.168	−0.025	−0.076	0.11
G3	−0.111	**0.802**	−0.046	−0.197	−0.069	−0.081	0.055
SJ1	0.007	−0.053	**0.845**	−0.058	0.008	−0.078	−0.101
SJ2	−0.006	−0.054	**0.894**	−0.003	−0.003	0.017	−0.095
SJ3	0.015	−0.013	**0.841**	−0.028	0.05	−0.034	−0.057
TE1	0.561	−0.132	−0.031	**0.878**	0.376	0.053	0.491
TE2	0.508	−0.171	−0.057	**0.798**	0.346	0.008	0.426
TE3	0.526	−0.188	−0.008	**0.799**	0.332	0.045	0.425
TE4	0.552	−0.136	−0.036	**0.79**	0.342	0.058	0.385
TE5	0.525	−0.168	0.005	**0.774**	0.342	0.057	0.369
TE6	0.548	−0.19	−0.043	**0.818**	0.352	0.056	0.454
I1	0.337	−0.043	0.02	0.384	**0.898**	−0.012	0.335
I2	0.281	−0.079	0.001	0.342	**0.835**	0.04	0.31
I3	0.338	−0.013	0.018	0.376	**0.832**	−0.01	0.322
EQ1	0.068	−0.116	−0.028	0.083	0.041	**0.861**	0.101
EQ2	0.067	−0.049	−0.021	0.035	0.044	**0.783**	0.069
EQ3	0.075	−0.057	−0.041	0.029	−0.041	**0.889**	0.135
SUL1	0.483	0.083	−0.068	0.46	0.334	0.139	**0.897**
SUL2	0.428	0.068	−0.091	0.467	0.31	0.102	**0.839**
SUL3	0.448	0.104	−0.088	0.431	0.319	0.123	**0.819**
SUL4	0.433	0.113	−0.105	0.439	0.32	0.068	**0.847**

Table 6. PLS-SEM results on barriers to livability satisfaction in Kuala Lumpur and Guilin.

	Kuala Lumpur (N = 395)			Guilin (N = 398)		
	Coefficient	t-Value	*p*-Value	Coefficient	t-Value	*p*-Value
Effect						
EB→SUL	0.167	3.735	0.000	0.259	4.115	0.000
G→SUL	0.138	3.004	0.003	0.200	4.064	0.000
SJ→SUL	−0.083	2.13	0.033	−0.081	2.106	0.035
TE→SUL	0.331	8.502	0.000	0.323	5.406	0.000
I→SUL	0.112	2.364	0.018	0.153	3.516	0.000
EQ→SUL	0.265	6.198	0.000	0.101	2.575	0.010
Control variables						
Gender→SUL	−0.029	0.719	0.472	−0.002	0.044	0.965
Age→SUL	−0.053	0.539^{F}	0.707	0.031	0.971^{F}	0.423
Edu.→SUL	0.034	0.375^{F}	0.826	−0.092	1.368^{F}	0.244

Note: The "^{F}" in age and education refers to the F-value.

The SEM results on barriers to livability satisfaction in Kuala Lumpur show that the standardized path coefficient from EB to SUL was 0.167 ($p < 0.001$), suggesting that economic burden significantly affects livability satisfaction. Similarly, government and infrastructure barriers were positively and significantly associated with livability satisfaction (β = 0.138, $p < 0.01$; β = 0.112, $p < 0.05$). Barriers to tourism ecology and environmental quality were positively and significantly associated with livability satisfaction (β = 0.331, $p < 0.001$; β = 0.265, $p < 0.001$). Social justice, however, was significantly negatively associated with livability satisfaction (β = −0.083, $p < 0.05$). On the other hand, individual characteristics, including gender, age, and education level, were not significantly associated with livability satisfaction ($p > 0.05$).

The SEM results of barriers to livability satisfaction in Guilin showed trends consistent with those in Kuala Lumpur (Table 6). Barriers associated with economic burden ($\beta = 0.259$, $p < 0.001$), government ($\beta = 0.2$, $p < 0.001$), tourism ecology ($\beta = 0.323$, $p < 0.001$), infrastructure ($\beta = 0.153$, $p < 0.001$), and environmental quality ($\beta = 0.101$, $p < 0.01$) were all positively associated with livability satisfaction. Similarly, social justice was negatively associated with livability satisfaction ($\beta = -0.081$, $p < 0.05$); however, individual characteristics, including gender, age, and education level, were not significantly associated with livability satisfaction ($p > 0.05$). The consistency of the results suggests that these barriers are not unique to any one city but are common across tourist cities. Although the two cities present the same livability barriers, there are certain differences in the impact of these barriers on livability satisfaction. Figure 4 shows a comparison of the heterogeneity of barriers to livability satisfaction in these two cities.

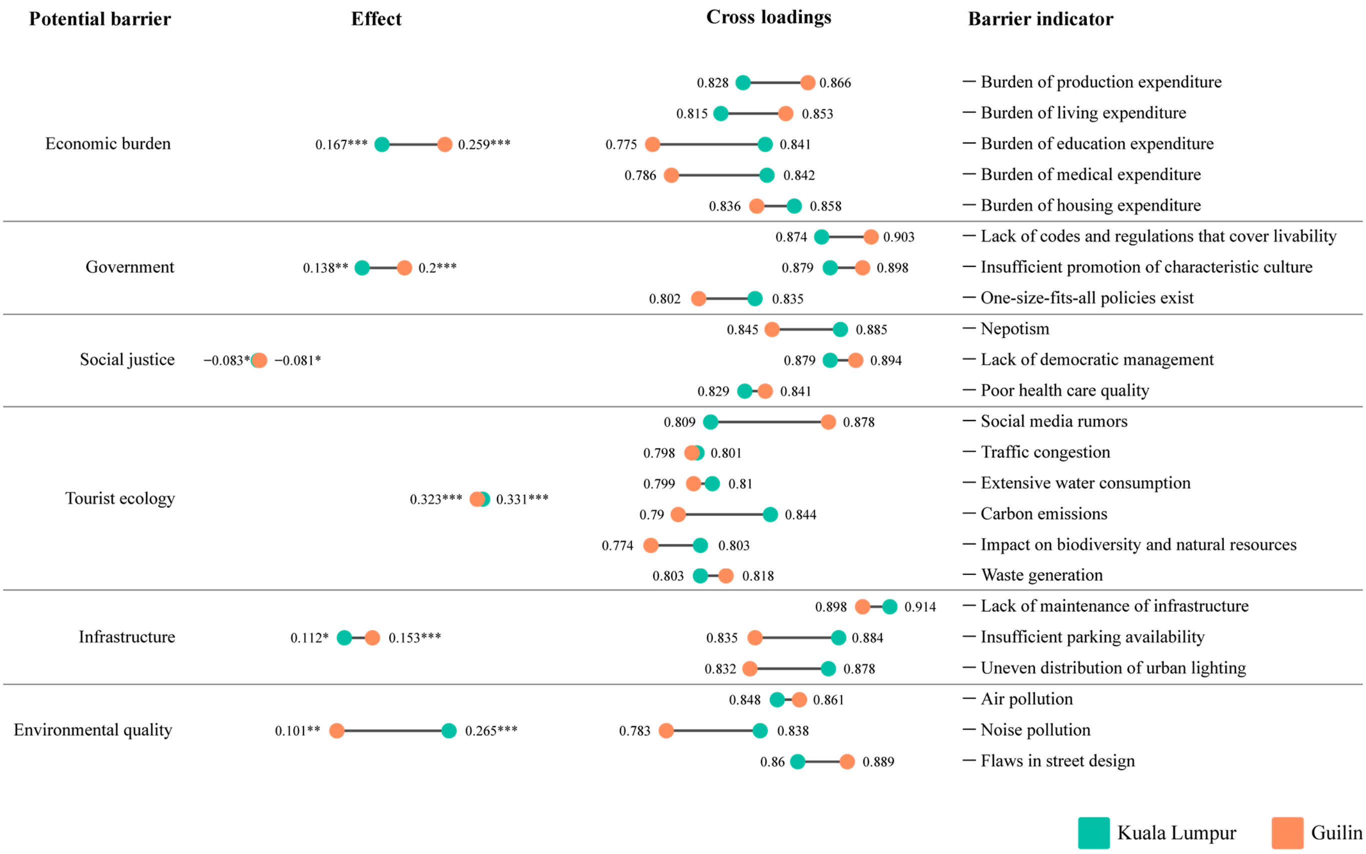

Figure 4. Comparison of PLS-SEM results of barriers to livability satisfaction between Kuala Lumpur and Guilin. Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

4.3. Multigroup Analysis

A multigroup analysis (MAG) facilitates researchers to identify heterogeneity between groups, enabling a more precise assessment [67–69]; specifically, this study employs MAG to investigate the differences between locals and visitors towards livability satisfaction in tourist cities. Before performing MAG for these groups within both cities, measurement invariance was assessed using the three-step procedure for measurement invariance of composite models (MICOM) as outlined by Singh and Kathuria [67]. The first step in the MICOM procedure involves assessing configural invariance to determine if an identical basic factor structure is present in both groups. Given that the same indicators, data treatments, and algorithm settings were applied to both locals and visitors, configural invariance was confirmed [68]. In the second step, compositional invariance was evaluated using 5000 permutations. The results indicated that the original correlation for both locals and visitors was greater than or equal to the 5% quantile, thereby confirming compositional invariance [69]. The final step entailed examining the equality of means and variances. The analysis showed that the mean original difference and variance original difference for most constructs fell within the 2.5% and 97.5% boundaries, except for age, barriers to environmental quality, and government. Consequently, both groups of locals and visitors met partial measurement invariance [67], permitting the continuation of the MAG. The MICOM results for testing measurement invariance are detailed in Table 7.

Table 7. MICOM results for testing measurement invariance.

Construct	Configural Invariance (Step 1)	Compositional Invariance (Step 2)			Equal Mean (Step 3a)		Equal Variance (Step 3b)		
		Original Correlation (=1)	5% Quantile	Partial Invariance	Diff.	Confidence Interval	Diff.	Confidence Interval	Full Invariance
Kuala Lumpur									
EB	Yes	0.996	0.994	Yes	−0.035	[−0.171, 0.169]	0.100	[−0.205, 0.212]	Yes
EQ	Yes	0.997	0.990	Yes	0.035	[−0.168, 0.167]	−0.018	[−0.219, 0.220]	Yes
G	Yes	0.999	0.985	Yes	0.006	[−0.166, 0.168]	−0.047	[−0.208, 0.203]	Yes
I	Yes	0.995	0.990	Yes	0.028	[−0.166, 0.161]	−0.040	[−0.207, 0.207]	Yes
SUL	Yes	1.000	0.999	Yes	−0.082	[−0.161, 0.167]	−0.048	[−0.202, 0.196]	Yes
SJ	Yes	0.890	0.887	Yes	0.116	[−0.169, 0.168]	−0.237	[−0.269, 0.278]	Yes
TE	Yes	0.998	0.996	Yes	−0.017	[−0.164, 0.167]	0.019	[−0.209, 0.210]	Yes
Age	Yes	1.000	1.000	Yes	0.173	[−0.167, 0.164]	0.349	[−0.188, 0.183]	No
Gender	Yes	1.000	1.000	Yes	−0.008	[−0.079, 0.083]	0.000	[−0.004, 0.004]	Yes
Education	Yes	1.000	1.000	Yes	0.062	[−0.170, 0.168]	0.079	[−0.180, 0.174]	Yes
Guilin									
EB	Yes	1.000	0.998	Yes	0.009	[−0.165, 0.162]	0.029	[−0.167, 0.166]	Yes
EQ	Yes	0.872	0.791	Yes	0.334	[−0.169, 0.165]	−0.090	[−0.221, 0.221]	No
G	Yes	0.997	0.544	Yes	0.126	[−0.169, 0.161]	−0.171	[−0.166, 0.173]	No
I	Yes	0.997	0.992	Yes	−0.130	[−0.168, 0.164]	−0.032	[−0.166, 0.159]	Yes
SUL	Yes	0.999	0.999	Yes	0.040	[−0.169, 0.164]	−0.018	[−0.159, 0.157]	Yes
SJ	Yes	0.910	0.507	Yes	0.055	[−0.161, 0.161]	−0.073	[−0.269, 0.266]	Yes
TE	Yes	1.000	0.998	Yes	0.063	[−0.167, 0.161]	−0.106	[−0.167, 0.165]	Yes
Age	Yes	1.000	1.000	Yes	0.103	[−0.163, 0.163]	0.017	[−0.172, 0.171]	Yes
Gender	Yes	1.000	1.000	Yes	0.045	[−0.086, 0.085]	0.005	[−0.011, 0.010]	Yes
Edu.	Yes	1.000	1.000	Yes	−0.045	[−0.164, 0.167]	0.119	[−0.175, 0.167]	Yes

MGA elucidated the differences in livability satisfaction between locals and visitors in both Kuala Lumpur and Guilin (Table 8). The MAG results for Kuala Lumpur indicated no significant differences between locals and visitors regarding tourism ecology, infrastructure, environmental quality, and individual characteristics. However, locals were more strongly affected by barriers associated with economic burden (β locals = 0.179, $p < 0.001$, β visitors = 0.027, $p > 0.05$, difference = 0.152), government (β locals = 0.207, $p < 0.01$, β visitors = 0.030, $p > 0.05$, difference = 0.177), and social justice (β locals = −0.144, $p < 0.01$, β visitors = −0.073, $p > 0.05$, difference = −0.071) compared to visitors. Similarly, the MAG results for Guilin revealed that in terms of livability satisfaction, there were significant differences between locals and visitors with regard to economic burden (β locals = 0.284, $p < 0.001$, β visitors = 0.133, $p > 0.05$, difference = 0.151), government (β locals = 0.256, $p < 0.001$, β visitors = 0.149, $p > 0.05$, difference = 0.107), and social justice (β locals = −0.111, $p < 0.05$, β visitors = −0.062, $p > 0.05$, difference = −0.049). Of note, although there were no statistical differences in tourism ecology, infrastructure, and environmental quality between the two groups in both cities, the coefficients were all significantly larger for the visitors than for the locals. We, therefore, presume that the compensatory judgment rules of locals and visitors lead to changes in the priorities of influencing factors. Furthermore, the MAG results for both cities show that individual characteristics, including gender, age, and education level were not significantly associated with livability satisfaction; this further confirms the previous results.

Table 8. Multigroup analysis of locals and visitors in both Kuala Lumpur and Guilin.

	Kuala Lumpur (N = 395)				**Guilin (N = 398)**			
	Coefficient (Locals, N = 201)	**Coefficient (Visitors, N = 194)**	**Diff.**	**Significance Diff.?**	**Coefficient (Locals, N = 195)**	**Coefficient (Visitors, N = 203)**	**Diff.**	**Significance Diff.?**
				Effect				
EB→SUL	0.179 ***	0.027 n.s	0.152	Yes	0.284 ***	0.133 n.s	0.151	Yes
G→SUL	0.207 **	0.030 n.s	0.177	Yes	0.256 ***	0.149 n.s	0.107	Yes
SJ→SUL	−0.144 **	−0.073 n.s	−0.071	Yes	−0.111 *	−0.062 n.s	−0.049	Yes
TE→SUL	0.295 ***	0.365 ***	−0.070	No	0.337 ***	0.350 ***	−0.013	No
I→SUL	0.133 *	0.147 *	−0.014	No	0.116 *	0.163 **	−0.047	No
EQ→SUL	0.223 ***	0.289 ***	−0.066	No	0.116 *	0.144 *	−0.028	No
				Control variables				
Gender→SUL	−0.086 n.s	−0.138 n.s	0.052	No	0.036 n.s	0.091 n.s	−0.055	No
Age→SUL	−0.016 n.s	−0.037 n.s	0.021	No	−0.014 n.s	0.006 n.s	−0.02	No
Edu.→SUL	0.011 n.s	0.051 n.s	−0.041	No	−0.09 n.s	−0.094 n.s	0.004	No

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; n.s $p > 0.05$.

4.4. ANN Analysis

To compensate for the linear limitations of the SEM results, path-significant potential barriers were entered as input neurons into subsequent ANN analyses to rank the critical barriers to satisfaction with urban livability [20]. Given the heterogeneity of livability satisfaction barriers in the two cities, we used the MLP neural networks to build two ANN models, where the number of neurons in the input layer is six (i.e., six potential barrier variables), the number of neurons in the output layer is one (i.e., livability satisfaction), and the neurons in the hidden layer are automatically calculated by the ANN. The nonlinear sigmoid function was used for the activation [65]. Figure 5 shows the ANN models for both cities.

Important in ANN analysis is the predictive accuracy of the model. RMSE and R^2 were used in this study to assess ANN's predictive ability through the 10-fold cross-validation [18,20]. As can be seen in Table 9, the mean RMSE values for both training and testing sets are relatively small and range between 0.108 and 0.168, indicating great levels of predictive accuracy, showing that the model fits well [66]. Moreover, the R^2 value further indicates that model A (Kuala Lumpur) can be predicted with 81.8% accuracy while model B (Guilin) can be predicted with 84.2% accuracy [65]. Therefore, it can be interpreted that both ANN models are reliable and capture the relationships between input variables and output outcomes [21].

Table 9. Predictive accuracy of the ANN models.

Neural Networks	**Model A—Kuala Lumpur (R^2 = 0.818)**						**Model B—Guilin (R^2 = 0.842)**					
	Input Neurons: EB, G, SJ, TE, I, EQ Output Neuron: SUL						**Input Neurons: EB, G, SJ, TE, I, EQ Output Neuron: SUL**					
	Training			**Testing**			**Training**			**Testing**		
	N	**RMSE**	**SSE**	**N**	**RMSE**	**SSE**	**N**	**RMSE**	**SSE**	**N**	**RMSE**	**SSE**
ANN1	353	0.126	5.606	42	0.142	0.852	355	0.165	9.666	43	0.148	0.946
ANN2	356	0.127	5.724	39	0.131	0.669	359	0.138	6.859	39	0.139	0.759
ANN3	354	0.133	6.238	41	0.108	0.477	356	0.134	6.362	42	0.168	1.180
ANN4	348	0.135	6.315	47	0.147	1.019	351	0.138	6.669	47	0.146	0.996
ANN5	344	0.127	5.554	51	0.128	0.835	347	0.140	6.806	51	0.129	0.844
ANN6	357	0.125	5.620	38	0.146	0.812	360	0.149	7.971	38	0.155	0.916
ANN7	351	0.130	5.911	44	0.121	0.642	354	0.133	6.301	44	0.166	1.215
ANN8	356	0.130	5.979	39	0.108	0.457	359	0.138	6.853	39	0.128	0.638
ANN9	348	0.129	5.797	47	0.113	0.605	351	0.136	6.519	47	0.144	0.971
ANN10	356	0.130	6.008	39	0.125	0.605	359	0.136	6.686	39	0.145	0.824
Average		0.129	5.875		0.127	0.697		0.141	7.069		0.147	0.929
SD		0.003	0.263		0.015	0.178		0.009	1.023		0.013	0.177

Note: (1) RMSE $= \sqrt{(1/n) \times \text{SSE}}$; (2) $R^2 = 1 -$ average RMSE during testing/average SSE during testing.

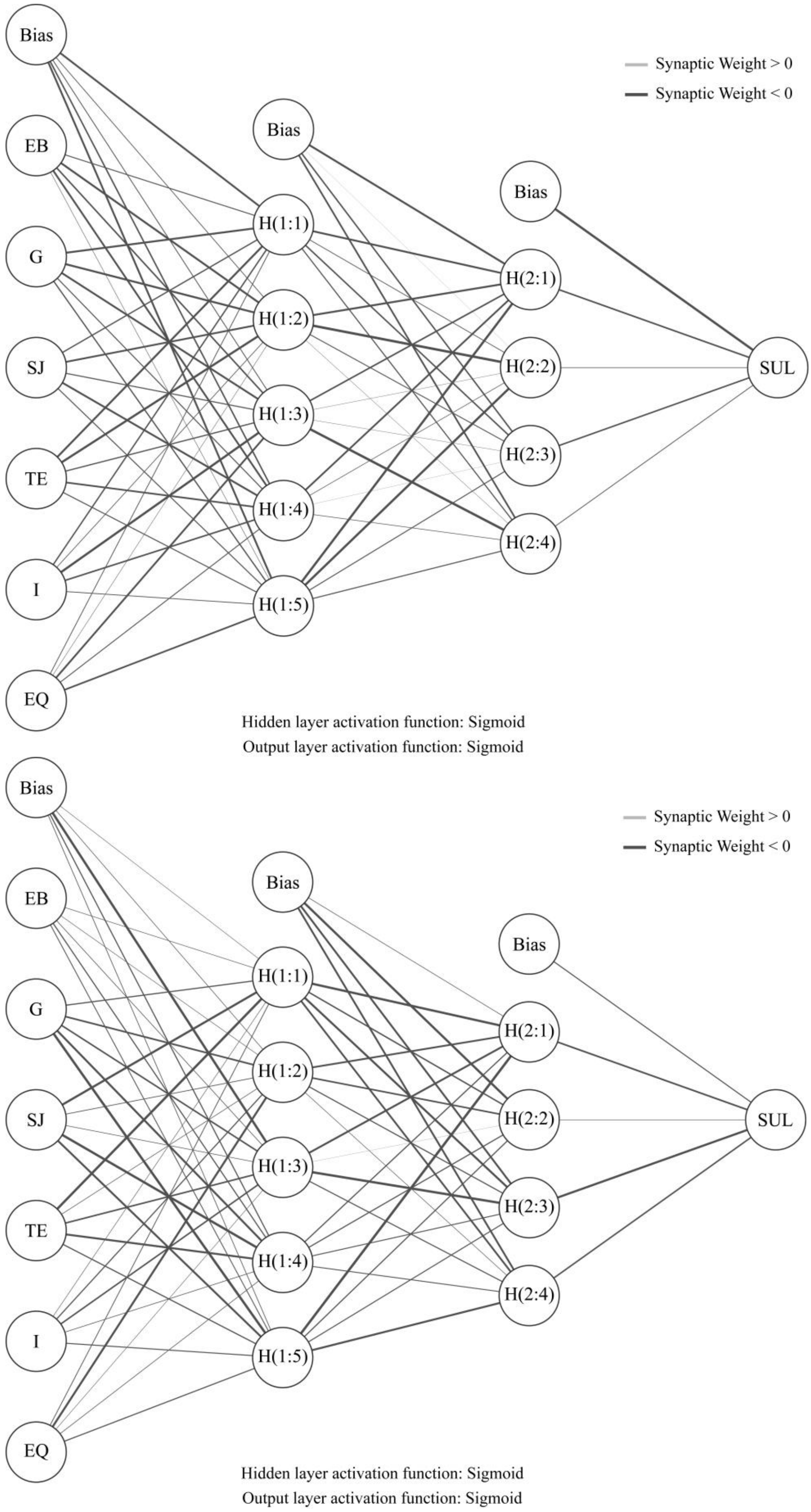

Figure 5. ANN models for Kuala Lumpur (**top**) and Guilin (**bottom**).

To ascertain the relative significance of potential barriers to livability satisfaction, a sensitivity analysis was conducted (Table 10). This analysis ranked each potential barrier variable based on its normalized percentage of relative importance. In Kuala Lumpur, tourism ecology emerged as the paramount potential barrier, securing a relative importance of 100%. It was followed by barriers associated with environmental quality, economic burden, and government, which demonstrated relative importance of 82.2%, 66.3%, and 48.5%, respectively. These were consistent with the SEM results, in which barriers associated with tourism ecology, environmental quality, and economic burden had the greatest impact on livability satisfaction. In Guilin, tourism ecology was also the paramount potential barrier with a relative importance of 100%. This was followed by barriers associated with economic burden, infrastructure, and government, which demonstrated relative importance of 87.4%, 51.7%, and 40.4%, respectively. These are generally consistent with, but slightly different from, the results of SEM, with differences in the impact of government-related barriers. The slight differences between the SEM and ANN analyses could be attributed to the nonlinearity and non-compensatory nature of the neural network model, as well as its higher predictive accuracy [20]. Figure 6 shows the comparison of results from SEM and ANN.

Table 10. Sensitivity analysis.

Neural Networks	Model A—Kuala Lumpur (Output Neuron: SUL)						Model B—Guilin (Output Neuron: SUL)					
	Relative Importance						Relative Importance					
	EB	**G**	**SJ**	**TE**	**I**	**EQ**	**EB**	**G**	**SJ**	**TE**	**I**	**EQ**
ANN1	0.135	0.144	0.155	0.248	0.094	0.223	0.315	0.036	0.02	0.301	0.299	0.028
ANN2	0.178	0.123	0.108	0.267	0.097	0.227	0.226	0.153	0.093	0.316	0.128	0.083
ANN3	0.179	0.179	0.163	0.206	0.103	0.171	0.277	0.16	0.096	0.247	0.117	0.103
ANN4	0.188	0.123	0.084	0.267	0.099	0.238	0.252	0.165	0.103	0.289	0.119	0.072
ANN5	0.177	0.137	0.093	0.293	0.059	0.241	0.308	0.05	0.119	0.29	0.197	0.036
ANN6	0.163	0.125	0.103	0.275	0.098	0.236	0.289	0.032	0.139	0.394	0.094	0.052
ANN7	0.19	0.037	0.157	0.31	0.114	0.193	0.25	0.156	0.115	0.295	0.149	0.035
ANN8	0.158	0.124	0.122	0.281	0.09	0.225	0.204	0.168	0.054	0.349	0.145	0.08
ANN9	0.17	0.108	0.117	0.286	0.081	0.238	0.253	0.153	0.126	0.267	0.129	0.072
ANN10	0.211	0.18	0.118	0.207	0.105	0.179	0.262	0.145	0.065	0.271	0.18	0.077
Average	0.175	0.128	0.122	0.264	0.094	0.217	0.264	0.122	0.093	0.302	0.156	0.064
Normalized	66.3%	48.5%	46.2%	100%	35.6%	82.2%	87.4%	40.4%	30.8%	100%	51.7%	21.2%
Ranking	3rd	4th	5th	1st	6th	2nd	2nd	4th	5th	1st	3rd	6th

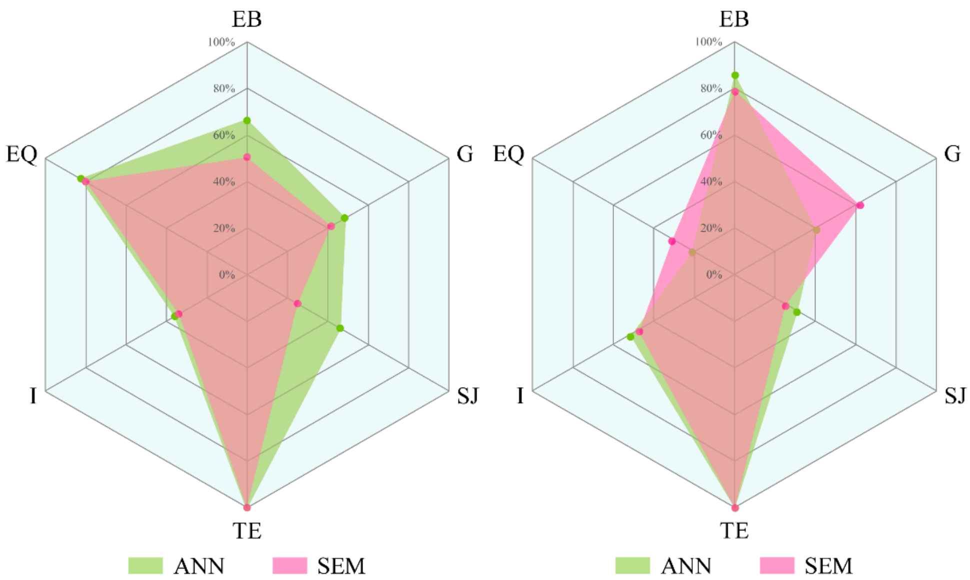

Figure 6. Comparison of SEM and ANN results of barriers to livability satisfaction between Kuala Lumpur (**left**) and Guilin (**right**).

5. Discussion

This study investigated the impact of seven categories of potential barriers to livability (i.e., economic burden, government, social justice, tourism ecology, infrastructure, environmental quality, and individual characteristics) on livability satisfaction, with a particular focus on tourist cities in different contexts. Drawing from the practice-based view, we proposed a comprehensive hypothetical model that includes all barriers. We used SEM–ANN analysis to validate our model. The following subsections discuss the results of SEM and ANN and compare them with the results of past studies reported in this field.

5.1. Economic Burden

The SEM and MAG results revealed a significant impact of economic burden on livability satisfaction in both Kuala Lumpur and Guilin, especially for locals (Kuala Lumpur: β locals = 0.179, $p < 0.001$, β visitors = 0.027, $p > 0.05$; Guilin: β locals = 0.284, $p < 0.001$, β visitors = 0.133, $p > 0.05$), which reflects the findings of prior research indicating the critical role of economic factors in shaping residents' perceptions of urban livability towards sustainable urban development [5,9]. ANN results further highlight its substantial relative importance, especially in Guilin (87.4% compared to Kuala Lumpur's 66.3%). The differences in magnitude between the two cities may reflect their economic disparity and tourism's impact on local economic sustainability. In Kuala Lumpur, specific economic burdens such as housing expenditure (EB5) and medical expenditure (EB4) significantly impact livability satisfaction, resonating with urban studies that point to housing affordability as a critical issue in rapidly developing cities [12,36]. Strong housing and medical barriers are perhaps attributed to Kuala Lumpur's more dynamic real estate market driven by its status as a global city. Conversely, in Guilin, the burden of production expenditure (EB1) and living expenditure (EB2) was more pronounced, potentially due to its status as a premier tourist destination affecting the prices of local goods and services. This aligns with existing research indicating that economic factors such as the cost of living and tourism-related inflation can detract from urban livability and sustainability [4,8].

5.2. Role of the Government

Government-related barriers showed similar significant impacts on livability satisfaction for locals in both cities. This outcome, reinforced by the ANN's relative importance metrics (Kuala Lumpur 48.5%, Guilin 40.4%), suggests that the sustainability (or unsustainability) of policies or strategies implemented by governments plays a crucial role in shaping residents' livability perceptions [36]. Previous literature suggests a universal challenge in integrating livability considerations into sustainable urban development frameworks [40,42]; this study confirms this view, with emphasis on the lack of codes and regulations that cover livability (G1) and insufficient promotion of characteristic culture (G2) in both cities. The MAG findings further underscore the regulatory planning that prioritizes residents' needs and cultural preservation amidst tourism growth is a needed policy for both urban livability and the sustainable development of tourist cities. This is supported by the works of Zhang et al. [30], who advocate for governmental responsibility in safeguarding urban livability and sustainability through comprehensive policy-making and regulation enforcement. However, the issues of one-size-fits-all policies (G3) reflect the necessity for governments to adopt more tailored, context-sensitive approaches to tourism management [41]. For example, compared to Kuala Lumpur, insufficient cultural promotion has a greater impact on Guilin, which might be associated with its status as a national historical and cultural city in China. Thus, for Guilin, a more proactive government role in the adaptation or expansion of policies to local heritage preservation and cultural promotion needs could further improve local livability satisfaction.

5.3. Social Justice

The hypothesis that social justice-related barriers are positively associated with livability satisfaction does not hold. SEM results for Kuala Lumpur and Guilin both show a negative relationship, while the relative importance in ANNs analysis was also lower. This outcome diverges from previous studies [39,43], which indicates that perceptions of fairness and equity are crucial to urban livability towards sustainable urban development. However, the negative effect found in our study is understandable because tourism's economic contributions might often overshadow social justice deficiencies. Previous research illustrated that tourism interests take precedence over community interests in several tourist cities (SJ2), where public projects pay more attention to tourist needs [4]. For tourists, the effects of such decision-making processes are generally positive, enhancing the attractiveness and accessibility of destinations. However, locals see their cities transforming in ways that cater more to tourists than to the long-term sustainability of the community [9]. Our MAG findings confirm this view, as social justice barriers did not have a significant impact on livability satisfaction among tourist groups in both cities. More specifically, for locals, nepotism (SJ1) can lead to feelings of injustice and marginalization, as individuals feel their prospects for economic advancement are limited by non-meritocratic practices [31]. However, tourists, largely unaffected by local employment practices, may remain oblivious to these dynamics, enjoying the amenities and experiences the city offers without a direct impact on their perception of local livability and sustainability. Furthermore, the influx of visitors can strain local healthcare services, leading to overcrowded facilities and diminished care quality for residents (SJ3). This is particularly problematic in destinations where health tourism is promoted, diverting healthcare resources to serve tourists at the expense of local populations [44,45]. Tourists, on the other hand, may benefit from dedicated healthcare services aimed at visitors, remaining largely unaffected by the strains placed on the local healthcare system. locals' and tourists' perspectives highlight a perception disparity in how social justice-related barriers impact livability satisfaction. Hristov et al. [34] attributed this discrepancy to systemic biases in policy-making and resource allocation. Consequently, the findings indicate that the sustainable policy to reconcile tourism development with urban livability lies in the adoption of equitable practices that prioritize the needs and rights of local communities. The literature supports the notion that sustainable tourism development should incorporate social justice principles to ensure that tourism benefits are widely distributed and do not exacerbate existing inequalities [8].

5.4. Tourist Ecology Barriers

Tourist ecology, with its multifaceted impact on urban living environments, emerged as the most significant barrier to livability satisfaction, and was equally critical in both Kuala Lumpur (β locals = 0.295, $p < 0.001$, β visitors = 0.365, $p < 0.001$) and Guilin (β locals = 0.337, $p < 0.001$, β visitors = 0.350, $p < 0.001$), with ANN analysis confirming its paramount importance (100% in both cities). The universal significance of tourist ecology-related barriers across both cities underlines the critical challenge of balancing tourism development with ecological sustainability and livability. This finding is consistent with the literature emphasizing the broad negative impacts of overtourism development on local livability and sustainability [4,5,8,25]. This type of barrier covers the triple bottom line, i.e., specific issues in social, economic, and environmental aspects, which may be critical for the sustainable development of tourism-centric cities but might manifest differently due to their unique ecological and urban characteristics. As revealed by the SEM for this study, in Kuala Lumpur, specific tourist ecology-related barriers such as carbon emissions (TE4) and extensive water consumption (TE3) significantly impact livability satisfaction, resonating with sustainable tourism studies that point to tourism as a significant factor in the increase in greenhouse gas emissions worldwide, and various tourist activities can greatly enhance overall water use by tourism [32,49]. These specific barriers may be attributed to the huge number of tourists that Kuala Lumpur attracts as a world tourism city. Conversely, in Guilin, the impacts of social media rumors (TE1) and waste generation (TE6) were more pronounced, potentially due to the high popularity of short-video social media such as TikTok in China, while waste disposal efficiency was reduced due to tourism pressure. As stated in previous research, rumors tend to spread faster on social media and are the most serious threat to social order and government management [46–48]. On the other hand, an increase in tourism will also lead to an increase in waste generation [32,34]. These results suggest the need for integrated approaches to urban development and tourism planning that mitigate the adverse physical impacts of tourism while promoting network atmosphere stewardship. This calls for collaborative efforts involving governments and the tourism industry to implement sustainable practices that balance tourism growth with ecological preservation, ensuring the healthy development of cities, for instance, engaging tourists physically or virtually in sustainability efforts to foster a collective responsibility towards maintaining the urban atmosphere.

5.5. Infrastructure Barriers

Infrastructure-related barriers showed similar significant impacts on livability satisfaction in both cities. This aligns with urban development literature that emphasizes the importance of infrastructure in enhancing the quality of life [10,28]. Lack of maintenance of infrastructure (I1), insufficient parking availability (I2), and uneven distribution of urban lighting (I3) underline the similar tangible effects of infrastructure deficits on livability satisfaction in both cities. These findings resonate with the broader literature on sustainable urban development, which consistently points to the importance of well-maintained, accessible infrastructure in enhancing quality of life and promoting social sustainability [15,36,39]. However, ANN results show varied importance of infrastructure in Kuala Lumpur (35.6%) and Guilin (51.7%). The variation in its impact between Kuala Lumpur and Guilin may reflect differences in policy priorities and infrastructure development stages, with Guilin experiencing a more substantial impact, possibly due to its rapid tourism growth outpacing infrastructure development [40], suggesting that tourism cities in different contexts need to formulate infrastructure development strategies for specific situations.

5.6. Environmental Quality Barriers

The SEM and MAG results revealed a significant impact of environmental quality-related barriers on livability satisfaction in both Kuala Lumpur and Guilin, which echoes global urban livability research that prioritizes environmental sustainability [2,26,39], emphasizing the centrality of a good living environment in the livability satisfaction of tourist cities. Environmental factors such as air pollution (EQ1), noise pollution (EQ2), and flaws in street design (EQ3) impact the experience of locals and visitors in both cities to similar degrees. These findings align with past research, which reveals that clean air, noise control, and thoughtful urban design have a positive impact on neighborhood and tourist satisfaction [10,11,51]. However, ANN results showed a higher importance of environmental quality in Kuala Lumpur (82.2%) compared to Guilin (21.2%). The difference in its relative importance between the cities may reflect varying levels of industrial activity, urban density, and environmental policy effectiveness [11], as Malaysia's heavy industry is mainly concentrated in the Masang Valley area centered in Kuala Lumpur. Kuala Lumpur and adjacent areas are the areas with the fastest industrialization and economic development in Malaysia. In contrast, there are almost no heavy industries in Guilin, possibly due to its renowned natural scenery and policies to preserve it. Comparison of the cities further illustrates the importance of context-specific strategies to address environmental challenges, ensuring that tourism development efforts are aligned with the preservation of environmental quality [4].

5.7. Individual Characteristics

Past studies reflect that individual characteristics, including gender, age, and education, influence satisfaction: Tournois [16] stated that satisfaction is closely linked to the age of respondents, K. Singh et al. [53] showed that a higher level of education leads to greater well-being for women, while Zhou et al. [54] found that age and education were negatively correlated with subjective well-being. However, the absence of a significant relationship between individual characteristics (gender, age, and level of education) and livability satisfaction in the context of Kuala Lumpur and Guilin, as found in this study, presents divergence from the findings of these works. This difference may be attributed to the cultural context and the evolution of environments. The impact of individual characteristics on livability satisfaction may vary significantly across different cultural and urban contexts. Malaysia and China emphasize community well-being over individual satisfaction, which could dilute the impact of personal attributes on perceptions of livability [70]. On the other hand, given the focus of this study on tourist cities, Kuala Lumpur and Guilin have undergone significant transformations aimed at enhancing urban livability and accommodating tourism, possibly leading to improvements in urban infrastructure and services that uniformly raise livability satisfaction across different demographic groups, thus masking the effects of individual characteristics [71]. Furthermore, individual adaption could also explain the differences. Individuals living in urban areas, particularly in cities with high levels of tourism, may develop adaptive mechanisms to navigate the complexities of their environments. Such adaptations could diminish the apparent impact of personal characteristics on livability satisfaction, as individuals learn to find satisfaction within their contexts regardless of age, gender, or education level [72].

6. Conclusions

6.1. Theoretical Implications

This study contributes to the urban livability, tourism, and sustainable urban development literature in multiple ways. First, this study builds the theoretical framework of barriers to urban livability by empirically quantifying the barriers to urban livability in the context of tourist cities, providing an understanding of how different potential barriers, i.e., economic burden, government, social justice, tourist ecology, infrastructure, environmental quality, and individual characteristics, impact satisfaction with urban livability, highlighting the diverse challenges and priorities that tourism-centric cities face in balancing tourism development with livability towards sustainable development. Second, by employing a dual-stage hybrid approach, this study demonstrates the efficacy of combining SEM's capability to model quantified correlations among identified barriers to urban livability, with ANN's strength in capturing nonlinear correlations and ranking significant antecedents demonstrating a novel methodology capable of capturing the complexity of urban livability dynamics. Third, by analyzing the contrast between locals and visitors in both Kuala Lumpur and Guilin, this paper provides an international comparative perspective to address a gap in the literature regarding the comparative analysis of livability in tourist cities across different cultural, spatial, and policy contexts, thus contributing to our understanding of the universal and unique factors influencing urban livability, thereby enriching a more globalized discourse on sustainable development of tourism cities.

6.2. Policy Implications

This study's findings offer several insights for local governments, policymakers, tourism managers, and stakeholders involved in the development and maintenance of tourist cities.

First, governmental agencies must adapt policies and spearhead efforts to mitigate the economic burden, social justice, and infrastructure-related barriers arising from tourism, the first two of which are particularly critical for locals. Economic policies should focus on ensuring housing affordability and regulating tourist-related inflations to balance the economic benefits of tourism with residents' well-being. This could involve the development of mixed-use housing that accommodates both locals and tourists, ensuring a sufficient supply of affordable housing through subsidies or incentives for developers and creating regulations to manage short-term rentals to prevent excessive rent hikes. These initiatives are designed to alleviate housing shortages and control rental prices to mitigate economic pressures on locals, thereby ensuring that tourism development contributes positively to the overall well-being of residents. Additionally, policies to ensure equitable distribution of tourism benefits contribute to improving social justice issues. This involves creating opportunities for local employment, supporting small businesses, and ensuring that public projects cater to both tourists and residents. The government could prioritize local hiring for tourism-related jobs and provide training programs to enhance local workforce skills. It can also implement anti-nepotism policies and promote merit-based hiring practices to enhance fairness and economic opportunities and mitigate feelings of injustice and marginalization among locals. Furthermore, they can support community-based tourism projects that involve local residents in tourism planning and decision-making processes, ensuring that local communities have a say in how tourism develops in their areas. By promoting fairness and equity, governments can enhance the social fabric of tourist-centric cities, thereby improving livability satisfaction. For infrastructure, policies should prioritize public transport, green spaces, and essential services. For example, cities could develop integrated public transport systems that connect tourist attractions with residential areas, reducing traffic congestion and improving accessibility for both residents and tourists. They can also expand urban green spaces to provide recreational areas for residents and tourists alike, promote environmental sustainability, and maintain sufficient parking availability and even distribution of urban lighting. Meanwhile, infrastructure planning should incorporate resilience to accommodate fluctuating tourist populations without compromising on service quality for residents. This includes ensuring adequate water supply, waste management systems, and healthcare facilities that can handle increased demand during peak tourist seasons. These areas require strong government commitment so that the tourism sector's growth does not come at the cost of social justice and livability.

Second, addressing the barriers associated with tourist ecology and environmental quality requires coordinated efforts from all stakeholders involved. Sustainable development policies that minimize environmental impact and conserve both natural and urban livability are essential. This includes addressing issues associated with carbon emissions, water consumption, and waste generation in urban environments, which could be considered through participatory planning processes that involve all stakeholders in meaningful dialogue and decision-making, fostering collective responsibility towards environmental stewardship. Promoting eco-friendly tourism activities and encouraging responsible tourist behaviors are vital steps towards minimizing the ecological footprint of tourism. This includes measures such as enforcing environmental regulations, promoting sustainable travel options, and engaging tourists in conservation efforts. For example, cities could implement eco-certification programs for tourism businesses, promote travel options like cycling and walking tours, and volunteer campaigns. Additionally, tourism development policies should emphasize the importance of preserving natural landscapes and cultural heritage, integrating these elements into the broader tourism experience to enrich visitors' understanding and appreciation of the destination.

Third, the study's findings underscore the necessity for policy adjustments that address the unique challenges faced by tourist cities in different contexts. Policies should be calibrated to the specific needs and characteristics of each city, taking into account factors such as cultural heritage, urban density, and socioeconomic dynamics. For instance, in cities rich in cultural heritage like Guilin, policies should focus on cultural preservation, leveraging tourism to support and enhance local traditions and historical sites while ensuring that development is respectful and sustainable. Conversely, in dynamic urban environments like Kuala Lumpur, policies need to address the challenges of rapid urbanization, focusing on smart city solutions that leverage technology to improve infrastructure, manage traffic congestion, and ensure sustainable urban growth. Furthermore, policy implementations must take into account the needs of tourists, businesses, and permanent residents, as well as be subordinate to the overriding objective of increasing well-being and improving the quality of life of residents.

Fourth, while the study found no significant relationship between individual characteristics (gender, age, and education) and livability satisfaction in the context of Kuala Lumpur and Guilin, this does not imply that these factors should be ignored. Instead, sustainable policies that seek to balance tourism development with urban livability must account for the diverse needs of different demographic groups to maintain and stabilize the local social fabric. From a macro perspective, policy adjustments or developments should be inclusive and aim to create living environments that are universally accessible and beneficial to all groups and provide reasonable access to resources and opportunities for locals and tourists, regardless of age, gender, or education. For example, implementing universal design principles in public spaces, transportation, and attractions to provide accessible facilities and services that cater to the needs of different age groups and ensuring that healthcare services are reasonably available to all can contribute to enhancing the overall livability satisfaction for diverse demographic groups. From a micro perspective, policies should consider the sensitivities of different demographic groups among locals and visitors, such as providing educational programs and awareness campaigns that highlight cultural sensitivity and promote mutual respect between residents and visitors to avoid potential conflicts between them and designing gender- and age-sensitive infrastructure to provide support services for women and children. Moreover, targeted interventions may be necessary to support vulnerable groups who might not equally benefit from general urban improvements. On the other hand, as noted in the previous discussion, individual adaption and resilience are crucial in urban areas, particularly in tourist-heavy cities. Policies could consider supporting these adaptive processes to improve livability satisfaction for all demographic groups. This could involve offering resilience training programs that help locals cope with the challenges of living in a tourist city, such as stress management, mental health support, and community-building activities. Similarly, they can also provide tourist support services that help visitors navigate and adapt to the local environment, such as visitor information centers, mobile apps with local tips, and emergency assistance services. Inclusiveness, sensitivity, and adaptive considerations in policies aim to address the diverse needs of different demographic groups to ensure that tourism development benefits all stakeholders and enhances overall well-being, thereby fostering a resilient, livable, and sustainable urban living environment.

6.3. Managerial Implications

Although the seven types of potential barriers influence the livability of two cities similarly, either positively or negatively, the magnitudes of their impacts vary, suggesting that these barriers are somewhat universal but have been partially improved through local policy priorities and management efforts. This indicates the potential for complementarities in tourism management or sustainable development policies across different regions. For instance, Kuala Lumpur's policy on providing tourism infrastructure financing funds could potentially address Guilin's challenges with such infrastructure, since infrastructure-related barriers impacted Guilin substantially more (51.7%) than Kuala Lumpur (35.6%). As considered in the existing tourism management literature, in the context of rapid urbanization, most tourist destinations possess the necessary instruments or policies for sustainable tourism management and only need to integrate them into a system [73]. Consequently, the study's findings advocate for cooperative efforts among tourist-centric cities and surrounding areas or neighboring cities to form urban agglomerations and construct a sustainable tourism management system through the mutual sharing of tourism management practices, sustainable development policies, and the complementarity of differentiated resource spatial allocation. Such a system has the ability to monitor, evaluate, and adjust the tourism city policies, ensuring swift and effective management of tourism impacts and providing targeted solutions for balancing tourism development and urban livability.

To implement the sustainable tourism management system in urban agglomerations, consideration must be given to educating all stakeholders about the importance of sustainability in tourism, including local governments, cooperation departments and businesses, community groups, and residents, providing training and workshops to ensure a common understanding and commitment to sustainable tourism and urban development goals. A comprehensive needs assessment should be conducted through surveys, interviews, and focus groups to understand the specific challenges and opportunities for tourism development within the urban agglomeration. Based on the input, tourism management policies that support sustainable urban development should be implemented through inclusive processes, ensuring that the voices of local communities, business owners, environmental groups, and tourists are heard and considered. Furthermore, key performance indicators (KPIs) should be established to measure the effectiveness of the tourism management policies, and these metrics used to monitor progress. Additionally, a continuous feedback loop that allows for regular assessment and adjustment of policies based on performance data and stakeholder feedback should be maintained.

Of note, the implementation process may encounter several challenges. Bureaucratic inertia, resource constraints, and the balancing of diverse stakeholder interests are key obstacles. Government departments and policymakers need to be prepared for potential resistance from various stakeholder groups, especially when proposing significant changes to existing tourism management policies. The successful implementation of sustainable tourism management systems in urban agglomerations depends on a variety of drivers, requiring government leadership, equitable distribution of tourism benefits, context-sensitive policy adjustment procedures, and the joint efforts of all stakeholders.

6.4. Limitations and Future Research

This study, like all research, has limitations that must be acknowledged. First, despite the comprehensive literature review, it is possible that not all relevant barriers were captured, particularly barriers directly linked to tourist activities. Future studies could broaden the scope to include possible potential obstacles to urban livability, such as schedules to main tourist attractions and the effects of tourists' urban footprint. Moreover, the impact of smart city technology, foreign policy, and corporate transformation on urban livability also deserves attention. Second, our study aimed to assess the livability of different tourist cities through satisfaction and did not incorporate the analysis of objective data. Future research could use multi-source data to conduct a detailed comparative analysis using a subjective–objective approach. Third, this study's cross-sectional design provides a snapshot of the barriers to urban livability at a specific point in time; however, urban dynamics and tourism trends are subject to changes over time. A longitudinal study design would allow for the examination of how these barriers and their impacts on livability satisfaction evolve.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Ethic Committee for Research Involving Human Subject of Universiti Putra Malaysia (JKEUPM–2022–269), and the Academic Integrity and Research Ethics Committee of Guilin University of Technology (–GLUTYS–2023–37).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Measurement items.

Construct	Measurement Item	
Economic Burden (EB)	EB1	The cost of production activities due to tourism is burdensome.
	EB2	The cost of living expenses increases due to the impact of tourism.
	EB3	The cost of education has risen due to the impact of tourism.
	EB4	The cost of medical services increases due to the impact of tourism.
	EB5	The cost of housing has become unreasonable due to tourism demand.
Government (G)	G1	There are inadequate codes and regulations to ensure livability in the face of increasing urban tourism.
	G2	The government does not effectively protect and promote local cultural characteristics amidst tourism development.
	G3	The policies implemented by the government are one-size-fits-all and do not address the specific needs arising from the tourist city.
Social Justice (SJ)	SJ1	Nepotism and favoritism in tourism exist in this city.
	SJ2	Lack of democratic management of urban tourism in this city.
	SJ3	The quality of healthcare services in this city does not meet my expectations.
Tourist Ecology (TE)	TE1	Social media rumors hinder the livability of the tourist city.
	TE2	Traffic congestion hinders the livability of the tourist city.
	TE3	Excessive water consumption hinders the livability of the tourist city.
	TE4	High carbon emissions hinder the livability of the tourist city.
	TE5	The destruction of biodiversity and natural resources hinders the livability of the tourist city.
	TE6	Poor waste management hinders the livability of the tourist city.
Infrastructure (I)	I1	The infrastructure in this city is poorly maintained.
	I2	There is insufficient parking available in this city.
	I3	Urban lighting is unevenly distributed in this city.
Environmental Quality (EQ)	EQ1	Air quality in this city is poor.
	EQ2	Noise levels in this city are too high.
	EQ3	The design of streets in this city has many flaws.
Satisfaction with Urban Livability (SUL)	SUL1	Unhealthy tourism consumption patterns reduce my satisfaction with urban livability.
	SUL2	Corruption reduces my satisfaction with urban livability.
	SUL3	Pedestrian unfriendliness reduces my satisfaction with urban livability.
	SUL4	The low sense of security in the city reduces my satisfaction with urban livability.

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